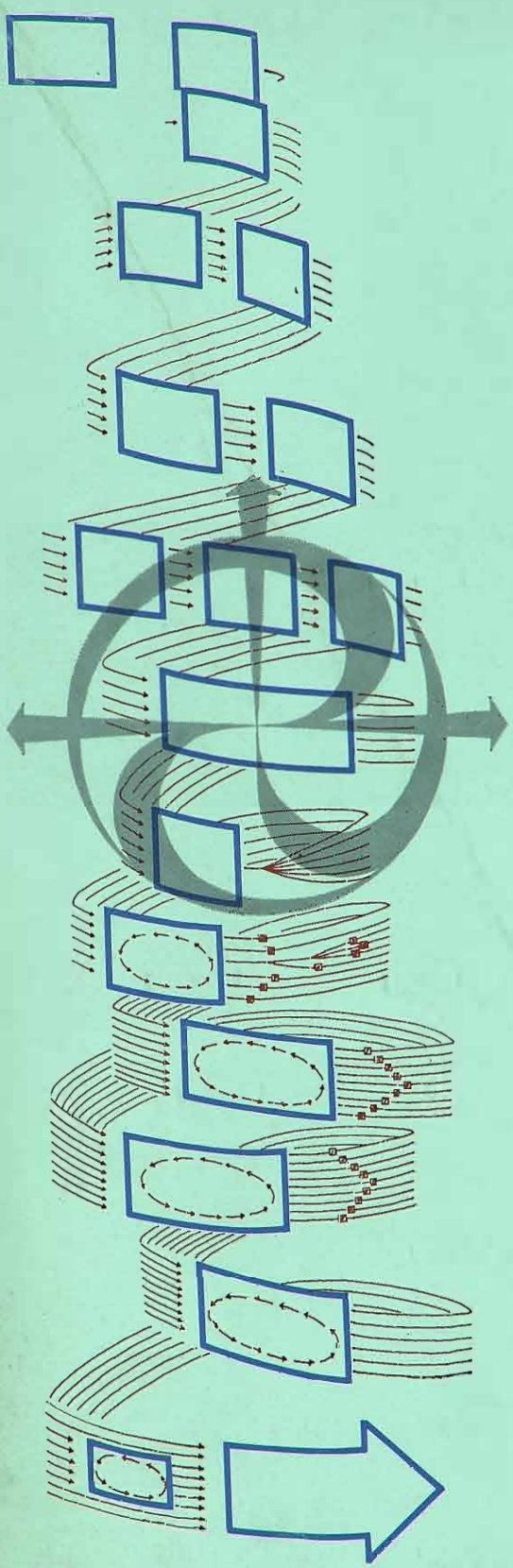

HUMAN NEEDS
NEW SOCIETIES
SUPPORTIVE TECHNOLOGIES

COLLECTED DOCUMENTS PRESENTED
AT THE ROME SPECIAL WORLD
CONFERENCE ON FUTURES RESEARCH 1973

VOLUME V

IRADES
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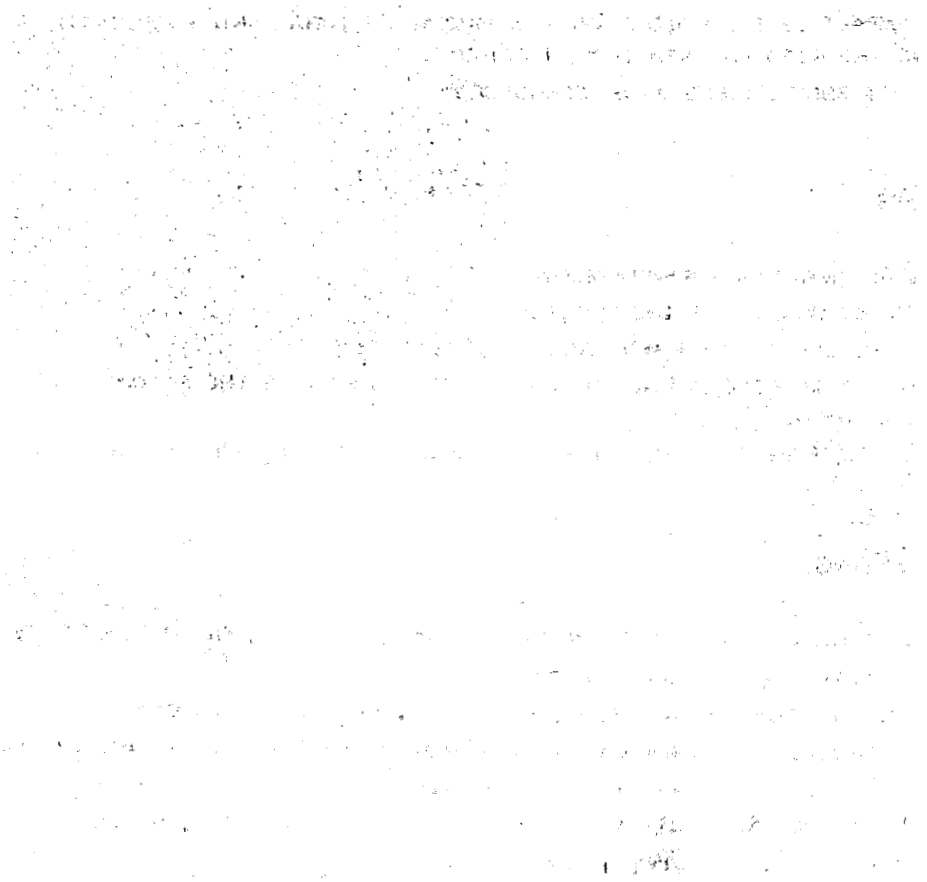

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Blueprint for a new technology: old technologies revised, intermediate technologies, innovative technologies, revolutionary technologies, new technological systems, communications technologies.

SOCIAL NEEDS AND INTERMEDIATE AREAS OF TECHNOLOGICAL INNOVATION

By Giuseppe de Rita
Counsellor Delegate of the Centre
of Studies and Social Investment

One of the problems which most frequently comes to light when we speak of new and future technologies is the tendency in cultural debate to favour a kind of dichotomy of enormous gravity: on one hand, the headlong plunge toward the somewhat futuristic formulation of easy, definitive technological solutions to problems never yet resolved (or of equally definitive ecological degradations); on the other hand, an attitude of almost total resignation to the present-day technological and organisational reality of our social order, yet critical of it as inadequate to our needs no less than to our aspirations.

Nothing good can come of such a dichotomy, or rather, nothing better can come of it than simply a dangerous line of schisms in attitudes and individual and collective expectations (for one thing, of absolute faith in future technology; for another, of frustration or passive acceptance of present-day breakdowns) without an intermediate area of commitment to a concretely possible improvement in what already exists.

It is indeed evident that it will not be easy to construct the future until we overcome the schism separating reality, expectations and technologies or until we establish intermediate fields and levels of concrete commitment. Since the development, technological no less than civil, of a society depends on the capacity of those who comprise that society and govern it, to operate in the realm of the concretely achievable and with concretely available instruments.

Such an evaluation arises from the normal observation that in modern societies, needs, the mechanism of evolution and intervention policies all have a configuration which is not dichotomous (preserving the existing and of future extrapolating) but one which defines and pursues spaces, breches, areas of commitment and action, which are all of them of intermediary type.

- indeed, the real needs of a society in development are all bound more to the demands of complex transformations in the various sectors of economic activity and social order than to the demands of a radical, unbalanced pursuance of various innovations which are highly advanced but isolated from the quantitative and qualitative evolution of the system in its totality;

- the mechanism themselves of such an evolution do not proceed by unidirectional and direct thrusts (as with scientific and technological progress) but rather come into being through processes of the reticular type, which aim to involve in the evolution all the cells of the social organism without the forward leaps that create dangerous solutions to continuity;

- and also in the public interventions into the mechanism of evolution (that is, in those interventions which could more lucidly aim at future objectives, technically well selected and technically well carried out), it becomes clearer every day that there is almost never any correspondence between political will and the instrumentation (even technical) of intervention, since the conditioning of the structures, of persons and of the techniques of existing intervention is constantly strong.

The process of innovation, therefore, and the consistent utilisation of new technologies hardly ever advance rectilinearly but rather in terms so complex that they impose the need for an intermediate commitment to needs of the intermediate type, to mechanisms of development and intervention structures of the intermediate type, with intervention techniques and operative technologies likewise of the intermediate type.

To prove this observation, one need only analyse the effective reality of any society which is modern and/or in rapid development (in our case, the references can easily apply to the Italian situation) in its configuration of needs and intervention and the consequent role of technology in those broad sectors of civil life where the demands for innovation are more markedly evident, and where the results expected of technological progress are greater and of greater political valency.

In particular we can remember what happens in terms of the schism separating reality, expectations and available technologies from the growing demand for intermediate zones in various important sectors of social intervention and key problems of economic development.

A) As for the great sectors of social intervention (those which relate more directly to individual and collective needs and expectations), a few large examples will enable us to explore in depth the hypotheses previously proposed.

a) Let us consider first what happens in the health service sector where, in most cases, the satisfaction of needs is guaranteed by an organization which is highly traditional and often downright archaic in its concept of health intervention; in the rigidity of the hospital's physical and organisational structure; in its tendency to cure the disease without ever taking preventative measures; in its methods of reinsertion into social life; and so on.

In opposition to this there exist some scientifically and technologically advanced sectors of research and experimentation -- biomedical research laboratories where new curative procedures are developed (sometimes with too much fanfare); pharmaceutical houses blaring forth publicity announcement every day that create high levels of expectation; hospitals performing extremely delicate operations which are "unique" in the world; techniques and intervention instruments -- artificial members, ultrasonic devices etc. --

indicating what can exist in the coming years; pilot centres (of prevention, mass screening, etc.) directed toward a radical transformation of sanitary systems, which are still experimental, even the most advanced.

By consequence, it is understandable that, in a mass civilisation -- in which the potential fall-out of news and hopes is extremely high -- the population and common opinion will end up by nurturing expectations far beyond the reality of the present health system and the concrete possibilities of innovating it. In other words, people who have read in the newspapers or heard on television about heart transplants will undoubtedly believe that the same kind of operation can be adapted immediately to cure their own cases.

Persons who hear a certain drug loudly praised, even it is still in an experimental phase, will be wholly convinced of its efficiency and want that drug for their own aliments.

Persons who hear about new surgical techniques will expect to benefit by them at the nearest hospital or dispensary. Thus grow expectations calibrated on the most technologically advanced stages but wholly disproportionate to the everyday reality of today's health system.

Indeed, not enough attention is being paid to those problems and intermediary technologies which make it possible to take adequate measures toward modernising the health structures and which are concretely open to implementation: the training of medical and paramedical personnel (partly by new didactic technologies); modernising the technological apparatus of centres working more or less potentially in prevention; introducing electronic equipment to computerise data on various diseases and their treatment, automatising hospital management, etc.; and those thematics which alone make it possible to break out of the conditionings and distortions of existing procedures without becoming lost in excessively advanced or unattainable objectives.

b) We can find the same situation, although less accentuated, in the sector of scholastic training, the configuration of which notoriously adheres to traditional concepts and methods. We need only think of the concept of the school building, the school-room, the class, the prevailing teacher-student relationship, the text book and the (very limited) work of research and experimentation.

Opposed to this tired, outdated reality is a growing emphasis on new educational technologies which goes so far as to predict the imminent death of the school as a result of the progressive personalisation in the learning process and consequently a progressive recourse to the utilisation of technologies and educational machines programmed instruction, "teaching machines", the instruction calculator, special materials for pre-school children, etc. It is obviously not by chance that there exists today a vaste range of study initiatives, experimental centres, exhibitions and markets, all related to the new educational technologies.

Thus we see an upsurge of false expectations (of the industrial structures on one side and the collectivity on the other) centring on hypotheses concerning future individual and collective training outside current organisational and operational procedures. Thus, inadequate attention is being paid to intermediary technologies of the futuristic type but applied to concrete and already matured problems -- teachers' instruments for training and updating, computerisation of data, experimental use of new equipment, rational employment of information flows; the commitment to execute new programmes and educational software, the utilisation of open-circuit or cable television, etc.

c) No different is the plight of the civic infrastructures in the great metropolitan areas. Indeed, we know how various phenomena housing shortages, transportation crises, the excessive length of time required to get about the city, the inadequacy of civic and social services, atmospheric pollution,

excessive noise, heavy traffic-impinge on the quality of urban life. Although these phenomena are becoming more and more dangerous, too little has been done about them in recent years.

Yet, we have an extensive international literature on optimal infrastructural technologies in rapid transit, new construction technologies, new plants to neutralise pollution and protect the environment, and new instruments for communications and interpersonal relations. The citizen who reads about experiments in monorail trains zooming at 200 kilometers per hour, plants for recycling water or electronic devices for regulating traffic will tend to frame his own expectations in overoptimistic proportions or, at least, to deplore the yawning gap between technology's abstract possibilities for urban services and actual conditions today.

Nevertheless, there is little commitment on the intermediate level aiming to resolve today's problems by adopting intermediate, not highly advanced, technologies.

Little attention is being given to problems of computerising the flow of traffic, industrial management of important distribution services, or the methods and techniques of industrialising the building construction sector and modernising the planning of its work. Consequently, in this sector, too, there is a dangerous dichotomy between the expectations encouraged by the public's awareness of new technological frontiers and its awareness of the defects and limitations of the situation today.

B) These same reflections on social intervention are equally valid although with different emphases, in the matter of production development.

Here, too, we are accustomes either to criticise a basic reality often technologically and organisationally backward, or to demand the contributions that could be made to economic development

through stepped-up scientific research and technological innovation. But we fail to realise clearly enough that the process of economic development, even where it is well advanced in the sectors and business industries benefitting from highly developed technology, can be achieved historically in the necessarily slow evolution in the productive areas of the intermediate type.

In this connection, we need only remember that in modern societies:

- there is a growing weight of the tertiary sector, that is a sector in which a rapid, rectilinear technological innovation is not possible;

- there is a strong innovative conditioning because of the weight of those activities and structures which provide the context and service to directly productive initiatives (scholastic training, public administration, the credit system, etc.), which do not always countenance new technologies;

- there is a fabric of individual attitudes and behaviour patterns which, bound to the prevalent type of culture and the naturally slow pace of its transformation, cannot always guarantee the necessary "subjective" impulse toward innovation and the introduction of new technologies.

To be sure, modern society is so complex that it prevents the new technologies from playing an autonomous and autonomously propulsive role. Instead it demands an innovatory programme capable of functioning in intermediate situations and by means of mechanisms which are not rectilinear but rather reticular.

Society as a whole does not make this demand; however, we find it even in the industrial sector, commonly thought to be the most open to technological innovation and therefore best able to guarantee coherence in the "new technology-development" equation and a rapid reconciliation with it. Stated otherwisely, in the

industrial sector there are:

- differences between sub-sectors which are technologically highly sophisticated and sub-sectors which are still extremely traditional and backward;

- marked contracts between large corporations which have excellent prospects for carrying out their own scientific research and innovating technologies and a myriad of small and medium enterprises which cannot cope with advanced technologies;

- advanced fields of technological commitment (to answer military, spatial and other demands) but with a fall-out of results (the so-called technological fall-out), which is still very slow;

- management options in which technological innovation claims primary importance, but also management options conforming to wholly different frameworks of reference (the market, labour costs, the size of enterprises, international integration, etc.);

- levels and types of personnel which accept new technological levels or automatically pursue them, but also vast areas of retardation and subjective resistance to innovation.

Therefore, in industry too, that is in the sector in which the predominant role played by the new technologies most often requires complex innovatory processes that can be inserted into those areas and mechanisms which are the basic weft but not the more evident aspect of a modern society's economic fabric.

- III -

The considerations examined in the preceding pages enable us to draw several conclusions, although certainly not definitive, on the social role of technology in a modern society:

- technological development does not of itself have that rectilinear character or dominating rectilinear capacity so often attributed to it, but rather involves only innovatory processes which must ultimately be pursued and actuated via specific actions in all the various phases of economic and social life;

- in the new technologies, such actions can find valid instruments of intervention; however, it must not be forgotten that the innovation of a society is a complex problem and therefore it must involve persons, structures, the apparatus of intervention, whole cultural and whole intervention conceptions;

- therefore, we must be able to work on objectives, needs and instruments which are consistent with the complexities of a given historical moment and which can avoid the danger of flattening what exists no less than the danger of fleeing beforehand from what can exist in the future;

- in this complex, "intermediate" formulation of the commitment to economic and social innovation, technology can have its influence but only insofar as the intermediate types of technologies are utilised, consistent with the needs and objectives to be pursued in the medium period.

The direction and speed of a development process are much less lucid phenomena than is generally imagined, since the life of a society is determined by the sum total of its phenomena, its processes, mechanisms, persons and groups which, naturaliter, refuse to be considered as a simple function of technological progress. If it is true, therefore, that historical processes evolve

from continual imbalances and reflexes (and which, as a consequence of the technological process as a primary factor of imbalance, constitute an irrefutable element of every development process), it is no less true that the social role of technology cannot be separated from a general process of programming innovative mechanisms, i.e. from a constant commitment to articulate the needs, objectives and instruments (including technological) under discussion today.

In this respect, the cultural responsibility of those involved with the future and with technology demands that they must not falsify the historical perspective in which we all find ourselves today; nor to falsify the concrete possibilities of technological innovations as a factor in solving many economic and social needs; nor to falsify the collectivity's expectations of the technological process hence, by consequence, the typically political relationship which links together the evaluation of needs, the evaluation of expectation and the evaluation of the technological instruments available.

This is a pledge of cultural honesty to which we must all adhere, not only those among us who are involved with research and innovation but also -- and perhaps especially -- those among us who have primary responsibilities in the process of guiding public opinion.

IS MANAGEMENT AND CONTROL OF TECHNOLOGY POSSIBLE?

By Lars Ingelstam
Secretariat for Future Studies

1. Background

Statements about the need to assess, manage and control technology abound. This no doubt represents a broad tendency, but one that gets its inspiration from quite different sources - from uncompromising anti-technologism to fears that Europe may be lagging behind the US and Japan in sophisticated production.

However, a fairly broad consensus seems to have been formulated in the Brooks report (°) to OECD, which states

> "Two central themes can be discerned in the situation of the OECD countries in the coming decade:
>
> 1. economic growth per se is no longer a sufficient overall objective, and
>
> 2. further interventions in the operation of the market economy will become necessary."
>
> .....
>
> "If, as we believe, growth and technological progress are two aspects of the same phenomenon, we can no longer consider technological progress as an indipendent variable. Science and technology are an integral part of social and economic development, and we believe that this implies a much closer relationship between policies for a science and technology and all socio-economic concerns and governmental responsibilities than has existed in the past."

The Ministers of Science of the OECD contries, in their meeting in 197I, stressed these aspects and as a result OECD is now so-

---

(°) Science Growth and Society -- a new perspective; OECD Publications, Paris, 197I

lidly committed to the idea of management and control (see also 37). The picture would seem to be essentially the same in other international organizations and in every industrialized country, at least in the West.
So far, so good. But this concern must be pursued further in at least two directions:

(1) The potentials and dangers of <u>particular technologies</u> must continually be put before decision-makers and the public, in terms as concrete and challenging as possible.

(2) Instruments for shaping and implementing <u>policy</u> must be developed (and used!) in order to get beyond both the beautifully phrased confessions to principle, and the necessary but fragmented cries of alarm.

The present paper intends to contribute to the latter of these points. The author's background and frame of reference is largely Swedish and he speaks of course only for himself.

2. <u>Management and Control - a need is felt</u>

Seen from this author's viewpoint, the general attitude towards the <u>need</u> to control and manage technology has undergone a very drastic change during the last few years.

Analyzing the debate, and in particular the possible mutual dependence between the more general attitudes towards technology on the one hand, and the prevailing economic climate and outlook on the other, would require much more space and effort than are available for this paper.

It is clear, however, that philosophically based, negative <u>and</u> fatalistic attitudes towards technology (such as those expressed by J. Ellul) has not played any significant role in the Swedish debate, at least not in recent years. The approach has been pragmatic and has at all times recognized that an interdependence exists between technological development and economic forces. Possible explicit and implicit assumptions about the nature of this interdependence and its significance for technological policy will be discussed below in Ch. 3.

It stands beyond doubt that the increased recognition of environmental problems during the last decade (Rachel Carson's Silent Spring appeared in 1962) has had an impact on public opinion such that the need to control technology is now apparent to everyone. The impact of this question alone had probably been quite enough to initiate the re-thinking that is now on the way.

But two other broad factors seem to have been of roughly equal importance in creating pressure for a more responsible and explicit management of technology.
One factor is the situation on the market for consumer goods.*)
Everyone knows that a good many products have become inferior in quality in recent years. While sophistication of products has in general increased, the really important characteristics such as durability, reliability and serviceability have too often decreased. Duplication in products, often excused and made possible by some non-vital but sophisticated technical function, is notorious. Commercial advertising focusses attention on non--essentials - technical or non-technical - and quite often tries to sell by pointing to such details in design and technology that everyone in his right mind must agree are harmful and dangerous.
There are many aspects of this "commercial pollution", but the one that interests us here is that clearly technology in this sector is not in fact brought to its best possible human use. The wide discrepancy between what is and what ought to be (far beyond any mystification such as "economic life-time" as opposed to "technical life-time") is beginning to create in people an anger that human ingenuity is put to such bad use; this anger must and will gradually be transformed into demand that explicit social priorities be set up for the management of technology.

The third area for technological awareness - in addition to environmental impacts and the conditions on the consumer market - is the situation in the working-places, particularly the conditions in producting industry. There has been a considerably

*) I speak here of course only of the situation in a rich segment of a rich country, and I am quite aware of the fact that what is said may seem irrelevant or even cynical if applied to poor countries.

sharpened attention to this problem in later years, after the problem first presented itself in the form of chemical and acoustical threats to the human body in the place of work - hence a close parallel to the concern for the "external" environment. However, the attention on these problems has also led to the recognition of psychosocial factors (stress, over- and understimulation etc.) that may also have somatic effects. But this again naturally leads over to the broader question of the role of human qualities in the organization of production technology. Beyond the very monotony of many jobs, questions are now being raised about the possibilities to communicate, to cooperate, to plan together and to re-organize routines and procedures. All these aspects are partly technological, and it is increasingly felt that the way technology has been designed is not adapted to long-range requirements of efficiency, considering the human component, and does not use technological skill so as to make the best use of both man and machine.

3. Are there means?

31. Means and policy

We now proceed the questions of means and techniques for the control and management of technology, for which the need is so clear. What means exist, which of them are feasible, which are the underlying assumptions? This chapter attempts to approximate answers to some of these questions.

Since action from society can be direct only in rare instances, policy has to be applied at points one or more causal steps away from the actual technology.
Hence, if society wants to adapt and develop technology according to social priorities it needs two things:

(1) an understanding of the basic mechanisms affecting technology

(2) a set of policy instruments to be used for management (such as legislation, taxation, grant-giving etc.)

It would be neat and logical if the sequence goals/priorities - mechanisms - policy instruments - policies - effects could be discussed in exactly that order.

It seems, however, that it cannot and that this is part of the trouble. Policy instruments have been developed without any clear understanding of mechanisms, or even assumptions about them. Too often policy instruments have been created but left hanging without goals or priorities to govern their actions.

Hence, the brief discussion that will follow will be structured not according to the logical order but rather after broad "philosophical" (metapolicy) alternatives that exist in fact or in theory.

32. Strict sectorization

There is a fairly well established traditional idea (visible in statistics, political debate etc.) to regard technological development (and science, lumped together as R&D) as one "sector" of society, alongside all others. The attempt to control and manage by strict sectorization represents a radically different view-point. By giving each activity area in society the responsibility not only for execution of current activity but also for planning and development of technology inside its area of responsibility, one may eliminate what is now a problem. The assumption is that, regardless of what more detailed mechanism (see 34, 35 below) are chosen, organizational closeness will bring about the desired harmony between policy execution and technological tools.

The prime limitation of this philosophy is that it is applicable only in such sectors where there is a reasonably well-defined center of responsibility. Such sectors tend to be found mostly in the public domain. Defence is of course the prime example, and in that sector the principle of sectorization has been applied to the full. Defence is also "ideal" (and hence atypical from the planning point of view) since the support to development work and the actual buying are both handled by the same organizational complex.

Examples of sectors in which policy centers lie in the public sphere, and in which strict sectorization of technological responsibility may seem reasonable are health and social welfare (the "social sector"), transportation, education, environment and consumer policy.

The above-mentioned areas are at present covered, as far as support for development work is concerned, by STU (see Appendix). Through its system of advisory committees for different activity areas STU exercises a sort of "proxy" sectorial responsibility. Against full application of sectorization can be argued that, in cases when a particular technology presents itself as an idea, it is not a priori clear to what activity sector it belongs. Also, one notices that considerations having to do with the fact that products eventually have to live with a market (more or less affected by public buying) may require special analysis and that it may be very unpractical to set up market expertise in each sectorial body separately. (This also ties in with the wider problem of relations between technology and economy (see 33, 34, 35).) The "proxy" solution chosen in STU since about two years will yet have to be evaluated, in view of the question whether it represents a reasonable approximation to the strict sectorization model*).

33. Non-specific policy measures

Policy measures directed at promotion (or suppression) of technology in general or at least over broad areas, would, to most observers, seem not to belong to the "management and control" category at all. Such measures would primarily be motivated by market failures leading to too little R&D (which is claimed to be the case in parts of our exporting industry) or sometimes too much (as is often said about the pharmaceutical industry). Could non-oriented policy measures, such as tax deductions for corporations for R&D expenses, or general purpose government funds, also serve as tools for the direction of technology to human needs?

The answer can be yes, provided at least two assumptions about the market are satisfied. One is that the consumer (individually

*) One must notice that this line of reasoning, when applied to STU, refers only to a part of STU's activity. Cf also 33, 35 and Appendix.

or collectively, as the case may be) is well informed about available alternatives and what they will mean to him in the short and long run, the other that no conflict exists between the preferences of the individual as a buyer and his preferences as a member of a collective (in other words when the large number of individual market decisions do not add up to a collective disadvantage, as it obviously does e.g. in the case of the private automobile in cities). However, in cases where these and certain other assumptions hold true, one may conclude that through the intermediary of the market, technology is directed to the needs of individuals.

It is quite clear that most of the reasons (see Ch. 2) for present discontent can be described as market failures; a line of argument often heard from economists is then that one ought to "correct" the market rather than "replace" it. Clearly this points to respectable alternatives that have to be tried undogmatically against others with regard to the specific problem area.

Considerations around selective vs. non-specific measures have recently become necessary in Sweden, where a fund of 30 million Swedish Crowns for industrial R&D was voted by parliament last spring. The political debate around this decision focussed on the relation between the fund and STU, and reflected at least in part a choice between a selective and a general, market-directed philosophy.

35. Selective support

Project-by-project government support has been regarded as the "normal" method of technology management from the point of view of society. Again it may be instructive to take the starting-point in STU.

In the government bill (1968:68) proposing STU the reason explicitely stated for giving support in project form (rather than as general incentives) was in fact the relative smallness and diversity of the institutions that needed support. However, in the political debate taking place simultaneously, the possibility to use STU for increased societal control of technical deve-

lopment was repeatedly stressed.
One can say that a double goal-structure has characterized STU from the beginning; in that it should

(1) support technology that is or can be made marketable (correcting internal market failures)

(2) support technology that is useful to society, but in a way that does not come through adequately through the market (counteracting external market failures).

Clearly these goals will sometimes be in conflict, or one of them would tend to dominate. The re-organization of STU in 1972 (see Appendix) can be seen as a strengthening of (2) as regards broad areas but (1) as regards specific projects.
Finally it should be pointed out that both (1) and (2), but the latter in particular, seem to rest on an unproven assumption of the economic nature of the idea-to-market process: that support in the close end - where technology is created - can create effects in the far end - the, possibly competitive, market - of the kind and magnitude that they can correct the "failure". It has been argued, in opposition to this tail-wags-dog hypothesis, that the concrete effect will only be that the "worst", high--risk projects are handed over to government financing.

35. Selective suppression

When a technology is found or suspected harmful the natural reaction of the legislator or the general public is of course to prohibit it.
This may be all right in simple instances such as firearms or toxic food cosmetics. In most cases, however, the harmful and the beneficial are inextricably interwoven and more complicated considerations are called for.
As for the discharge of environmental pollutants, the debate on whether legislation or fees would be preferable as instrument of control still ranges on. Under certain conditions the two methods are exactly equivalent from an economic point of view. It can be observed, however, that in respect to their effect on technological development, they may in fact differ: under fairly reasonable assumptions it seems that a fee system

will make it more profitable to develop new and more friendly technology than one based on administrative controls.
It also seems that in the case of suppression and sometimes banning products off the market, the questions of conflicts of interest and organizational loyalty become much sharper than when it comes to support. The different existing bodies with suppressive powers or roles (such as the Consumer Ombudsman, the Traffic Safety Board, the newly established Product Control Board etc.) have often been subject of sharp public controversy and have had to safeguard their integrity against outside pressure, e.g. by production interests, in different ways.

36. Science policy as technology policy?

The aim of the few words under this heading is simple: to put in question the wide-spread belief that science and technology are so closely attached that management and control of technology could be handled by policy measures directed at science.
In the first place (as e.g. Derek de Solla Price has repeatedly pointed out) there is no clear-cut causal relationship of this kind to be found in historical material. Against this could of course be said that modern organization of the production of knowledge is such that, nevertheless, there is a close parallelism.
A negative coupling seems to be among the least questionable: without basic competence in science in a certain area the corresponding technology will falter. But then, the "basic competence" is largely international, so seen from a national science policy point of view this assertion is not of much help either.

On the positive side, the interrelation seems even less clear. Trying to create technology of a certain kind mainly by promoting basic science will probably in most cases be one of the most expensive ways of arriving at the goal. On the other hand, the conception of basic science as a resource pool for technology seems, however, well founded and important. Somewhat paradoxocally, it may be that one of the most important uses of this resource pool would be in short-range, "crash" programs for technological development, simply because first-rate <u>scientists</u> can

often be quickly transformed into first-rate technologists, while first-rate science only slowly becomes useful to technology by a more normal working of things.

37. Technology assessment and technology planning

In what has been said above about control and management we have implicitely assumed that there is a way to map out the effects of a certain technology in the broader societal context.

This is, of course, what Technology Assessment (TA) sets out to do. No doubt, TA, as a banner and a movement, has flourished more in the US than in Europe, but it is equally clear that the basic idea of TA has gained recognition in many European countries since several years.

While preparing a report[1] on TA in Sweden, we noted without surprise that quite a few activities already exist that would qualify as Technology Assessment as the term is now used. So even if TA as a "movement" or a set of methodologies is not strongly present on the Swedish stage, the function of TA is recognized.

In addition to the definition currently associated with TA

> "systematic studies of the possible consequences of existing or potential technological methods for society as a whole"

an even higher ambition has often been expressed in recent years. The Swedish Future Studies Commission's report[2] says for instance:

> "Besides this type /TA/ of consequence studies, in which one tries to assess the spread and effects of a certain product or technology at various levels, another possibility presents itself. This is one, in which one tries to tackle a known, non-technical problem or to obtain a certain goal by producing a new tool, tailored to the need... Systematic feed-back from general studies of the societal milieu to people representing technical competence would give a much richer base of ideas".

1) Technology Assessment in Sweden: 9 Case Studies. Secretariat for Future Studies (S-103 20 STOCKHOLM 16), Stockholm 1973

2) Att välja framtid (Choosing a future). SOU 1972:59, Stockholm 1972. An English version is being planned.
The Secretariat for Future Studies was set up as a result of that report.

In the existing attempts at TA, one can notice that their ambitions vary somewhat between these two types - for which the terms divergent ("from technology and out") and convergent ("from society and in") Technology Assessment have been suggested (U. Landergren).

Convergent TA is of course essentially the same as normative planning, applied to technology. In most areas, the idea of controlling technology by means of scenarios of desired futures, is completely unrealistic and will no doubt remain so. But in certain key areas - and I want to mention three

- energy (production and consumption)
- industrial production technology (man and machine)
- technology for non-physical communication

- it should probably be done.

Planning for these technology-heavy areas is difficult, and one will commit many errors. But planning is probably less dangerous than "managing" by the combination of greed, blind forces and chance that we are being led by now.

THE NATIONAL BOARD FOR TECHNICAL DEVELOPMENT (STU)

(Excepts from descriptive STU material)

General description

The Swedish National Board for Technical Development (STU) is the central government agency responsible for supporting technical research and development in Sweden. It is authorised to initiate, follow-up and assist projects from their creation right through to their industrial application. It was created in 1968 and has for the current fiscal year a budget of about 150 million Sw.Crs.

Objectives

The aim of STU is to stimulate technical progress in Sweden and, by so doing, contribute towards the competitive power of trade and industry and towards the development of the community as a whole. This is done by giving support to selective technical development projects in the form of financial aid and other types of assistance.

Sectors of need

In 1971 it was decided that the support to R&D projects whould be directed towards well specified areas of need within industry and the society in general. Accordingly, it selected a list of 10 priority sectors and allocated to each a budget of between 10 and 20 million Sw.Crs. The 10 categories selected were:

Energy technology
Materials technology
Transport technology
Production technology
Chemical, Forest and Wood technology
Information processing, Process control and New Components
Pollution control technology
Social technology (Applied medicine, ergonomics and consumer problems)
Food technology, Bio-sciences and the Pharmaceutical industry
Natural resources technology (incl. sea bottom)

Specific needs and technical developments sometimes make it necessary to adjust this breakdown. To enable STU to meet such exceptions, reserve funds are set aside for the express purpose of handling such projects which either fall outside these sectors or which overlap.

A committee is attached to each sector of need. Every committee has approximately 10 members familiar with the need for R&D within the various sectors, with the developments in science and technology and with the problems associated with the application of R&D results. Their main tasks, as mentioned, are to provide STU with a plan of action and to evaluate the relevance of projects within the framework of each respective sector's objectives and programme of activities.

An administrative unit is also attached to each sector and consists of 2-3 persons employed by STU. The task of each unit is to provide the committees with the necessary basic material for their activities and decision-making functions and to carry out and follow up approved resolutions. The formal power of decision on project support rest with the Director-General of STU.

Project analysis

For proposed projects, STU considers essentially the following four aspects:

a) Project's connection with sectors of need. - The project shall try to solve problems within priority sectors. The most important task of the planning function is to give priority to such sectors which offer particularly good opportunities for making effective contributions to Sweden's trade and industry. Of equal importance are the specific needs for new technological developments experienced by the community as a whole.

b) The project's originality. - The proposed project shall contain clear advantages compared with other known solutions to the problem. STU considers it most important to give support to Sweden's resources of creative ideas.

c) The project's feasibility. - There must be good expectations that the necessary qualitative and quantitative resources are available to complete the project within a reasonable period of time, and also that the results can be put into practice.

d) The risks and resources of a project. - It is important for STU to support projects that involve taking large risks.

APPROPRIATE TECHNOLOGY FOR DEVELOPMENT

By Ranjit Kumar
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& Technology

"... there is the task of playing a significant role in developing a new international community with a different set of values as expressed in terms of national expenditure, from the values accepted today. I lean towards an international community where smaller and smaller sums of money and effort are spent on military activities, and even traditional diplomatic activities, and where we all make increasing contributions to the task of improving the living conditions of all humanity. This objective is founded on the belief that humanity, for all its superficial divisions, is an indivisible and closely-knit community where any significant development in one group has an inevitable and swift repercussion on the whole. We cannot avoid our responsibilities; the challenge is to face them with spirit and imagination."

M. Gerin-Lojoie,
President
Canadian International
Development Agency

APPROPRIATE TECHNOLOGY FOR DEVELOPMENT

This paper outlines a proposal for the creation of appropriate technology institutes in developed and developing economies to encourage a more effective utilization of scientific and technological knowledge in the global development effort. Its purpose is three-fold. First, to sketch a perspective of the human condition as it relates to the ever-widening gap between the haves and have-nots. Then to suggest how a more pragmatic application of the existing scientific and technological knowledge could help diffuse the benefits of these advances to the less developed societies. Lastly, to submit a proposal as to how the educational enterprise could, more profitably, become involved in the development effort and contribute to the alleviation of the looming crisis facing mankind during the Second Development Decade.

MANKIND IN THE 70's

We live in a world of extremes - extreme poverty and extreme wealth. About 1,000 million people on spaceship earth enjoy a per capita income of $2,300.00 a year, while 2,600 million make no more than $180.00 a year, about thirteen times less. What is more alarming is the disparity in the per capita income growth rate; four percent per annum for the rich and only half as much for the rest. The problem is further compounded by the fact the population of the less developed societies is growing at twice the rate of the affluent nations. The cataclysmic implications of this state of affairs is alarming to say the least. Our job is to ensure that this widening gap is bridged in peace and harmony.

One cannot decry the unprecedented efforts of the developed nations, both at the national and international levels, in providing assistance to the developing countries

since World War II. However, this enterprise has suffered from four major shortcomings. Firstly, the aid programs have been insufficient in relation to the needs of the developing world. Secondly, the development effort has been characterized by the 'black box' approach - an idea that you pump money and technology into the box called "development process" and out comes a developed nation. This has led to massive investment in many gigantic prestige projects resulting in enclaves of prosperity, but with little or not effect on the economic condition of the large masses of population. Thirdly, insufficient attention has been given to understanding the diffusion process which would equitably distribute the benefits of development assistance. Massive doses of assistance concentrated in high technology projects have often prduced secondary effects which seem to have created new social and economic problems in the process of solving the old ones. The net value of such endeavours has sometimes been negative.

Finally, the major thrust of the past decade or so has been on the achievement of aggregate economic objectives such as, five percent increase in the GNP of developing countries. This approach was based on the belief that such improvement would almost automatically provide better living and social conditions for all. Unfortunately this did not take place. As the Pearson Report points out, "Development was too often only seen as a consequence of decision-making at the top. The vital need to bring about mass participation in development was at times sacrificed to the enrichment of special groups or individuals."

Changing Perspective

The main focus of this paper is on the nature of technology necessary to the development process. However, at this point, it is important to make two observations concerning the changing perspectives in development.

Firstly, there is little doubt that most participants in the development effort are

in the process of re-examining their objectives, especially after the disappointment with their experience during the First Development Decade. The disillusionment of the donor countries is well known and well documented. But the disillusionment of the aid-receiving countries is equally great, though not as well articulated. The problems alluded to earlier are being recognized and there seems to be a shift to achievement of more specific objectives in terms of sufficient food, lower fertility rates, better education and employment opportunities, etc.

Secondly, since the advent of the "limits to growth" debate there is a growing conciousness that we are all part of a global society. This awareness, even by the man in the street, has heightened the need for new knowledge and better understanding of the radical forces - economic, social and political, at work throughout the world. The increasing realization, at every level of human affairs of the world as an ecological unit is beginning to conduce a global perspective not only on environmental problems but economic and social as well. Certainly rising literacy and the spread of worldwide education through print and electronic media have also served as catalysts in promoting the notion of the global village.

These signs promise a more open, enlightened and co-operative attitude towards the global problems, particularly towards environmental and economic development problems. The climate seems to be more favourable for greater cooperation between nation states and for people-to-people programs. In this new climate much hope hinges on Man's capacity to learn some lessons from his past mistakes so that seemingly invevitable catastrophe on a worldwide scale is averted.

Massive programs of financial and technological aid must remain an essential goal for many years to come and must be stepped up. However, the nature of development assistance programs must be carefully re-assessed to ensure a more immediate and

equitable distribution of the benefits by improving the chances of employment, better nutrition and health, lower fertility rates and more educational opportunities.

Educational enterprise can play an important and rewarding role in the development process. This particularly concerns the nature of technology transferred to the developing world in the name of progress. The needs of the developing countries are not the same as those of the industrialized societies. The eminent French futurist, Bertrand de Jouvenel, opposes the view that a developing country is like a train running on the same railroad track, but only a few railway stations behind. The past for the advanced countries is by no means futurity for the developing countries. The developing world may need certain products of advanced technology such as the telephone, the radio and the aeroplane, but by and large its needs are for tailor-made technology designed for quite different environments. Educational institutions can facilitate the development of the so-called intermediate (or appropriate) technology made-to-measure for the needs, life styles and resources of the developing countries. As Michael Lubbock, the Executive Director of the Canadian Association for Latin America, has put it "our paramount concern should be to help the man in the condition he is and where he is." This philosophy, it seems to me, should provide an eminently sensible guidepost for technological assistance effort during the Second Development Decade.

The Job Crisis

The most important concern in the coming decades will have to focus on equitable distribution of the benefits, accruing from the development programs to the exploding masses of population and consequently rapidly increasing labour force in the developing world. Currently the world population is estimated to be approximately 3,600 million. In the next decade some 300 million will be added to the world's labour force, 250 million of which will likely be in the Third World. While the economic growth rates, largely accelerated by development programs, have averaged six to seven percent in the

Third World, the "employment gap" has widened further.

Overemphasis on industrial development has resulted in massive movement of village populations to the cities. This gigantic movement of people has totally and suddenly dislocated many established communities and grossly over-burdened the infrastructure of urban centres desperately needing further heavy injections of investment to build new housing, schools, hospitals, transportation systems and above all sophisticated manpower to manage the complex urban framework. The flow of rural populations to the cities has far exceeded the rate of industrial manpower needs and this has swollen the ranks of the unemployed. As Barbara Ward says, "this urban 'cell creation' could put whole societies into a terminal crisis of social and economic disintegration."

It has become apparent that mere increases in development aid will not solve the growing crisis of unemployment and poverty. Resource transfer should be planned and production organized in such a way that it does not cause widespread disintegration of communities. Employment creation must become a primary objective and not be left as a by-product of economic growth.

Appropriate Technology

Now it is quite obvious that this requires a very great effort and primarily a great effort of the imagination to evolve a whole new approach in development strategy. New methods and new technologies will have to be developed appropriate for the conditions of the Third World.

The first problem is that of developing low cost labour intensive techniques. Research interests of the developed countries have largely concentrated on the development of military and industrial technology which are quite unrelated to the needs of the Third World. Of the estimated 65 billion dollars spent annually on research, only a small

fraction of this is directly or indirectly beneficial to the developing countries. Those who embrace the proposition that one percent of developed nations' GNP should be devoted to international development should consider the merit of setting aside one percent of R & D expenditures to the development of appropriate technology for the developing world. This should make a much more meaningful contribution to international development than providing far greater sums of assistance in the form of capital intensive mass production equipment.

It must also be recognized that an enormous amount of technical knowledge already exists which could be suitably adapted and applied if adequate channels to facilitate this enterprise were established. To bring this about institutions must be established to bridge the gap between technology and all other financial, economic and social functions. There lies the challenge facing us in the Second Development Decade.

The meetings of a Committee under the sponsorship of the United Nations during the 1960's published in 1971 a document entitled "World Plan to Action" which had specified the major technological, financial, social and legal measures necessary for a more wholesome development approach. In this paper I do not propose to go into the details of this plan, except to note that the plan calls for an urgent attention to increasing employment opportunities through a more effective use of science and technology.

The question is often asked, "What do we mean by appropriate (or intermediate) technology?" In the international development context, I think most would agree that it has something to do with creating low cost labour intensive tools of production and services which would enhance the productive capacity of a community with minimal displacement of its members. It must also maximize the use of local resources.

There are several areas in which appropriate adaptation of existing technology and

generation of new knowledge can greatly contribute towards fuller utilization of human resources. I shall first discuss the scope of these opportunities, and then examine the need for an institutional framework which alone can systematically translate our hopes into reality--the reality of making comunities more self-sufficient and more self-reliant.

Opportunities for technological innovation exist in every sphere of activity. However, for illustration, let us focus on just two--food and agriculture, and industry.

Food and Agriculture

Today nearly half the world's population is malnourished and hungry. With the prospect of an increase of another one billion people in the next decade or so, the current rates of gross food production will provide even less per capita in the near future.

How can the food supply be increased? Basically, there are three possibilities--to increase yield, to increase acreage and/or to develop synthetic foods. The last belongs to the realm of high technology and will not be considered. But the other two offer numerous opportunities for technical innovation, both at highly sophisticated levels of research, such as developing new strains of seeds but also at more basic levels by improving the tools of cultivation, water utilization, multicropping, harvesting, storage and distribution.

In animal husbandry there is a great need for developing simple methods of livestock farming; improving meat, milk and egg yields and decreasing livestock mortality.

Similarly, food yields from the water can be increased by development of aquaculture, better fishing methods and improvements in storage and transportation of perishable produce.

One has to remember that the majority of the world's rural community is desperately poor, illiterate and poorly endowed with even the basic tools of technology which are taken for granted in the industrialized milieu of urban societies. What many farmers need most of all to improve their economic condition is just a simple understanding and value of the three great insights of science--the wheel, the lever and gravity.

The work of several community development projects has amply demonstrated how methods of production can be improved by providing better tools, adapted to local conditions. The pioneering efforts of the London based Intermediate Technology Development Group serve many examples of what can be achieved in the rural areas with appropriate technology.

Industry

Here again the challenge and the opportunity for creating labour intensive employment opportunities by utilizing simple low cost tools of production are very great. Many important resources in the developing world often go to waste for lack of capital, markets or, more often, lack of know-how. Agricultural and industrial by-products could be profitably utilized with the help of appropriate technology. Agricultural by-products such as, rice hulls, peanut shells, bagasse and sawdust can be used to manufacture food additive glutamate, furfuraldehyde for plastic production, ethyl alcohol for industrial chemicals and paper, building boards and fuel briquets from sawdust. Similarly, small industries based on several industrial by-products and waste materials can provide gainful employment for many urban dwellers. Then there are countless small-scale cottage industries which could be developed with simple equipment and cheap local resources

One of the most serious problems facing the developing countries lies in the area of repair and maintenance of imported machinery used in industry and agriculture. This often results in heavy down time on expensive equipment. There is an urgent need to train a

corps of technicians to help them find gainful employment.

Other areas of application of appropriate technology requires clever thinking and original solutions. Many items of capital-intensive manufacturing equipment could be suitably redesigned by using indigenous resources and build into them more labour-intensive components. For instance, a Japanese sheet glass company has succeeded in reducing the plant size of its operation in India to half and at the same time modified the plant machinery so that it uses three times as many workers. There are countless opportunities of this nature, not only in industrial sectors but in storage, distribution, transportation, housing, and so on. But the above examples will illustrate the point.

Essential Ingredients

The concept of appropriate technology embraces a philosophy which is new, exciting and full of meaningful opportunities both for the developed and developing nations. It implies a more wholesome and equitable development process in which the problems of redistribution of income and unenmployment are tackled immediately. However, it must be remembered that this will not offer a magic panacea. It will merely contribute in alleviating some of the bottlenecks in international development.

The essential ingredients in developing appropriate technology are basically three:

a) institutional framework to facilitate research and development.

b) a corps of specially trained manpower to diffuse new knowledge and philosophy at the grass roots level.

c) information-gathering, processing and dissemination of scientific and technological knowledge pertinent to the needs of developing communities.

Clearly a comprehensive blueprint of action embracing this approach cannot be charted on the back of an envelope. Once we grasp the importance of technological innovation for development as a distinctly

different enterprise from wholesale transfer of technology we will begin to accelerate development in ending the world's overlong division into opposing camps of the rich and the poor, the hungry and the well-fed, the ill and the healthy. There will have to be some radical new thinking and bold initiatives taken (characteristic of space program spectaculors), by which Man's scientific knowledge could be geared to bridge the development gap. Our survival depends on it.

International Institute of Appropriate Technology

Time has come for a decisive and urgent action. I believe the educational institutions should be mobilized on a global scale to play their part in the development process. It is proposed that immediate consideration be given to creating appropriate technology institutes both in developed and developing countries linked together through some form of an association. These institutes should focus on the following objectives:

1) to provide facilities for research in designing new tools, equipment and processes appropriate for the needs of the developing societies.
2) to design and offer intensive training programs relevant to the demands of the technological conditions obtaining in developing societies.
3) to provide training and opportunities for volunteer development corps, in liaison with national and international agencies engaged in community development programs.
4) to gather, process and disseminate technological know-how suitable for developing societies.
5) to participate in development education programs emphasizing the role of appropriate technology in the development process.

Appropriate Technology Institutes

The basic rationale for recommending a new type of institute system is based on my belief (indeed many people have made similar recommendations) that the nature and the urgency of the problems facing us are such that the traditional educational institutions reflecting a fundamentally different orientation, do not provide a suitable vehicle. In the developed countries scientific and technological education is too narrowly geared to serve the needs of the industrial and military complex. On the other hand, the

Third World aspiring to western style development has over-zealously copied the courses, the techniques and the institutions from the developed countries without much regard to relevance. The result has been that thousands upon thousands of students are processed through ill-conceived programs in science and technology who end up being useless in their own societies.

Research and Development

In the development field one has to take a building-block approach and start by taking a careful inventory of the prevailing conditions; then ask oneself how incremental gains can be made by creating tools and know-how suitable for local conditions. This should yield a wide variety of researchable problems, the sort of problems which the proposed centres should concern themselves with. Most problems would merely call for simple adaptation of existing tools and machines, and others may be more complex, requiring extended study at institutes of higher learning.

It is envisaged that the proposed centres should be closely linked to on-going post-secondary institutions and would draw on their human and physical resources for research and training purposes.

The centres based in developed countries, though remote from actual areas of application, would serve as technology and information transformation centres as it were, to scale down technology in terms of lay-out, manpower, size, machines and cost to fit the needs of potential users. But these centres can only make useful contribution if they are closely interlocked with their counterparts in the developing countries for receiving information about the exact nature of problems and opportunities. This can be best accomplished by providing freedom of movement to researchers engaged by the institutes between centres. Financial resources would also have to be freely transferable.

Training

At the centres located in the developing countries, facilities and programs of training should be provided to develop a corps of trained technicians who would take their skills to the communities they serve. These programs should be non-academic, in much the same way as many company training programs which are designed to train new employees for specific jobs in industry. This would ensure that these centres do not compete with formal academic programs offered at the universities and technical colleges, but at the same time contribute to the specific training needs in community development.

At a recent conference on Intermediate Technology held in Ottawa, Professor Gordon Goundry of Memorial University cited examples of what can be achieved by training technicians. In agriculture, for instance, many jobs requiring the skills of traditionally trained extension workers were broken down. For example, agricultural demonstrators were given the necessary technical knowledge about a single crop such as maize, cotton, or ground nuts. There were much lower educational prerequisites for such trainees.

Imaginative solutions of this nature are indeed found in many community development programs. What is lacking, however, is the institutionalized thrust on a global scale which the situation demands. Secondly, some of these indigenous solutions developed in one environment could be copied elsewhere if a framework to transfer such knowledge existed. The centres may well provide the means to do so.

Development Corps

While the magnitude of financial aid is the most pressing problem, equally great is the need for a well-trained corps of development specialists. In spite of all the advisors and consultants who abound the aid programs, we just do not have enough of them; not enough at the grass roots level at any rate.

The advisors attached to most national and international programs are, by and large, expensive and overly-qualified to be employed at the community level. The lack of qualified manpower at lower levels poses the most serious threat to international development. Several volunteer corps, such as CUSO and Peace Corps, have made a valuable contribution in alleviating this problem. But these agencies have had difficulties in raising enough volunteers from their own countries. In this regard, the recently established UN volunteers program, designed to draw manpower internationally, is a very gratifying innovation. However, for reasons not quite clear to me, this agency, too, appears to have difficulties in attracting volunteers.

Perhaps one possible avenue lies in enlisting the active support of educational institutions--both in developed and developing countries. Could the post secondary institutions be persuaded to offer alternatives to their graduating students? For instance, a student in his final year, in order to qualify, could choose between taking a certain number of courses at the college, or alternatively agree to join a development corps for a certain length of time on a well-defined project relevant to his chosen vocation. If enough institutions would contract to offer such alternatives, it should be quite possible to swell the ranks of volunteers. Knowing the traditional resistance of formal educational institutions to unconventional ideas, the response may be disappointing. But there must be enough avant garde educators willing to cooperate that the effort would not be completely in vain.

It is interesting to note that at the Ottawa conference, Gamani Corea of Ceylon proposed something akin to what is suggested here. He felt that in the developing countries high school graduates should be encouraged "to go into life, either into actual work or into technical training institutes or vocational training institutes for a two or three year period. Only after that would they seek entry into the university. Entry into the university would then be based on various tests of aptitude taking into

account the experience gained by students during this two or three year period. It is essentially a proposal to marry the world to the world of learning, to create a kind of educational system which is more relevant to the realities of the economy."

The proposed centre could provide a valuable vehicle both in facilitating research by students in appropriate technology problems as well as training the volunteer development corps for service in the field. The centres should closely liaise with ongoing international development agencies, (volunteer programs and others) to find suitable employment opportunities for the contracted period.

Information

We live in an era of information explosion. However, the essential tragedy of the information explosion is that it is becoming increasingly impossible to sort out relevant information from irrelevant. We have to get down to the job of designing a knowledge bank which would be appropriate at the grass roots level. This literature must not only be comprehensible to unsophisticated, semi-illiterate masses in the developing societies, but must also be easily accessible.

The proposed centres should serve as an excellent vehicle in gathering, processing and disseminating essential knowledge as a part of the major research and training functions envisaged for the institute.

Development Education

The growing disillusionment with foreign aid programs, coupled with worsening domestic economic problems in the industrialized countries, has led to a weakening of will to sustain international development effort. There is, therefore, serious need to step up development education programs. More importantly, these programs must attempt to

instill "participatory attitudes" for two reasons.

First, from what has been said, it is clear that more than financial assistance is called for. There is a pressing need to enlist the support of citizens, particularly the young student population, and encourage them to give their time and talents to the cause. Secondly, it is vital that such programs be directed at the administrators in educational institutions to bring about a positive global orientation in academic programming. It is no longer sufficient to have a tolerant citizenry, willing to support programs of financial assistance, but indifferent to the effectiveness of such endeavours.

Organization

It is readily conceded that this proposal does not lay any claims to originality. This subject has been the concern of many eminent visionaries in the development field and does not really say anything that has not been voiced more forcefully before. My main concern is to consider how one can proceed to implement this idea. This concept, like all others, will stand or fall on how it is put into practice.

It is also acknowledged that many international, national and voluntary agencies already exist which are making an indispensable contribution. This proposal does not detract from these fine endeavours in any way, but seeks to strengthen their work by providing a framework for a more systematic transfer of appropriate know-how and information. If such centres were to be created it is suggested that the individual institutes be governed by a board of directors drawn from the on-going, non-governmental agencies as well as government and business representatives. This would ensure that unnecessary duplication of effort is minimized.

The Centre for International Programs, with which I am associate, was conceived roughly along the lines suggested here. We have been in operation for a year. Considering the severe financial

constraints under which the Centre has been operating, we can look back to a most gratifying period of success. Foundations have been laid for a very promising future but our ability to move forward is contingent upon raising sufficient funds.

An international association to foster the planning, coordination and financing of the activities of the world-wide centres would, of course, be very desirable. This association might function under the auspices of one of the member institutes. The Secretariat of such an association should be located at this institute.

The Secretariat should be assigned the task of promoting the basic objectives of the member institutes. The functions of the Secretariat should include:

1) exchange of information relating to research and training and identified technological needs;

2) fostering collaboration of appropriate technology research and training activities;

3) organizing task forces in problem areas, seminars and conferences;

4) provide contact with international development agencies, governments and educational institutions;

5) provide assistance in the placement of development corps volunteers.

The proposed association should have an independent board of governors drawn from development experts from all the countries cooperating in the venture.

Some proponents of this idea have suggested that a UN agency should be created to coordinate the work of these types of institutes. In principle this would be acceptable but I would be inclined to follow a less formal approach for two reasons. Firstly, the decision-making process in the UN is of necessity, complex, slow and subject to pressures of opposing political forces in world politics. It would simply take too long to evolve such an

institute and may well end up being something quite different from what is envisaged. This is not to suggest that we should not seek the closest relationship with various UN agencies which are doing a fine job in this area. Secondly, it is important to bring many international NGOs together. Their contribution to development work has been invaluable in providing dedicated manpower and innovative ideas which often do not receive the recognition and financial support which they deserve.

One more point ought to be emphasized. The challenges facing us are global in magnitude. Unless we mobilize the scientific and technological community on a world-wide scale to work closely with one another, both in developed and developing parts of the world, we stand to lose access to a considerable amount of information and know-how which would be profitably utilized in international development. It is, therefore, vital that we establish appropriate technology in developed as well as developing countries to facilitate a meaningful exchange of resources; human, material, financial and technological.

It would be folly to think that a blueprint of this magnitude could be translated into reality overnight. It requires courage, ingenuity, patience, vision, finance and, above all, persuasion at the highest levels to get such a proposal off the ground. Furthermore, it would be necessary to spell out the organizational and administrative matters in much greater detail. It would also be vital to prepare a complete inventory of the existing enterprises in this field and seek their cooperation in starting the proposed institute network.

Obviously, the plan is not cheap. It is also very demanding in terms of manpower. But the dire consequences of inaction at this stage are such that we cannot afford to perish the thought. For if we do not begin to bridge the development gap in this decade by creating more opportunities through wise application of science and technology, some grim prospects lie before us.

ACKNOWLEDGEMENTS

This paper was inspired by Robin Clarke's monograph "The Great Experiment" published by the United Nations Centre for Economic and Social Information (New York, 1971). The data used in this presentation was obtained from several UN publications and Kaplansky's recent article "The Job Crisis" in Co-operation, a publication of the Canadian International Development Agency.

This report has also liberally drawn on ideas of too many eminent social scientists to mention them all by name here. However, I must gratefully acknowledge the contribution of a few who have made the greatest impact on the evolution of my own thinking on the subject; they include Jack Baranson, Charles Cooper, Edward Hawthorne, Fritz Schumacher, André van Dam and Barbara Ward.

THE FUTURE OF THE DESIGN PROFESSIONS

By Richard L. Meier
Professor of Environmental Design

INTRODUCTION

A good reason can be found for taking a careful look at the directions the design professions are moving -- their prospects are changing very rapidly. Perhaps this reflects some fundamental changes in the way the world views itself; whether it does or not, these arms of modern culture, commissioned to create something new out of the old stuff, are thinking of different roles to play and jobs to fill. We wannot construct a future without them.

The design professions as a whole are made up largely of functionaries who preserve the status quo by projecting it upon the future. Yet even these are people who prepare new micro-futures which take the form of novel artifacts, layouts that guide future growth, fashions that take hold gradually, and organizations that find new kinds of clients interested in guided environmental change. The novel approaches are usually undertaken in a highly entrepreneurial milieu. An agency of government or a bureaucratic corporation may bear the financial risks but monetary returns are not the major gamble; the reputations of the individual sponsors depend upon gauging the subjective responses of users and critics.

The views to be presented here reflect conditions in North America much more than in Europe or its cultural province of South America. (Asia and Africa open up special problems of reporting), but it can be fairly argued that for the next decade or two trends in America will set the pace for the world. Every ambitious designer is eager to visit America to see for himself the surprises that are forthcoming, and perhaps contribute his own concepts. Americans are unexpectedly and inconsistently generous in their support of design and their desire for novelty. As a result virtually every school in Europe is represented somewhere in America, but each quickly loses its original identity in interacting with neighbors who follow modern Asian, revived indigeneous, and even some African themes.

The syntheses achieved -- taking the form of photos, products, models, or advice -- are propagated through the marketing prowess of the multi-national corporations. These complex organizations have recently learned how to transfer social technology and huge amounts of capital across national boundaries and cultural barriers. Cosmopolitan designers gain from this growth in international trade, though the means are antithetic to the radical ideologies they commonly profess. Thus, if the design professionals described here are not representative of the world, the odds are that their characteristics will become so as markets for the capital invested in growth and redevelopment become even more interdependent than at present. Actualized design ideas are nourished by the hundred billion dollars worth of Euro-dollars and Euro-yen that currently flow around the earth seeking opportunities for quick profit -- a fact that the leaders recognize but have no power to change. As a result of this interchange the design professions are expected to reach in a decade or so a level of world integration that the scientific, technological, and financial professions have already achieved.

Most investigators prefer to hear new and interesting proposals before they start worrying about methods for verification or confirmation. Then they ask how much they should trust the proposal. What were the means of inference in this instance? Methodologies for forecasting can create endless debate, therefore that part of the discussion is postponed. The approach used here is comprehensive and based upon the kind of common sense that persuades prudent men who must make responsible decisions for others and not just for themselves. It takes the methods used in recent publications on forecasting, and applies those that seem likely to be productive of new insights. It then searches for new relationships that provide additional hints about future trends. Finally the arguments are greatly compressed and ordered so that what seem to be the greatest surprises are taken up first. The slender possibilities that are nevertheless extraordinarily interesting because their likelihood may be enhanced by action taken now, are discussed later. Each proposal was produced by following a current trend through to its foreseeable implications, and was then tested against events arising from parallel trends. Often trends vitiate each other; they

are not worth discussion in a review of highlights. That will explain some rather major omissions in the discussion, especially of trends often taken up at informal meetings of design professionals. The overall intent of this exercise is to enrich such discussions with new propositions. The image-laden style of presentation is an accommodation to the mainstream of the profession.

Starting Points and Definitions

Before we launch into the infinite expanse of possible futures, attempting to chart those paths that are feasible, acceptable, and quite likely to be explored, we must establish the coordinates of the launching platform. We must know what and where we are. Thus we must identify the propellants, the guidance systems, the backup or fail-safe mechanisms and the communications links with the publics that pay the bills. Only then will it be possible to identify the trajectories in professional development that have sufficient force to carry the routinized behavior of the design professions to a stage where patterns of interaction begin to change again, due to events not yet foreshadowed.

Even though the fine distinctions involved appear to be dull and replete with hairsplitting, definitions are a good place to begin: The design professions are dominated numerically by architects, who have a richly documented past but feel extraordinarily insecure about their future. The next largest component in North Americа, though not elsewhere in the world, is an assortment of engineer-artisan-designers whose responsibilities merge with those who are industrial artists at many points. This group is concerned with the form, structure, and imagery of an artifact, whether it be an engine, a book, or a utensil, yet the standards of each circle or group are so different from each other that each set of specialized practitioners has little to communicate to the others.

A third group contains the landscape architects, whose present tasks are devoted to improving the "fit" at the interface between modern man and his natural environment. Landscape architects are licensed in most states and provinces, so that much of their skill has been codified.

It is possible to spell out "the least cost" method of acquiring that level of professional status, but most schools add much more to their training programs. Finally, there are urban designers and planners, who work on a larger scale. A large fraction of the latest group of planners to emerge from the schools sees its function as one of reforming and reconstructing public institutions. These persons have retained the original arena assigned to their profession, the urban region, but are relegating almost all the physical aspects of development to others.

The design professions have not been very closely linked with the professions of learning -- science, philosophy, history, language -- but that independence now seems to be changing into a courtship at a distance. In the past the fine arts have provided basic skills and creative stimuli for the design professions, but the applied sciences, both hard and soft, as well as the arts of politics, have been incorporated in the pre-design education and drawn upon in the curriculum. Historians note that engineering followed a very similar path as it evolved from the crafts of artisan-inventors into the professions organized to exploit scientific discoveries. Landscape architecture still seems to depend much more than the other professions upon the master-journeyman-apprentice relationship evolved during the Renaissance.[1] The landscape designers' changing image of professional competence appears to be most strongly influenced by advances in architecture and planning, while horticulture is being replaced by synecology. As landscape architecture begins to take on larger problems it draws heavily upon geography and environmental psychology for factual information and scientific principles relevant to landscape design.

Sociologists have recognized since the 1920's that the professionalization of the occupations displaced first the absolute authority of the state, and then, somewhat later, the controls over individual behavior available to the capitalistic firm. This reorganization of the structure of the social elite had a major consequence, because each of the respective professional groups is held responsible to moral ideals set by its own members as part of an ethic negotiated with others in the social system. Daniel Bell identifies the professional class as the "prominent occupational group in the post-industrial society" as it is being

[1] H.J. Habakkuk, American and British Technology in the Nineteenth Century, Cambridge: Cambridge, 1972); M. Kranzberg, ed., Technology in Western Civilization, (New York: Oxford, 1967), vol. 1.

transformed from a goods-producing economy to a human services delivery system.[2] Its rate of growth outpaced all other occupational categories in the United States in the last quarter century, being twice that of the runner-up clerical category. The "new men" he believes are the scientists, mathematicians, economists, and engineers, who help a post-industrial society make decisions based upon the findings from R & D, cost-effectiveness calculations and simulation models. (He seems to have overlooked the law profession, and the upcoming planner-designers, unless for him the latter function as hybridized economist-engineers). They compete in a meritocracy that, hopefully, propels the toughest and most respected professionals to executive posts. Bell (following Michael Young's Rise of the Meritocracy) argues that equalitarian outcomes from social participation erode elevation according to achievement, so the task for the professional ranks in post-industrial society is to construct a just meritocracy, i.e. a system with unequal responsibilities and rewards that is accepted by the remainder of society because it believes it gains the highest grade services from such an arrangement.

Numerically, the design professions taken all together bulk less than the chemists, or the psychologists; they have been almost totally ignored by social investigators because they do not seem to be changing, or even shaping, human destiny, nor have designers created any engrossing human dilemmas. Even the novelists have paid exceedingly little attention to them.

Modern designers fancy themselves as being imaginative, creative and open-minded; they favor the new as against the familiar, the traditional or the antique. At the same time they are rarely so radical that they advocate destroying the present in order to build anew, or so utopian that they are willing to ignore the past that remains with us and work only for their ideal. Thus we must assume that the design professions prefer a somewhat higher discount rate for their social system than the public at large; they would like to see social change accelerated and redirected.

2 Daniel Bell, The Coming of Post-Industrial Society, New York: Basic Books, 1973), pp. 41-2. A summary of contemporary thought on the professions is provided by Talcott Parsons, "Professions", in David Sills, ed., Encyclopedia of the Social Sciences, vol. 12, 1968 (2nd ed.), p. 546. Parsons proposes that a new contender for leadership in the societies presently modernizing might well be the "artist" taken as a category and not as an individual. Bell, on the other hand, regards the cultural sphere, to which the professional designer must be particularly sensitive, as in increasing disjuntion to the existing social structure; he would have the professions engage in the "sober construction of social reality."

At least this is the impression one gets when comparing their professional journals with those from law, medicine, education and engineering, which express much more conservatism in intellectual outlook.

We must make up our minds as well about the time span of the future within which the visible trends will have significant influence. How far away is the horizon for the design professions? Is it the expected life of the designs created by the practitioners, or the usefulness of their laboriously developed skills, or/of the urban communities to which they contribute? If designers were part of the mainstream of society we could use the public discount rate as a measure (say the interest rate on the second mortgages needed to initiate new construction). We could argue then that a unit of wellbeing (health, status, income, security, etc.) produced seven years hence would at a 10% rate be worth half a unit at present, while the same unit produced twenty years hence would have a present value of only a little more than an eighth of such a unit, which is getting close to our ability to discriminate relative value in the environment. Thus a normal human generation of about a quarter century seems to be a reasonable forecasting horizon for the social system but in what way is it evident that designers deviate from the mean?

Sometimes the individuals recruited to a profession want something different for themselves than they want for society, and sometimes recruitment introduces new people with a very different set of values than those that prevail in the journals. If that were the case the horizon of the present leaders of the

profession would not fit that of the future practitioners. In 1968 we set out to discover whether there were major discontinuities between generations of designers at Berkeley, which was then not only the largest school in America but also perhaps the place in the world at the time where the generation gap was most emphatic.[3] Informal, but carefully standardized interviews of twenty-five randomly selected freshmen and sophomores showed that as far as job preferences went, about half would seek quick payoff opportunities (high discount rate) and the others would look for the slow-but-sure path to professional achievement. Their predilections for now-versus-later appeared to be normal as compared to students elsewhere in the university and not substantially different from students earlier.

3 This introductory study was undertaken by a faculty-student group from the College of Environmental Design, University of California, Berkeley, with the title of Task Force for Future College Programs, and with myself as Chairman. Carried out at a time when the younger generation had become sensitive to manipulation and therefore highly suspicious of formal surveys, our interviews had to be totally disarming if they were to yield reliable results. Chance encounters between peers were set up where the interests of the information gatherer seemed to drift over a number of related topics. The substance of the interview was recorded on a form immediately after it was related to the interviewer. The intention was to use information acquired earlier by the Institute of Personality Assessment Research (Berkeley) regarding architects and discover the extent to which voiced complaints by some students and faculty might be causes of the student unrest for which Berkeley had become internationally known. An important proportion of these explorations was devoted to preferences for physical environments, because the camaraderie of studio culture seemed to be dissolving. No detailed report is made of the findings because they underlay the studies by Belle L. Cole and Joel Stein, "I. An Economic Analysis of Tuition and Finance for Professional Education: An Application of Cost-Benefit Analysis to Education in the Design and Planning Fields. II. Studio Culture in Wurster Hall", Institute for Urban and Regional Development, University of California, Berkeley, February 1970. It was also found that

The economic findings are summarized and updated later./ the studio culture appears to be alive and well but students feel that two or three exposures in the course of their studies is enough. Now that most of them have apartments they can do a great deal of work at home. Having better preparation than before, it is also possible for them to draw much more heavily upon the rest of the University, so that a general education can be obtained instead of a stylized, group-mind approach. Most students felt that studio approaches had important uses, but that they should not monopolize design education.

In contrast, a significant deviance did exist in the personal preference for risk. Entering students like to play the long shots - a big "high" is much to be preferred over several moderate ones. In all other ways this random sample of new recruitment yielded profiles that were almost distressingly normal, since participation in campus turmoil had led to the easy prior hypothesis that students were now different from before. The study was extremely modest but it satisfied me that the plausible hypothesis about a sharply different intake flow of students who were to become the professionals of the 1970-2000 A.D. era, especially a sharp increase in intellectual quality, could not be defended. The shifts, if they existed at all, were gradual.

Planners were predominantly "competent do-gooders" who grew up in professional families, went to recognized colleges, and showed considerable organizing initiative, often by holding down a job for a year or two. Drawn from many backgrounds, with 15-20% from overseas, they were introduced to studies that were essentially an application of the social sciences to public choice in the urban and regional context. Almost everyone seemed to overcompensate for his background. Those with mathematics, physics, or econometrics behind them took up the soft science of community organization while those with architecture and liberal arts undertook formal quantitative models and systems analysis. The increasing number drawn from the Black, Oriental, and Spanish-speaking minorities were chosen primarily for their leadership potential; their most serious problem was that of maintaining membership and fulfilling responsibilities in their own urban community while attending the University. Reports from the rest of North America, combined with visits among faculty, suggest that these patterns were repeated quite consistently with only minor local deviations. The newest entrants differ only in being still more diverse in background, since experience with philosophy, psychology, and history now also suggests the possibility of a career in planning the future of human communities.

Designers taking up graphics, photography, plastic arts, and textiles are more idiosyncratic and more mature. Few of them expect to fit into a large organization and make a living out of it. They think of moving from one commission to the next and of opportunities to do "their thing", although many will actually settle down to teaching positions. Nobody can say whether this or that group is representative, and the annual intake changes greatly from one year to the next.

It should be noted that a succeeding series of exploratory interviews revealed that entering landscape architects (juniors and seniors) differed from architects in several significant ways. One of these was the high proportion of "outdoorsmen", i.e., youth who had early learned to value nature and were therefore seeking a vocation that would allow them to maintain the contact. Whereas persons entering architecture normally had been considering it for one to a dozen years, the majority of the landscape architecture students had made up their minds within a matter of days or weeks. Such a property is to be anticipated where the students do not read voluminously at high school age ("outdoorsmen" had an alternative) and the profession is not universally represented in college catalogs. These observations may not apply to the rest of the country, because California, or the West in general, has evolved a special subculture based upon out-of-doors living.

The early 1970's, which opened with the first celebration of Earth Day and led on to a period of reactions to the widely publicized United Nations Conference on the Human Environment in Stockholm, brought a new infusion of very strong candidates seeking admission to the design professions. Although initially attracted to the physical sciences and computers, due to high school successes in those areas, they soon developed strong misgivings. They and their friends embraced the environmentalist "nature ethic" almost without reservation. Its conflicts with a standard establishment-serving professional role caused these young people to seek a career line that enabled them to be of service to the environment. For the most intellectual of them such an occupation must provide a chance for synthesis, as distinct from analysis, criticism, or the refinement of knowledge. Only a small fraction of those that try to make the transition actually succeed in gaining an entry to the professional schools; the selectivity possible from such an excellent group allow high standards to be set for technical and literacy competence. Landscape architecture schools in particular are affected. All over the continent they had been, until recently, an academically depressed area with less than their share of top-ranked students, but now part of the intake is as highly qualified as the very best in the University. Their impact upon the profession in the latter part of the 1980's will be notable, perhaps revolutionary. Architecture has been adding many candidates with similar backgrounds, but also redirected entries from such streams as medicine, mathematics and English literature.

Jobs have never been sufficient in number, particularly because designers have strong preferences for the small selection of urban environments where the studio sub-cultures are getting well established. Any reasonably competent professional can find

employment in "the sticks", but most will continue to prefer a hand-to-mouth existence from part-time employment in a favored metropolis over that alternative. The extra competences of the new design professionals in these complex environments enable them to discover or create many new niches in American metropolitan society that sometimes have quite high financial reqards.

All these considerations lead to the belief that the prospects for designers are reasonably stable. Surpluses are not creating pre-set time-bombs between now and a horizon fifteen to twenty years off, such as can be detected in physics or in teaching.[4] Future designers apparently will continue to discount the future a bit more rapidly than society at large and therefore find themselves among the "change agents". Most designers and fellow freethinkers nevertheless favor preservation of the natural scene and much of the historical tradition. They are fully conscious of their ambivalences and make little effort to resolve the internal conflicts generated. For these idiosyncratic reasons a number of designers will increasingly participate in governmental and corporate decisions both poliitically and professionally. At the same time their traditional jobs at the drawing tables will be taken over by trade school technicians.

Investments in Design Education

Economic motivations do not seem to be very influential among those that choose the design professions at the time that their commitment is made.[5] Those that seek part-time employment begin to get serious about acquiring marketable skills, but only as they approach the completion of studies is there an appraisal of comparative prospects for income. Naivete about the job market is perhaps greater in design schools than elsewhere in the University setting. Nevertheless, overall prospects for satisfactory incomes are quite good and still improving.

The idea of professional education functioning as a social investment was scrutinized very carefully in the 1960's. Names such as those of Theodore W. Schultz, Burton Weisbrod, Gary Becker, and John Vaizey have been associated with the development of this approach to assessing the costs and benefits attributable to education. These calculations have been applied to categories of education, such as that provided by the full range of secondary school attendance or the complete set of professional schools in a field such as law or medicine. The

4 R.H. Bolt, W. Koltun, and O.H. Levine, Human Resources and Higher Education, (New York: Russell Sage, 1970); C.V. Kidd, "Shifts in Doctorate Output: History and Outlook", Science 179, February 9, 1973, pp. 538-43.

5 I have encountered only one, an architect, who had thought very seriously about using his skill for money-making. He intended to make a million dollars quickly and then retire to become a political advocate for design. So far, five years out of college, he has lost his gamble.

components of theory, administrative practice and critiques in this field that are relevant to urban society have been recently assembled into a single volume.[6] It reports that the lifetime income expectations of a person trained to the level of at least one year beyond the bachelor degree were about $600,000 in the United States in 1966, as compared to $500,000 for those with only four years of college, but it also queries the use of the market prices for skills as an indication of social utility. It has already been noted that money rewards are inadequate motivators for designers; they would prefer more direct indications of appreciation of the work they do. Nevertheless the market system does keep their salaries in a moderately reasonable consonance with other professionals' contributions to the production of goods and services.

Belle Cole, an economist, was asked to follow up the exploratory surveys with an analysis of the finance of education in the design professions. She used factual data when it existed and best possible estimates wherever it did not. Information drawn from the accounts of the University of California are at least reasonably typical of the larger professional schools in America that produce a major proportion of the total supply of new blood.

The first task was to separate out the cost to the University of producing a year of instruction to an enrolled design student after making allowance for service courses offered to and by the remainder of the University (Table I). Salaries have not kept up with inflation since 1968 so the costs in 1972-73 are expected to be only 15-20% greater on a per student basis.

Table I

Net Costs in the College of Environmental Design per Student Enrolled in 1968-69

Architecture	$1500
City and Regional Planning	2000
Landscape Architecture	2300
Design	1500

However, it is apparent to the students that much heavier costs are borne by them and their families. This includes their loss of earnings as well as payments of fees. Methods of estimation used were based upon the same principles as those used in earlier studies of the investment in the human agent (Table II).

6 Melvin R. Levin and Alan Shank, Educational Investment in an Urban Society: Costs, Benefits and Public Policy (New York: Teachers' College, 1970).

Table II

Average Annual Private Costs Borne by Design Profession Majors, 1968-69

	Undergraduate	Graduate
Architecture	$4300	$5800
City and Regional Planning	--	5600
Landscape Architecture	4300	5600
Design	3200	4500

Before we can obtain the entire social cost further estimates must be made of scholarships, grants and similar assistance. In Berkeley, for example, about 80% of the part-time jobs obtained by students were design-related, and the returns from these were ten times as great as the grant-in-aid and scholarship assistance for graduate architects, five times for landscape architects, and twice for planners. For design students financial aid was so small it was meaningless to make comparisons. These kinds of assistance increased as enrollment of minority groups improved but began dwindling again in 1972-73 due to reductions in voluntary contributions. They are added to the social costs of professional education at the same time that earnings are subtracted from the alternative value of the student's time. The final calculation shows that landscape architecture was somewhat more expensive than the median, and design less so, for a year of education (Table III). Inflation since then has added about 30% to these costs.

Table III

Social Costs of Education 1968-69

	Undergraduate	Graduate
Architecture	$5700	$7800
City and Regional Planning	--	7600
Landscape Architecture	6400	8800
Design	4700	6900

The figures above have been increasing from year to year as a function of the salary scale of professionals (say 5-7% p.a.). The relationships vis-a-vis each other are affected by the vagaries of selective service, the availability of

student loans, and perhaps even community issues, such as erupted in the form of the widely publicized People's Park confrontation of 1969-70.

From such data it is possible to estimate the total cost of a professional degree in design after a high school diploma.

	1968	1973
B. Arch. (no longer offered)	$31,000	$ --
M. Arch.	39,000	49,000
M.C.P.	38,000	49,000
M.L. Arch.	43,000	51,000
M.A. Design (no longer offered)	33,000	--
Ph.D. CRP	58,000	74,000
Ph.D. Arch.	56,000	73,000

The above figures do not take into account the extra social costs of dropouts, if any. This is impossible to calculate because a large fraction finish later, usually somewhere else, often in another vocation. In general, the cost to the student runs 65-70% of the total. Thus the design professions are so expensive they are not very accessible to the poor, even in a state university.

Interestingly enough, the cost of doctorate degrees in Planning and Architecture (presumably also for Landscape Architecture when they are granted) appeared to be about the same as those in English Literature, significantly less than in Sociology or Zoology, and half that in Physics, which was the highest in the learning professions.[7]

Does Design Pay?

Are the investments made by the individual and his family worthwhile? We shall argue this point primarily from a logical basis -- an analysis of the relative value of outcomes -- at the start, and then review the limited inferences that can be derived from the scattered quantitative data available. The individual and his family make the predominant share of the investment in America, but the proportion contributed by the state must be given credit for enabling them to make the commitment. Launching a new professional is a joint enterprise in which the state holds 30-40% of the stock, but rarely receives that fraction of the direct returns in the form of added taxes.

7 The cost relationships are drastically changing in the 1970's due to cutbacks in the size of graduate schools and the scarcity of employment opportunities. The humanities are becoming much more expensive, the natural sciences will stay about the same, and engineering is switching to more professional training similar to law and planning, which changes the nature of the academic product and increases the cost.

Perhaps the principal return to the individual is an achieved role in society. He is respected by others, so he gains in self-respect. He could reach at least the same level of respect by acquiring a skill that would improve the community, say in Boy Scout leadership, Junior Chamber of Commerce activities, Rotarian service, or in high level electronic equipment maintenance, but a design degree represents virtually universal status. Properly trained designers are able to function in almost as many locales and situations as doctors, lawyers, or engineers, and in many more than teachers, since the latter are constrained by formal curricula and specialization.

The return on an investment in professional training to the society is gauged by the usefulness of the training in meeting the challenges presented by society's compulsion to survive and its desire to grow. The design professions are rarely helpful in the contest for power in society; they have been most used to reinforce the transmission of a Message that mobilizes collective behavior. Designers manipulate public and private images so as to guide self-organizing urban activities, and to reduce friction, conflict, and other hindrances to growth. Their function is less central or immediate than that of the politician, banker, doctor or technologist. It is rare that competence in design will trigger a revolution or the dissolution of a public enterprise. Therefore, society will normally attach less prestige to the design professions than these others. Design skills are more like the butter on the bread - desirable but not essential.

As soon as a society becomes involved in a race - catching up or keeping ahead - the ability of designers to manipulate the physical environment may put them into the same league with the promoters, politicians, and leading educators. They are only able to improve efficiency but also to persuade citizens, tourists, and customers of the quality of exported services or products. What Talcott Parsons suggests is that the designer-as-cultural-hero is as likely in such situations in the future as the hero role was for Einstein, Edison, and Carnegie in a history founded upon advances in science and technology. Other members of the affected profession bask in the limelight as surrogate-heros.

When societies are retrenching they are inclined to be more skeptical about intangible values. Money is scarce so it becomes a primary consideration in judging the worth of a skill. Most of the monetary value of a skill accrues to the individual as income, but the income comes at different times in the career for different

kinds of professions. The most sensible way of comparing degrees is to compare their present value at the time they are granted. In this procedure all net income streams to be anticipated on the basis of current income scales are discounted to the present. Designers tend to be different from most other professions in that they are trained in professional offices for several years before they advance to full professional standing, and they are paid technician's wages during that period. Thus deferment of reward for effort spent in study extends two to five years beyond the academic degree, a feature rarely encountered in American business, law, engineering or teaching.

Based upon income data available in the 1960's (the same period that set the expectations of present design students when they committed themselves to their present careers), the income stream in architecture (the only one of the design professions to be compared) found by Mary and John Peterson,[8] shows that at an 8% discount rate the present value of a new M. Arch. degree is $77,000 to the holder. Because many M. Arch. recipients teach this is less than the B. Arch. at $83,000. These findings put architecture ahead of the biological sciences, education, social work, and the bio-technical professions related to medicine, more or less equal to the engineering fields but less than physics, chemistry and mathematics and much less than medicine, dentistry and law.

The conclusion to be derived from these expectations is that in architecture, at least, the flow of new recruits will not be deterred by better information regarding income expectations. For landscape architecture, which suffers from being a compromise with the biological sciences, there might well have been a continuous deflection of the most competent, broadly-educated students away from the field in the past. This situation is only now being changed by the attention paid to conservation and ecology in landscape architecture. The returns to landscape architecture in the form of personal income have been poorer, despite evidence of a somewhat greater social investment in the degree. Because of the great scarcity of planners, the same kind of piecemeal evidence regarding employment suggests that planners are rewarded earlier than architects, thus contributing heavily to the present value of an M.C.P. degree and resulting in a worth of 15-25% greater than the M. Arch. Graduates of miscellaneous design curricula are treated like poets and ministers of the gospel - they must marry well in order to live well,

8 John and Mary Peterson, "What Educations Means to Architect's Wallets", American Institute of Architects Journal, March 1966, pp. 52-55.

or else draw upon inheritance. Only a few hit the jackpot of fame and fortune that all hope will come to them; otherwise their existence is hand-to-mouth.

Changes in Role and Income Expectations

The profession under greatest pressure for change is landscape architecture. Its members have a new role to play as guardians of the health of the natural eco-system, and as advisors on issues regarding when and how to intervene in on-going living processes. At the moment this role responsibility is in conflict with the job status of the practising landscape architect. He is rarely able to achieve a supervisor's level, even over other landscape architects, but almost always reports to engineers or architects. Accordingly few landscape architects reach top income levels. Moreover, until very recently (say 1972) only twenty to forty percent of the land developers in North America felt the need for the services of landscape architects, even when there was experience with collaboration. Nevertheless for community recreational purposes and in government of all levels, quite a few new openings are appearing. In those roles the elements of professional training based upon natural science and technology are in greatest demand; in government services and large scale consultation the activity of "environmental planner" is being formulated. Albert Fein's recent study of the landscape profession suggests that environmental planning could split off in the late 1970's just as city planning and regional planning did during the 1920's.[9]

The situation for planners is very different because there have been thousands of unfilled positions in the country - several times the number of professionals produced by the graduating classes of the planning schools. Old time planners grumble that the "kids" are pushed into responsible posts years before they are ready. The reasons for this condition can be traced to:

1. Demands on the part of the Federal Government that its grants to communities or regional authorities be made part of some integrated plan for development;

2. The need for planners to lay out proposals for new growth whenever the regional economy is expanding;

3. The need for projects that produce jobs or some special impact when the economy is shrinking;

9 Albert Fein, "Summary Report of the Study of the Profession of Landscape Architecture", Landscape Architecture, October 1972. It includes recommendations for the expansion of the responsibilities undertaken by the professional, even to the extent that the name would be changed.

4. The acceptance and widespread use of long-range planning in corporations as well as in some operating departments in Washington, and therefore a corresponding increase in understanding of the methods of planners for introducing relevant considerations into the power structure. Thus generalist-planners are increasingly required.[10]

Thus the planners find their field opening up into several directions simultaneously, each of which demands a more than the specific skills of the profession and requires much learning-by-doing on the urban and regional frontiers. Many new graduates spurn all the known directions and seek to carve out new niches for themselves as organizers, advocates, and unique specialists. The great discrepancy between demand and supply left a kind of vacuum that drew in the older design professions as well as engineers, political scientists, geographers, sociologists and a miscellany of others into posts originally intended for "planners". Most planning schools have expanded, and quite a few new teaching programs have been organized, but the vacancies will probably continue until the end of the decade.

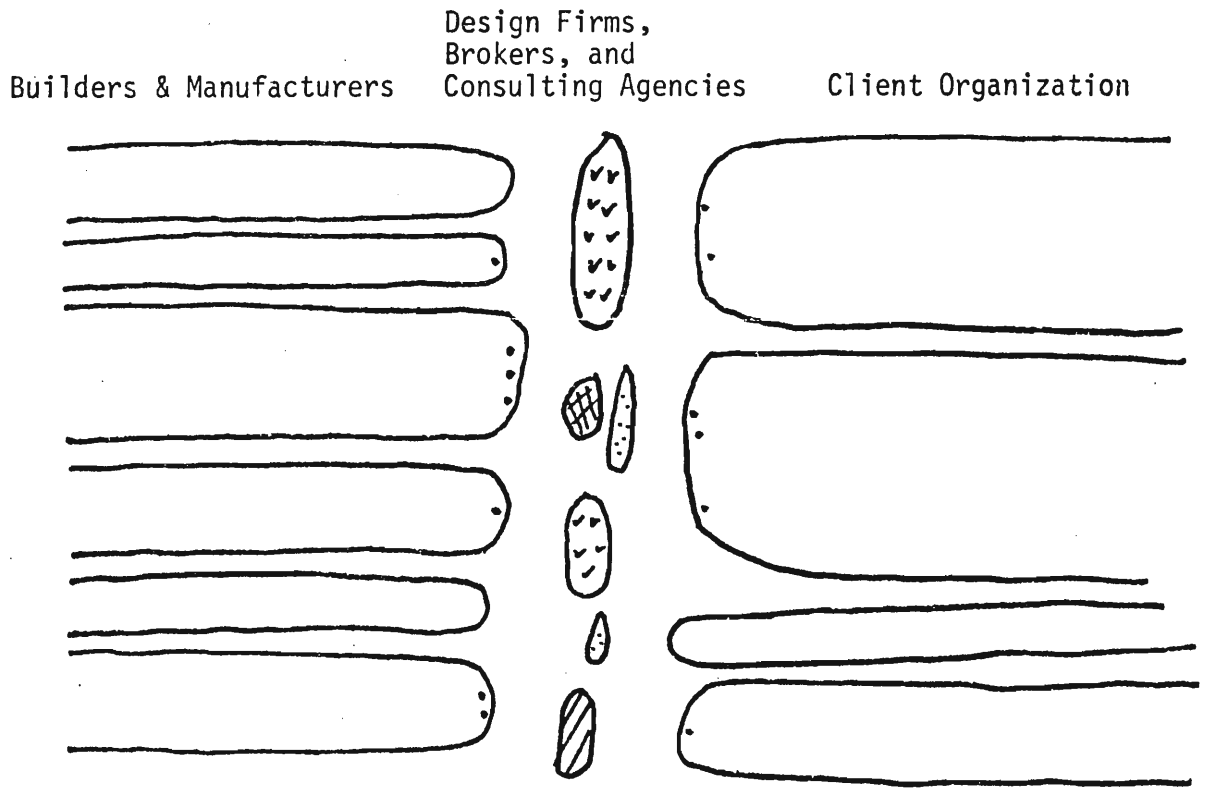
When landscape architects move into planning in the future it seems likely that they will be assigned responsibility for land development on local, community, and regional scales. It does not matter whether they have been educated to do land development, as no one else available has been trained for it either. Many errors can be prevented by bringing together multi-disciplinary teams, a technique that will be employed increasingly for the more important projects that do not have too much pressure to get into immediate operation. In these instances the professional will spend most of his time in working out land development <u>strategies</u>, rather than taking the more classic approaches to design which depend upon maps prepared for subsequent implementation.

When architects move into planning they are most likely to become involved in urban redevelopment. Initially these tasks range from community organization and advocate planning to traffic planning and urban design, but architects work up to general plan studies within a few years of work in an agency. Ten years out of the university it is impossible to discover who was trained for planning and who learned it on the job. Over the next few years it seems likely that a majority of the posts will be filled by architects, primarily because their supply is so much greater than that of any of the other partially relevant degree holders.

The graduate schools see increasing evidence of recognition by the young professionals with B.L.A. and B. Arch. degrees that "planning" constitutes a "wave of the future". They come back to the University to study urban design or as many planning courses as they can. There they find themselves competing with engineers and social scientists who see the same opportunities for useful and increasing employment.

[10] Stefania A. Denbow and Thomas E. Nutt, "The Current State of Planning Education", AIP <u>Journal 39</u>, May 1973, pp. 203-9, "Prospects for Urban Planning Education", Ibid 26 July 1970 by Nutt et al.

The other major direction for the professional designer is one that has hitherto been most distant in role-playing fantasies in the studios but is being brought closer by a further development of the socio-political environment. It casts the designer as an "organization man". Many top professionals observe already that the "office", or firm, works increasingly at the interface between building and manufacturing organizations that are growing in complexity and clients which are either other corporate types or technically competent government departments. The following diagram portrays the typical situation to be anticipated:



A pithy, unwritten rule among management consultants recognizes that although the opportunities and challenges are greatest at the interface between the organization and its customers, those who work at the interface frequently get squeezed. Bankruptcy rates are high in those activities. Thus they find the low morale of the design offices completely understandable - those are men who have lost control over their lives, feeling they must submit to the philistine demands of entrepreneurs

or the prosaic, unimaginative requests of builders and manufacturers. But what is the solution? How is appreciation of design enhanced? One way of dealing with the interface problem is exemplified by the law profession, where an important fraction of the members of the bar will serve as counsels within an organization and will identify with its fortunes enough to commit themselves to moving up the promotion ladder to the top posts. Law firms deal with counsels of clients and counsels of government agencies or of private organizations. If the architectural firm should do this, it would deal with in-house architects who served both clients and builders, with the result that fewer mistakes and greater refinement would show up in hospitals, office building, production facilities, and land plans.

An alternative possibility is to merge the designers with other consulting professionals - engineers, economists, accountants, and investment analysts as well as specialized lawyers, in order to offer a complete package. A promoter could then order almost anything from a new line of products to a recreational community, and the multi-purpose firm would make all the arrangements - for a commission and a share in the profits. A few such multi-professional firms have been formed in the past decade; they are expanding but have much to learn.

The major consideration that prevents a designer from following the lawyer is the image he has created of himself as a professional. Good design, like good science, was held to be above politics. When that naive tendency is overcome the special skills of communication and synthesis he has acquired can be as useful as those picked up in law school. In a fast moving cosmopolitan world the designer-president of a large organization should have a competitive advantage over an engineer-president or a counsel turned president. Success in reaching the top, however, depends much more upon a man's stamina and his ability to educate himself on the job rather than upon the curriculum in the school he attends.

Income rewards for organization men tend to be greater than for the present range of design jobs. In government these benefits are obtained earlier in life, although at the expense of opportunities to reach the very highest pay scales later. All these factors must be taken into account when viewing income prospects for a profession as a whole. Therefore, primarily because their social roles can readily be expanded into these organizational interface positions, the present value of a degree in any design field but that of industrial or product design is likely to be even greater than expectations based upon current salary range. The

opportunities that the bulk of the design professions can move into are not those open to technicians - narrow, repetitive, and unimaginative - but those requiring the generalists and synthesizers that are now increasingly attracted to the schools.[11] As compared to other professions and disciplines - overhung with surplus graduates and more restricted in problem-solving skills - the outlook for the design professions is strongly encouraging!

The New Tasks

Novel designs are rarely ever produced to meet some critical social need; they most frequently spring out of some new technological capability as applied to an exceptional opportunity. A stream of imitations usually follows. Some of them are clumsy compromises with the past but most tend to be superior in detail to their progenitors. Therefore, innovation in design may be confidently predicted on the basis of the major breakthroughs that have already begun in technology, social as well as physical. Occasionally relatively tiny developments, as measured in dollar value or headlines, may add another dimension to design. The list that follows cannot be complete because it is evident that much more remains to be invented and synthesized in the forseeable future than has been accomplished in the past. How will the financial resources, the time, and the expertise ever be assembled for the exploration? Certainly post-industrial society seems to be a prerequisite for crossing new frontiers.

1. Aquatic settlement. The earth has much more marine surface than land. Yet designers have been diffident about seeking solutions to the design of ecosystems and communities that occupy the surface of the sea. As a result of the coastal engineering work, as well as floating platform design, the basic engineering required for human settlement of the seas is sufficient for architectural designers to explore the range of alternative forms. Well on the way to realization are the energy islands, super-ports, and marine industrial complexes. Next should come resorts, village scale conglomerations, towns, suburbs, and satellite cities. Since the resources in the sea, and below the deep sea, are too thinly distributed to support urban populations, most of this development will occur in and around

[11] Gerald M. McCue and William R. Ewald, Creating the Human Environment, (Urbana: University of Illinois, 1970).

major coastal metropolises where aquatic settlements add to the variety of residential environments offered to persons gaining their livelihood largely from land-based occupations. (The well-publicized underwater program will be much less significant, resembling much more a camp-like environment for thrill seekers, similar in purpose to mountain climbing huts above timber line).

2. Around-the-clock space sharing. The communications satellites and the jetcraft will keep inter-metropolitan services going around-the-clock. Thus far they have only affected the airport districts, but in the future the central spaces will have to introduce the kind of time-sharing that is already familiar to users of computers. The bio-rhythms built into the physiology of plants, animals, and humans then become basic data for designers. The use of light for dynamic imagery at night (as in Las Vegas) has barely begun. The cityscape should become much more colorful and moving than anything we have known to date, but still incorporating many convenient niches for those who do not wish to participate in the "big scene". A major support to be added should operate in the early morning hours when non-establishment types (computer programmers, musicians, artists, users of low cost flights, newspapermen, television production staff, students, etc.) move onto the streets to produce another kind of urbanity. This component of the city population will be joined by a group that work with the world markets, especially those most active on the other side of the world.

3. Interestingness and fun. These are two dimensions of human behavior much more demanding of creativity than the "basic needs" of food, shelter, love, etc. Designers cannot depend upon the voiced "perceptions" of the users, and their proxies, the clients. Designers must design new contents for the environment that remain interesting because they tease both the senses and the intellect. They must invent places that are fun to be in. It can be argued now that creative play, drawing upon wide-ranging stimuli, expands one's experience or repertory for action in a novel social setting - an asset that can be drawn upon later whenever one is subjected to stress. This approach to design transmits apparently non-utilitarian information in such a way that it is cheerfully accepted and imparts continued motivation to learn. In most respects designers must explore ahead of the behavioral scientists. Through a mixture of observation and experiment they discover facets of behavior the existence of which is only suspected by the specialists and for which they

have as yet no terms capable of producing adequate descriptions. Many such experiments can be carried out with "tentative" structures, using light demountables and inflatables and the information can be displayed from slides, tape, and film in readily portable packages.

4. Completion of the urban transition. Becoming vaster than any of the other agenda are the full implications of the population explosion in the villages and towns of the world. Until these people have been mobilized by modern city-based institutions little hope exists for their social and economic advancement. For 90% of the future population it appears that this will mean finding a new home in an urban region and working in a highly organized milieu - construction site, factory, market place, office, studio, etc. Over the next three generations at least ten times as many buildings must be put up and furnished for occupation as are now in existence. The challenge also requires the design of new eco-systems that allow men to live comfortably together in relatively high density along with plants, animals, stationary machines, vehicles, and automata. The potentials for designing effective recycling systems are extraordinary, reaching into the synthesis of new food products and tastes, as well as clothing, furnishing, and housing. Even though a sufficient set of technologies has been created to handle a transformation of these dimensions, designers have not yet had an opportunity to fit together more than a few pieces at a time. City planners have the biggest challenge, since the Indian sub-continent alone will probably need a hundred metropolises the size of Tokyo before the population can be brought into equilibrium, and the scarcity of resources in the world during the next three generations will require substitutes and economies that result in strikingly different urban design. New solutions will be required at every scale - from micro-artifacts, such as personal, built-into-the-body telephones created by bio-engineers, to the traffic circulation systems for a megalopolis as evolved by regional planners.

The Social Utility of New Designs

Design philosophies, particularly the cosmic world views favored by working intellectuals, have not yet recovered from the sudden collapse of the beaux arts outlook. Students of the 1970's, even the most cynical of them, are enthused by their interviews with the great men of the profession, though they had to admit that what they sensed could not be called an achievement of a holistic philosophy. They are picking up flashes from an unusually effective personality - the kind they would like to cultivate for themselves over the next several decades. They

are able to detect the flaws in the verbal assertions of the massive egotists, whose names are still dropped in casual conversation the way the pious call upon the saints to defend their every claim, but they find no new guiding principles.

Nevertheless the search goes on among the most enterprising. The methodology of the design process is brought out into the open and scrutinized, in the manner of the investigators of artificial intelligence. The theory of signs (semiotics in America, semiologie elsewhere) and latest concepts of linguistics are debated. The philosophic sophistication in the leading design schools exceeds that of the departments of natural science because the need is greater. Some seek a language that distinguishes the basic elements, like the physicist's particles, the chemist's elements, and the biologist's species, while others look for internal consistency that will generate defensible proposals, and still others wish to formulate economical ways of discovering the covert data and secret agenda in social situations that often make the difference between a viable design and a sterile imposition. If there is a missing ingredient in all this cognition about future design theory and philosophy, it has to do with the politics of pluralism - city planners have been concerned, but much more at the level of action than the resolution of intellectual difficulties.

Some students, even an occasional faculty member, will put on the mantle of a revolutionary for a few months at a time, and participate in groups dedicated to tearing down the "whole rotten system". Soon, however, they are intimidated by the gulf that lies beyond, should the system actually collapse. What are the principles for constructing anew? As designers they would be called upon to lead the reconstruction - even at this stage, when existing systems are to be ripped to shreds, they are sometimes asked "What is your program?" The more intelligent realize they have none; neither Marx, Mao, nor Che were designers, so they have no blueprint to borrow. Quite a few progress further when they join a seminar aimed at setting up an "intentional community" that has achieved partial consensus about an environmental ethic for dropouts. When put into practice, however, it usually appears that the economics of community life, isolated in the redwoods, fruit orchards, mountain valleys, or warehouse districts on the wrong side of the railroad tracks, have been badly miscalculated, thus calling into question the ethical consensus that had been reached.[12] The grapevine that carries reports back from the communes leads us to believe that few architects lasted more than a summer,

[12] Patrick W. Conover, "The Potential for an Alternative Society", The Futurist 7, June 1973, pp. 111-116; Lea Adamson, Phil Armstrong, Jack Fleck and Larry Kozimo "Urban Communes: A Study of Group Living in Berkeley, California", Institute of Urban and Regional Development, Working Paper 208, February 1973.

but the artisan-artist, who for long periods must present his wares at street fairs, becomes the mainstay of the group. The social designs have much greater variety than any single person could imagine - each of them containing major deviations from custom, many of them on the wrong side of the particulars of the law. Virtually all are parasitic upon the urban economy, with quite a few living on relief checks and food stamps. The ethical philosophies that are evolving appear to be existential sub-assemblies of new guides for behavior.

About five years back it seemed that the landscape architects and the tiny splinter of planners and architects that had somehow acquired a fair background in systematic biology would be more relevant. Ecological thinkers were evolving a public philosophy that would guide their value judgments. They had some unusual spokesmen in both Huxley's, de Chardin, Waddington, Dubos, the Bulletin of the Atomic Scientists, the Conservation Foundation, Nature Conservancy, and hundreds of effective disciples as advocates. Scores of voluntary organizations were formed; in California the Sierra Club became a kind of established church. The principles of living with Nature without destroying it make a good deal of sense, as does the argument that ecosystem impacts should be gauged for both the long run and the short run before intervention in Nature. The possibility existed that the language of macro bio-systems could be translated into terms understood by the other architects and planners, and a new guiding philosophy emphasizing participation in the preservation of the living systems would arise.

In recent years, however, schisms have developed in the ranks of Nature - worshipers. For a few evangelists the wilderness became the highest good, while others took extreme positions favoring birds, fish, and even insects over people. Consensus was lost, particularly among the scientific contingent. Then, from a totally unexpected quarter, pleas to "save the Bay", "save the air", and "ban DDT" that might be expedited by alternatives put forward by designers were shown to be promoted at the expense of the poor and the uneducated - who rated the improvements to be obtained at the bottom of their list of priorities. Ecological imperatives, as translated into policies and designs, almost always favor the relatively educated and financially secure at the expense of the poor, so the equalitarian instincts of younger professionals, in particular, are being violated. Some difficult tradeoffs will be necessary, and the compromises will be painful. The responsible designer will have to balance what he learns about the subtle inter-relationships in the ecosystem against his sense of social justice, recognizing that secondary

and subsequent effects of policies on the socio-economic system are quite often larger than the intended direct consequences.

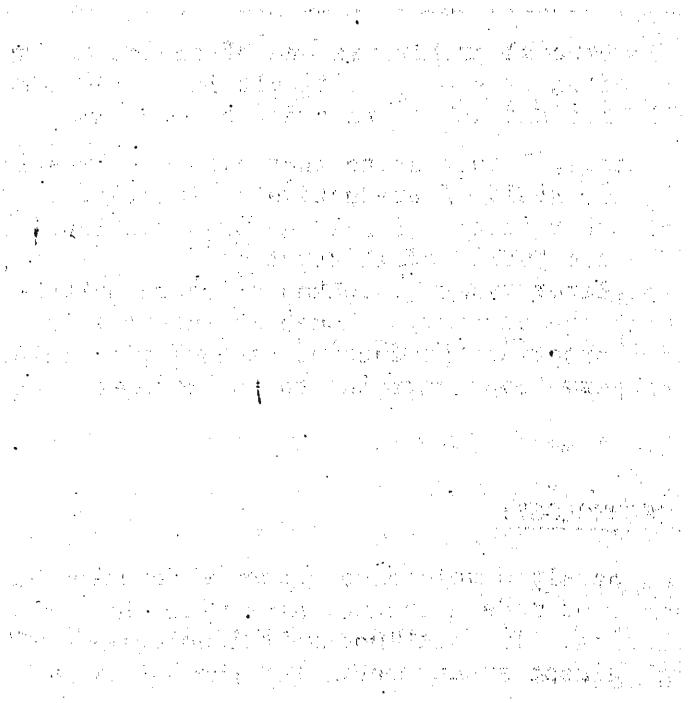
There remains to be created in the more distant future, perhaps taking an eloquent form in the late 1970's, a synthesis of the long term requirements of the social system with the "spaceship Earth" ecosystem constraints. It can be spelled out at present only in the most utterly simple terms, but the relevance to design is evident.

Consider the example the designing of an utterly new capacity into the environment at little or no cost to existing capacities. This would be regarded as a useful innovation. That extra capacity would stimulate, or merely permit, a number of extra social transactions, usually of a participatory kind. The extra transactions, once they had been repeated several times, would set up new bonds, either between people or between men and sites. Some of the new bonds would be mobilized into new organizations, or they would add a new capability to existing organizations. Such organizations provide a means for people to cope with the unusual stresses presented by the environment; they enable people to cope noticeably better than before. The added coping mechanisms make the social and physical environment more healthy in positive mental health terms. This is a constructive public health approach to the environment that goes beyond intervention in order to stop the vector of an epidemic; it aims at contributing components that enable us to grow a new generation of somewhat better people.

One can be still more explicit about "environments that grow better people". Urbanization stresses arising from too many messages affecting too many personal commitments, so that human capacities are overtaxed, are building up. People thrive on improved communications and enlarged responsibilities, enjoying it up to a satiation point - it is the occasions beyond this point that irritate, exhaust, and destroy. Too often people subject to urban stresses use land as a buffer; they create space-consuming life styles in their preferred retreats based upon avocations involving horses, boats, swimming, golf, gardening, etc. An increasingly important task for the landscape architect is to find ways to accommodate a maximum variety of these life styles with minimal conflict between them, while the industrial designer, architect, and city planner can design protective interfaces in the metropolis that forestall the demand for land on its periphery.

In an affluent society like that of North America, where funds for innovation exceed by far those available elsewhere in the world, designers have more

opportunity to innovate. Because urban income levels reach benchmark points one to three decades ahead of the European (two to five decades ahead of Latin American), the professional designers can borrow relatively little from elsewhere. The North Americans are cast in the role of pacemakers, whether they like it or not. They are forced by circumstances to take into account the requirements for social justice as well as responsibility for continuity of the eco-system, so the philosophy they are groping for may well be called environmental humanism. The formulation of a practical ethic that is internally consistent is one of the current tasks that it must undertake in concert with others in the learned professions. Fortunately the new generations of designers are drawn from the whole world, and the calibre of the recruits is rising, so the chances for avoiding a parochial resolution of issues and reaching a fundamental formulation are good.



WANTED: A TECHNOLOGY FOR DEVELOPMENT OF PRIMITIVE ECONOMIES

By T.K. MOULIK
Social scientist

Although there is a great deal of controversy in the matter of the precise role that economic development ought to play in the ultimate goal of human well-being, it is one of the dominant concerns of governments in all the underdeveloped countries. Generally the underdeveloped countries seem to be committed to economic development as a desirable and essential phenomenon which is essentially perceived as the process of increasing material comfort or raising standard of living of the people. This implies that the essential task of the governments of underdeveloped countries is to assure adequate production of goods and services in the first place in order to make possible their distribution among the population. It is, in this perspective, a rapid rate of technological progress that offers most hope of economic development of underdeveloped areas. But, the fact that the large majority of the population is occupied in the rural sector of underdeveloped countries, and since it may be argued that the traditional non-mechanized methods of production have absorbed whatever improvements are possible in the process of being in use for a long time, the main thrust of technological progress must be directed in the service of the rural majority. Such a technological progress cannot be independent of the techniques chosen now. The use of particular techniques today might determine whether the possibilities offered by such methods can be profitably used in the long run to achieve the desired goal of economic development.

Thus, the crucial problem is one of choice of appropriate technologies. The choice is often extremely difficult involving both technical and non-technical elements and therefore creates a dilemma.

At this stage, I must state that although my main theme today concerns techniques in the field of productive activities, it does not undermine the importance of other institutional and organizational technologies related to social welfare and public administration. What I am interested in is to refer to these later types of technologies as a backhround factor closely associated with the economy. Though my interest is in the larger problem of choice of appropriate productive technologies in underdeveloped countries, much of the observations pertains to the primitive economy of Papua New Guinea.

SOURCES OF TECHNOLOGY:

There is hardly a volume on economic development that does not relate the advancement of modern technologies with the experience of Western industrialization. In fact 'modern technologies' and Western 'industrialized' countries are almost synonymous. For the underdeveloped countries which aim to modernize their traditional economic structure through introduction of new technologies, the very example of economically developed nations, particularly Western industrialized nations, becomes the obvious source-place to look for advanced technologies. In the former colonial areas, however,

the choice for appropriate technologies for economic development is severely restricted in the sense that alternative examples are not examined or experimented, simply because colonial power generally lacked planning and lacked also both the ability and the will to control the allocation of resources on more than the smallest scale. However, few authors openly suggest that the underdeveloped countries need to reproduce the same political, social and economic atmosphere which was enjoyed by the developed countries during its period of most rapid progress. It is neither possible nor desirable.

But inspite of the general understanding that the reproduction of the same historical experiences is virtually impossible in almost all developing countries, the implication lingers in the form of assumption that sufficient technologies exist in the developed world to meet all the needs of the developing countries for many years to come and what underdeveloped countries need is merely the transfer of technology.

There is perhaps some truth in these views, but also fallacy. The fallacy arises from the fact that little scientific endeavour has been directed to discover advanced technologies which are suited to the factor-proportions and socio-economic structure of underdeveloped countries. So, in many cases suitable alternative technology is not available for particular needs of a developing country and often suitable techniques designed to meet the needs of the industrialized developed countries are chosen to be applied. The results, of course, have been both disastrous and unpalatable.

TRANSFER OF TECHNOLOGY:

Let us, for the present, assume that there are some technologies in the developed world which can and should have to be transferred to underdeveloped areas. What are these transferable technologies? How much of it can be transferred and how? Finding answers to these questions quite clearly involves the problems of transfer of a modern technology evolved over many years in developed countries into an alien environment of underdeveloped areas. I need not enter in this place into a detailed discussion of the complexities arising in the course of transfer of advanced technologies into a less advanced society. This problem involves not only economic and engineering consideration, but also social, political and psychological; it has received in recent years much attention by various authors.[1] At the risk of being tautological, let me briefly mention two critical issues which make the transfer of technology difficult and sometimes even an impossible task depending upon the types of technologies:-

1. See, for example, Chapter 7 of Human Resources for Industrial Development, Geneva: ILO, Studies and Reports, N.S.71, 1967, pp.201-217; W. E. Moore, Industrialization and Labour, New York, 1951; Robert E. Asher (ed.) Development of the Emerging Countries, The Brookings Institution, Washington D.C. 1962, pp.126-31 and Kenneth Berrill (ed.) Economic Development with Special Reference to East Asia, Macmillan & Co. Ltd. London; St. Martin's Press, New York, 1964, pp.386-87, 389-96.

First, modern technology depends both deliberately and instinctively on requirements and factor endowments in industrialized countries and consequently they are basically labour-saving and capital-intensive devices. 2. This means that these technologies are typically suited to an environment with large markets, a relative abundance of capital and entrepreneurial and managerial skills, and a shortage of labour. The present factor-endowments in the underdeveloped countries are just the opposite characterized by abundant or even redundant labour and severe scarcity of capital and skilled manpower.

Secondly, modern technologies are casually associated with urban-industrial model of society based on the immediate-family unit with a strong urge to attain ever-increasing standards of material welfare (that is greed and acquisitive instinct) and committed to a strictly disciplined and punctual way of life as demanded by the urban-industrial technologies. It is also associated with an impersonal monetary exchange economy and a strong sense of individualism. On the other hand, the developing countries are predominantly rural with a distinctive village way of life based on extended family system, with traditional social and kinship relations and obligations; where needs are relatively few with no vulgar craving for material possessions regulated effectively by social sanctions; where there is no sense of urgency, efficiency and high speed activity of modern industrial life; and the day-to-day life is not characterized by impersonal individualistic exchange relationships.

Although it is probably a caricature to characterize modern technologies in a few broad strokes, it definitely shows the enormous gap between the environments of developed countries and the under-developed world and thus one can imagine the complexities of the problem of transfer of technology. Examples of such complexities are not wanting. A wide variety of cases has been presented by Goldschmidt [3] which needs no repetition here. However, the special situation of a 'primitive' socio-economic structure of Papua New Guinea provides some extreme examples:

One of the revolutionary technological innovations brought into the subsistence-affluent tribal communities of Papua New Guinea by the Western Colonial powers is the capitalistic exchange economy based on money. Even after a long period of contacts, the indigenous response to the incentive of money-economy has still remained to be a partial commitment, especially among the rural majority. The dependency of the average Papua New Guinea villagers on cash economy has risen over the years, but not to the point where they cannot choose to retain or to change their traditional social

2. H. W. Singer, "Obstacle to Economic Development in a Non-Schumpeterian World", Social Research, 1953.

3. See W. R. Goldschmidt, "The Inter-relations between Cultural Factors and the Acquisition of New Technical Skill" in B. F. Hoselitz (ed) The Progress of Underdeveloped Areas, Chicago, 1952, pp.135-51.

and economic organizations and values as against those demanded by the capitalistic cash economy. At the best, cash is only supplementary to subsistence economy. In other words, "love of money" could not dissolve what stood in its way in Papua New Guinea villages. Instead, given subsistence affluence, the traditional institutions and customs (kinship obligations and social sanctions) often reinforce each other in excluding new ideas and creation of new wants through "demonstration effects" in the sense that earning of more money or acquiring or consuming more wealth for personal satisfaction after a relatively low socially approved level becomes meaningless. As a result, a large portion (varying between 30 to 60 per cent) of cash crops (coconuts, coffee) are left unharvested or unexploited; with a low level of demand-ceiling for cash-expenditures (an average cash expenditure of $A2.50 per month per consumption unit, cf a family as against the average monthly cash income of $4.50 per consumption unit), the backward-sloping supply curve of efforts start to operate at a relatively low level (an average 3 man hours of labour efforts per adult per week into cash-earning activities); for the few entrepreneurs who invest money into business enterprises (most commonly trade-stores and trucking businesses) monetary profit becomes the secondary aim, while the primary aim is to earn prestige by sharing the income with the kins in the village or simply by owning the trade store or a truck and, by obliging kins (by providing a free ride in the truck and giving away trade goods) and thus ultimately ruining the business completely; and because of the lack of mechanical knowledge and cost of repairs, the business trucks are driven without any maintenance and care until they become unserviceable and then rejected as junk (average life for an indigenous-owned vehicle is two years). On the other hand, those entrepreneurs whose sole aim is to obtain monetary profit from investments has to undergo considerable social costs and severe social sanctions which are not always easy to live with. [4.]

The purpose of this long list of adjustments is to show that whatever it be that we may care to designate a modern technology, that it cannot be transferred, like a stock of raw materials, from advanced countries and applied to the situation in underdeveloped countries. Modern technology has to be adapted to the factor endowment and socio-cultural values and structures of the underdeveloped countries.

ADAPTATION TO MODERN TECHNOLOGIES:

A country's capacity to adapt modern technology depends on its techno-economic resource base, domestic stock of skills (not only technical skills, but also managerial and entrepreneurial skills), and the complex of

4. See T. K. Movlik, "Money, Motivation and Cash Cropping in Papua New Guinea", New Guinea Research Bulletin, The Australian National University Press, Canberra (forthcoming).

cultural and religious values and social structures. Obviously, changes or modifications are needed on all the above-mentioned variables in order to adapt modern technologies in a developing country. But adaptation is essentially a two-way process meaning that a change or modification is also essential at the other end, that is, the modern technology. This is the point often overlooked by many who, out of their over-enthusiastic ethnocentrism justified by the attainment of a wealth of material satisfactions, are so convinced of the virtue and superiority of the modern technologies and rules of life in the developed countries, cannot conceive the future of underdeveloped nations except as an effort to abolish or change the traditional socio-economic structure and values. It is not that they are now aware of the consequences of technological fever, but they do not really believe them and therefore continue to delight in any mechanical improvements. There is almost a paranoid concern of such people with the absence of a discouragingly long list of 'pre-requisits' for economic development in the underdeveloped nations, which range all the way from adequate transportation facilities to basic psychological attitudes and social values and structure. Such a realization, however, brings in the inevitable 'chicken-and-egg problem' of decision-making rather than a comprehension of the total process of adaptation involved. The decisions arise out of this model is, either the change in social values and structure must be accomplished first or the modern technologies should have to be introduced first to produce those changes. It is assumed that either the underdeveloped countries are so strongly committed towards economic development model of the Western industrialized countries that the desirable social changes will be produced somehow or once the modern technologies are introduced acculturation will take place by creative adjustments and alterations of social structure and values. There is perhaps some truth in these assumptions. But it is often overlooked that strains and tensions are often so great that modern technologies are rejected, or the social and political costs are so great that innovations are fended off; where the innovations are imposed and the society cannot reject, serious social disorganization results. It is true that without tensions and imbalances, technological progress is impossible and in a certain sense all innovations produce tensions. But it poses the most tortuous problem in any programme of purposive technological change: How much of the imbalances and tensions will be endured before it succumbs? How deep are the commitment of the underdeveloped countries to economic development and what sort of economic development? It is therefore important to view the adaptation of modern technology by the underdeveloped

countries from the perspective of the members of such a society, and especially of those that are involved in bringing development about. There is a lack of systematic attention to this aspect of the problem.

For the newly emerging countries, economic development and technological progress is as much a process of building a nation politically as to raise levels of living. Mobilizing and involving masses of people in the modern productive processes is not simply a function of the accumulation-and-saving construct but involves social and political compulsions and compromises. However, inspite of differences between the developing countries, there are some common elements in the overall national aim or aspirations about the shape of the future as envisaged by the leaders of these nations. Essentially, the plans of economic development of the underdeveloped areas are crucially rooted in the interrelated aims of political sovereignity, military security, and economic independence through mass participation in the productive activities with equal opportunities and egalitarian distribution of wealth. This is, in many ways, reversing the order of history of classical economic growth of the present industrialized countries. The underdeveloped countries aim to avoid the ugliness, abuses, mistakes and sufferings of technology-god of the industrialized countries from the very beginning rather than hoping to repair the damage in the end. In search of material wealth they are desperately trying to find both a better and more genuinely indigenous answer to the problem of economic growth than the presently advanced nations has provided with its mod, supertechnolized, polluted and squalid slums, with its dreary, grimy and hopelessly overcrowded cities, and its depopulated, dehumanized or defaced countryside. They often express their resolve to modernize their countries without lessening the originality of their own particular traditions and modes of behaviour which are useful and valuable. For example, Papua New Guinea leaders' vision of good society is to preserve the traditional values of egalitarianism, kinship-ties and obligations. [5.] Preserving some traditional values and social structures does not necessarily mean to go back to the idealized and glorified 'noble savage past'. What it means is selective changes and adjustments and a greater inventive effort rather than a slavish imitation of the urban-oriented advanced technology.

To achieve these aims of economic development of underdeveloped countries it calls for developing new technologies which usually do not have exact

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5. This was emphasized in the lecture given by the Chief Minister, Mr. Michael Somare of Papua New Guinea to the Economics Students Association of the University of Papua New Guinea on March 19, 1973. These aims were also endorsed by the House of Assembly of Papua New Guinea.

counterparts in advanced countries. The process of adaptation of advanced technology by underdeveloped countries should then involve, not only changes in social structure and values in the adapting countries, but also modifications of modern technologies and invention or development of new indigenous technologies suited to the needs and aspirations of the less developed countries.

INDIGENOUS TECHNOLOGY: THE ULTIMATE GOAL:

Perhaps, I have over-stressed the difficulties of transferring and adaptation of modern technologies in the less developed areas. There are, of course, some technologies (not many) which can be easily adapted in the developing world without much difficulties, especially those which are simply a qualitative improvement of the existing ones but can be used almost in the same way and for the same kind of productions. The most illustrative example of such a technology-adaptation in the context of primitive economy of Papua New Guinea was the replacement of steel axes in place of the traditional stone axes. [6] But the difficulty arises when a modern technology for which there exists no approximate equivalent in terms of skill and experience required is intended to be introduced. Unfortunately, most of the modern machineries of production evolved in the developed countries are of the second type and, hence my emphasis on the difficulties of transfer and consequent adaptation of modern technologies in the less developed areas.

However, my main concern here is not just to catalogue the difficulties of transfer and adaptation of modern technologies by the developing countries but to the basic question of the selection and form of modern technologies to be transferred and adapted. In other words, the basic question to be considered is, whether indigenisation of modern technologies is possible, and whether such an indigenisation can bring about the social and economic goals aspired by the underdeveloped countries. These questions are directly related to the general problem of optimal allocation of investment resources.

Choice of technology being equivalent to the problems of allocation of resources, the important question is, what should be the criteria for resource allocation in the developing countries? This is an old problem in economics and as such many conflicting criteria are put forward by

6. Even such an easy adaptation of an improved technology may cause serious social stresses and strains as described by L. Sharp "Steel Axes for Stone Age Australians, in E. H. Spicer (ed) Human Problems in Technological Change New York 1952, pp.69-90. In Papua New Guinea, for example, 30 per cent of adult male labour efforts for subsistence production was reduced by the replacement of stone axes with steel axes creating proble of utilization of extra-leisure time productively. See, for detailed account R. T. Salisbury, "From Stone to Steel" Melbourne University Press 1962. Nevertheless, the introduction and adaptation of steel axes was relatively easier as compared to other sophisticated machines (e.g. automobile, factory machines etc.) for which there was no existing skills or knowledge.

various authors reflecting different evaluations as regards the objectives of socio-economic development.[7] It is not possible here to present and evaluate all these criteria. However, considering the broad policy objectives of the underdeveloped countries and the immediate problems of massive unemployment, maldistribution of wealth, widening gaps between rich and poor, and between rural and urban areas, ever-increasing migration of rural population to already overcrowded urban centres and a severe shortage of capital resources and techno-managerial-entrepreneurial skills, the choice of technologies for investment of resources must have to be suited to the increase in the mass productivity of rural economy - that is, mainly agriculture and other primary products and a rapid development of labour - intensive small-scale rural industries especially linked with agriculture-supporting industries.

Apparently, the capital-intensive advanced technologies cannot meet the requirements of such investment priorities. A new technology has to be developed which would be labour-absorbing and capital saving, relatively simple (demand for sophisticated skills should be minimized) and largely directed towards production based on local materials for local use.[8] Since the development of such a technology would have to rely heavily on the indigenous effort, creativity and local available resources, it might be called 'indigenous technology' rather than what is popularly known as 'intermediate technology'.[9]

How can these indigenous technologies be developed? It certainly does not mean that epochal innovations such as electrical power, wireless,

7. See for example T. N. Srinivasan, "Investment Criteria and Choice of Techniques of Production", Yale Economic Essays, Vol. 2, No.1, 1962, pp.59-63 ECAFE, "Criteria for Allocating Investment Resources among Various Fields of Development in Underdeveloped Countries", Economic Bulletin for Asia and Far East, June 1961, pp.30-33; A. E. Kahn, "Investment Criteria in Development Programmes", Quarterly Journal of Economics, February 1953, pp. 76-96; and O. Echstein, "Investment Criteria for Economic Development and the Theory of Intertemporal Welfare Economics, Quarterly Journal of Economics, February 1957, pp.56-85.

8. This is the approach suggested by E. F. Schumacher "Industrialization Through 'Intermediate Technology'" in R. Robinson (ed) Industrialization in Developing Countries, Cambridge University, Overseas Studies Committee Conference on Role of Industrialization in Development, Cambridge, England 1965, pp.91-96.

9. It is preferable to use the term 'indigenous technology' rather than 'intermediate technology'. The latter is often, by definition, regarded as inferior technology as compared to advanced technology and therefore advocacy of 'intermediate technologies' is misunderstood and resisted in the underdeveloped areas on emotional grounds. On the other hand, the term 'indigenous technology' is easily identified with the national pride.

air-transport, radio, modern medicines, as well as a host of manufacturing processes have to be rediscovered anew. What it means is the application of the underlying scientific principles and technical know-how embodied in the modern technologies to produce simple, yet ingenious and inexpensive ways of making or growing things.[10] Gadgil suggested three ways of utilization of technical know-how for the development of 'indigenous technology':

1. Transformation of existing traditional techniques by utilising knowledge of advanced techniques but retaining some elements in existing equipment, skills and procedures.

2. To adapt and adjust advanced technologies keeping the twin requirements of indigenous technology, that is, relatively labour-intensive and suited to small-scale simple operations.

3. To conduct experimentation and research in the direct effort to establish indigenous technologies.

Perhaps, an example of an 'indigenous technology' can clear the underlying concept:

Recently, in India (particularly in the State of Bihar), the use of bamboo instead of steel pipe in the boreholes for irrigation purposes has attained increasing popularity among the farmers. In this, the bamboo poles are coated with tar on the outside and rope is wound round it. This procedure is repeated till the desired outside diameter of the borehole is obtained. When the tar sets and hardons round the rope, a reliable and durable lining for the borehole is obtained. The borehole is lined with sections of these bamboo poles recessed to fit into one another and held down by weights to keep it water-tight. The bamboo poles are lowered to the depth of the hole several feet below the level of water and the water is pumped out to the surface.

In this example, there is a mixture of both indigenous traditional materials and technologies and advanced technologies. It saved money by using local materials in place of steel pipes, and at the same time advanced technologies, such as pump, is utilized. Also, in the process, local available skills to shape the bamboo-poles with traditional tools and equipment are utilized. This technology is more efficient than the traditional irrigation processes in India and opened a new market for the traditional skilled labour and local materials needed for the technology.

10. D. R. Gadgil, "Notes on Rural Industrialization", Artha Vijuana, Poona, India, Gokhale Institute of Politics and Economics, Vol. 6, No. 1 March 1964, pp.9-15.

Application of 'indigenous technologies' are not only limited to the utilization of primary products of agriculture, animal husbandry, forest etc., it can be used over a much wider range of productive activities. The priority of the agricultural development and agriculture-supporting industries are, however, obvious and understandable. Other examples that readily come to mind are the manufacture of furniture, shoes, apparel, bricks, ceramics, cigars, baskets, weaving, pottery and traditional handicrafts, as well as large parts of the food-processing and construction industries (building and repairing roads and buildings), retailing services, truck and bus transportation and servicing of automobiles and agricultural implements. The recent Chinese experiment with agricultural development and small scale industries reveals the unlimited potential for the future towards technological progress from below centering on construction of agriculture and nature by the masses of rural majority. Starting from small and large-scale irrigation facilities, water-storage, production of organic fertilizer and forestation, full-scale soil survey and soil improvement, improvement and manufacture of agricultural tools and equipment, selection of higher grade seeds and other agriculture-supporting industries, Chinese have shown that even steel can be made by cottage industrial techniques.[11]

It must be pointed out here that there are certain sectors in the economy which are entirely outside the technological and capital capabilities of the local small-scale industries. These are the processes characteristic, for instance, of mining, oil refining, basic iron and steel industries, manufacture of chemicals etc. But it should be added here that while labour intensive indigenous-technologies may not be applicable in the main line of production in the above-mentioned cases, that in the complementary fields, such as, building operations, transporting, supplying foods and retail services to the factory workers etc., the scope will be considerable.

The advantages of the use of 'indigenous technologies' are that: it would spread employment and productivity increases more widely and

[11] The quality of such steel has however restricted its use to a few goods. Also the process seemed to be physically inefficient and the experiment appears to have been virtually dropped. But it shows what is possible in small-scale rural industries. The experiment is, however, successful in the revitalization of indigenous technological thought based on self-reliance and has made a beginning of the evolution of rural majority with myriad skills.

develop local managerial-entreprencurial skills; it can have a decisive impact on the levels of living on the rural majority, without causing that lag between values and structures which often accompanies the more sophisticated advanced technologies; it may help to avoid the rural-urban dichotomy that has arisen in most industrialized nations today by reversing the historical course of, modernization --> industrialization --> urbanization to a process where it ends in a stage of ruralization of urban areas instead of polluted urbanization. But above all, it provides the foundation stone for the eventual technological progress of underdeveloped countries by way of expansion of technical knowledge and training about mechanized production processes among the masses, not just a privileged few.[12] Moreover, since 'indigenous technologies' are based on selective modern technologies, particularly suited to local conditions, it is relatively less dependent on foreign experts and capital and therefore can maintain the important aims of economic development-political sovereignity and economic independence.

The directions for alternative technology for economic development of the underdeveloped areas are ideally set, and perhaps all that is needed is time and a bold moral leadership. Much would depend upon how much the people of underdeveloped areas are prepared to sacrifice for a greater satisfaction in the future. But more than that, the success of 'indigenous technologies' will depend upon political compulsions - both domestic and international.

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12. Technological knowledge born in the course of actual productive operations has far wider scope and more immediate return than the learning through long-term and expensive educational programmes. This, of course, does not mean that development of educational facilities are not necessary.

TOWARDS A NORMATIVE IDEOLOGY OF SCIENCE POLICY IN UNDERDEVELOPED COUNTRIES

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INTRODUCTION.

Underdevelopment is used in this paper to indicate a phenomenon of global proportions which originates from the integration of the vast territories discovered in the XIV and XV Centuries into the world economic system. The international division of labor and the national and international structures that emerged have been the result of this integration process. Underdevelopment is therefore a historical and structural phenomenon: it is not a stage in a diachronic, linear process.

As a logical consequence, "underdeveloped" societies cannot be analyzed and understood in terms of "developed" ones since a given structure cannot be explained in terms of another structure. (1) It is not the main purpose of this paper to go into a detailed analysis of structuralist concepts. For our objectives, it is enough to say that the process of economic and social "development" should be defined as a transformation of structures. (2)

Therefore, if a given structure has its own system for the self-maintenance of its equilibrium, the passage from this structure to another one, or its transformation into a different structure is a question of capital importance not only for epistemological considerations, but from the point of view of the policy-maker. From the first viewpoint, it is essential to analyze the genesis of structures and their transformations. And from the second, the policy-maker will want to examine the ways and means at his disposal to disrupt a given state of equilibrium and start the drive towards another coherent state; but also the ways and means to "ride the rapids" inherent to the sometimes painful passage from one specific coherence to another.

It follows that the conventional approach to science policy making which accepts a linear and diachronic stage-by-stage concept of development is quite inadequate. It is no longer acceptable to think in terms of "applying the forces of modern science to development". This concept originated in the idea, deeply engrained in developed countries, that science could be used to

achieve particular "goals": win a war was probably the first explicit mission given to science during this century's world conflicts. Science policy institutions sprang up in major countries to enroll the powerful forces of science and technology in the war effort: Canada, England and the United States are fine examples.(3) Researchers and technologists were called in to perfect new weapons, means of transport, new drugs, etc. But once the war was terminated, this approach was maintained through the imperatives of the Cold War, the arms race and space competition. Even beyond these goals, science policy was limited to the belief that mission-oriented science and technology was its only expression. The RANN concept (research applied to national needs) recently proposed in the United States is a variant of this school of policy-making.

The same approach was adopted by international organizations like the United Nations, UNESCO, OECD and the Organization of American States (OAS). Since in these forums the phenomenon of underdevelopment was understood in the best Rostowian tradition, it is no surprise that science and technology policy had as its main objective the "application" of the potential or real forces of R&D to the pursuit of developmental goals. Science policy, they counseled underdeveloped countries, must assign science and technology the role to act as gap-closing, stage-burning agents in the effort to achieve the same form and degree of development existing in the industrial nations. The typical example of this view is furnished in the UN document entitled "World Plan of Action for the Application of Science and Technology to Development".(4)

I. The Structural Relationship between Science and Society.

Probably, one of the things that have been at the origins of such a simplistic approach to science policy is the lack of a set of values, ideas, beliefs and concepts on the relation existing between science and society - that which Dedijer calls an "ideology" of science policy.(5) This most complex of questions cannot be given simple explanations as to how science can "develop" an underdeveloped society by solving its essential problems such as

housing, industrialization, food and clothing, etc. Of course many examples can be given of how a scientific achievement implies profound changes for the social system where it appears: from the age of Copernicus up to quantum physics, passing through the Renaissance and the celestial mechanics of Newton which contributed so much to the design of a new model of the Universe. A reasonable amount of speculation can be carried out as to the effects of new scientific developments that are being born every day: from a relativistic conception of a limited, expanding and circular Universe to molecular biology. It is probably very tempting to analyze the effects of science on society due to the fact that for the first time in history, man has the possibility of drawing a unified perspective of what science is: from astronomy to economics.(6)

However, it is also as unilateral to explain the relations between science and society from the point of view of science being produced by society. In this sense, a given society preoccupied by certain problems generates a certain type of science with its proper methodology. Again countless examples could be enumerated. But this is also an oversimplification of the problem because science and society maintain a symbiotic relationship rich in iterative processes.

This is the conclusion arrived at by two great historians of science. For John Desmond Bernal, a man of considerable scientific experience as well as first-hand knowledge on the "application" of science and technology to a specific goal (winning a war), even if the growth and initial development of science was a consequence of the existing political and economic factors, once science had been recognized as a means to guarantee the existence of economic and political power, scientific progress became a very important factor of social and political life. In marxian terminology, Science can be considered as an "oberbaü" that has serious effects on the social "unterbaü". Science has a very strong impact not only over the material structure of society (for instance, production relations), but also on the ideas by which a given society maintains its explanation of the Universe and justifies the ratio--

-nality of its socio-economic and political system.(7)

On the other side, Thomas S. Kuhn deals with the problem of how Science suffers its revolutions, how the vast changes in scientific "paradigms" are brought about. But he also devotes considerable attention to examining how each scientific revolution modifies the historical perspective of the community that expe-- riments it.(8)

Science is therefore not only a powerful element in aiding a specific social system the attainement of certain concrete goals. It is also a force that will have an impact on the structure of a society: on its rationale, on its internal transformational laws and on its self-regulatory functions.(9) This is not only a hypo-- thesis: it is a very real fact and failure to recognize this by the science policy-maker in underdeveloped countries has very serious implications not only for their present social context, but very probably for countless unborn generations.

The traditional ideas about "applying science & technology" to development imply a methodology centered on the problem of how to define which tasks are really of high priority. The possibility of having science and technology offering new alternatives or helping design new development models is not only ignored, but in fact totally blocked.

One case in point is Professor Marvin Cetron's matrix for the identification of research priorities designed for the United States Navy and modified by UNESCO in order to apply it to under-- developed countries. Cetron's methodology is focused on the pro-- blem of the translation of certain national "goals" into R & D priorities, and at a higher stage, on the translation of technical objectives into very concrete R & D programs.(10) UNESCO used a similar methodology as part of a project with the Advisory Committee for the Application of Science and Technology and the United Nations Development Program.(11) Consequently, the UNESCO/ACAST matrices were filled out in many underdeveloped countries using a very faulty methodology - the results were taken seriously in some cases.

The document formulated by the United Nations' Advisory

Committee entitled "World Plan of Action for the Application of Science and Technology to Development" is of course another example of conventional science policy.(12) The World Plan sets down a series of general guidelines as to what the research effort should be in relation to several topics: housing, energy, food technology, industry, agriculture, education, transport, communications and even population. In no part of the document is there mention of the possibility of allowing the full potential of science and technology to play a more active role in modifying existing structures. For example, in the chapter concerning urban development, the World Plan does not consider the alternative of having a different type of urban design: cities in underdeveloped countries must still be patterned after the old urban designs existing in the industrial countries - urban designs that have outlived their own time and are by all means obsolete.

The lack of an "ideology" of Science Policy (no analysis of interrelations between Science and Society) is one reason that explains these absurd conceptions. But in more general terms, Science Policy as understood in international organizations is inadequate due also to the deliberate attempts to apply concepts pertaining to Science & Technology in industrialized countries to underdeveloped countries. For example:

i. Considering that underdeveloped countries are increasing their imports of technology every day, and that there are a series of very important problems related to this process of transfer of technology (not only the question of costs but also the issue of appropriate technology), the World Plan of Action does not recommend the establishment of screening & identification units that could help control and regulate this flux. In its model of the National R & D System, the Regional Plan for Latin America does not include supervision and control of imports of technology which will presumably continue to bypass the local scientific and technological system.

ii. The concept of "R & D" itself, which is based on the traditional tripartite classification of scientific and technological research, is not adequate. It implies the

OECD definition: "The criterion that distinguishes R & D activities from those which are not R & D is the presence or absence of appreciable novelty".(13) According to such definitions, a series of activities that are an important element of "inventive activity" would be excluded (not from the concept only, but from the action of Science Policy as such!). For one thing, this definition ignores Arrow's comment: "...the activities of production and investment can generate increases of productivity without an allocation of resources specifically directed towards such an end".(14)

iii. In the same light of analysis, we can question the relevance of other concepts commonly used in science policy discussions; for example:

a.- Measurement of the "scientific effort" by expenditure on R & D activities, or scientific performance through registration of patents;

b.- The concept of a "balance of technological payments" in view of intra-corporation transfer of resources between inter-affiliate firms.

This is not the proper moment for carrying out a detailed and exhaustive critique of concepts used currently in international organisms. A global discussion of the foundations of Science and Technology policies will entail a revision of concepts as well as methodologies.

What is important to consider is that once priorities have been determined through a given procedure, these "hi-priority" tasks can be carried out by individual components of the scientific and technological system (for example, by a special agricultural research institute). They can also be carried out by mission-oriented task forces comprising several elements working on a inter-disciplinary basis. In any event, the completion of these tasks may imply a certain amount of basic, oriented, and applied research, as well as experimental development.

The corollary of this set of "hi-priority tasks" is a

corresponding pattern of resource allocation. These financial or material resources can be channeled through the normal finan-- cial institutions and through government bodies such as the ministries of education and/or industry. But they can also be funneled through the central coordinating organ of the scientific and technological system, for example a "National Science and Technology Council". Whatever the institutional arrangements are, the criteria for determining resource allocation levels are basically the same. Global allocations may be set down as "goals" in terms of percentages of GNP that will be devoted to R & D efforts. But within the allocation pattern to the different components of the scientific system, various evaluation methods are used in order to maximize efficiency and results (cost - benefit and cost - effectiveness procedures are not uncommon). It has been rightfully pointed out, "all of these methods are based to a large extent on establishing and extrapolating past relationships among quantitative variables - they are useful to understand what happened in the past but less useful to define what future allocations will be or should be, unless it is further assumed that the system is going to behave in the same way as in the past."(15)

As a preliminary conclusion, we can say that the conven-- tional planning methodologies are definitely not suited for use in the formulation of Science Policy in underdeveloped countries. A totally new approach to science planning is needed, very close to a recently defined concept on the real nature of planning: "There is much more to planning than working out an effective and economical distribution of available resources and arranging for the efficient conduct of a particular operation. Planning implies a thoughtful combination of goals, the input of as much relevant information as possible, the creation of a system offering multiple options, and the possibility of reformulating goals as circumstan-- ces demand".(16)

II. Recovering the concept of Normative Planning.

An innovation in the natural and social sciences rarely comes about as a result of a sudden heterodox effort on the part of one individual. Usually, a researcher or a scientific community work for some time on a problem using the paradigms that already exist,(17) until they reach a point where they are ready to create a new set of rules and break with the past.(18) In other words, the good imitator becomes the good innovator. If we apply the above reasoning to the "policy sciences" and in particular to science planning, it may seem that the orthodox view of Science Policy can play the role of the "old set of rules" that can serve as a launching platform for a new paradigmatic framework for Science and Technology Policymaking.

Already we have witnessed an evolution in the concept of what a "plan" is and what it should be. The French planning experience offers a good example of this. The First Plan fathered by Jean Monnet in the early post-war period was a declaration of several great guidelines as it was quite clear what had to be done. Reconstruction was the general objective, and once it was achieved things started to change. The latest five-year plan is more a "general market study" which complements and corrects the deficiencies of the market mechanism.(19) Planning tends more to eliminate risks than to offer new alternatives.(20) In spite of how much lip service is paid to normative planning, it is evident it does not exist in France.

At this level of analysis, much of what can be said of general planning is applicable to science planning. Therefore it will be interesting to make a brief examination of the "state of the art" of planning. The following characteristics are revealed. The list may be long, but each feature is rich in implications:

i. There is no mechanism for the normative design of new and possible alternatives. The role of planning is to provide for a "surprise-free" future. Forecasting plays an extrapolative and not a normative role.(21)

ii. Emphasis on the short term. This may be due to a number

of reasons: the time horizon of the politician is precisely the short term and he therefore heavily discounts the future for the present; lack of imagination "obscures the possibilities of new alternatives and solutions" in the long term.(22)

iii.- Extrapolation is the most widely used forecasting method.(23) This is in part responsible for the "more of the same" approach to planning: more production, more technological change, more transport, etc.

iv.- No feedback allowance for the correction of original goals. In fact, the plan is never revised, it is entirely substituted by a new one when it expires. As we shall see later, there is no a priori reason to support this procedure.

v.- The "cultural regulator" (society's set of values and norms) is accepted as a constraint which cannot be acted upon. This is probably the most powerful reason explaining the decline of normative planning. There are no possibilities for "cultural design".

vi.- The production of documents is very commonly found to be the main function of "planning". This is of course a reflection of the political importance of having a "plan".

vii.- Current planning methodologies provide a partial and often isolated view of a very complex problem.

We can therefore agree with Hasan Ozbekhan when he writes: "We have neither a general theory nor special theories of it (planning), we have no widely accepted language that communicates its logic, no structure that organizes its predictive or explicatory propositions into an operational model, we do not even have such propositions. In sum, whatever it is that we call "planning" lacks that solid foundation from which it should be possible to strengthen and flesh out, to direct and evolve, to dispute and adjust the corpus of the practice itself".(24)

The fact is that there are no proven and reliable tools for the treatment and manipulation of an extremely "complex system"

that somehow deals with the totality of human experience. In the words of Jay Forrester, "the order of a system is equal to the number of integrations or accumulations within the system. The order of the system is equal to the number of states necessary to describe the condition of the system." And "an adequate representation of a social system, even for a very limited purpose, can be tenth to a hundreth order."(25)

In this context, the "order" of the complex system that has to be considered and dealt with in Science Policymaking is probably of a very high rank, in such a way that existing analytical tools are not relevant any more.

Therefore, if the "creation of a system offering multiple options, and the possibility of reformulating goals" is deemed desirable, a totally new approach is needed. This approach will have to struggle against the built-in inertia of every system because it will not be easy to accept that short-term decisions must be framed by long-range normative planning in which culture is no longer a totally independent variable. Without a doubt, history is more aware of itself today than ever before, and this self-consciousness may mean that culture design is a feasible method for creating new aims, goals and values. This process will come to maturity when a holistic view of Society is attained. A new concept of Science and Technology planning will undoubtedly contribute much to the realization of these objectives.

This new approach must take into consideration the following elements:

A. A method for normative planning of science and technology in underdeveloped countries should include a design of an ideal Scientific and Technological System (STS), defined by Sagasti as a collection of interrelated operations and activities that generate and transform the intangible good "knowledge".(26) It must be noted that R & D stricto sensu is included, as well as a series of "research support activities" and a set of "other technical activities". This ideal design will have to provide for a number of alternative models, thus maintaining a certain number

of options open.

Methodologies for design of social systems are a very scarce commodity. and much has to be done in this field. In fact. normative planning in science and technology has never been carried out - so almost every step in this direction will have to be an innovation. However, at this point it is perhaps necessary to clarify that designing an ideal scientific and technical system is far away from any speculative effort to create feverish utopias. Contact with reality and feasibility must and can be maintained through:

a.- Increased inputs of good quality information concerning the interaction between components of the STS and between the STS and its environment;

b.- Reliable diagnosing capabilities through the use of improved analytical tools;

c.- Continuous iterative processes also provide a sense of "keeping in touch" with reality by reviewing original models and their feasibility.

But it is equally important to point out that a design, whether a research design, a social design or an architectural design implies much more than just organizing or arranging a given body of knowledge. In Jantsch's words, "we have to ask the penetrating question whether design is not inherently more than just organisation of 'rational' knowledge".(27) In other terms, knowledge must share the stage with other elements of human experience which are indispensable in the creation of social systems (28) and which must provide the basis for a holistic view of culture and planning of the interrelations between Science and Society.

As far as the "contents" of this ideal design, it must cover as a minimum the following areas:

i.- Scientific or technological activities that must be strengthened or promoted. For example, what should be the ideal balance between basic and applied research, or oriented research and experimental development.

ii.- Types of relations or liaisons to be established between the different components of the Scientific and Technical

System. For example, how will research facilities serve production in industry and agriculture.

iii.- Institutional arrangements that are suited for the above objectives. For instance, creation of information and documentation centers, extension services, etc.

iv.- Relations between the STS and its national and international environment: education, production, other scientific and technological systems, etc.

v.- This includes not only integrating science and technology planning with other planning activities (most evidently with economic and educational planning), but also establishing homogeneous relations between specific science policies and mechanisms and policies in other areas that may entail an "implicit" component of science policy.

In general terms, we can say that this contents of an ideal design of a scientific and technological system desired in the long term corresponds to Sagasti's definitions of "contextual and stylistic planning".(29)

B. Participation is no longer a simple ethical requirement (although this is more so in normative planning for the long term), it is also a prerequisite for implementation and efficiency. Besides, the formulation of a plan through a participatory process will leave behind a most valuable set of by-products. For one thing, it will provide a unique opportunity to non decision-makers to learn about policy-making and understand the "problématique" of decision - making. Also, it will create a growing awareness of what social and cultural roles are. For example, a given scientific community may have very serious reservations as to what is the validity, usefulness and dangers (for its acquired privileges) of having a science and technology policy-making body. This scientific community may be educated as to its role vis-à-vis society through its own participation in the planning process. Again, this is no utopia and there are some very concrete examples that show that participation of large numbers of scientists and technologists in an iterative planning process yields practical results

in the short-term: India's Science Plan is formulated with the participation of more than 2,500 scientists. The methodology in the Republic of South Korea is another case in point.

Of course, much can be said about the actual techniques for achieving this large participation. For example, should a central planning office draft some basic guidelines that may serve as a framework of reference to be confronted later in the process with the scientific community, the productive apparatus, students, consumers, etc. that may participate through special committees and may appoint a drafting commission that will produce a final version of the plan. Or is it better to return to the planning office with a series of recommendations that must be taken into account when writing a final report. Many relevant questions remain to be answered, for example regarding the iterations of the planning model, composition of committees, nature of the representation (this is a key problem), etc. The fact is that global answers cannot be given and each country will have to provide its own solutions. However, one thing is clear: it is undeniable that participation in the formulation of the plan constitutes a safeguard against a central planning office working in a vacuum.

But the most powerful argument for participation in planning is provided by the fact that normative planning demands a dynamic feedback process in order to have a "realistic" view of Society. We must expect increased demands for participation in decision-making in underdeveloped countries as modern communications increase information availability for the average citizen.(30) And gradually there seems to be a weakening of the old prejudice that in order to take part in planning a subject had to possess all of the relevant information: therefore, only "experts" were up to the task. Both Kuhn (31) and Jungk (32) have pointed out that "lack of information" is not a handicap but rather an advantage that stimulates creativity.

C. There must be a shift from the short term to the

long-term as a proper frame of reference. Of course, different types of decisions require different time horizons. But a long-range perspective is definitely required.

It is evident that there is no a priori justification for setting down a fixed time-horizon, for example five years, and never revise goals, trends and objectives until the pre-set period has expired. Actually, what takes place when this happens is the substitution of the old plan by the new set of rules of the new plan. No feedback is allowed for and the plan fails to act as a reference or guide in the long-term.

If participation and feedback are both desirable in long-range normative planning (whether for science or for the economic system), a new concept of time horizon is needed. In this new concept, the time horizon could be any fixed period, for instance five years, but the plan would never expire. Every year the plan would be revised, its implementation evaluated, and its objectives reviewed. The five-year temporal horizon would simply "slide" one year, thus providing a permanent frame of reference. Of course, in an analogy with Constitutional Law, not all of the "fundamental political decisions" would be revised every year. But there would be a basic flow of feedback information that would yield the required holistic view of Society needed for cultural design and for the redefinition of values and objectives.

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IMPACT OF TECHNOLOGY ON MAN

(SOCIAL, CULTURAL AND BEHAVIOURAL ASPECTS)

AND

THE NEED FOR NEW TECHNOLOGIES

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It is an immensely pleasurable and stimulating experience to be invited to a special Conference on Future Research. We are accustomed in general to conferences which deal with problems but rarely offer solutions. We are also quite familiar with reviewing problems, discussing people and their patterns of living or the progress or deterioration that may have occurred in our respective areas but seldom do we get together to discuss the future projections in terms of research. The theme of the congress itself will offer clues to the historians of tomorrow.

The fate of the mankind is no longer entirely dependent on the course of the biological evolution. Man is now capable of shaping his own destiny. Advances in modern technology have raised a hope that man may subject the nature to his finite control or command. Genetic Engineering even hopes to select or modify the genes at will. Evolution being a phenomenon of natural selection determined by heredity and environment can thus be artificially controlled.

Technology has been changing the environment of man ever since antiquity. Fire-drive hunting of prehistoric man

and intervention to control periodic flooding of Nile basin are classical examples. The impact of technology on human environment has now reached enormous proportions. Subjects of air pollution, water pollution, insecticide pestilence , supersonic booms, possibility of climatic changes leading to uncontrollable floods or an ice age, radiation fall outs and the danger of exhaustion of natural resources including air and water have been widely discussed in recent years.

One could take up either the impact of technology on man, or discuss the desirability of innovating newer technologies, or determine the impact of man on technology, but it would be most appropriate that the twin problems of the impact of technology on man himself - particularly on his mental health, society and culture receive our attention. Perhaps the environmenta health hazards of industrialization have preoccupied our minds so far and the simultaneous socio-cultural changes which have taken place during their period have come to be accepted as a part and parcel of our modern life without questioning their genesi

The impact of technology, new and old, on man, society and culture is much more prominent in a country like ours, where consciousness of environmental hazards was already in existence and where the human, social and cultural values had a strong and long tradition of thousands of years. I have therefore decided to share my observations and experiences with you and discuss in this paper the extent and depth of influences of modern technology on the social and cultural fabric of our society.

. Of the several varieties of technologies one would, in particular prefer to discuss Agricultural Technology, Industrial-Urbanization technology, Transport technology (domestic movement and inflow of western philosophy and way of life) and perhaps Biomedical technology. In this paper areas such as, economy and industry, matrimony and domestic problems, politics, religion and castes, Ethics, Education and communication have been discussed as they are influenced by newer technologies and inturn have an impact on the mental health of the nation.

It is equally important to remember that socio-economic, socio-cultural, religious and behavioural aspects of our community are undergoing a change, older technologies are fast being replaced by newer ones, traditions, and conventions are being subjected to a very systematic onslaught and the, society is adopting a newer way of life. We are not in a position to strike a balance between the gains and problems caused by technological advancement. It is, therefore, well within the purview of a psychiatrist to discuss the behavioural problems which are a direct contribution of new technology. Newer technologies have of necessity brought fruits of plenty, affluence and prosperity. It is therefore, my endeavour to discuss the social,cultural, economic, political, religious and educational changes which have been let loose by technology. I do however, feel that a mere elaboration of problems is not enough, equal attention should be paid towards remedial aspects as well. This paper is, therefore, also directed towards that aim.

Mental Health has indeed become an important consideration

whereever modern technology has made inroads. It may well be that newer technologies foster mental ill health, more affluence leads to more insatiable needs, individual breaks away from family identity, has no other equally powerful support to fall back on, entertains conflicts and then tries to overcome anxiety by superficial means. He may go on, 'Trips', may become part of unknown, untried and untested groups, may establish newer behavioural norms including freedom to establish unrestricted sexual relationships. As a consequence promiscuity with unwanted pregnancies, veneral diseases, illegitimate births, abortions or one parent families may not be unusual sights. Tobacco smoking, alcohol consuming, sleeping pill taking and a divorce/prone society is therefore replacing a 'backward' and a relaxed one.

There is no doubt that a new world is unfolding its different and never ending layers of change, the full magnitude of which is impossible for us to comprehend. Aero-apace travel is really shaking the entire world. Super-sonic jet is opening up newer vistas of travel. Computers are doing things which tens of thousands could not do. Population of the world is increasing

at an alarming rate, but new technology is also for the first time offering some hope that man may not die of starvation. True there are areas which are at the mercy of rain Gods but there is every prospect of introducing change. Similarly the possibility of laboratory genesis is more intensively being looked into. Medical science has or may make it possible for vital transplants to be successful. For most, modern technology has brought economic bonanza but let us not forget the horror and devastation which has often been brought about in recent past by advances in newer technology. Rapid technological changes have resulted in tremendous industrialization and massive urbanization with multitude of accompanying problems. It is commonly felt that developing countries may advance through technology and also that the gap between developed and developing countries will keep on widening, since the rate of further technological growth cannot be matched by poor countries.

In order for us to understand the significance of technology old or new, one must fall back on the original source of such information which to the best of my knowledge is to be found in

the undeveloped or a developing country. When technology did not exist and offered little, man got along with his intuition. Many of such intuitive innovations when applied with ingenuity became the basis of old technologies. It seems that when such was the pattern of technology, there were frequent gratifications, partly as a result of achievement and partly as a symbol of usefulness. The older technologies therefore in a way strengthened the very fibre of our society. Man was so overwhelmingly employed in the pursuit of his vocation that he either did not have enough time to think in terms of his problems or conflicts or else he had little time on his hand for leisure. With older technologies leisure was limited and as we know now leisure is a difficult commodity to handle. One cannot but be impressed by the ingenuity and resourcefulness displayed by the founding fathers of modern technology. Little did they know then that what they were discovering will not only provide vast prosperity to the succeeding generations but will also unfold problems of the gravest magnitude. I have tried to record observations in terms of problems and attitudes which were to be found in the era of an older technology, have compared them to

modern era of sophisticated technology and associated problems, more particularly as they strike an observer in India. By saying this one is not being ungrateful to the new technology in fact some of the new technologies have given rise to the highest forms of political, social, economic progress but no one would deny that modern technology has also contributed substantially towards the creation of newer problems. It has brought together differing idealogies and newer relationships have emerged between different communities. Such relationships have both a peaceful and an irritable pattern. New technological advances make it difficult for people to accept any oppressive or exploitative behaviour at the same time newer means of destruction make it relatively easy to bring about disintegration of such community if so desired by mighty nations. And since any concurrent observations on technology and people must encompass behaviour, an attempt has been made to offer some comments on the past and future behavioural problems as well.

Needs of a Developing Nation

Technology has created unprecedented problems for the entire mankind. Nations which are advanced are obviously making every attempt to encourage further growth and enhancement of their targets, the ones which have been lacking in even the essential technological milestones are more concerned with mere catching up. India in particular is a poor country, has been labelled as a developing country and is in company of several other states which too have attained a similar label. As a psychiatrist dealing with human behaviour and observing the phenomenon of disease it would be best to relate the occurrence of disease with rapid advances in technology, also it would be quite profitable to delineate a set of problems which existed in India prior to 'independence' and how do they compare with circumstances of growth now. As you know India became independent in 1947 and every attempt has been made by the people of India that they should attain a reasonable level of growth, that they should establish industry which is the key to prosperity, affluence and strength. Consequently it is absolutely

essential that as a Psychiatrist one must study not only the patient but also the society if one is to grasp the adjustments or maladjustments that may be called upon to play on the part of the individual or on the part of the society. One should study man's adaptation to environment and the resultant stress should be taken into account, if the society is to be understood at all. The value system of a society as it has fluctuated in response to change in technology from old to new, makes its study a most interesting one. And in view of far reaching revolutionary changes including social, cultural, economic, religious and others that are occurring at a pace faster than we can grasp, it may well be that we shall not be in a state of readiness to handle the problems which will be generated by advancing technology, as has been witnessed in the West. Similar phenomenon is bound to occur as India goes into more rapid and complete strides of economic growth.

Religion of India

It would be best to begin with description of India as it is today. The India of today has a total area of 1.26 million square

miles and a population of over 550 million people. There are no less than 17 states each of which is a country by itself, since there are marked characteristics which distinguish one state from the other. Many of these have different languages, different customs, and there is in some area very little communication between one state and the other. India has multiple religions, divergent subcultures and as many as fourteen languages that have been recognised by the Constitution. Hinduism is the flow of Indian life, because a vast majority of the population are Hindus. Even though India is a developing country she has invariably exercised an overwhelming influence in world affairs and part of the reason may be its long history, ancient civilization and traditions. The spiritual and moral values which motivated the sages and philosophers of India have stood the test of time and have survived many social and political upheavals. Another very distinguishing feature of the Indian culture is the continuity of values which were evolved thousands of years ago and which even today exist in a modified form.

It would be important to very briefly comment upon the theory of Hinduism. The basic beliefs of Hinduism which are held by all, consist of three outstanding characteristics, first that God is in every thing (Pantheism), second a tendency towards tolerant syncretism, and third a complex conception of individual destiny contained in the doctrine of Karma, reincarnation, and Moksha (Salvation). According to Hindu religion life itself has no meaning, it has meaning only as a link in the chain of births (past and future). The process of birth and rebirth is based on one's own deeds. By virtue of deeds an individual becomes holy or sinful. It is an attempt to make the people of India believe that their present suffering is the result of their former misdeeds. With such an attitude one expresses a feeling of helplessness over a difficult situation and an attitude of fatalism develops. Rationalisation is consequently a very important aspect of Indian life.

Technology and Agriculture

India is primarily an agricultural country. The basic feature of pre-British Indian Society was to carry on agriculture

with primitive means. Ploughs, bullocks and simple tools were the order of the day. The village population consisted of a variety of people who were involved in trades which were by and large determined by a process of 'inheritance'. It included a few industrial workers such as Carpenter, Barber, Weaver, Washerman and a goldsmith. They were mutually dependent on each other. Kingdoms rose and fell but the pattern of village life remained very much the same. In addition to rural India there were a few towns which had sprung up on account of their political importance or of religious significance, or if they were of a commercial value. During the middle of the 19th Century, interms of old technologies, transport facilities improved and laid the base towards modern industrial set up. With the rapid increase in transport facilities migration of people started from rural to urban areas and consequently gave rise to a different set of problems.

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The British Government was thoughtful enough in formulating plans for educating the Indian people. In the pre-independence

India education was introduced mainly to meet the requirements of British empire and it was essentially limited in nature and was patterned in the English Style. Now of course education upto a certain level is compulsory, large number of universities have been set up all over India, more and more students are demanding that they must be admitted to university courses even though they may not be in possession of qualifying requirements. The emphasis is on a degree, since that holds a passport for obtaining a job. Consequently education has given rise to large number of problems. The law and order situation and problems of discipline have received an urgent attention from all concerned authorities. For example, only two months ago the famous University of Lucknow of which I am a teacher, witnessed some of the unprecedented and unparallelled scenes of lawlessness. It all started with the functions and powers of student's union. Should it exercise powers only in an advisory capacity or its views should be binding on the authorities of the University. Since that was not to be, very soon one found that the authorities

were polite towards students particularly union leaders, the union leaders insisted on readmission of rusticated students, suggested that the requirement of a minimum attendance should be waived, that certain courses for examination should not be introduced, that the examination system should be overhauled and so on. They were soon getting ready to participate in the appointment of teachers. A series of unfortunate events culminated in a systematic burning of a large portion of the University. The University was shut down for a number of months, examinations had to be postponed for indefinite time and one wondered whether the University would survive at all. It really did not matter what the needs of the society at that time were, all it mattered was that the needs of the students should be gratified. Such events are now to be witnessed in numerous institutions of higher learning. Education which ordinarily should provide an effective channel for conversion of old into new technology, has itself become a victim of new techology and the progress of the country is bound to suffer.

Paradigm of Caste as an Index of Technology

Another problem which has played a very crucial role in the development of India, both the ancient and the new, in formulating technologies old or new, relates to the all pervasive caste system. It is one of the major characteristics of Indian life. No where else would one come across the structure of caste so well established in such a systematic manner as in the social life of India. Caste system has divided the Hindu community into a multitude of hierarchically graded sealed groups based on birth. It is more ancient than the Vedas, but with the growth of racial admixture, geographical expansion and development of craft industries the original castes broke up into several smaller castes and sub-castes. Hindus became socially distinguished with the ever increasing number of groups and sub-groups. In all vital social matters such as marriages, vocation and family ceremonies each sub-group was an exclusive unit. Even though certain basic beliefs may be held by all Hindus yet the caste system determined not only the ancient living but is influencing the modern living as well.

In the older days persons belonging to certain castes were occupied in the then prevailing technologies. In a way caste determined the placement of a farmer, warrior, goldsmith, cobbler, sweeper in their respective professions. One would not be surprised if one were to mention that even the present election system which is so successful and we are considered the largest democracy in the world, is terribly influenced by caste. In my own State of Uttar Pradesh which has a population of over 90 million it is not unusual for a candidate belonging to a particular party to have been nominated on the basis of caste. A Brahmin may be put up in a community where Brahmins are in majority, Kshatriya may stand election as a candidate to parliament or state legislature and has a good chance of success if the community that he would represent consists of overwhelming members belonging to his own caste. Therefore the political parties have exploited the caste system beyond any stretch of imagination and have reaped very rich rewards in terms of success. It is not unusual however, that a person may be well known, may be universally liked, may

have attained eminence in a particular field of his choice and therefore he may defeat a candidate who belongs to the same caste as the local community is. Such occurrences are however exceptions and one does not take into account these factors when one plans a strategy of this nature on a national basis. Similarly the caste system would usually determine marriages. Marriages are arranged by parents, and would involve communities which are similar in caste. Large number of people have however eroded these conventions and have tried to get away from these restrictions.

Break up of Joint family

While talking of a developing country, such as India, it would be very unfair if one did not take into consideration the family system which again has a very important role to play towards transition from an old technology to a newer technology, also which has a very vital role to perform in fulfilling human needs. The joint family system has been the chief characteristic of Indian Culture. For a long time life in India was centered around the joint family constellation. In such a family unit

more than two generations often lived together, usually a joint family may consist of parents, grand parents, uncles, aunts, children and of course grand children. All of them lived together in a single house which was usually a large one, often no individual accounts were maintained and every one's needs were taken care of by the head of the family. The oldest member of the family usually a male was recognised as head. He made all decisions, arranged all marriages, he is the one who thought of purchasing property or disposing of a cow, priorities were laid by him in terms of expenditure that should be incurred by the family. Individual careers were chosen by him, it was he who decided which child should go and where, which of the children should be encouraged to pursue a more enlightened state of education and which was the one to be deprived of such a basic opportunity. If any member of the family had any difficulty it was for the entire family to offer relief. A particular attention was paid to a person who was handicapped, who became crippled, who lost a necessary support of life, the young widow

who may have lost her husband or in time of illness a special requirement was met with by the initiative and the command of the head of the family. Such family units are now not terribly common. Joint family now a days may consist of the immediate members such as parents, occasionally sisters or brothers, but large units are on the decrease. This has happened more as a result of necessity rather than a planned item.

Technology and Migration

The migration of people has been taking place at a phenomenal growth since India has been moving from a primitive or an agricultural society to a highly industrialised country. Of necessity rural areas which contained more than 80 percent of the population had to provide manpower for factories or other industry and consequently the whole family could not move, only the young individuals had to go out. If they went out they formed new associations, developed newer values, and often times got married with or without the blessings of the family, but not necessarily with the consent of the family. As I mentioned above many young men and women left their family units to take up their

jobs and a mass migration took place from rural to urban and a new society emerged with new values, newer expectations, newer responsibilities, and obviously a different set of needs. It is a common day experience for the senior citizen to register displeasure against the newly innovated social systems.

New Technology and New Values

Living in an industrial community is quite different from a warm environment of the joint family which offered protection and security to the needy. These young men and women may have broken away physically but are expected to fulfil their 'family obligations' even though they are involved in a new and a competitive survival. If a son has gone away and has obtained a good job he is expected to share his income with his parents, is expected to take care of younger brothers and sisters in terms of their education, is expected to substantially help the family in their hour of need, may it be marriage or purchase of property, or expenses to be incurred on a funeral.' The arrangements produce an emotional imbalance and one is constantly facing a

conflict between the newer values as one has adopted and developed in a set up where a new technology is emerging, where heavy industry is producing lot of modern products, where the teaching and training in terms of establishing one's own individuality and identity is different from his earlier beliefs. A conflict ensues between older values which were incorporated into his thinking and personality while he was growing up, and new values which are hard for him to accept. Often times he would break down, not being able to decide whether the old technology and old system was better or he should prefer the newer system with resultant newer social problems. These changes may produce not only difficult situations for the young but are also very disappointing and frustrating for the older generation. They would much rather have older technologies, revolving around a rural system of living. They may prefer closeness of a small community and are proud of a joint family set up. True the old technology offered no financial rewards, did not produce prosperity but to their way of thinking offered peace, contentment and

happiness. To them new society, with new technology with an infinite promise of prosperity is a very poor substitute for the old one, for the simple reason that new technology has produced tremendous amount of instability, uncertainty and has made people emotionally vulnerable.

New Type of Individual

From the above it would seem that a satisfied and a relaxed Indian is being replaced by a fatigued and a strained citizen who is more often than not confronted with stressful situations and has to make adaptations to a mechanized urban industrial society based on a Western pattern. It has resulted in many hazards with resultant anxiety as an inevitable phenomenon. Industrialization with added newer technology means a new way of life for most of the Indians. Parting with older values of life has often brought about painful crises. For example, it has been mentioned in several studies in our country that with industrialization a very great increase in crime has taken place. In the old stagnant society of villages there was very little crime although there was certain amount of socio-economic backwardness. In

Crime and New Technology

modern steel towns for example, there is greater occurrence of crime because of the conflicts that have arisen in a new society. In similar other industrial towns where additional availability of reasonable income has come through, such peaceful life is a rarity and instead a criminal activity has been on the increase. Law and order situation in particular has become worse with the introduction of new technology. In larger towns, for example where the transport facilities are greatly multiplied, large number of semi-lite-rate rural folks have taken to taxi-driving or they own a scooter rickshaw (three wheeler) and are assured of a very decent income. As a consequence one is shocked to record accounts which indicate that lonely passengers are taken up on fast moving three wheelers and are subjected to torture. Often times they are looted, assaulted and subjected to all types of indecencies. Such instances of urban life are multiplying at a fantastic rate.

Modern Rural Society

In a rural society of modern India such as in Punjab, Haryana, Himachal Pradesh the farmer has come into tremendous prosperity. With green revolution widely prevalent and agricultural

income exempt from all taxes, the pattern of rural life is fast undergoing transformation. Only in the recent past it was difficult for a farmer to make both ends meet. He was dependent on old skill and old technologies. Now he has taken up new methods of farming, his household contains modern furniture, consumption of alcohol has so multiplied that several State Governments have decided to openly grant licenses for Liquor shops charging only a license fee. Women have taken to drinking in a great number and the prosperity which has come to them as a result of newer technology, has brought about weakening of old associations. The cemented marital bonds are no longer that firm. People are known to develope intimate extramarital affairs. A greater degree of mobility, independence and prosperity has made all this possible. Their households contain not only essential items but also television sets which are a luxury in modern day India.

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One may therefore state that the behaviour in India is changing very fast and this change is related to a transition from the practice of old technology on to the adoption of a newer technology.

All over the country more and more items are being indigenously prepared, better and better industries are being set up, more sophistication is coming through, imports have greatly diminished. India is already self-sufficient in terms of arms, by and large, is on the threshold of developing nuclear technology, but one can also observe changes in social structures, as I mentioned earlier. Superstitions are far less rampant today, the process of modernization is no longer confined to urban areas alone but rural areas are receiving the benefit of modern civilization. Indian village has considerably changed, and it is felt that unless new technolog is adopted whole-heartedly, no firm or lasting progress can take place.

Drugs and Student tension

Similarly recent surveys, clinical impressions, newspaper reports indicate that indulgence in drugs is no longer a rarity. For generations cannabis and its preparation were a household word There are families which have been consuming Bhang for a long time and one generation has gracefully passed it on to the next. Every available study indicates that long term use of Bhang is devoid of

any cognitive or physical side effects. Newer generations of students prefer sedatives - mostly non-barbiturate but sometime opiates & hallucinogens as well. The 'trips' as one observes in the west are not a usual phenomenon in India. More often it is a means of obtaining attention, communicating a desire but an increasing number of students do wish to experience kicks. It is an attempt on their part to achieve what their counter-part has done in the west - where technology is more advanced.

Technology holds the key to solving problems of all walks of life and every country should therefore adopt more sophisticated technology if one is not to be left behind. It is quite true that in India we are not in a position to incorporate many of the changes which have occurred elsewhere in the world but we are trying. Some of the behavioural impacts of technology are peculiar to India alone. In India we have witnessed for example rapid crumbling of joint family system, higher education and influence of western civilization has brought about greater awareness of the rights of the individual and a society has emerged which is now becoming self-oriented. An individual after breaking away from 'older'

society for realistic or unrealistic reasons has not yet been able to hold a firm control of himself, and can not effectively handle the moral, physical and spiritual aspects of life. One is inclined to feel that a rising number of emotionally young unstable individuals may well be a direct product of the changing social structure. Sexes and religions have readily mixed, and altogether free pattern of living has emerged, drinking, smoking drug addiction and other social activities have created lawlessness amongst students, have given rise to an increased crime, delinquency and other associated psychopathic behavioural patterns. Thus India of today is vastly different from India of yesterday. The well trusted Indian social values have been replaced by a new untried patterns of living. It is undoubtedly true that there is a tremendous amount of concern in regard to these phenomena and we are very seriously concerned about our having to follow the pathways of the West, but it seems to be a futile hope. A miracle in agriculture has taken place during the past six years, unfortunately a new variety of stress has been introduced inspite of a newer technology this particular year. In 1972 we witnessed an unpreced-

ented drought situation, no rains were visible, consequently there is shortage of food, the power generation has greatly been curtailed and there is shortage of power. Society has begun to offer concern and take note of newer challenges in terms of non-availability of essential articles, and there is another section of the society where wealth is unlimited, where a parallel black economy is emerging, and it has been so only because more production and sophisticated means of evading taxes, concealing incomes have been mastered. The employment opportunities have greatly broadened and more and more people are once again migrating to different areas.

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Some of these problems may be unfamiliar to many of my colleagues who are sitting here and belong to countries of the West. Much of the increase in population, for example of the world is because of what is happening in India and China. With our present rate of increase by the year 2000, our population is likely to be over a billion people. This is inspite of the fact that we have adopted family planning technique as a national

policy and we have been utilizing available means of controlling population but so far without any startling success. We have overcome the problem of disease, many of our infectious diseases have been controlled but we are not able to control our population. Our people are living longer, we are producing more people, we are producing less food, and our resources are now being stretched to the utmost capacity, therefore we have had to face a different set of problems which are unknown to people in the West. We may have prevented over 10 million births in the past five years but on the whole the family planning programme has not made any overwhelming impact upon our masses. In addition a multiplicity of psychological problems have been let loose by our failure to control our population. Inspite of the fact that the newer technology has been adopted our problems have multiplied. If this continues there will be great poverty which could lead to chaos, lawlessness and a still more intense stress. Problems of obtaining adequate food, finding minimum housing accomodation, adjusting to a new society do require adequate psychological preparation. We do not wish to give up our efforts towards obtaining new technology, but we do

want our people to enjoy the fruits of technology. The environment therefore needs manipulation, but whether it would be possible for us to do so in the forseeable future remains to be seen. Whereas in the past malnutrition was considered to be responsible for a host of physical diseases it is now related to psychological and intellectual development as well. A high degree of subnormality has been seen in our country to be prevalent amongst poorer classes. So one may venture to predict that we shall have a much larger population, land will not be in plenty for adequate distribution, factories will not be able to employ as many people as exist, production will not be enough to feed all the citizens of India and no amount of planning is likely to provide an outlet for the employment and the health of the nation will be subjected to a very severe stress.

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The newer technology may also make it impossible for any one individual to learn and to incorporate all the knowledge that is available in any single speciality. He will be subjected to limitless knowledge and the capacity for acquiring and storing

information will necessarily be a restricted one. We realize that the number of independent cognitive components the man can cope with at any time is strictly limited. So far, man was different because of his capacity to cope his large interrelated facts but now technology developing so fast, newer theories and methodology working out in a startling manner, it will be impossible for any member of the society to master such complex mechanisms and consequently we would be left with a variety of problems. Already technological knowledge has become so vast and is increasing at such an unbelievable pace that no single person is capable of mastering different aspects. Under the prevailing conditions therefore one may even say that newer technology has replaced old technology, but has also brought a variety of problems. It has replaced or displaced more relaxed acceptable pattern of living, it has brought about anxiety and other emotional disorders which were perhaps unknown or rare in any case in the past. With a decline in social purpose and social cohesion, members of one community may become individually isolated and the conflicts and hostility to each other may become more and more manifest. Finally

with the extent of progress that is now occurring, skylab flying over us, the extent of technological, social, political, economic changes may be very hard to predict. One can only say that as civilization and culture become more complicated conflicts will multiply and our capacity towards adaptation will unavoidably weaken and will result in producing individuals who are weaker and more vulnerable.

Consequently we must now take stock of the situation. We should encourage adoption of modern technology. We should also try and introduce courses for teaching and training of medical students in which a great deal of emphasis should be laid on human needs and how they may be met when confronted with newer technology. It may still be possible to reinforce the family bond, rather than anticipate complete disruption when a member of the family migrates to another area. We should inculcate a feeling of responsibility on the part of the individual, but how do we indoctrinate an Indian, that one part of what the West has achieved is good and that another part which is an integral part of Western society is bad.

I believe we could reemphasize the time honoured values of our civilization, we could mould the thinking of our teachers and we could then hopefully expect that our teachers would do a good job in turning out good student.

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A SOCIOLOGIST'S VIEW OF TECHNOLOGY

By Andrzej Sicinski
Social scientist

From inorganic to super-organic

A revealing view of technology, allowing a systematic analysis of its social aspects, is acquired when we consider it as an element of the super-organic world. What we have in mind here is a certain specific feature characterizing the human species.

Contrary to other phenomena occurring in the physical world (at least those investigated by science), the organic world involves "construction" which consists in setting its elements in order (in terms of the science of information: its enthropy diminishes, whereas the inorganic world displays growing enthropy). Man is the supreme, most complicated product of the organic world. But thanks to his action man himself becomes a constructor trying to put the existing reality in order and to introduce purposeful (that is intentional) transformations. In other words, man continues the process of setting the world in order which before his appearance was going on in a different form in the organic world. Man's contribution does not consist in promoting further development (evolution) of the organic world, but first of all in the impact he exerts on the inorganic world organizing his environment according to his own needs, in order to survive and develop in a way adjusted to his ideas and possibilities.

The above statement calls for certain explications. Firstly, the term super-organic should not be identified with Herbert Spencer's (and particularly, his followers) concept of the super-organic stage of evolutionary development, characterized by phenomena resulting from the cooperation of different organisms. According to that view the society is a super-organic aggregate in many respects similar to living organisms (an organicistic trend in sociology concerned with

the analysis of those similarities has not added much to our knowledge of the human society). When introducing the term "super-organic world" we by no means refer to such concepts.

Neither do we refer to discussions concerning the concept of culture and the unique character of the science of culture, discussions which have been carried out since several dozen years. In arguments emphasizing this uniqueness, the sphere of cultural phenomena has, among others, been defined as "super-organic" one (the idea was formulated by a well-known American anthropologist, Alfred Kroeber).

Secondly, when saying that human actions are subordinated to certain social needs, and calling them purposeful actions, we by no means want to say that all such activities effectively satisfy the needs which evoked them, or that they always fit the original goals. We only want to point to the fact that these actions should not be examined in isolation from certain factors stimulating human behaviour. The importance of the above distinction will become clear in the course of our argument.

Thirdly, it is sometimes pointed out that man is not the sole living creature able to "construct"; there are birds with their nests, as well as certain mammals and also insects which often build quite intricate constructions (e.g., ant-hills). But such activities are essentially different from human actions. The basic, qualitative difference lies in the fact that the scope and character of animals' activities are inscribed and transmitted in their genetic code and, consequently, fairly well defined for a given species. Man, on the other hand, does not inherit the bulk of his skills but learns them and develops in the course of his life handing them down to other men, and particularly to younger generations, by social means (not genetically). As a result "constructivist" abilities of the human race, unlike those of animals, constantly develop and accumulate.

Consequently, man is the only living creature able to carry out the struggle against nature, or - to use a more modern expression - to pursue a game with nature, and to score victories in this struggle or game. (1) Whereas more primitive creatures can only profit from favourable external conditions or adjust themselves to unfavourable

conditions, man has an ability to adjust his environment to his own needs, introducing changes and imparting his own order by developing the super-organic world.

Tools and speech

There are two factors specific for the human species enabling man to create the super-organic world. These are: tools and speech (2). The first is connected with a physical (energetical) aspect of man's struggle against nature, and the other with informational one. Both these aspects of human actions are closely related to each other.

Whereas tools unmeasurably expand man's ability to affect his environment, speech (as well as thinking and reasoning, inseparably linked with it) plays an essential role in acquiring, accumulating and disseminating man's knowledge of the world.

The struggle against nature, that is the construction of the super-organic world, is carried out socially. Not only in so far as both the knowledge of nature and tools and skills are accumulated and transmitted by social means, but primarily because this struggle or game is as a rule carried out by groups of people. Here we should also bear in mind that group organization in a human society has its specific character. Though different forms of social life can also be observed in the animal world, man is the only living creature whose social organization is adapted not only to environmental conditions but also to aims and goals for which he strives (and these are changing aims and goals, both as far as an individual and social life are concerned).

The Concept of "technology".

After these introductory remarks we shall now try to formulate a precise definition of the term technology as it will be used in this paper. As it often happens with terms used in everyday language (as well as in journalism and in science), the word technology has many meanings. It can mean at least three different things: either /i/ tools, especially in their more complicated form of machines; (3)

and it is in this sense that the word in most often used in everyday speech and sometimes in ethnography and ethnology; or /ii/ the whole body of methods applied by man; as in many theoretical considerations, particularly those carried out by sociologists and anthropologists of culture (such a definition is used, among others, by Jacques Ellul).

Neither of the above two meanings seems accurate. While the first reduces technology to material objects and ignores its applications, the second is too wide, embracing as it does all kinds of methods but without mentioning material means (tool) as an element of technology.

The most accurate seems to be the third meaning, which we would put in the following way: /iii/ technology is a totality characteristic for the human species, embracing tools as well as rules (4) of applying them, aiming at subordinating of nature. This definition covers the whole range of problems included in the first meaning, and partly those embraced by the second.

It may be said that our above presented definition conveys the wider meaning of the term. First of all because tools may serve both man's activity directed towards the "outside" world, that is towards his physical environment, as well as towards himself. But the term technology is often used (particularly in everyday language) to define tools and rules applied only towards the non-human world. In such a case we may speak of technology in its narrower sense, i.e., excluding bio-engineering (e.g., medicine, applications of the results of genetics, etc.), psychotechnics (in the sense of exerting a given influence on man's psyche), sociotechnics (influencing the life of society), etc. (5)

Though it may be interesting to discuss problems of technology in a wider sense, we are here concerned only with technology understood in the narrower sense. We think that man's actions in relation to his non-human environment differs essentially and in many respects from that directed towards men themselves. Problems connected with the former sphere of technological undertakings are by themselves

sufficiently complicated to be worth special attention, in isolation from even more complicated, but distinct questions pertaining to the other sphere.

Technology understood in the narrower sense of the term, embraces several fields of man's activity. Particular attention is here due to the technology of production, embracing production tools and rules of their applications. Karl Marx extensively dealt with the problem of the social character of production (meaning man's activity aimed at utilizing the nature's riches and powers for the production of goods, that is at adjusting them to his needs)(6), saying, among others, that: "The farther back we go in history, the more clearly we see an individual's and consequently, a producing individual's dependence on some bigger unit of which he is a part.... So when we speak about production we always mean the production at a given level of social development - the production of socially involved individuals". (7)

On Problems of technological development

We have emphasized the social character of technology. Generally speaking, the development of technology (in its narrow sense) is determined by two factors: by requirements of the process of subordinating nature; and by social organization. The first factor prompts people to improve technology, in order to reduce man's toil and risk and expand his power to influence nature. The second factor involves much more complicated problems. One can here speak of dialectical interaction, since the development of technology leads to changes in social organization, while the over increasing problems of social organization bring about technological transformation. An arrangement resulting from an interaction between these two factors determines the rate and direction of technological changes.

The Marxist political economy has for a long time tackled the problem of this interdependence in connection with production problems. Oskar Lange wrote: "It is clear that a given level of production forces calls for appropriate production relations. Production relations

also affect the development of production forces. Production relations adapted to the needs of production forces create stimuli favouring further development of production forces. But production relations inadapted to given production forces hamper their development... Because of such a dependence existing between production relations and the level and development of production forces, production ways applied at the given level of social development form an internally balanced entity. Marx expressed this idea in an undoubtedly simplified but nonetheless concise and vivid form when he said that: 'hand-mills give us a society of feudal lords, power mills a society of industrial capitalists....' "This is the basic regularity with which the development of production relations complies. We call it the law of necessary conformity between production relations and the character of production forces". (8) We should add one reservation which clearly follows from an overall analysis of the above dependence. Namely, that what we have in mind when speaking about the necessary conformity is a certain permanent tendency, and not that such a conformity necessarily occurs at every moment of social development.

Stefan Czarbowski, an outstanding Polish sociologist of the inter-war period, thus wrote about this matter: "An old technological culture everywhere predominated till the appearance of a new invention brought about by economico-social changes, as a result of which an old tool or article was replaced by a new tool or article... The persistence of a given technology and its changes offer a good example of mutual relations between the present and the past, which take form of a permanent struggle to transform the past and replace it with the present... The word struggle is here used intentionally. Because every generation and, especially every newly formed social class, comes into the world inhabited by both ideal and material objects called into being by a previous generation and a formerly prevailing social system. It has to free itself of these previously accumulated products at least to a degree enabling it to control and assimilate them, that is to shape them according to its own mould. Those which cannot be assimilated, are put outside the pall of socially organized life." (9)

It is not our aim to carry out a detailed analysis of technological development. But there are three particularly controversial issues, which we would like to discuss. They are: rate of technological development; its relative autonomy; and contemporary changes in ways of utilizing technology when striving to subordinate nature.

It is often pointed out that the rapid development of technology constitutes one of the most characteristic phenomena of our epoch. It is in connection with this phenomenon that the widely popularized term of scientific-technological revolution has been coined. The rapid rate of growth often arouses anxiety and is treated as a kind of menace. Without questioning this obvious acceleration in the rate of technological development - which can be measured in a variety of ways - it is perhaps worthwhile to point out that in all probability this development is not indefinite. We know that development of many phenomena occurring in the organic world - and probably also of those occurring in the super-organic sphere - can be graphically presented in the form of a curve reminding the letter "S" (logistic curve). Processes which initially proceed at a very slow rate, or even unnoticeably, tend to intensify rapidly at a certain point and then slow down again regaining equilibrium when they reach a level of "saturation". It would be extremely difficult to prove beyond doubt that technological development is one of such processes, and even more difficult to define its level of saturation or even the point at which the curve bents. Nevertheless, it is our hypothesis that in several fields of technology the development in fact follows such a course and that many fields of technology are just now nearing the "bent" point.

An increased autonomy of technological development consists in the fact that the impact of the two previously mentioned factors determining this development, that is of problems resulting from subordinating nature, and of social organization, tends to diminish, though they by no means cease to influence its course. So, in the case of the primitive stages of social development one can speak of the determining role of tools which were then nearly identical with respective types of societies. Later on this determinism markedly diminishes. Finally, in a modern society, technological activity is only partly determined by man's actual needs to control nature, and its development only

partly depends on technology's instrumental functions. We often say or write that technological development follows its own "independent logic", probably having in mind the fact that numerous (or even the majority) of technological problems currently tackled derive from the need to solve questions posed by technology itself (and not necessarily by nature). Comparing it to certain bureaucratic organizations which become "self-sufficient", limiting their activity to problems directly connected with their own functioning even at the cost of tasks for which they have been set up, we may say that technology is also becoming "self-sufficient" tending as it does to fix its attention on its own internal problems.

These facts often prompt people to exaggerate the role played by technology and to treat it as an independent "being" or even as destiny which cannot be escaped. They forget that statements saying that "technology deals with" such and such problems are in fact hyposthatic. The development of technology always results from man's own actions. The course of technological development, its fortunes and misfortunes are determined by people and not by technology itself.

While arguing against the tendency to exaggerate the scope of technology's independence we by no means want to suggest that the problem does not exist at all. On the contrary, the fact that present-day technology develops in a relatively autonomous way has several important and even dangerous consequences. First of all, one can easily notice that the greatest efforts are not always directed towards the solution of problems which are most important from the point of view of man's need to subordinate nature. Secondly, what is probably even more important, the development of technology is insufficiently adapted to social organization (10) and sometimes even helps to create conditions threatening man's existence (the most obvious example of such a situation is a much discussed problem of environmental deterioration). It is not technology, however, which should be blamed but social organization prevailing on our globe, and the goals which the contemporary man poses himself.

The third problem we want to mention are qualitative changes in ways of utilizing technology, resulting from its rapid development. Let us quote an opinion voiced by an outstanding Polish psychiatrist: "One may say that until recently technology actively opposed nature; it tried to subordinate the forces of nature; thanks to technology man has acquired control over his natural surrounding and created an artificial environment in which he does not feel well. He has now reached the point at which he must stop to exercise this control over nature and transform technology's attitude towards it from an antagonistic into a symbiotic one. The symbiosis between technology and nature will make man's environment less artificial and uniform, adding it an individual touch. The first tokens of such a cooperation can already be noticed. We have started to model technology according to natural patterns. Much more attention is now attached to the preservation of nature. Town-planners and architects try to adjust elements of natural landscape to their projects of towns and houses. The cooperation between specialists in automation and neurophysiologists becomes ever closer (it is to neurophysiology that automation owes its several inventions, whereas models of digital and analogous computers allow better to understand brain's functioning). More attention is called to man's adaptation to conditions created by modern technology (medicine and sociology of labour), etc." (11)

It would perhaps be too optimistic to say simply that man must change his attitude towards technology. But it semmes justified to say that people start to realize such a need and that a certain change in that direction is already to be noticed. At the present moment it is still impossible to envisage all possible consequences of such a change. But they will be no doubt extremely important and will change further course of technological development, decreasing that feeling of technology's domination or autonomy.

Conclusions

We have to admit that we have examined technological problems from only one angle, but the angle which seems to be most important, that is from the point of view of the role technology plays in the overall social development and the impact it exerts on the super-organic world, determining conditions in which people live.

It is not the only aspect of links existing between technology and human life. One could mention here an important sphere of social micro-phenomena, such as, for instance, the impact of technology on people's life-style or the dependence of work conditions and ways of spending leisure time on the development of technology, etc.

Another group of problems should be discussed if we tried to examine relations between technology and man's psyche. Does technological progress effect our psychology and our values and if so, to what extent? (And, on the other hand, to what extent does it depend on values?) Are "technological men" characterized by any specific features, and, if so, what are these features? What are the specific problems of creative work in the field of technology? These, as well as many similar questions, are undoubtedly worth special analysis since it is in this sphere that technology is supposed to present the greatest danger (causing mental anxieties, identity conflicts, etc.)

This is what the previously quoted psychiatrist once wrote on this subject: "Homo Faber's view of the world depends on tools with which he conquers it. The surrounding world looked different to a man equipped with a stone or a bludgeon than it looks to a man who employs complicated instruments.

"In spite of its obvious benefits, technological progress brings a serious danger prompting a tendency to view the world from the point of view of the machine with the aid of which man conquers the world. Machines are often treated as something more important than man himself, as a sole criterion of his achievements. The surrounding world turns into an emotional desert or even an enemy with whom one can do whatever

one wishes depending on one's current needs. And since the human world is primarily a social world, such an approach is consequently applied to individual people and whole communities. Man becomes merely a more or less efficient part machinery, a part which from time to time needs a rest or renovation. It suffices to apply to him some chemicals or carry out certain operations in order to refit that particular part of machinery. The society is viewed as a complex machine consisting of millions of wheels and gears (that is individual people) which can be freely arranged, controlled or dismissed. It is obvious that such a picture of the human world and, in fact, of nature in general is simply not true". (12)

Scarcity of space does not allow us to provide at least a general outline of this subject matter. However and interesting, it pertains to phenomena occurring within the f r a m e w o r k of problems discussed in our paper.

Our main aim was to gather arguments allowing to demonstrate that technological progress can to a large extent be consciously controlled by man, and that it can contribute to the fulfilment of selected values. The main problem is clearly to define goals which are to reflect these values, and, on the other hand, to improve our knowledge of relations occurring between values and technological means favouring their implementation. The first task is an axiological problem, and the other is a domain of science.

However, in order to overcome technology's "autonomy" and to subordinate its development to social needs, it may not suffice to formulate goals whose implementation technology is to serve. It may also call for changes in social organization. An analysis of the range and character of these changes, depending on existing forms of social organization of a given society, is of course a separate problem which we cannot attempt to discuss here.

FOOTNOTES

(1) A change in terminology characteristic for contemporary science (e.g., game theory, decision theory), replacing an old term "struggle" a more "elegant", less emotional term "game". It is perhaps a token of man's increased self-assurance.

(2) Tadeusz Kotarbinski puts forward the following definition: "By tools we mean implements which either themselves are a source of energy and at our instance exert a direct or indirect pressure on a given object, or those which serve to transmit such a pressure or our own impulse of any kind onto another object; and in both these instances are made specially for that purpose of some external substance". (Traktat o dobrej robocie /The Treaty About Good Work/, Lòdż 1955, p. 52/.

(3) In the above cited book Kotarbinski writes: "Tools understood in this sense, that is as products destined for special purposes /...../, are given names of appliances, instruments, apparatuses, machines, devices, equipment, installations, etc., depending on their purpose, dimensions and intricacy without, however, any direct link between these terms and particular types of tools or their particular dimensions. They are simply customary names....." (Traktat..., p. 55).

(4) We propose to use the term "rules" (or "procedures") and not "methods"; by the term "method" we mean something more general which may embrace different procedures, different rules of action.

(5) Stanislaw Ossowski proposed a slightly different division: "From a certain point of view we can distinguish three different techniques of social activity. For these are three different ways of exerting an impact on people's lives, three different ways of forming their psychological attitudes, influencing their decisions and shaping inter-human relations. One way is by transforming the material environment in which man lives; the other by directly affecting man's organism, especially his nervous system, by means of chemical agents or mechanical intervention; finally, the third way is by influencing man's outlook by means of symbolic systems". ("O osobliwościach nauk społecznych /On Intricacies of Social Sciences/ "Dziela" Vol. I. O nauce /On Science/; Warszawa 1967, p. 307).

(6) Based on O. Langé's definition /Ekonomia polityczna" (Political Economy). Vol. I; Zagadnienia społeczne (Social Problems), 2nd ed.; Warszawa 1961, p. 14).

(7) K. Marx,"Introduction to the criticism of the political economy" (K. Marx, Fryderyk Engels, "Dziela" /Works/; Warszawa, 1966, Vol. 13, pp. 704-5).

(8) O. Lange, "Ekonomia polityczna", op. cit., pp. 29-30.

(9) /Past and Present in Culture/ from: "Dziela" /Works/, Vol. 1: Studia z teorii /Studies on the Theory of Culture/; Warszawa 1956, pp. 117-8.

10) For example: technology of production becomes ever more collective whereas, in Western countries, social organization remains individualistic. The introduction of collective action on an international scale is thereby even more difficult.

(11) A. Kepinski, Rytm zycia /Rhytm of Life/; Krakow 1972, pp. 151-2.

(12) A. Kepinski, op. cit., pp. 21-3.

CONFERENCE PROCEDURE

EVENING GROUPS

1) The possibilities and utility of global models.
2) Policy-making for the future.

Evening group on:

The possibilities and utility of global models.

INTRODUCTORY STATEMENT

By Gerhart Bruckmann
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Sam Cole has asked me to make an introductory statement. I could limit myself to one sentence, namely: read his paper on "Models and World Problems" or, if you don't have time to read the entire paper, read the abstract. It is the best summary on global models I've ever come across.

I have said this not just to be polite to Sam Cole, but because it is an excellent starting point. Why read an abstract which is, in essence, nothing else than a model for the respective paper? Or, more specifically: if - for what reason ever - you do not have time to read the paper, is it better to read the abstract, or to read nothing at all? Or would one go as far as saying: since an abstract necessarily falls short of all the shortcomings of any model (subjective judgement in abstraction and selection), should nobody ever be allowed to write an abstract.

After having read also the fine paper by Craig Sinclair and the most stimulating one by Johan Galtung, it seems worthwhile first to get a few semantic questions straightened out. In particular, I suggest strongly to keep apart the discussion on the usefulness of world models from the discussion of the one specific application we find in "Limits to Growth". This is all the more necessary as the evidence of lots of shortcomings in "Limits to Growth", unfortunately, has led to a world-wide movement to throw the baby out with the bathwater. There are two conclusions certainly not to be drawn from the MIT report:

Conclusion No. 1: Because Forrester and Meadows have committed serious mistakes, models are of no use whatsoever;

Conclusion No. 2: Because Forrester and Meadows have committed serious mistakes, the world is in no danger.

Both conclusions, of course less explicitely stated, one bumps into day by day.

There are three items I would like to say about models in general.

1. I fully agree with Craig Sinclair's detailed analysis of all the shortcomings of models. I am worried, however, that he is rather vague about the alternatives he suggests to analyse complex systems. In fact, I would claim that any feasible alternative method of analysis is nothing else than a model again! When Sinclair says that the different strata of decision making must be brought into the picture, that stochastic elements must be considered, and when he then draws a nice chart, I would call this a model related to reality like an abstract to a paper. Whether this is a formalized one or not, is of secondary importance, and whether a computer is being used or not, is of even lower importance.

2. I do not go along with Sinclair when he demands that model builders "must ensure that the activities and results are convincingly valid" (p. 2). No statement about the future, except the most trivial ones, will or can ever be convincingly valid. The progress of science was the progress of dubious theories and of trial and error. If science had always waited to make results known only when they were convincingly valid, we'd be still living in caves - some might claim we'd be better off.

3. My third critique refers to the notion of time.
Freeman says about the use of models: "We regard this as still a question for experiment and discussion", more or less suggesting not to make use of models until they, some day, shall be more refined. If your brother is just about to drown, would you say: "I better take another course in rescue swimming before I jump in"? Time is so pressing that we must scratch together the little methodology we have, with as much openmindedness as possible, without overemphazising any particular method, to throw some more light on the road on which we race into the future. Cole says it in his paper: "In essence, it is not the models that are insufficient, it is our knowledge upon which these models are based".

As regards "Limits to Growth", let me take the paper by Johan Galtung as a starting point. I agree with the facts and shortcomings he states, but I do not agree with most of the conclusions he draws.

Most of Galtung's objections are not of a technical but of an ideological kind; let me pick out a few of them just to prevent that the baby is being thrown out with the bathwater also in this respect.

Galtungs statement that pollution is receiving worldwide interest now that it hits the middle class may be quite true. What is not true, however, is his conclusion that <u>therefore</u> pollution is an old problem not to be worried about any more today than in former times. The decisive difference is the difference in <u>scale</u>. Never before did pollution threaten the survival of mankind as a whole, be it the pollution of the sea or of the air. I consider it extremely dangerous to reduce environmental concerns to elitist reactionary class struggle and thereby to belittle it. This kind of thinking, also reflected in statements of the Oi group (see p. 7 of Galtung's paper) comes close to the example Schumacher gave about the people on the "Titanic" fussing over the arrangement of the deckchairs instead of caring about lifeboats.

There are many more questionable details in Galtung's paper. But let me turn directly to his simplistic black-and-white summary critique of "Limits to Growth" (p. I9 of his paper). I think this is doing grave injustice to the maybe naive, but certainly devoted young MIT-scholars who knew quite well that they risked their reputation by what they did. There are too many scholars in our times who devote their entire efforts to critizising others only stating what should <u>not</u> be done. I think we need many more scholars of the positive type who have the courage to present a new and necessarily insufficient approach publicly for open discussion. And this is my plea for the future of Futures Research: let's stop with continuously discouraging creativity, let's start to encourage creativity, in the First, the Second and the Third World, on as large a scale as possible.

Evening group on:

Policy-making for the future.

POLICYMAKING FOR THE FUTURE

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INTRODUCTION

Talking on the future is much easier than trying actually to influence the future through present decisions. But, in my view, one of the main justifications for futures studies is in their implications for present policymaking. (See Yehezkel Dror, Ventures in Policy Sciences. N.Y.: American Elsevier and Amsterdam: Elsevier, 1971, chapter 5).

There exists an increasingly intense connection between the present and the future, even though a nonsymmetric one. Present decisions more and more shape the future, because of the growing power of available policy instruments; while images of the future and desires for the future should and sometimes do influence present decisions, in part because of recognition of the growing implications of present action for the future and, in part, because of increasing ideological commitment to the future. This connection constitutes the intellectual justification for future-oriented policymaking.

The existence of an intellectual justification and even of a diffuse desire do not, by themselves, assure actual policymaking for the future. To actualize policymaking for the future much more is needed, including political will and suitable reforms of the policymaking system. This article is devoted to a preliminary exploration of some such issues related to policymaking for the future. (This paper is based on an article dealing with policymaking for the future in Venezuela, prepared for the 30th Anniversary Issue of El Nacional Caracas, Venezuela, August 3rd, 1973).

Having worked on related issues in a number of countries in South

and North America, Europe and Asia -- I am convinced that the fundamental challenge of increasing the conscious influence of humanity on its future through organized social action is a universal one. Detailed solutions depend on local conditions. But required general strategies and core institutions seem to be essentially the same for all complex societies. It is this finding of mine, arrived at through both theoretic research and applied work in a variety of different countries, which serves as the moral and intellectual justification for the basic ideas and proposals presented in this paper.

It is up to the reader to judge the applicability of my analysis and proposals to concrete situations. I myself regard my ideas as tentative and provisional, to be regarded as suggestions and starting points for experimentation rather than as final and definite conclusions. The only thing that I am sure about is, that no country will be able consciously to influence its future without innovative policymaking. How to go about doing this -- that is a question in which homo sapiens is just a beginner and on which we all together have much to learn. But in order to learn we must start somewhere. Being deeply committed to the ideal of increasing the capability of humanity consciously to influence its future with the help of systematic knowledge, structured rationality, organized creativity and responsible value-judgment, I offer this article as a discussion paper on the critical problem of how to improve policymaking for the future.

NEEDS, DEMANDS AND OPPORTUNITIES

Policymaking for the future is not something to be taken as obvious and nature-given. Humanity during long stretches of history has had the presumption and the desire to shape the future, on individual as well as collective level. But when desired results of nearly all longer-range-directed activities are compared with actual results, then, in general, attempts to influence longer-range futures (such as twenty to forty year spans) must be evaluated as failures, and usually as dismal failures. Therefore, the contemporary trend to engage in futures studies as an activity aimed at improving policymaking for the future, needs justification, if it is to be regarded as more than a new form of escapism, in which unsolvable present problems are handled through displacement into an undefined tomorrow.

When policymaking for the future is taken seriously, it must be understood as a product of three main factors, namely needs, demands and opportunities.

There is increasing need for future-oriented policymaking, because of the rapidly growing power and complexity of policy instruments available to modern society, as a result of advancing science and technology and of integrated social management. Nuclear energy, bioengineering, massmedia of communication, large-scale comprehensive development, urban mass-transity systems, space travel, birth control techniques -- these are only a few illustrations of

the many activities which, on one hand, have a long lead-time and a long lifetime and, therefore, can only be justified if undertaken with long-range purposes in mind; on the other hand, these activities illustrate possible dangers of long-range irreversible effects (for instance, on ecology), which make it essential that long-range results be taken into account in present decisions. Therefore, the clear need is for taking into account longer time perspectives, that is, for future-oriented policymaking.

More demands for future-oriented policymaking result from a value shift: Whether to plant trees now, so our grandchildren can rest in their shade and eat their fruits; or whether to cut trees so we can sell the lumber and have a good life, never mind if our children will have to live in a desert -- this is, fundamentally, a value issue to be handled through responsible moral choice. Societies, groups and individuals with a development ideology and with a vision for the future, are characterized by preference for preparation of resources for meeting future needs over satisfaction of immediate demands. The existence of such an ideology is both a driving force for future-oriented policymaking and a condition for it. When the future is regarded ideologically as a main target for policymaking, then future-oriented policymaking becomes politically demanded and desirable. This conclusion can be turned around into a necessary condition for policymaking for the future: Ideological consensus on the importance of the future and on readiness

to defer satisfaction of present needs in favour of satisfaction of future needs -- is politically essential for future-oriented policy-making. Building up and gaining support for such a value-preference for the future is, therefore, an activity necessary to provide a basis for future-oriented policymaking (care being taken to avoid misuse of such an ideology as a kind of popular tranquilizer which makes acute suffering bearable by unrealistic promises for an undefined future, without anything being done really to achieve a better future).

Needs and demands for policymaking for the future would be of no avail and, indeed, counterproductive in effect, unless future-oriented policymaking is in fact possible. This is a serious issue, because a strong claim can be made that, in view of the many uncertainties about the future, attempts to engage in policymaking for longer-range futures are in vain, and had therefore better be abandoned.

This argument must be taken seriously, especially as it contains more than a grain of truth. To be frank, about twenty years ago such an argument would be irrefutable, in parts. True, even twenty years ago planning was useful in respect to sectors where uncertainty is low. But usually short-range planning was the maximum that could be done. Surely, longer-range policymaking would have been utopian twenty years ago in most areas of social activity.

What has changed during the last twenty or so years is the

invention of new policymaking approaches which are able to handle long-range uncertainty. These approaches are much more complex and much less tidy than classical planning theory. Oriented towards structured learning, social experimentation, phased decisionmaking; and involving a complex mix between crisis management and comprehensive master-policy determination (in the sense of mega-policymaking and meta-policymaking. See Yehezkel Dror, Design for Policy Sciences, N.Y: American Elsevier and Amsterdam: Elsevier, 1971, chapters 10 and 11) -- modern policy sciences (however they may be called in different countries) provide sophisticated approaches and complicated tools, which permit useful policymaking for uncertain futures. Therefore, an opportunity exists to engage in policymaking for the future.

This is not an easy opportunity, as I will soon show. But this is, nevertheless, an opportunity which one can use to meet needs and demands if, and this is a great "if", a society is ready for the necessary innovations in its policymaking modes. Because of the dominance of uncertainty in respect to the future, good improvisation is often preferable over classical planning, which assumes certainty. What is really necessary and desirable is a sophisticated and complex policymaking mode which can really influence longer-range futures in desired (and changing) directions. But such policymaking is a difficult road, with hard intellectual, emotional and political requirements.

One definite barrier to better policymaking for the future are unreliable futures studies. Futures studies in which no distinction is made between reliable forecasts of alternative futures, imaginative invention of inspiring utopias, daydreaming by angry young or not-so-young men, and attention-seeking pronouncements by platform-seekers -- such futures studies may do more harm than good. The tendency of even many of the better futures studies to adopt weak and unexplicated methodologies and to repress many uncertainties, adds to the difficulties actually to use futures studies for better policymaking for the future. The absence of reliable quality criteria in respect to futures studies and the extreme self-selection process at work in futures research activities, including various futures conferences, further aggravates the situation.

When a society is able to solve its problems through improvisation, muddling-through and slow learning from trial-and-error, this is, therefore, a much easier road than policymaking for the future. Maybe some societies can do so, though I doubt it. But surely societies facing critical decisions which shape their long-range fate cannot choose to ignore the needs, demands and opportunities for future-oriented policymaking. It seems to me that most contemporary countries must engage in at least some policymaking for the future, if they want to achieve some of their high hopes and aspirations; and at least to avoid some very undesirable possible futures.

INTELLECTUAL, EMOTIONAL AND POLITICAL REQUIREMENTS

Reality-influencing policymaking for the future -- which is designed to have impact on reality, rather than being an intellectual exercise to be admired by other professionals, but useless for society -- depends on the satisfaction of difficult intellectual, emotional and political requirements. Leaving scholarly treatment of the underlying theoretical models and comparative studies from which these requirements are derived, for other opportunities (see, for instance, my book Public Policymaking Reexamined, Scranton, Penn: Chandler, Intext Publishers, 1968), let me concisely illustrate some of the more important requirements. I will do so by taking six main dimensions of policymaking for the future and showing involved requirements on the intellectual, emotional and political levels. These interdependent and in part overlapping dimensions are: (1) handling of uncertainty; (2) constant learning; (3) need for innovation; (4) systems view; (5) value judgment; and (6) implementation. Discussion of these dimensions of policymaking for the future will serve to bring out some of its intellectual, emotional and political requirements. It will also clarify the nature and some of the characteristics of policymaking for the future.

(1) Handling of Uncertainty

Handling of uncertainty involves two main processes: Patterning of uncertainty, by reducing it as much as possible, and structuring irreduceable uncertainty in the form of alternative futures;

and then using policymaking approaches which permit handling of the irreduceable uncertainty, such as design of alternatives which operate quite well in different futures, setting up monitoring arrangements which permit quick adjustment to unfolding reality and constructing crisis management units which permit good improvisation under difficult conditions.

These and related intellectual requirements are much easier (though still very difficult) to meet than related emotional requirements, including, for instance, tolerance for uncertainty and for ambiguity and the mental habit to think and use intuition in terms of probabilities, alternative futures and uncertainty; and ability to stand stress and to improvise in ways directed towards long-range goals, while quickly adjusting to changing details.

On the political level, ability to sacrifice present satisfactions for future goals is needed as well as the readiness to face disagreements now for the sake of better handling the future. Let me illustrate the last point, which is typical of the political problems: Every political leadership constitutes a coalition between persons and groups with, in part, divisive values, interests and opinions. Being able to work together depends, therefore, on limiting debate as much as possible.. As a result, there is a universal tendency to defer consideration of issues till they become acute and to limit search for alternatives. The reason for this trend is clear - who wants to raise sleeping dogs by bringing up for

debate problems which do not seem acute? And who wants to stimulate disagreement by increasing the range of considered alternatives? Here, we have a real conflict between the needs of better policy-making for the future on one end and the needs of coalition maintenance on the other hand. The first requires present decisions concerning future problems and search for additional alternatives for better shaping the future; while the second requires reduction of decision issues and reduction of alternatives. Policymaking for the future requires, therefore, a readiness to bear the inconveniences of more disagreements. This, in turn, requires a degree of political consensus able to take the burden of debates on the future.

(2) Constant Learning

Accelerated learning is, strictly speaking, one of the ways to handle uncertainty -- by permitting fast adjustment to unpredicted and, often, unpredictable occurences. But this is so important a dimension of policymaking for the future as to deserve separate treatment. Thus, there is much to be said for some modern approaches to planning modes of policymaking, which regard its main function under conditions of uncertainty as a structured, systematic and rapid learning approach.

Research findings agree with the experience of practice in clearly showing that individuals, organizations and societies have the greatest difficulties in learning from their own experiences. Defense mechanism which cause all occurences to be regarded as successes

and which cause all undeniable failures to be explained as caused by uncontrollable circumstances -- are too strong in all human affairs to permit learning from experience. When social change is slow, tacit learning through trial-and-error seems to occur through latent processes which do not clash with the just mentioned defense mechanisms. But, under conditions of very rapid social change, much more is needed in order to fight the strong tendency to repeat the same mistakes all over again, sometimes even in aggravated form (as illustrated by the widespread trend to repeat a policy which failed, with more investments and on a larger scale). Under conditions of rapid change and much uncertainty, learning must be accelerated by constant monitoring of occurences, speedy evaluation of happenings and rapid drawing of conclusions from unfolding reality for changes in policies. Learning must even be pushed ahead by artificially creating conditions for time-compressed learning from experience. This can be done through carefully designed social experimentation, which often is the only way to improve future-oriented policymaking dealing with novel and complex social issues on which no reliable knowledge and experience are available.

Constant learning requires, intellectually, knowledge of methodologies in monitoring, evaluation, feedback and social experimentation. Emotionally, a very difficult requirement is capacity to overcome main defense mechanisms and to be able to take a clinical view of decisions in which one was closely involved. Also needed is

an "open mind", in the sense of capacity to change one's views and orientations. Political requirements include: readiness and capacity to admit, at least to oneself, mistakes; to cut sunk political costs; and to be elastic in policymaking.

(3) Need for Innovation

The learning dimension of policymaking for the future must be complemented by innovativeness. Need for innovation stems directly from the novelty of problems which are faced and of the missions that are undertaken. To modernize a country in the economic-technological sense; to develop an unique culture, which combines the best of the old and the new; to design and realize a just social order -- these are tasks which have little successful precedent in human history. Surely, even some approximation of such policy-goals will require much innovation, both in respect to the operational contents of the goals themselves and to the policy instruments utilized in order to advance on the way to these goals. Ideological, social and technological inventions are, therefore, a must as an important dimension of policymaking for the future.

The trouble is, that not much can be done on the intellectual level to encourage innovation. A little is known on conditions which encourage creativity and that little must be put to maximum use. But the main variables influencing innovations are social and cultural and are beyond the scope of social engineering, certainly in the next thirty to fifty years. Social prophecy, charismatic

leadership, folk-creativity -- these illustrate factors shaping innovation, which are difficult to plan for. Nevertheless, some emotional and political requirements can be identified. On the emotional level, tolerance for new and unconventional ideas and thinking is needed, as well as "creativity" and "propensity to innovate". On the political level, there too is need for tolerance for new and unconventional ideas. Also necessary on the political level is heterogenety of opinions -- which serves as a strong stimulus to innovation, if not endangering basic consensus. This point well illustrated the required delicate balance between different and sometimes contradictory requisits: too much heterogenety impairs basic consensus and, inter alia, makes future-oriented policymaking impossible; too much homogenety and consensus reduce stimulus and inhibit innovation.

(4) Systems View

Policymaking for the future requires a systems view, in the sense that different policies dealing with various components and aspects of society must take into account the interdependencies of these components and aspects in the future. Overall long-range alternative systems futures are necessary in order to assure synergism between different policies and, at least, to avoid stark contradictions between them. Because of uncertainty and rapid change, no detailed alternative long-range systems images are possible and desirable; but some main outlines are essential in order to assure

consistency between different policies (including consistency on the more sophisticated level of adopting simultaneously policies oriented towards different possible contingencies, as a way to hedge against uncertainty -- what is called a "mixed strategy"). This characteristic of good policymaking for the future involves a three-dimensional systems view, in which different components of society are regarded and handled in their interrelationships in the time dimension.

Intellectual requirements for this dimension are clear: good knowledge of various system approaches and system design and direction methods. Emotional requirements include capacity to handle complexity and capacity to intuit in terms of systems rather than components. Needed is, among other things, intuition on high levels of abstraction. Very important is also readiness for what Jay W. Forrester called counterintuitive thinking, because the systems approach to long-range policymaking leads often to conclusions which contradict commonsense and daily experiences.

On the political level, one must get somewhat away from the pragmatism which characterize contemporary political cultures. Comprehension and handling of issues within a broad and future-oriented systems view requires, in essence, a new appreciative system (to borrow a concept from Sir Geoffrey Vickers) by politics, which handles issues within a systems view, rather than one-by-one as they come along. This is quite a change for most so-called "practical politics".

(5) Value Judgment

Implied in the already discussed dimensions of policymaking for the future is the dominant role of value judgment. Policymaking for the future unavoidably requires more value judgment, by presenting for choice alternative longer-range futures. Indeed, this is the main moral justification for future-oriented policymaking; when issues are handled pragmatically, with policies running after pressing problems and erupting crises, then there are few significant alternatives and little scope exists for value judgment. But when we try to shape the longer-range future, more real alternatives do become available and clear value-choice between alternative social futures becomes possible and essential, at least in general lines. In facing long-range policy issues, value judgment between present and future payoffs and between low-risk and high-risk alternatives also becomes necessary and possible.

The beautiful thing about policymaking for the future is,that it provides an opportunity for conscious, responsible and transparent value choice -- by posing alternative futures and putting in concrete form questions of long-range overall goals. Therefore, policymaking for the future fits perfectly the democratic ideology, which wants to maximize opportunities for value choice by the legitimate decisionmakers, such as elected politicians and, on suitable matters, the population at large. But, in reality, conscious, responsible and transparent value judgment contradicts basic characteristics

and needs of every political structure, organization and even individual. Value judgment unavoidably involves choices between getting more of value X and getting less of values Y and Z, or getting more of value Z and getting less of values X and Y. As a result, the more value judgment is required -- the more disagreement, tension and conflict. Value judgment reduction and value judgment opaqueness are convenient and, to some extent, essential for permitting persons and groups with different values and interests to cooperate. This leads to strong tendencies either (a) to reduce opportunities for value judgment, by adopting a pragmatic and short-sighted policymaking strategy; or (b) to postulate for long-range policymaking utopian goals where values are expressed in meaningless generality, so all can agree on them and none must take them seriously, with no implications at all for present action and no impact at all on emerging reality.

The difficulties of value judgment are well illustrated in futures studies. Futures studies are much less constrained than real life policymaking. Therefore, surely problems of value choice should be squarely faced at least in them. But many futures studies tend to ignore problems of value choice or brush them over with shallow generalities, usually by either assuming that all values can be satisfied simultaneously, or postulating meaningless value-slogans, or assuming complete agreement on a limited set of values -- namely those which the particular author happens to like.

Intellectual requisits for advancing the value judgment dimension of policymaking for the future include knowledge of methodology of value-analysis and of normative disciplines, such as law and political philosophy. Emotionally, ability to choose between values and to face the dilemmas of exchange-rates between different absolute values are necessary, as well as emotional acceptance of the nonpermanency of all values and the need to orient policymaking for the future towards achieving future values, rather than present values which are often axiomatically postulated for the future. On the political level, requisits are most difficult to meet. The political requisits cluster around the need to develop the capacity to make more explicit, more operational, more transparent value judgments on larger and more significant value issues.

(6) Implementation

Policymaking is not an end by itself; it is a means for increasing the influence of conscious human action on the real future in the direction of achieving more of human values, which themselves are also changing all the time. Therefore, good implementation is an integral dimension of good policymaking for the future. This point deserves emphasis, because of the necessity for a careful balance between an over-realistic approach to policymaking, where only what already exists is regarded as feasible; and an over-utopian approach to policymaking, where there is little distinction between wishful thinking and policymaking. What is needed is some combination in the form of "realistic utopism" or utopian realism". The self-

realizing and self-defying effects of prophesy must be recognized as well as the capacity of human devotion to realize sometimes the nearly impossible. At the same time, the future depends in part on what exists and, in part, on semi-stable characteristics of human beings. (When the characteristics of so-called homo sapiens are changed -- then we face radical uncertainty, which constitutes a watershed for futures studies and future-oriented policymaking. See my companion paper "Assignment: Improvement of Mankind"). Therefore, there are strict constraints on the domain of possible futures or on the horizons of policymaking for the future.

Intellectually, modern prediction methods and feasibility analysis can provide much help in mapping the range of the possible, with due attention to the significance of idealism and of human and social will. Emotionally, there is a difficult need for combining idealism with a clinical approach to the possible. Politically, the necessity to combine ideological utopianism, as an important contribution to shaping of the future, with careful and even quantitative feasibility testing -- poses very hard demands on the capacities of the political system.

ACTION IMPLICATIONS

No one human being, organization and structure can meet all the requirements of policymaking for the future, only some of which have been mentioned in this article. We know that Plato's solution of solving complex problems through a single person or group that is all

wise, all knowing, all good and all powerful -- is impossible, and that attempts to move in that direction -- will either fail or have serious negative consequences. Therefore, we not only want pluralism for ideological reasons, but also should view pluralism as the most efficient way for good social direction, including policy-making for the future. But the components of the pluralistic policy-making system and their interaction rules must be somewhat changed, so as to increase capability for better future-oriented policymaking by meeting some of the latter's requisits. Not all requisits can be met through purposeful reform of policymaking. But some can and should be met in this way.

Exhaustive examination of the many changes needed in the policy-making system to meet requirements of policymaking for the future would lead us far beyond the confines of this paper. But let me at least try and illustrate needed and possible changes by mentioning a few:

a. Think Tanks

"Think Tanks" or Policy Research Organizations are an essential bridge between knowledge and power and also between present pressing decisions and long-range perspectives. A typical Think Tank should be composed of about thirty to forty highly qualified persons, in part scientists and scholars from different disciplines and in part people with different kinds of life and work experiences. Such Think Tanks should engage in the analysis of long-range policy issues

ranging from construction of alternative systems-futures to study of specific issues and analysis of policymaking improvement proposals. Think Tanks should be working for different audiences, preparing studies in part for the government and in part for discussion by the public at large.

b. Policy Planning Units

In government itself, in parties, in Legislatures, in trade unions and in other public action units -- there should be small policy planning units. Such units, composed of at least three to five persons, should be responsible for applying long-range systems views to current decisions, for preparation of long-range policy guidelines and for utilization of modern policy planning methodologies. In part, such units should also serve as liason between planning bodies, Think Tanks and academic policy research on one hand and current decisionmaking inside their units on the other hand. With the help of such units, different public groups can become more oriented towards policymaking for the future, for instance, by including in party election platforms long-range policy proposals.

c. Evaluation Units

Recent studies in a number of countries show clearly that special evaluation units are essential for systematic learning from experience. The role of such units is not to praise or condemn the past, but to study the experience of the past in order to make future-

oriented proposals. Special evaluation units within the government and the main ministries are, therefore, an important institutional contribution to constant improvement of policymaking for the future.

d. Policy Analysis Professionals

Without suitable professionals, few proposals for better policymaking for the future can be realized. Training of policy analysts (never mind the name) is, therefore, essential. Advanced university programs which combine theoretic study with clinic learning on real projects are needed to prepare such professions. Intense crash programs can help train policy analysis professionals to meet urgent needs.

e. Courses for Policymakers

New units and new professionals are probably not very useful and perhaps even dangerous, if the main policymakers are not equipped with sufficient knowledge to understand the new approaches and to be able to judge their uses. Therefore, courses for policymakers are, in my opinion, essential. All senior executives should go through four to six weeks intensive courses in modern policy sciences to prepare them for their roles in policymaking for the future. Even more important are, in my opinion, shorter courses for politicians. However unconventional this proposal may be, I think that, for instance, every member of a Legislature should spend every year at least three weeks in intense learning. One-week workshops for members of Cabinets are not less urgent. Unless politicians know the problems

of modern policy planning and the uses and pitfalls of various approaches -- they either will underutilize modern knowledge or overutilize it. Therefore, courses for high level policymakers are essential for meeting the requisits of better policymaking for the future while preserving and even strengthening the prerogatives of elected politicians.

f. Citizenship Teaching

In the long run, I think that either the capacity of citizen to understand complex issues and to adopt an intelligent autonomous position on them must be increased, or the influence of citizen on future-oriented policies will either decrease or be for the worse. Policy-making for the future -- this is a very complex matter full of pitfalls and illusions. To maintain and increase citizen involvement and to progress, slowly but surely, towards intensified citizen participation (perhaps up to the proposal of Bertrand de Jouvenel to have referenda on desired alternative long-range futures) -- this depends, inter alia, on better preparation of citizen for their increasingly complex decisionmaking roles. Such preparation must start early in schools, when the citizen of tomorrow should get the intellectual, emotional and moral equipment to participate in an intelligent and responsible way in policymaking for the future. Mass media of communicating can also make a great contribution, by presentation of complex policy issues in a way conducive to autonomous decisionmaking by citizen. (This, in turn, may be approached

initially by intense training in policy planning for news media commentators.)

These are only some ideas out of many, presented here in all too schematic a way. But I hope the six illustrations are sufficient for at least one purpose: to show that concrete action to meet the requirements of policymaking for the future can be taken and that, therefore, better policymaking for the future is not a utopia, but a concrete proposition.

Political leadership, basic social consensus, rationality components in culture and real interest in the future -- these are requirements of better policymaking for the future which are hard to get when absent. Better policymaking for the future also requires readiness to try out new ideas and to overcome taboos and inertia. Excellent persons, money, time and patience must also be added to the scarce inputs necessary for better policymaking for the future. Therefore, not all countries are ready for moving in this direction and every effort to move towards better future-oriented policymaking will be hard and difficult.

I personally believe that every country and every international unit needs better policymaking for the future and is capable to make better policy for the longer-range future. Good will, while essential, is not enough. Concrete action is needed to achieve better policymaking for the future, in the form of reforms of the policymaking system on the lines illustrated above. Such reforms will significantly increase the capacity of humanity to influence the future. Better policymaking for the future is possible and is useful, but its realization

requires hard work and persistent efforts. It also requires intense intellectual efforts to design systems capable to make preferable policies for the future. To the encouragement and stimulation of such efforts this paper is devoted.

Evening group on:

The possibilities and utility of global models.

"THE LIMITS TO GROWTH" AND CLASS POLITICS°

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1. Introduction

This article is about the study commissioned by the Club of Rome, The Limits to Growth,(1) produced by a research group at the MIT, using a model of "world dynamics" developed by Jay Forrester. However, the article is only taking that book as a point of departure in order to present some views on some aspects of the ecological movement prevalent today in many rich, industrialized countries, particularly in the West -- a movement which one may, perhaps, refer to as "ecologism".

However, since the general line of this article is critical, let it be stated immediately that we consider the LTG study to be both significant and relevant. The problem is real enough. What we feel is only that the analysis is misleading, and that this will have serious implications for the action consequences.

The message, as well as the methodology, of the LTG book is clear. It is already given in the title: there are limits to growth. Of course, very many have said this for a long time, and when this book has been paid particularly much attention to it is not only because of excellent public relations for the book, (2) but also because it is riding on a wave created by others. However, our major thesis can be stated immediately: the book gives the message of the finiteness of nature, of increasing pollution and decreasing resources, in a way which is completely acceptable to the elites of the world. The book gives a message in what books like a "non-political" form, at no point are political constants and variables introduced. It presents the world, with rich countries and poor countries, with oppressors and oppressed, with all of us, as if it were an ecological system with some animal and some non-animal components, a thermodynamic system or even a mechanical system for that matter. Of course, it is also

a thermodynamic system, but above all our world is a social system.

A second thesis is that this book would only have been accepted, and even to some extent be translated into a well-known political document, the letter written by Sicco Mansholt to the Commission of the European Community (which was to become a letter addressed to himself), if the elites referred to above had felt that the difficulties referred to were remediable within the limits set by the prevailing political and economic system of the world, and did not imply basic change of that system. In short, that technical solutions exist.

To discuss this further, let us take a very brief book at the methodology as well as message of the study.

There is no doubt that the study is made in what could be called the "malthusian" tradition. We define this tradition as a budget approach to the world, with positive and negative entries. To Malthus the positive entry was the food supply, the negative entry the population, which implicitly means food demand. In his famous study (An Essay on the Principle of Population, published I798) he contends that the means of subsistence increases as an arithmetic series, whereas the population increases as a geometric series. The result is seen as catastrophe, in the sense of too many struggling for too little, or the operation of some factors to put limits on population growth. In the first version of his book only war, famine and disease were seen as such limits, in the revised version (published in I803) the idea of "moral restraint" was introduced. As is well known this has served as one take-off point for population control through "modern" family planning.

The LTG study has added two elements to what Malthus originally did.

First, they have extended the range of variables on the positive and negative sides. On the positive side industrial capital has been added, and on the negative side pollution and depletion (of resources) have been added. This makes a total of five, Malthus' two old ones and the three new ones. (Incidentally, it is interesting that in the list of references, that characteristically enough includes practically speaking only LS sources for the study of a global "predicament of mankind", (3) there is no reference to their spiritual father.)

Second, the study has added to what Malthus could do the idea of multi-loop, non-linear feed-back systems, and the computer to deliver the goods when fed with appropriate data and estimates and assumptions about functional relations. (4)

But apart from this not much new is to be found in this study appearing almost two centuries later, which can be interpreted as a credit to Malthus, or, as it should, as a discredit to the Club of Rome and the MIT group.

What Malthus referred to as arithmetic and geometric series now appear as linear and exponential growth curves in the MIT study. Catastrophe is predicted, under ceteris paribus assumptions, and the same mechanisms are invoked to stave off catastrophe. Moral restraint is called for, this time not in the form of sexual abstinence, it is not man's relation to women, but this time Man's relation to Nature. He shall waste resources less, he shall pollute less, (5) he shall see the danger ahead and act accordingly.

2. The compatibility with Christian culture

At this point one should perhaps pause to note how well this type of message fits into the Western, Christian social cosmology. More particularly, there seem to be three points of some significance here.

We just mentioned one: the puritanism, the ethics of saving, whether of money, semen, or nature; the "moral restraint".

Then, there is the way in which the message of the three evils, the producers of population, pollution and depletion can be used to establish a list of sinners, even a ranking list according to the magnitude of the evil they produce. The way many Protestants regard Catholics or others with ten children or more, and the way increasing fractions of society have started regarding industrialists in terms of how much pollution and how much depletion they produce, are significant here. When catastrophe is predicted it is good to have a basis for establishing a list of sinners, even ranked according to the magnitude of the sin, correctly calculated as negative social indicators.

But more significant is the applicability of the Christian gospel: the sinner can be forgiven through conversion, repentance and disavowal of his own sin. He who produces many children can stop doing so, or at least he can limit the evil. This will happen through increased insight and increased consciousness, awareness of the techniques available, and a new life. Thus, the industrialist who adapts measures to absorb pollution and to recycle resources is like the couple practising "moral restraint", whether by use of the mechanical-technical means condoned by Protestant churches, or by the non-technical means condoned by the Catholic church. At this point we shall hasten to say that in the LTG study no register of sinners is appended. It is more likely that the left wing of global and national society would point an angry finger at the top ten or top hundred on such a list and say j'accuse, than that a study produced from what globally speaking is rather far out on the right wing would do so. They would talk in more general terms, but in so doing they provide a basis for the identification as well as the more or less voluntary conversion of sinners. (6) And each converted sinner saves the system from a much deeper conversion. (7)

Third, there is the idea of the apocalypse. This idea, which not only means that man's time on earth, even earth itself for that matter, are finite, but that the end takes the form of a catastrophe a doomsday, is shared between traditional Christianity and the LTG study. This provides a general compatibility of the message with underlying, more or less conscious general culture. Of course, nobody would be believed if he predicted doomsday tomorrow or next year; in that case he would be classified together with certain sects who take refuge to high mountains or elsewhere to watch the world go up in flames. Readers will simply look out of the window, see no sign of impending catastrophe, and engage in shoulder-shrugging. Similarly, if the author places the apocalypse much further out on the time scale, say in five hundred years, he will not be taken seriously either, but this time not because he is not believed, but because nobody feels the threat. Psychologically speaking one might surmise that few people would project much further into time than they identify with their own biological off-spring, which in most cases would not go beyond their grandchildren, perhaps their great-grandchildren, which in turn would mean that the upper limit for an

apocalypse to be taken seriously is below one century. And this is exactly where the LTG study places the apocalypse: somewhere in the middle of the 21st century, late enought to look credible, soon enough to be a menace. The apocalypse has been regained!

3. The compatibility with economic growth ideology

What we have said so far is that the action implications of the study are of such a kind that they can, at least in the short run, be carried out within the constraints set by our culture and our system. If the difficulty is that one cannot increase industrial capital or food supply sufficiently so that the positive entries can balance the negative ones, then one may attack the three negative entries through population control, pollution control and depletion control. Concretely, pollution and depletion control will take the form of what one might call anti-factories. For each polluting product produced there will be another factory producing an anti-product that coupled with the first product cancels the effect of the product. Thus, for each car factory one might build an anti-car factory so that each car can be equipped with an anticar, for instance in the shape of a box to be placed under the car, filled with material so as to absorb all the pollutant in the exhaust. When the bow is saturated a red lamp will be lit somewhere in the car, and the driver has immediately to pull in at a gas station, the saturated box is taken off and a clean one is put in, for a reasonable fee. Similarly for the depletion: a budget for materials is made,if scarcity is threatening recapture of atoms and molecules is not only advocated but implemented through recycling processes, and this recycling will take the shape of an anti-factory to be coupled to other factories. (8)

As has been pointed out by US economists already (9) this will provide considerable opportunities for business, and is in no way a threat but even increase: they are both forms of processing, they enter the values circulating in society somehow, so that pollution as well as anti-pollution, depletion as well as recycling can all be included as positive contributions to the gross national product. Far from limiting the growth this may even increase the growth. (10)

One argument against this type of reasoning is that it is based on a type of "technological optimism" that is unwarranted: the technology simply does not exist. To this one may object in two different ways. First,

this is not an optimistic vision, it is a pessimistic one. All that is said is that the type of analysis given by the MIT group in the LTG study is completely compatible with such initiatives, and everyone can judge for himself whether they have not already come quite far. The vision is pessimistic because it envisages more growth through more depletion of human resources, more division of labor in society through the introduction of a new profession, the professionals in the fields of anti-pollution and anti-depletion, and more control in society through the introduction of bureaucracies whose task it is to see to it that pollution and depletion budgets are kept within the limits given. (Thus, the driver who does not pull in to a gas station although his box is saturated and the red light is on will of course receive a very high fine, similar to the motorist at night who continues driving instead of buying new bulbs although his lights are out.) In short: more vertical division of labor in society, more control, more centralization, more economic growth.

But in addition to this we doubt that those who say that new technologies will not arise, and much more quickly than the LTG study assumes, are right. One reason why can be glimpsed by looking at the ability of Western, industrial society to mobilize in times of war: when the threat is really felt, is well propagated through society and is doubted by almost no-one it is almost incredible what can be mobilized of human and non-human, also inhuman, resources. The authors of the LTG study do not include among their assumptions the possibility of whole faculties, universities, armies of scientists and technicians working full-time on problems of pollution and depletion, in the same way as they have done for the military on problems of destruction. They do not envisage a growth in new technologies that may be far more than exponential, to some extent also stimulated by their own book -- but all the time within the limits set by the existing system.

However, there is another objection to our own reasoning with which one presumably will have to agree, although it is difficult to have a specific opinion about it. We are thinking of thermal pollution and energy depletion. Somewhere in the picture the second law of thermodynamics enters and sets limits to the possibility of regeneration. If one wanted to recycle the exhaust coming out of cars and bring it back to gasoline the energy needed would somehow have to correspond to the energy given to the car in its forward thrust, and this effort would obviously only

add to pollution and/or depletion. On the other hand, one could also envisage that in the relatively near future so much knowledge will be obtained about the total production cycle in such a way that completely new cycles will be planned so as to put either evil under reasonable control. One possibility is already well known: the pollutant of one process is the resources of another one, as when the carbon dioxyde from certain industrial processes are led in pipes into enormous greenhouses cover by plast so that CO_2 atmosphere becomes much denser and the production of food-stuffs goes up. Actually, there are even those who maintain that one source of the green revolution is not HYV (high yielding varieties), but the pollution of the atmosphere. Needless to say, this would work for some pollutants, among them CO_2, but not for others.

The thermodynamic death of our environment in the universe has been prophesied many times, but however good or bad these prophecies may be it seems relatively safe to say that if the two evils of pollution and depletion could be partly annihilated through anti-processes and channeled in the direction of thermal pollution the time horizon for the catastrophe might expand. In fact, it might expand so much that it would come beyond the limits of a perceived menace. Result: apocalypse lost but economic growth regained: perceived menace. Result: apocalypse lost but economic growth regained!

4. Ecologism: a middle-class ideology

So far everything we have said deals with why this type of study is not only completely acceptable to the forces at the global and national right, but even fashionable, yes, even laudable. Of course, there may be an occasional enthusiast for classical industrially-induced economic growth who sees no reason whatsoever for any "moral restraint" and who has not yet understood the mechanisms of absorbtion. Many of these will be located even further to the right than the forces behind this study, and will probably be used by them, consciously or unconsciously, to locate a political anchoring point further to the right so that they themselves stand out as "radicals". But they are not, and in this part of the article we shall try in some detail to show why. For that purpose let us give the word to some young scientists from the developing countries, themselves much closer to the reality of this world than the MIT group. More particularly, we are thinking of the young scientists belonging to the Oi Committee International (for a Critical and Holistic Approach

to Development and Human Environment), the Ote iwapo! group, derived from a Swahili proverb, meaning "all that is, must be considered". (11)

At the UN Stockholm Conference on the Human Environment in June I972 they published a declaration (I2) which among other things says:

> "We strongly reject models of stagnation, proposed by certain alarmist Western ecologists, economists, industrialists and computer-fans and assert that holding economic growth per se responsible for environmental ills amounts to a diversion of attention from the real causes of the problem which lie in the profit-motivation of the systems of production in the capitalist world. Likewise we state that the level of consumption (affluence) per se is not a cause of environmental problems. Therefore the bulk of the so-called "ecology-movements" in most industrialized countries that stress personal ethics of recycling and non-consumption are at best diversionary tactics which fail to put the primary emphasis on the destruction of the profit-oriented system of production."

Before that, at a conference called by the UNESCO for young scientists, on Population and the Environmental Crisis (in Paris 2-4 May I972), many of the same people participated and in the report of the conference it is stated: (13)

> Much the heaviest criticism of the model, however, was at the political level. Through its selection of five basic parameters which are purely technical, most participants felt that the model was not one which applied to the real world. The breakdowns predicted by the model if current trends continued resulted from the interaction of these five factors whereas breakdowns in the real world which were already apparent in the developing countries and which could be predicted for the future elsewhere could be argued to depend on quite other factors. Why, it was asked, were war, arms trade, colonialism and imperialism rejected as specific factors that might, and indeed already were, causing breakdowns? Why was the unequal distribution of resources, both between nations and within them, not included in the analysis? How could a model of this type, which specifically excludes those factors which are widely believed to be the root cause of global ills, be held by its inventors to be "a-political"? On the contrary, there was considerable agreement that the model was élitist (as evidenced by the use made of the recently published book) and that all assumptions were conditional on an unaltered status quo in world affairs: it was a "conflict-free" model of a world which, in reality, was torn by conflict.

So, why these strong words, why this fundamental criticism? Is not this only a sour critique, negative from scientists (and not only in developing countries) jealous of the quick reputation obtained for the MIT group through the publication of the LTG study?

In one sentence: precisely because this "dynamic world model" is so politically blind, and because this blindness in itself constitutes a political view, which colors the presentation from beginning to end, and which explains very well why this book meets with acceptance in circles holding the same type of view.

The simplest expression, but also one of the most repulsive ones, is found in the very notion of a "coming crisis". What is the nature of this crisis? Formulated in the terms given by the study the crisis has three parts: over-population, over-pollution, and over-depletion. In other words, the crisis leaves mankind living under crowded conditions, in a poisoned environment, and short of resources. But it is almost incredible that it has not struck the authors that these are exactly the three conditions under which a very high proportion of the population of the world, perhaps even the majority, are already living, and have been living for a long time. One does not have to invoke the word Calcutta (14) to see this; any slum or working class district for that matter in the most big cities in the world political and economic periphery will do. And if one goes back in time a little bit, if one reads the conditions described by for instance Marx under which the British industrial proletariat was living in the middle of the last century we get a very vivid illustration of the impending crisis depicted in the MIT study. Poisoned food, poisoned air and water, dirt and shift around, overcrowding, scarcity of food-stuffs, and also of "industrial capital" for that matter, have been conditions under which very large portions of mankind have been living for such a long time that it is rather strange how the MIT group somehow has failed to see it.

So, why the cry of catastrophe right now? One simple explanation because some of the same conditions have recently, due to some changes in the organization of production and in the technology, also reached well into the middle classes, in poor and rich countries alike. (15) One can see this so many places in the world: how the water washing the shores where working class people lived, always near to factories, to dumping places for waste of various kinds, was the first to become undrinkable, and later on unswmimmable -- and how these conditions are now reaching other parts of the cities and the villages, also threatening higher classes in society. (Of course, the real upper classes are never threatened, they always have the means at their disposal to escape from such hazards

and take refuge in the still unpolluted havens of the world.) But of course, the authors could never formulate their conclusions in such terms. It has to be formulated in global terms, in "we are all in the same boat" language. But were we not also in the same boat before? Why are we only in the same boat when the noise and dirt, even the flames, reach the upper tiers of the ship?

The study treats the world globally, as an aggregate, in terms of global trends and global averages. This methodology is compatible with the "we are all in the same boat" ideology, and obscures all differences. To this the MIT group may reply that such a criticism should be taken seriously, because a global average will not correspond well enough to any regional situation to give the type of credibility that is needed. Some places may be better, some places may be worse, none of them being exactly equal and particularly not equal to the global average. Hence, more studies, regional specification.

However, this is not the objection. The objection is not in terms of horizontal variations from one region to another. (16) On the contrary, if one now proceeds by making studies for regions such as Latin America or Africa, or for countries such as Argentina and Nigeria, in the tradition of "area studies" found in some of the universities around the world, (17) one would only once more escape the real problem. The real problem lies in the vertical differences, between rich and poor, oppressor and oppressed, exploiter and exploited - and in order to catch these differences one has to study the economic production and consumption cycles in the world, and they do not respect the type of division of the world taught in elementary school when small children are for the first time confronted with the world map and the globus. Only the politically very innocent will believe that a division of the world into "continents" and "countries" can serve as a guide to understanding how the world works. The real map of the world is written in quite different languages and representations, not yet taught even far beyond elementary school.

5. Economic cycles, pollution and depletion

We have indicated that one indispensable representation is in terms of economic cycles. This is not the place to go into detail, let it only be said that economic cycles are characterized by the flow of economic goods, in both directions (flow and counter-flow) and that they pass through Nature to some palm trees, and Man to Robinson Crusoe, living off the

palm trees for his essentials where nutrition, clothes and shelter are concerned, giving back to them manure (in addition he would get oxygen from the atmosphere, giving back carbon dioxide). Such a cycle would have three characteristics:

1. ecological balance
2. even accumulation
3. limited extension

The ecological equilibria on which nature depends, some of them static, some of them dynamic, are not destroyed; there is no uneven accumulation in this case since Robinson Crusoe is alone in accumulating, at a modest level (the moment Friday enters the picture this changes); and the economic cycle has such a limited scope that it is understandable to him who participates in it. Contrast this with the economic cycle induced or administered by any major multinational corporation today:

1. ecological imbalance
2. uneven accumulation
3. unlimited extension

By "natural disequilibrium" we mean precisely pollution and depletion to a point where the regenerative mechanisms of nature are no longer sufficient to undo the damage; by "uneven accumulation" we mean exploitation of those who get least by those who get most: by "unlimited scope" we mean an alienation caused by the inability to see and understand the scope and nature of the economic cycles in which we, willingly or not, wittingly or not, participate.

Today's economic cycles span the world, and are characterized by the negation of the three properties of the Robinson Crusoe cycle, which does not mean an advocacy of a return to the Robinson Crusoe existence, but a general advocacy of the three virtues with which the Robinson Crusoe cycle were endowed, according to this view.

Our basic view, certainly not original,is that economic cycles do not have to include these three negative properties. But if the economic cycles operate under the assumption of capitalism the three consequences follow. The reason for this can be seen if one instead of focusing on who owns the means of production (private capitalists, state capitalists, the people) focuses on another aspect of capitalism: the extremely high mobility of production factors. Concretely capitalism is based on the idea that capital, nature in the form of raw materials, and labor in the form

of "raw" and skilled labor, are moved towards points of accumulation, "poles of growth". These accumulation points become the centers of the system, the rest becomes the periphery. Depletion, pollution and uneven accumulation are immediate consequences, and so is the unlimited scope or the improved means of transportation and communication.

Let us now return to the LTG study, and draw two conclusions.

First, it has been in the nature of the capitalistic economic cycle, and still is, to organize the cycle in such a way that the major negative effects of pollution and depletion have been placed at the feet of the weak. By "the weak" we here mean two things: nature in general, and the periphery among nations and within nations. They have been the targets, the receivers of pollution and depletion. Nature has been raped, deprived of raw material and received various types of poison in return; the weak among and within nations have served as the dumping places for the waste. In recent times, and still today, this has taken the form of depleting the sources of raw materials in Third World countries, processing them in the rich countries, polluting the rich countries, and selling the processed goods back to the poor countries. That this had lead to uneven accumulation because of the terms of trade and because of the spin-off effects of processing raw materials, is clear enough. What is new is the point that pollution, being essentially located in the industrialized countries, not only threatens people in the industrialized countries as mentioned above, but also in its own peculiar negative way might tend to make the economic cycle less uneven. The riches accumulated through the vertical division of labor characterizing the economic cycle under capitalism might to some extent corrode under the influence of excessive pollution.

We have mentioned above how pollution can be counteracted through anti-technologies (which should be distinguished from human technology, even from new technology for that matter). Thinking in terms of economic cycles makes it now possible to formulate another strategy already engaged in by the developed countries: to locate polluting industries elsewhere in the economic cycle. In other words, instead of the old division of labor making out of the weak countries in the Third World the sources of raw materials and the markets for consumer and capital goods the new division of labor would in addition make them the hosts of polluting industries, particularly producing the type of goods that were produced in the early phases of the industrial revolution in the countries today on the top of the global vertical division of labor. (18)

In other words, with the exception of pollution right now, or perhaps better some years ago, the evils have a clear address between countries, and always had a clear address within countries - obtained by such simple means as having working class districts located very near to the factories. What is praiseworthy in the LTG study is that a variable is brought in where the "problem" is not as usual seen in terms of doing something with the "developing countries". The "population problem" has always been treated that way: from the simple, capitalistic notion that economic growth is the increment of GNP per capita it follows that if it is difficult to increase the GNP (and it is very difficult, because GNP is a measure of how high one is on the vertical division of labor/ degree of processing axis where the top positions were reserved for the top countries), one may at least decrease the "capita" through family planning, etc. This induces an administrative view of developing countries, currently entertained in all technical assistance agencies in the rich countries. The variable "pollution" is not in this category, at present. So, what we fear can be expressed in one simple sentence: in order to obtain compatibility with the general nature of the economic cycle discussed, and with the general world view of "problems" as being something that geographically is located in the Third World, the logical conclusion would be to move the polluting industries there; rather than fight pollution.

The vertical dimension of pollution/depletion has another consequence than its uneven distribution, however. When the evils are placed at the feet of the weak they are not resisted, not even pointed out, because the weak are too weak to do so. Poor people around the world struggling for survival are not in a position to protest against such abstract phenomena as depletion and pollution when life is a struggle to get very primary, essential goods such as a little food, some cloths and some shelter. These primary needs are primary in the sense that they are given priority, and no cry of WOLF (19) printed out by a computer located in the very center of the Center part of the world will change these priorities. It is only when such evils reach people higher up and nations higher up, reach into the middle classes, that organizational potentials strong enough to lead to, for instance, the Stockholm Conference, are tapped. That conference was organized by the World Middle Class International a strong trade union, considerably stronger than those who are the real victims of the ills on the agenda.

The other weak party is, or perhaps rather was, Nature. Nature has been raped, it has been made to serve its menial role in the economic cycle. Man's relation to Nature has become one of total dominance, certainly not one of partnership. And in this process non-economic factors must be pointed to in order to see the total picture. It is impossible not to put a large portion of the blame on Christianity as a cosmology. Religious cosmologies can be classified in terms of how they distribute soul, and Christianity has an extremely asymmetric distribution. First, nature is deanimated, made soulless; animation is stamped out as "superstition". Second, it took very long time before Christianity endowed all human beings with a soul, and soul, like most other human rights and qualities, did only cross the usual ascriptive borderlines, such as race, ethnic group, sex, age after considerable fight. Third, even if other human beings are not deanimated and soulless like Nature there is no doubt that the Christian soul is seen as having a higher quality than the non-Christian one. Needless to say, such views were entirely compatible with the role given to Nature and to other peoples in the world-embracing economic cycles to be established after the Great Discoveries.

A nature without soul is easy to destroy; a nature with soul is one that invited partenership, respect, equilibrium. We point to this factor because it is so clearly seen in today's socialist countries that changes in the structure of the economic cycle, particularly in the direction of a less uneven accumulation, is not sufficient to protect Nature. (20) Nature can be raped with the same cruelty to serve even as to serve uneven accumulation. The point is only that when the economic cycle in addition leads to uneven accumulation, then those who are worst hit by pollution and depletion are not in a position to defend themselves. In a socialist economy with the primary needs satisfied and relatively even accumulation and ecological consciousness would stand a much fairer chance of leading to restructuring of the economic cycles than in a capitalistic system, for the simple reason that the whole population would be about equally hit and equally able to mobilize. Hence, although the chemical composition and the physical cause of the pollution may be the same or very similar in capitalist and socialist economies, the socio-economic structure by which they are caused, and through which they can be counteracted, are different.

Nature has become soulless, but recently nevertheless able to mobilize some kind of defense. We are thinking not so much in terms of the slow asphyxiation a poisoned atmosphere may lead to, nor of the sinking into the water of such cities as Venezia (presumably because of the disequilibria induced through excessive use of industrial water by the neighboring highly-industrialized town of Mestre), (21) but of earthquakes that may be caused by the cavities left behind when too much oil and water and gas has been extracted, or when the ground water has sunk too deep. Nature can defend herself through incrementalism, the slow asphyxiation referred to, or through quantum jumps like earthquakes. The point is that Nature now becomes a strategic force, hitting back in expected and unexpected manners, and this may lead to a respect that Man in his arrogance has lost, if not to a reintroduction of some kind of individuality in Nature putting her on a more equal footing with Man.

6. Some assumptions in the LTG study

In short, the classical economic cycle induced by capitalism is now confronting some difficulties, but they are not yet strongly enough articulated, and books like the MIT study instead of clarifying the matter contributes directly to obscurifying them. How does that happen, how do these people think in order not to see the relationship between the economic system and the phenomena they are analyzing? An answer to this is given in the book, for him who tries to get at the philosophical underpinnings.

It is most clearly expressed in this passage: (22)

> "If one wanted to predict exactly how high a thrown ball would rise or exactly where and when it would hit the ground, it would be necessary to make a detailed calculation based on precise information about the ball, the altitude, the wind, and the force of the initial throw. Similarly, if we wanted to predict the size of the earth's population in 1993 within a few percent, we would need a very much more complicated model than the one described here. We would also need information about the world system more precise and comprehensive than is currently available."

In other words, what is needed for exact prediction is the introduction of many more variables and the collection of more precise data. Social systems do not differ from natural systems, a bridge is built between

the two through the word "similarly".

This is a very good example of an uncritical application of one particular approach in natural science to social matters. The view is mechanistic, more particularly Laplacean: if you know all characteristics of the components of a system at time t_n, then you will also know it t_{n+p}, in other words forever. The state of the system in the future is contained in its present state. There is no indication in this view that systems may be self-transcending, that they may undergo discontinuous breaks with their past and present, that they may change their nature so thoroughly that no regularities valid at t and t_n can be assumed to be valid at t_{n+p}. Of course, one may have intuitions about the future system, but that is not the same as the type of knowledge needed to make the kind of prediction hailed in this particular passage.

One might say that this passage is only philosophically naive, the natural consequence of a certain deformation in academic training.

But, however that may be it is dangerous and has very definite political consequences, much more clearly seen in this passage.

> "Capital stock is not permanent. As capital wears out or becomes obsolete, it is discarded. To model this situation we must introduce into the capital system a negative feedback loop accounting for capital depreciation. The more capital there is, the more wears out on the average each year; and the more that wears out, the less there will be the next year. This negative feedback loop is exactly analogous to the death rate loop in the population system. As in the population system, the positive loop is strongly dominant in the world today, and the world's industrial capital stock is growing exponentially."

Again, one sees clearly the extreme dangers inherent in the general system approach: capital depreciation in the capital system is seen as "exactly analogous" to the death rate in the population system. This is the type of conclusion the authors can only arrive at if they regard the capitalistic economic system prevalent in the world today (although less so than it was 60 years ago) as somehow the "natural system", and all other systems as aberrations from it. In fact, like most Western economists their view of economics is so limited that it should probably more properly be referred to as "capitalistics" as the science of the capitalistic system. (24)

More concretely: the words "exactly analogous" will lead to one very very important "analogy": just as the death rate has a lower limit, capital depreciation will also have a lower limit. But if there is anything that characterizes capitalism in addition to the three properties of the economic cycles and the mobility of production factors referred to, then it is precisely the need built into the system for a high rate of capital depreciation. This is not the place to go into details: suffice it only to say that if many more things were built in such a way that they lasted if not foreover at least for a very long time, then there would be no need for replacement, neither of consumer nor of capital goods, and if there were no need for replacement the machinery would not have to be kept operating in the same way. Capital depreciation, particularly in the form of "planned obsolescence" is a necessary condition for the stability of the capitalistic economic system. One may of course, guided by a puritan ethic, introduce some saving measures and reduce the capital depreciation somewhat, like the death rate is reduced through lower infantile mortality (brought about by polluting insecticides, etc.). But that is not the same as stepping outside the capitalistic system, viewing it from a vantage point where it appears as one among many ways of organizing the economy, and where "capital depreciation" is not only seen as a parameter that can undergo a certain variation, but as a basic, pivotal element in the total configuration, subject not only to variation, but to transcendence.

The complete failure or inability to step outside the capitalistic system, not only to view it in its relation to pollution/depletion, can also be seen many other places in the book. A typical example is the uncritical views of economic growth and population growth data, taken from the International Bank for Reconstruction and Development (25). The lowest rates in economic growth in the table are Nigeria (-0.3) and China (0.3). It does not strike the authors that this latter figure may say more about GNP as a measure than about China. They may perhaps not be aware of the inability of the GNP to reflect the type of economy to a large extent found in China, organized in people's communes aiming at self-sufficiency and above all as satisfaction of primary needs. The production of foodstuffs for self-consumption may increase tremendously, it will not be reflected in the gross national product unless it is processed and marketed. It is not strange that the World Bank will produce exactly such data, but it reflects in this study the whole model of the world on which they

are basing their conclusions.

The same attitude is found in the discussion of "technological side-effects", with particular emphasis on the Green Revolution. (26) There is much talk about "social side-effects", and a perfectly acceptable analysis of the net effect of the Green Revolution is given: "agricultural unemployment, increased migration to the city, and perhaps even increased malnutrition, since the poor and unemployed have no means to buy the newly produced food". (27) But then comes the strange observation: that such effects "must be anticipated and forestalled before the large-scale introduction of the new technology". (28)

But these are not side-effects, and there were no difficulties at all in anticipating them! Anybody with the most elementary knowledge of how a capitalist economic system works would know this perfectly well in advance. More capital-intensive production will necessarily lead to new flows in the production factors, for instance in the directions indicated. If equitable distribution is the goal, then this goal has to be built into the economic process from the very beginning, it does not come about as a "side-effect". As a matter of fact, a more intuitive way of anticipating what to the authors of the LTG study seems to have been unexpected can be developed simply by asking one question: we have now had capitalist economics for centuries - why is there less equality than ever? And, was there anything in the social and economic organization of the Green Revolution different from capitalistic economic cycles in general?

In short, the study stops where to our mind it should begin: asking basic questions about other aspects of these economic cycles than the imbalance with nature. The study should have started with an analysis of cycles as such, looking into the uneven accumulation and unlimited scope of the cycles found today, discussed how exactly the exploitation and alienation implied by necessity lead to 1. an equally asymmetric distribution of the evils of depletion and pollution, and 2. an asymmetric distribution when it comes to power to react against these evils. Those who are hit most are the least powerful to react, those who are the most powerful to react are only hit indirectly through the reported imbalance with nature. This means that their motivation will be abstract, something that has to be conveyed through a book like the LTG study, whereas the motivation of those who are most directly hit will be highly concrete, but probably directed much more against exploitation and alienation than against imbalance.

And that is the real tragedy of our situation. Any basic political change has to be carried by forceful actors, and the economic cycles currently spanning the world are of such a kind that they create actors with highly disparate interests. For that reason there is no wonder that the LTG study ends up (29) with a list of the type of "practical discoveries that enhance the workings of a steady state society". They include, first, the two types of anti-devices against pollution and depletion mentioned above, then "better product design" in order to decrease capital depreciation (with no mention of what would then happen to vacant production capacity!), and then three on the paper excellent looking technical ideas (more use of solar energy, natural pest control, letting insects fight insects (?), and medical advances that would decrease the death rate). And finally, more advances in the field of contraceptives. These proposals are all relatively concrete, but everything that has to do with social and economic structure in the whole study remains vague and wishful rather than thoughtful.

7. Conclusion

So, to summarize: the critique offered here is not that the LTG study is irrelevant and unimportant. It states the contradiction between economic growth on the one hand and the finiteness of the world on the other in no uncertain terms. It sees the system from the outside, studying it like a black box, watching the inputs and outputs and their interrelations, incapable of seeing what goes on inside and how the black box might change its equations with the surroundings. Given this point of departure, the study will point to solutions in some directions, not in others -- and it will be absorbed by some quarters, not by others.

More particularly, what we fear is that this type of analysis will not

lead to a politics of equity, equality, justice, since these were never made the primary variables of the study but seen as "side-effects"	but to more of the politics of growth, in order to create all the anti-technologies needed to counter-act the effects of the present technologies
lead to a new technology, with less ecological imbalance, less uneven accumulation and less alienation in the economic cycles, but	to anti-technologies for anti-pollution and recycling

mobilize the population in order to assure a joint fight not only against overpopulation, over-pollution and over-depletion, but also against their uneven distribution	but lead to the only type of "fight" our system knows: a new class of experts, new professionals in anti-pollution and anti-depletion (just as we for a long time have had "population experts") with a technical, administrative view of the problem and an instrumentarium of manipulative techniques at their disposal
decentralize the initiatives, down to the level of the smallest nation-state and the smallest little district inside the nation-state	but centralize them for the above reasons, favoring superstates (like the European Community) for reasons of planning and in order to exercise control against infractors
lead to a deeper harmony and partnership with nature, an understanding of the oneness of man and nature.	but to more of the old Herr-Knecht relation, man as the master of nature, only with more emphasis on how man can exploit nature for recreation than for production.

So, to conclude: the LTG study is the kind of study one might expect from an elite's technological elite. It is a dangerous study because it might be interpreted as the latter day version of the old "first growth, then distribution": "first zero growth, then distribution". (30) It is dangerous because the authors, and many others, seem to believe that they have discovered the three evils mentioned. The fact is that these evils are very well known and have been mentioned in social protest and struggle for centuries. What is new is only that the protest is now articulated higher up in society.

If the result of that is more emphasis on the politics of equality within and between nations than on the politics of growth, this is fine. But we are afraid this is not going to be the consequence. A study that sees a political problem as a technical one is likely to translate politically into technocratic and administrative solutions. He who wants to fight against such cheap and dangerous solutions, he also has to fight against the type of analysis out of which they are born, however laudable their intentions.

N O T E S

° This study is the outcome of many discussions on the book Limits to Growth and the Club of Rome, not the least during the Third World Future Research Conference, Bucharest, 3-10 September 1972, and also at the University of Oslo and University of Trondheim, October I972. It can be identified as PRIO-publication no. 27-7 from the International Peace Research Institute, Oslo.

1. We are referring here to the American edition, published at Universe Books, New York, I972, by the Potomac Associates.

2. According to the report from the conference referred to in footnote 13 below, "the preliminary findings have been published as a book called The Limits to Growth, 15,000 copies of which have been dispatched to political and social leaders throughout the world". The project was supported by the Ford, Fiat and Volkswagen foundations.

3. Of course, this tendency in the United States mainly to quote US sources is not limited to this study. A faith in cultural self-sufficiency has always been typical of "great" powers, and contributes to their decline because they become insufficiently sensitive to what happens outside their own cultural circles. In the US case, as for other "great" powers, very limited knowledge of foreign languages is an important factor in this connection.

4. In his review of World Dynamics, one of the three predecessors of the LTG study, all authored by Jay Forrester (the other two being Industrial Dynamics and Urban Dynamics), Martin Shubik refers to the book as "blatant and insensitive advocacy for unsubstantiated model-building on a very large scale". (Science, vol. I74). But this is not our concern. Models have a very important function: they serve as base-lines, as anchoring points for thinking, not the least for critical thinking. As such the LTG study also has had an important function, not the least in stimulating a vast critical literature.

5. The psychoanalyst might get something out of the double sense of the word "pollute" as relating to overpopulation as well as overpollution. The puritan overtones of either connotation when "moral restraint" is introduced is obvious: keep your waste products, including your semen, for yourself!

6. We would not be surprised if in industrialized countries exactly the worst polluters would be among the first to suggest this ranking list, and then start engaging in competition for better positions on the list. In this connection it should be pointed out that amount of conversion depends not only on how good you have become today, but also on how bad you were yesterday - it is the distance that counts. We can envisage great gatherings of industrialists telling themselves and the rest of the world what bad polluters they were yesterday, and what a leap they have undertaken.

7. A good example is the Philips advertizing in Time Magazine: "Another innovation: our air pollution measuring system." It is the key to cleaner air. The text adds the words: "Water's next in line." But is this not excellent? Of course it is much better than doing the opposite. The point is only that it shows the system's capacity for makeshift measures without looking into deeper aspects of how the pollution is produced. And there is also another implication, pointed out by Andre Gorz in the roundtable with Sicco Mansholt, reported in Le Nouvel Observateur, no. 397, I972 (also in Liberation, Sept. I972): the corporations will now also start owning, producing and marketing not only depollution devices, but also clean water, even clean air, and other clean and recycled goods.

8. Of course, car and anti-car, factory and anti-factory do not cancel each other like matter and anti-matter, leaving only energy. Rather, they complement each other or cancel each other to some extent where some kinds of pollution and depletion are concerned. But this is exactly our concern here: the search for new technology does not lead to new products, only to compensation or complementary technology.

9. A typical example is the article by James Brian Quinn, "Next Big Industry: environment improvement", Harvard Business Review, Sept.-Oct. I97I, pp. I20-I3I.

10. As pointed out by Quinn: "Far from being a costly drain on the economy, the ecology movement could produce profitable new markets for business expansion", and new industries - "represent important addition to GNP". (ibid.).

11. For the publications of the Oi Committee International, write Astreavägen 5, S-I8I 3I Lidingö 1, Sweden (for Europe), and Box II26, Washington University, St. Louis, Missouri 63I30, USA (for North America). An important publication from this circle is The Careless Technology, Ecology and International Development, edited by M. Taghi Farvar and John P. Milton (Natural History Press, distributed for North America through Doubleday and Co., New York; and for other countries by Feffer & Simons Nederland, Rijnkade 70, West, Netherlands).

12. Declaration on the Third World and the Human Environment, Stockholm, June I972. The quotation is from page 1.

13. UNESCO document ED-72/CONF. Young Scientist/3. The quotation is from page 3.

14. In an interesting review, or editorial on the LTG study in Science (vol. I75, I7 March I972) Philip Abelson concludes: "A member of the audience at the recent symposium privately reminded us that, although Meadows predicts hell in 50 years, hell is already present on Earth in places such as Calcutta."

15. This is also pointed out by another critic of the LTG study, W. Beckerman, Welt am Sonntag, 2 July I972, p. 9: "A lot of middle-class privileges are threatened by economic growth". Beckerman's point is that to fight against pollution and depletion one has to continue economic growth, and one should look more at the immediate implications today, particularly for workers, than at the possible consequences tomorrow for the whole world. Our point in addition to this would be that one also has to change completely the conception of "growth".

I6. Characteristically, the following-up of this study seems to be precisely this kind of flat geographically-minded analysis, reflecting the administrative view of the world found in the division of foreign ministries into sections and "desks", in multinational corporations, and so on.

I7. This type of studies are currently encouraged by Nordic universities, and even on a division of labor basis, with a Nordic Institute for African studies in Sweden, for Asia studies in Denmark, for studies of Eastern Europe in Finland, and so on. These are precisely ways of cutting up the world whereby the structure is destroyed so that it can no longer be seen. Much more significant ways of studying the world would be in terms of depedency relations in general, factors promoting and impeding military growth, and so on - cutting into sectors rather than areas, keeping the world intact so that the true nature of economic and other cycles can be seen.

I8. It is enough here to mention the Colonna plan and the Tinbergen plan to indicate the new trends in this connection.

I9. Quoting the title of Carl Kaysen's review in Foreign Affairs. (July I972, pp. 660-668), "The Computer that printed out W°O°L°F." Kaysen makes many points, but it is difficult to see that his point about the price mechanism as a factor limiting severely the demand for non-renewable resources is not discussed in the LTG study.

20. Thus, Cuban industrial policy today is certainly aimed at point 2 in connection with the economic cycles mentioned: less uneven accumulation. It does not take ecological balance too seriously, as for instance seen in the atmosphere in the city of Havana; nor is it much concerned with the alienating effect of economic cycles running through planning agencies where all important decisions are taken. But we repeat: with a less uneven accumulation forces against pollution and depletion, and alienation, can more easily be mobilized.

2I. According to an article in the Broadsheet of the Anglo-Chinese Friendship Society this is not happening to Shanghai because one has clearly understood the situation. Cavities are filled, water is recycled and so on, and Shanghai no longer sinks. But does this have to do with attitudes to industrialization and economic growth?

22. LTG study, p. 93.

23. LTG study, p. 4I.

24. This is certainly not to deny that "capitalistics" is terribly significant since capitalism is so significant, and that the two badges of "capitalistics", the apologetic branch called liberal economics and the critical branch found in marxist theory, are fundamental to our understanding of the world. All we say is that it should not be identified with the theory of other economic systems - and it is difficult to see that marxism so far has contributed much to these alternatives.

25. LTG study, p. 42.

26. LTG study, pp. I46 f.

27. Ibid., p. I47

28. Ibid., p. I48

29. Ibid., p. I77

30. Thus, we find not very satisfactory the major conclusion in the commentary written by the Club of Rome (ibid., pp. I92 f.):

> "Short of a world effort, today's already explosive gaps and inequalities will continue to grow larger. The outcome can only be disaster, whether due to the selfishness of individual countries that continue to act purely in their own interests, or to a power struggle between the developing and developed nations. The world system is simply not ample enough or generous enough much longer to accommodate such egocentric and conflictive behavior by its inhabitants. The closer we come to the material limits to the planet, the more difficult this problem will be to tackle."
>
> So, you poor people of the world: our common boat can no longer accommodate any conflict! But what shall the "developing" (meaning "not-developing") nations do when there is such a lack of understanding at the top of the world that produces such a book! When an analysis is written where international (and intra-national) division of labor is not even mentioned once! What is wrong is not that "individual countries continue to act purely in their own interests", but that the system is made in such a way that when they do so, then they produce imbalance, exploitation and alienation. And this will lead to "power struggle" as long as the structure lasts, regardless of any Club of Rome estimate of how ample and generous the world is.

Evening group on: Policy-making for the future.

Dr. Horst Schmelzer

Direktor, WEMA– Institute, Cologne

GOAL PLANNING AS AN INSTRUMENT FOR SHAPING THE FUTURE

— Concepts and Methods —

Paper prepared for THE ROME SPECIAL CONFERENCE ON FUTURES RESEARCH

IRADES

I. Introduction

Recognition of the need for and possibility of applied futures research has increased radically during the recent years;but efforts to relate present actual decisions to the futures with the help of scientific methodologies have not increased adequately. This paper presents an attempt to overcome this gap. It discusses an empiric-logic-prescriptive study which developed a goal planning concept for value-oriented shaping of the future of environmental protection in one of the Länder of the Federal Republic of Germany.

The author hopes that presentation of an empirically founded, logically structured and prescriptively oriented goal planning study may add to the discussions at the IRADES- Conference on value-oriented shaping of the future.

This paper deals with the utilization of a modified Delphi Method combined with benefit-cost analysis and logical value taxonomies as an integrated instrument for future-oriented planning.

This paper presents the basic concept and the methodological foundations of the proposed goal planning method, as applied to the above mentioned study of environmental protection. The complete material is scheduled for publication in the spring of 1974. (Persons interested in the complete study are invited to send their names to Dr. Horst Schmelzer, 5000 Köln 51, Von-Groote-Straße 34)

II. Goal Planning as an Instrument for Shaping the Future — Basic Concept and Methodological Foundation

Goal planning is an operational method which aims to present in a transparent form complex factual relationships, combined with the relevant goals and values of the appropriate decisionmakers. Goal planning permits rational action — that is,action which is consciously and implicitly related to the goals within a benefit-cost frame — in complex areas (e.g., politics and economics), where the classic methods of systems analysis by themselves are insufficient, because of their one-dimensional approach. In its intellectual and disciplinary foundations, the goal planning approach combines policy analysis methods with applied social science tasks within a policy sciences orientation.

The results of appropriate goal planning show what measures, projects and programs must be carried out and what relative urgency they have, in order to attain the purpose of shaping the future in accordance with operationalized values in an economically efficient way.

Here, **planning** is understod as a strategy for the improvement of the guidance and learning capacity of systems. **Goal planning,** in this context, includes future-oriented and systematic consideration and formulation of desired action-impacts (goals), within a system-oriented iterative planning process.

In the course of goal planning, one must distinguish between two main phases— **Goal finding;** and utilization of goal planning for formulation of decision criteria for the **comparative evaluation** of action alternatives.

Goal planning is also an essential instrument for impact evaluation and for learning feedback. These aspects of goal planning are not discussed in this paper.

1. Goal Finding

Goal planning involves, on one hand, operational "problem definition". To arrive at operational problem definitions, a complex problem cluster—e.g., environmental protection — is structured in terms of operational sub-problems. This must be done in a form which preserves and reflects system-specific overall interrelations. In practice this is achieved with the help of taxonomic structuring (e.g., hierarchical structures) which fully explicate internal relations (e.g., means-ends relations).

On the other hand, goal finding also involves "definition of desired action-impacts", that is, formulation of goal statements. With this in mind, the integrated solution of part-problems in a fashion leading to the operational solution of the whole problem-cluster, is established as goal. This is done in a form conductive for evaluative comparison of possible problem-solving alternatives, through establishment of so-called evaluation criteria or decision criteria. The hierarchical order of goal statements in the form of a goal tree, is called "goal system." This goal system is action oriented. Therefore, its structure must be compatible with the structure of the main action-organizations (economic and administrative), so as to permit allocation of action responsibility to definite units. "Goal frame" and "goal program" are categories which refer to the extent of operationalization (less and more, respectively) of the goal system of a complex problem-area, again in a form which parallels the main levels of economic and bureaucratic institutions.

The **goal frame** includes the general strategic objectives, related to organizational functions. The subsequent **goal programs** express those goals which are related to organizational functions on the project level and to the desired characteristics and specification of concrete implementation-projects.

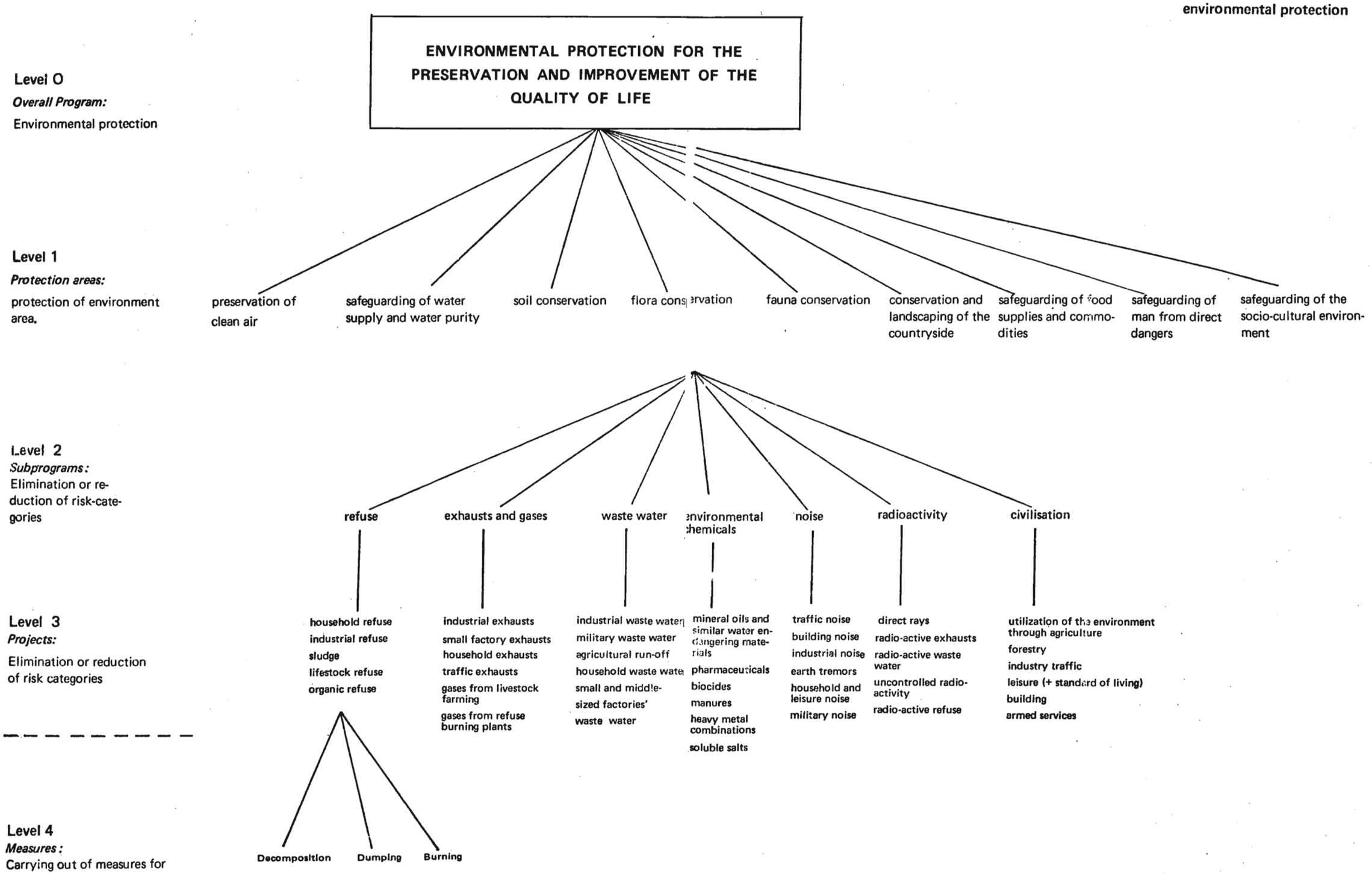
The idea of goal planning and its methods can now be presented with the help of an empiric-logic-prescriptive study dealing with environmental protection. An example of the design of a goal system in the problem area of environmental protection is shown in Figure 1.

The system is presented by a tree-structure. The single elements on each level of the tree formulate, with increasing concreteness, goals – in a way which permits relevance-testing in respect to environmental protection as the overall goal. (This tree structure, as well as the following classification of alternatives, have been developed within the above mentioned project and are the results of a defined task. Therefore, they should not be regarded as an universal model for environmental protection goal planning.).
Taking as a starting point the global goal "improvement of the quality of life through best-possible protection of the environment" ,the first level includes definition of environment-areas, which must be protected because of their direct relevance for the improvement of the human quality of life. Such "protection-areas", include substantive life-resources. These were structured as follows :

- air
- water
- soil
- flora
- fauna
- countryside and landscape
- food
- " man "
- socio-cultural environment

These protection-areas constituted the first goal level, with which the

Fig. 1 Structure of the goal tree environmental protection



to-be-protected environment is circumscribed. The protective measures which are to be adopted should alter the "quality" of these areas and contribute in this way to the improvement of the resources necessary for human life.

The quality of these protection-areas is endangered through risk-categories, which constitute the second level of the described goal system. Such risk-categories include:

- refuse
- exhaust gases
- sewage and waste water
- environmental chemicals
- noise
- radioactivity
- stress on natural systems

The last concept presents human intervention in nature through agriculture, forestry, industry, city-building, traffic etc.

A more precise specification of the risk-categories is developed on the third goal level (e.g., household and industrial refuse, sewage sludge). During the sub-differentiation of factors, care is taken that the splitting into more specific risk-categories is done in a way which fits possible policy instruments (and action units). This is done in order to permit a direct connection of counter-measures to specified risk categories -- on the fourth level of the goal system (which becomes here a goal and measures system). It is this movement from general goals, to specific goals and from there to counter-measures -- which characterizes the uses of goal planning, as practiced in the discussed

case , for better and concrete future-oriented policymaking.

The measures presented on level 4 are directed at the elimination, reduction and prevention of specific risk-categories. Individual measures are combined in order to arrive at comparable types of measures. This systematization is a requisit for the following comparative evaluation of the measures.

2. Comparative evaluation of action alternatives

The problem structure of the goal system is the basis for a system-correct classification of all the programs, projects and measures, which are formulated with the help of the goal tree. The evaluation is made within a benefit-cost frame, through systematic interviewing of political and subject experts, in the form of a modified Delphi Method.

To explain the evaluation-task which must be handled, Figure 2 sums up once more the structure-logic of the goal system, applied to environmental protection.

If one looks on the tree from the top down, then the elements of a higher level (father-elements) describe the aims to be achieved, while the elements of the next lower level (son-elements) presents the sub-problem/sub-objective/means which must be solved/ applied (respectively) in order to achieve the main goals/values. This perspective is critical for the step-level structuring of the environmental protection problem cluster – which leads to definition of programs, sub-programs, projects and measures.

For alternative-evaluation one looks at the tree from the bottom up. The solution of sub-problems and the execution of measures, projects etc. (son

STRUCTURE LOGIC OF THE GOAL TREE

Action Area	GOAL – MEANS – STATEMENT	EVALUATION CRITERIA

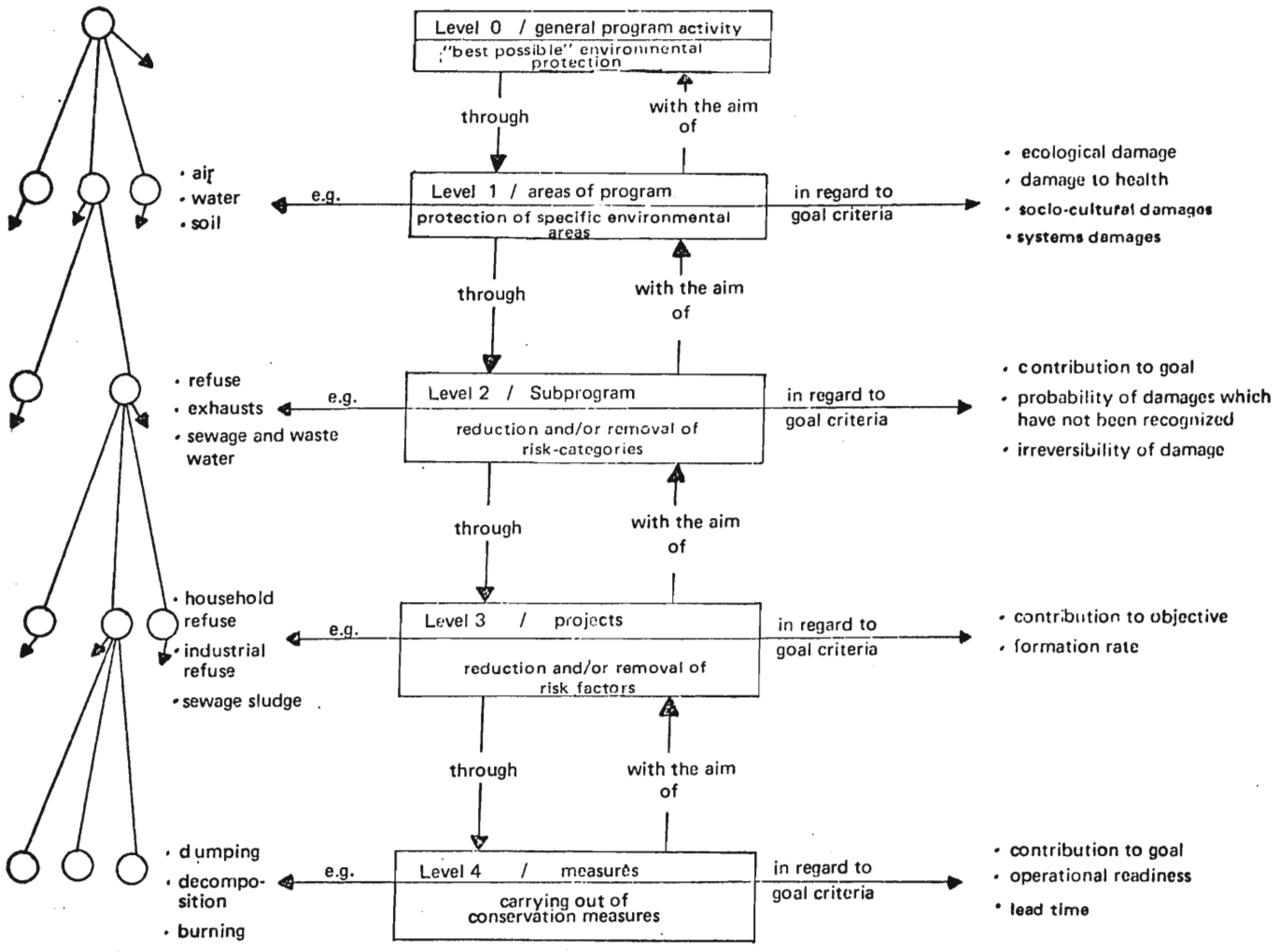


Fig. 2

elements) should be oriented towards achievement of the goals set by the higher level (father elements). Accordingly, the experts have to reply in respect to every father-son-element combination to the question, in how far the handling of a sub-issue (son-elements) is useful for achieving the higher-level goals (See Figure 4). To present the experts' statements, a point scale (e.g., 0 – 9) is used, with the help of which the elements that are compared can be graded.

In order to quantify differentially such expert judgments, it is adviseable to formulate special judgment-facets (so-called "goal criteria"), which should guide the grading of the elements of the goal tree. As shown in Figure 2, specific "criteria sentences" are formulated for each level of the goal tree. The totality of these criteria are here called "evaluation criteria".

The coherence of this evaluation logic is shown in Figure 3. The experts must fill in for each combination a so-called evaluation matrix. In each matrix the grades given by an expert to the compared elements of a goal-tree-branch (measure, project, sub-program etc.) are written in. These grades are given by the experts with due consideration of specific goal criteria which are oriented to the achievement of a higher-level goal tree elements (project, sub-project, sub-program, program-area etc.). The points received by the individual elements (measures) are then weighted according to the relative importance of the relevant criteria and summed up in the form of part-benefit-values. The latter is an expression of the relative urgency with which the various actions (measures, project, sub-program etc. should be executed in order to realize the goal/actions formulated on the next higher level. The total benefit-value of an action-set over all levels of the goal system is calculated through multiplication of the sub-benefit value of all the elements which lie on the same branch of the goal tree.

THE PRINCIPLE OF MULTISTEP EVALUATION

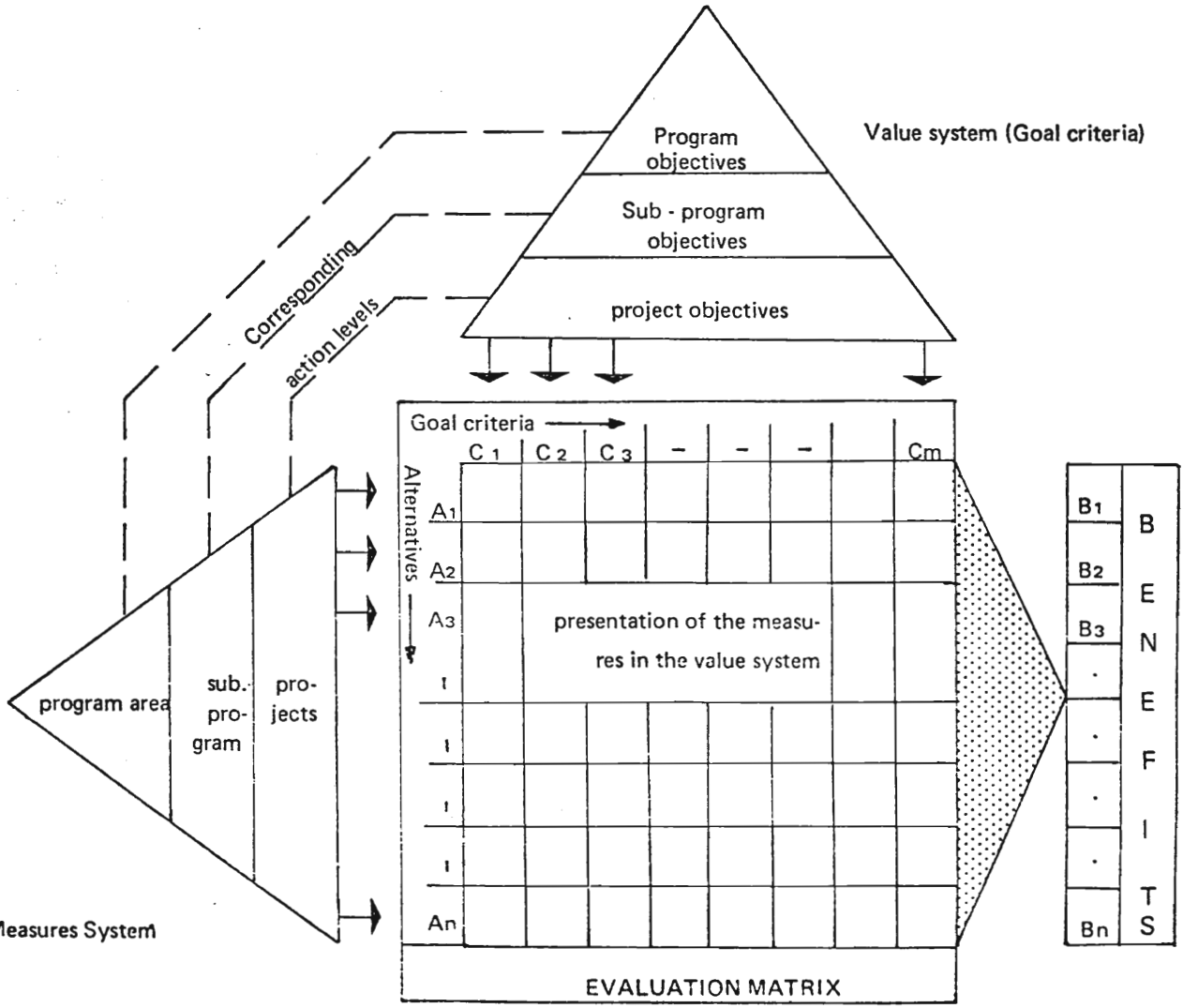
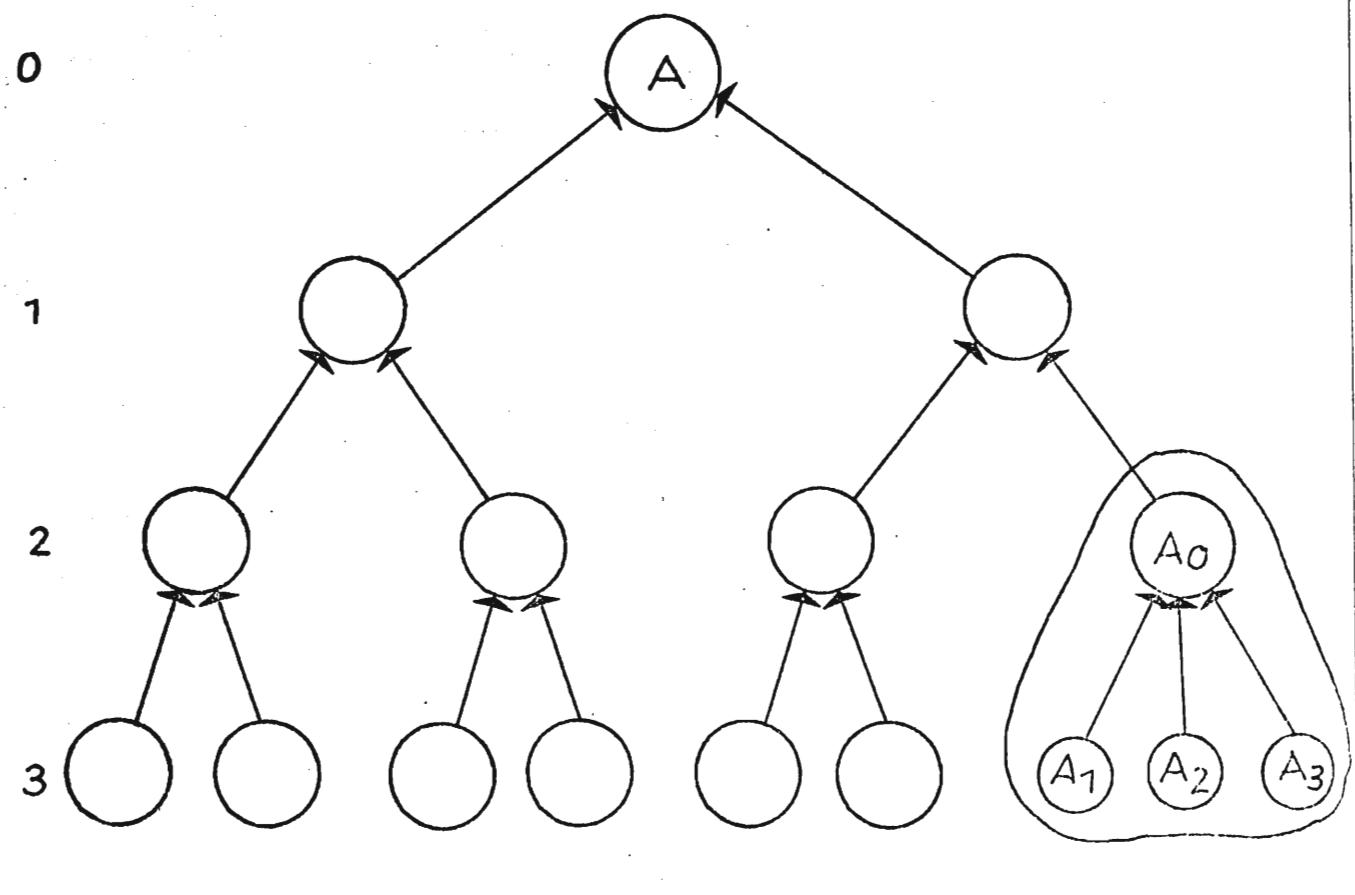


Fig. 3

PRINCIPLE OF THE SUBDIVISION OF THE EVALUATION PROBLEM THROUGH MULTILEVEL EVALUATION



For each branching in the goal tree experts' opinions must be obtained, concerning the relative contributions e.g. of A_1, A_2, A_3 to the achieving of A_0.

0 = Program level
1 = Subprogram level
2 = Project level
3 = Level of individual measures

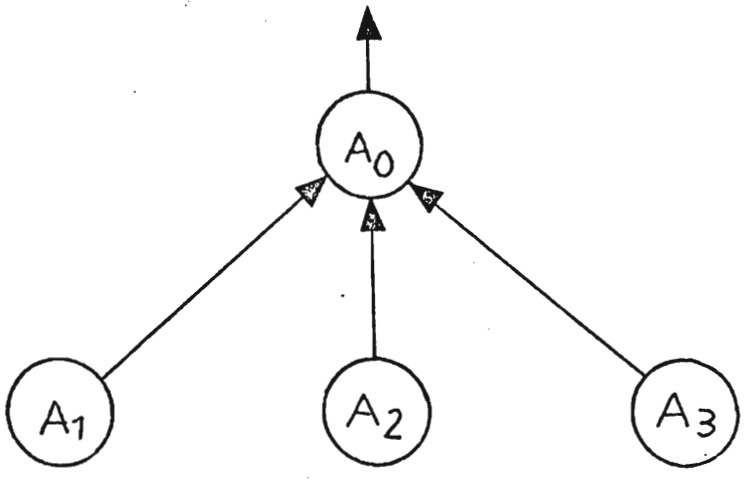
Fig. 4

A simple evaluation-illustration is provided in Figures 4 to 6. The goal evaluations (grades) given in Figure 6 are not real, but serve only as illustrations.

In this way, one received as a result of the benefit-value-analysis and through a graded processing and combination of value judgments and professional judgments a rank-order of the considered action-alternatives, which are quantitatively reflected in benefit-values. This rank-order (or priority order) can be further modified and refined. This can be done through division of the benefit-values by the costs of implementation. The benefit-cost ratio derived in this way serves, then, as a basis for decision on how to combine optimally various action-alternatives within a limited budget.

In addition, explicit benefit-values can serve in modified form and within a planning cycle, as a basis for impact-evaluation (comparison between expected and actual benefits). For this purpose, it is suggested that the benefit-cost analysis be done with the help of computers. Figure 7 provides a preliminary schematic view of a possible benefit-cost analysis program (BCAP) based on the described goal planning approach.

ILLUSTRATION OF PART – EVALUATION IN ENVIRONMENTAL PROTECTION



Evaluation Task

To be evaluated is the relative importance of the measures $A_1 - A_3$ for the attainment of the objective A_0, according to evaluation-criteria C_1 and C_2

Measures – Goal (Project)

A_0 = Prevention of water pollution caused by refuse

Measures – Actions

A_1 = Burning of refuse

A_2 = Dumping of refuse

A_3 = Decomposition of refuse

Goal – Criteria

C_1 = Contribution to objective, i.e. relative share of measures in pollution prevention

C_2 = Lead-time until measures take effect

Fig. 5

PRINCIPLE OF EVALUATION AND OF BENEFIT CALCULATION

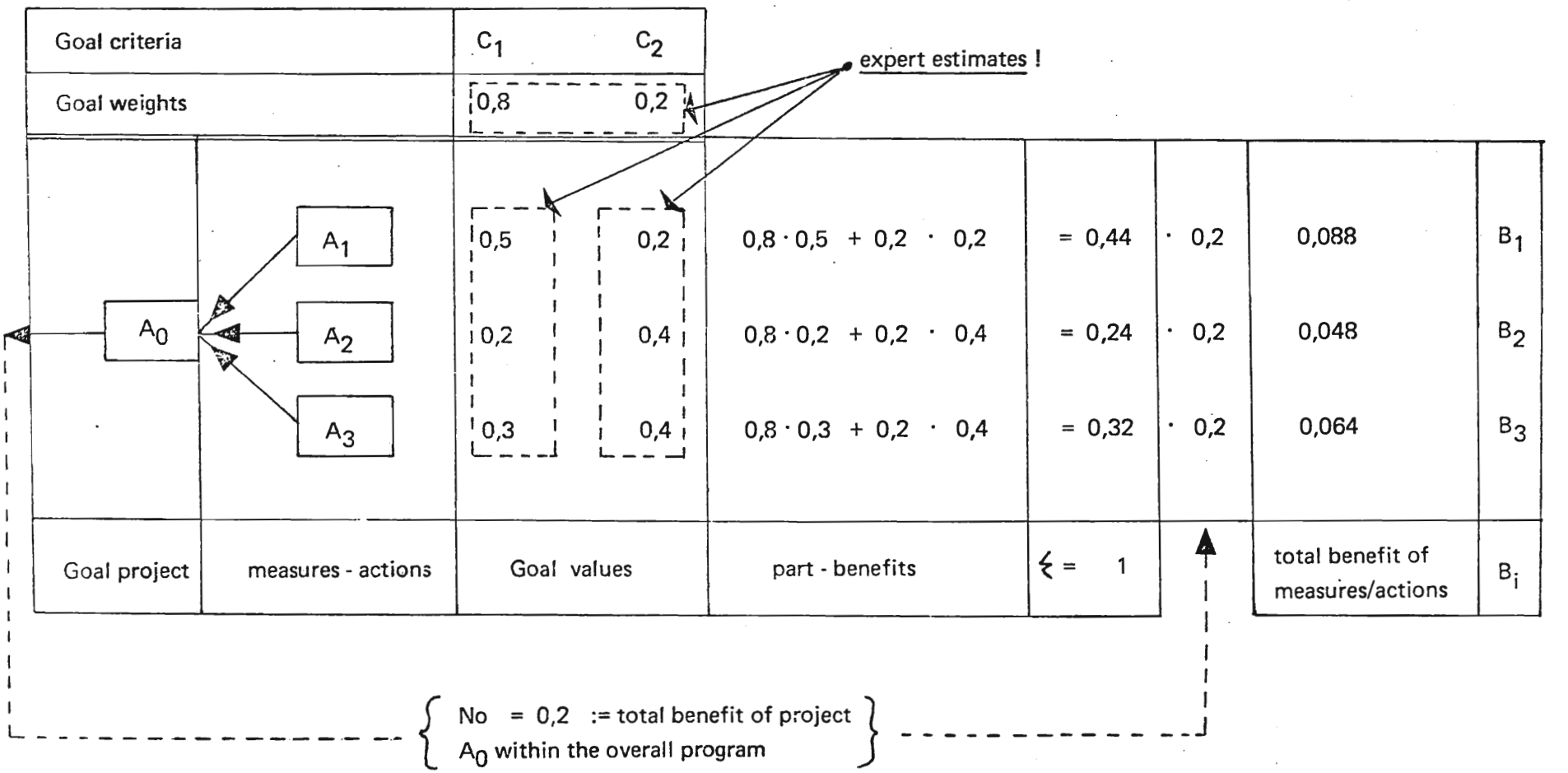


Fig. 6

GOAL PLANNING

General System Morphology

of a Benefit Cost Analysis Program (BCAP)

Features		Processing possibilities	1	2	3	4	5	6	7	8	9	
Method cluster	1	*Evaluation method*	benefit cost analysis	mixed benefit cost analysis	1 + 2							
Benefit cost analysis method	2	*Definition of goal*	storage of standard goal system	structured goal presentation	unstructured goal presentation	1 + 2	1 + 2 + 3					
	3	*Goal weighting*	direct classification	direct classification in groups	indirect classification in groups	1 + 2	1 + 2 + 3					
	4	*Character of goal output*	yes	no								
	5	*Types of scale*	nominal	ordinal	cardinal							
	6	*Methods of scaling*	direct allocation	indirect	value functions	1 + 2	1 + 2 + 3					
	7	*Uncertainty of goal value*	three point assessment	distribution assessment	1 + 2							
	8	*Competence weighting*	yes	no								
	9	*Evaluation statistics*	referring to persons	referring to groups	1 + 2							
	10	*Rules for value synthesis*	nominal	ordinal	cardinal	1 + 2 + 3						
	11	*Sensitivity analysis*	error analysis	risk analysis	goal value analysis	weight analysis	1 + 2 + 3					
Presentation of results	12	*Numerical*	synopsis	in one step	linked	in several steps	1 + 2 + 3 + 4					
	13	*Graphical*	ordinal value profile	cardinal value profile	benefit distribution	1 + 2	1 + 2 + 3					
Evaluation situation	14	*Number of alternatives*	10									
	15	*Number of goal criteria*	200									
	16	*Number of steps in goal syst.*	10									
	17	*No. of evaluations x No. of evaluation phases*	25									
Systems technique	18	*Type of ΔDP operation*	batch processing	dialogue system								
	19	*Capacity for further development*	to dialogue system	methodological advancement	1 + 2							

Fig. 7

Evening group on:

The possibilities and utility of global models.

ACTION AGAINST THE FUTURE

Progress Report on the "ADMONITOR Project"

By Milòs Zeman
Engineer

1. What is "ADMONITOR Project"?

The idea of "ADMONITOR Project" starts from the working hypothesis that the social function of futurology is to warn from dangerous but logically possible futures. After the description of these futures in the form of a consistent model, we may define a multidimensional space of safe futures.

To select these futures and to divide them into more or less desirable ones, is not the task of futurology but that of planning.

Every dangerous future is undesirable as a complex even if some part of it may be appreciated positively. Not every safe future is desirable. For instance, the population growth may be safe in one given country but it need not be planned as one of the positive aims. On the contrary, it could not be planned if the futurological model depicted it as one of the main sources of the future disequilibrium of the social global system. The planning may be based on futurology but cannot be identified with its possible basis.

This identification -- identification of safe and desirable future -- may have been an implicit impulse for the criticism of today's futurology. The futurologists are neither planners nor politicians. They are seekers for special but complex in-

formation - information about the barriers and obstacles in the safe future behaviour of a given system. The disease of Messianism would only lead to some recurrence of Utopian thinking and to disarmed, non-effective humanism.

In order to fulfill the given tasks, the global teratological /warning/ model is developed. Probably three steps are necessary for such a development:

- developments of non-global but macrostructural models of some social subsystems and elements
- a development of a global but very simplified qualitative model of the social system
- iterative synthesis of the results of the two preceding steps.

This progress report will be oriented at the problems of the historical background of "ADMONITOR Project", at the first experience with the developed simulation model and at the simplified synoptic scheme of the global model.

2. The Background

The pre-scientific impulse for the "ADMONITOR Project" was probably the Dystopian thinking. The future situations are in fact a kind of literary extremizations of the presence. This way of extremization, of the investigation of the absurd behaviour of the system, might be very fruitful for warning forecasts. Naturally, the possible rich information could not be discovered merely by literary means.

Technological forecasting forms the second part of the background. By means of methodology developed, some pieces of the global system were transformed from verbal, essaystic concepts of their future to a more serious form. The technological forecasts were usually positive-oriented because of their seeming autonomy and the lack of interaction with the relevant environment /see, for instance, the ecological crisis/.

The emergence of systems dynamics is likely to represent a very important step on the way to more general models. It may be possible to model complicated interactions; the system is expressed not like mechanism but like organism with feedback loops structure; a really creative dialogue between man and computer begins. Speaking enthusiastically, we might say that the new type of complex simulation models may be expressed as "the second generation" of scientific forecasts.

In the end, the respectful results of the Club of Rome should be mentioned. Here, the Forrester's model becomes an integral part of the methodology of warning forecasts. It has also been one of the aims of the "ADMONITOR Project" to contribute to some extent to further development of that specific methodology.

3. Six Basic Simulations

In January, 1973, the simulation model was completed for long-term forecasts of one of the elements of the global so-

cial system. The model is relatively small: it has 83 endogenous variables and 24 exogenous variables. The number of relevant feedback loops is sixty one. The number of equations is 629. The programme language was Fortran, the computer used IBM 740.

The simulation model is based on the principles of Forrester's systems dynamics. Some methodological modifications cannot be described profoundly in this progress report. The model was constructed for the real system with long and rich history. The real system /or element in the global social system/ gave rise to some problems with the data /long-term homogenous trends were necessary/. On the other hand, reality verified the model better than any artificial, stylized construction.

As the first experience with the model shows, six basic simulations will probably be necessary for the warming forecasts:

A. Verification of the model. As a method of verification, the "simulation of the past" is probably the most advantageous. The model starts its activity from some past year and reproduces the real development during a testing interval up to the presence. The interval might be sufficiently long. /about ten years/. During too short an interval, the atypical oscillations may prevail or even an absence of discrete structural changes /which are also to be reproduced/ may occur.

B. Simulation of the so-called "spontaneous alternative". Only a spontaneous adaptation of the system occurs and no innovative decisions are supposed inside or outside the system. Under these assumptions, the emergence and development of

internal discrepancies are modelled. Such phenomena, as growing instability of the system, sub-optimal allocation of funds and first of all the conservative effect of the previous system aims may be observed. Some very important but empirically non-observable trends may be revealed, too. Spontaneous alternative tests the adaptation ability of a system and/or its sensitivity to the complete absence of system's decision.

C. Simulation of the environmental innovations. The sensitivity of a system to the changes in a relevant environment is tested. For instance, the model may test the impact of a possible fulfillment of the external forecasts of a relevant environment /including official plans/ on the system. According to the following synoptic scheme, the reference frame of a system is formed by the demographical, educational etc. development processes. On the other hand, the response of the system to its environment was tested both in the external demands of the system and in its external functions /factors and effects/.

D. Simulation of an individual decision act as an expression of internal innovation /for instance, some re-distribution of funds or labour forces, some organizational change etc./ with respect to a certain year. In that case, the well-known difference between the short and long responses of the system emerges. The simulations of the changes of the system's aims and their long-term consequences are again of great importance. Simulation of an individual decision act responses to some questions of system's tactics.

E. Simulation of a decision strategy as an organization of individual decision acts. Here, the innovative programmes /not only the isolated innovations/ are implanted into the system and their long-term complex effect is tested. The linear /in the same way/ strategies are usually sooner or later unsuccesful. The dangerous hypertrophical effects are the main feature of future absurdities. The non-linear strategies /where the decision changes its aims under the feedback pressure of growing discrepancies, saturation of some needs etc./ may be more perspective. On the other hand, the false non-linear strategy may be more dangerous than the false linear one.

F. So-called "integral simulation" where the external /environmental/, internal /of decision/ and spontaneous /of adaptation/ innovations are combined. The purpose of the integral simulation is to define a set of future limits of the system as non-linear and interdependent processes. As a final result, the mentioned multidimensional space of safe futures occurs.

Naturally, the relatively simple and small model could not simulate all the necessary operations. For instance, the very interesting problem of an divergently oscillating system was omitted. The working hypothesis says here that if the divergently oscillating system crosses some critical amplitude /or a set of critical amplitudes/, its behaviour becomes irreversible and extremal - something like "system's agony". During the simulations of that type of a system's behaviour it may be possible to get deeper knowledge about the laws of standard /normal/ be-

haviour. The extremization of future development to such absurd futures on the border of reality is a serious task requiring further improvement of methodolgy.

4. The Synoptic Scheme

Fig. 1 shows a very simplified scheme of the synoptic global model. The synoptic model was constructed in order to find the structure of the relevant environment for the less general simulation models. The simulation model of the global social system as the transformation of existing synoptic model will be the next, very difficult stage of work.

In the scheme, some important relations have been ommitted and some subsystems aggregated. The only task of that scheme is to suggest the possible differentiation of various types of systems dynamics in the global model, based on their transformability.

Within the limits of a brief progress report it is impossible to explain the different terminology. Therefore, only some remarks may be given to the scheme. The differentiation starts from a relatively simple form - the population dynamics - and ends with the form which is considered as the most complicated one - political dynamics.

The transformability might be one of the central categories for the teratological models. For it is transformability and not the concrete value of some variable /for instance, the amount of national income/ that influences the possible deformation of the system structure.

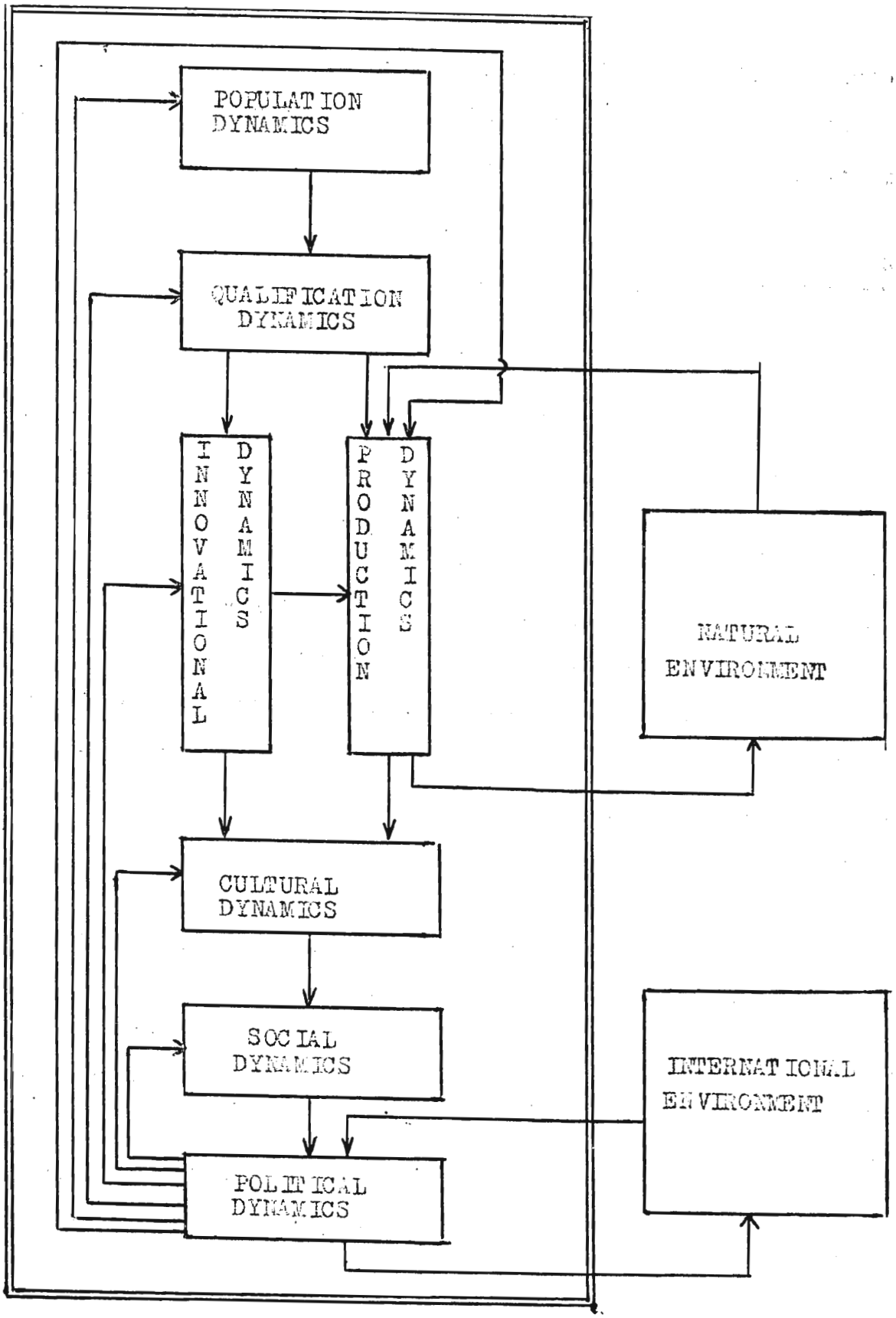


Fig. 1: The simplified scheme of the synoptic model

The population dynamics expresses in one form or other the development of the biological potential of a given society. On the other hand, the qualification dynamics expresses the intellectual potential. An example of a possible discrepancy may be given by the part of a new population that has not been transformed by the educational systems.

The innovational dynamics is a source of spontaneous /adaptative/ innovations inside the social system. It covers all creative activities described by the subsystems of science, technology and art. On the contrary, the production dynamics is expressed in the model in a relatively narrow sense: it has no creative character but the character of stereotype reproduction. Therefore, the human being may be theoretically substituted here by technological innovations.

The relation between the innovational and production dynamics is very important for the synoptic global model. It expresses the transformability of the intellectual /qualification/ potential of the society. Not every man qualified for some creative activity may form the molecule in the input flow to the innovational dynamics and vice versa. Naturally, the transformabilities of innovations /from innovational dynamics/ or natural resources /from natural environment/ by the production dynamics are also to be calculated.

The usual broad definition of culture is not used in the model. The cultural dynamics expresses the relatively consistent patterns of life including the consumption structure, the time structury /not only leisure time/ and the structure of values. The interactions of the subsystems of value dynamics,

consumption dynamics and something like "life style dynamics" are not expressed in the simplified scheme.

As an example, the transformability of production dynamics to cultural dynamics may be given. The ineffective economy may be one of the relevant factors of that transformability. Also the frequently mentioned "consumption society" may be expressed as a possibly dangerous development of the creative innovational into the cultural dynamics /the lack of new value flows/.

At the stage of the social dynamics /this term is used again in a narrow, sociological sense/ the cultural dynamics as a development of the patterns of life is transformed into the structure of social groups which are integrated by the same culture. The total lack of transformation may lead to a uniform, amorphous society without any social differences.

The political dynamics may be represented by the complicated structure of institutions /institutionalization of group interests/ and their real power. It is the decision power /or power of decisional innovations/ that ought to be investigated here. The decision acts and/or strategies are specific combinations of material funds, human abilities and information resources /including the transformed information from the international environment/ which form the input flows for the above-mentioned subsystem. Therefore, the population policy, qualification policy etc. are to be formalized and simulated in the global model including the transformability of these "investments", to speak economically.

In the simplified scheme only the interaction of natural environment with production dynamics is expressed. The trans-

formations have an ecological character here. The international environment interacts with the subsystem of political dynamics; this reduction also does not occur in the global synoptic model.

Among others, the complicated structure of feedback pressures was ommited in order to make the simplified scheme as clear as possible. For instance, the subsystem of political dynamics operates with a lot of feedback loops. Nonetheless, it would not be useful to discuss these problems in this progress report.

A synoptic global model, based on the growing experience with the simulation models of individual subsystems, will require a lot of work if it is to function properly. The author wishes to stress that all that has been mentioned here should only illustrate some disputable problems - nothing more.

/Miloš Zeman/

CONFERENCE PROCEDURE

OPEN PUBLIC MEETING

EVOLUTION AND EMPLOYMENT OF "MANAGEMENT" IN FRONT OF DEVELOPMENT

By Franco Bernstein
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For listeners who are specifically interested in knowing how to evaluate and organize the possibilities of the approach to the future, there is no use in having a long preface on the dynamic characteristics of a society in rapid evolution, not only technological but now also humanitarian.

The very attitude of man facing the future is being rapidly modified, but this does not always represent a greater faith or even only a greater capacity to evaluate the future.

Our evolution is more rapid and is even progressively accelerated, as by deciding to evaluate not only the first derivative but also the second, of motion, and perhaps the third: speed, acceleration, and variations of acceleration.

There is nothing to be astonished about if the phenomenon, when it only comes vaguely and is superficially perceived, presents an alien, preoccupying component; it is seen almost with terror (and perhaps not by chance is science fiction so often inclined to slide into the "thriller" if not directly into the "thrilling.)

In a society which asks for "communication and participation" man morbidly tends to escape from the openings (or to see this as an act of courage, almost of heroism) to find refuge in an egoism more severe and, I prefer to say, shameful.

The future creates fear. We feel ourselves involved in the race of a vehicle which we can no longer control.

For that reason, it is worthwhile to verify not only how the passengers behave themselves, but also the drivers of the vehicle, the leaders, the managers who are not only the "business directors"

but all those with them who have the responsibility of guidance and therefore of choice in all fields of activity: business, state, church, culture...

A brief technical newsletter from HAY (men and directions) dedicated its May number to "the Enlightened Manager" and began with the statement "Dogmatism, lack of originality, and initiative, refusal to calculate the risk of the turns in business policies: very often the manager reaches this scarcely enviable aim after having developed, frequently for many years, directive duties in a business.

The same article posing the problem of "what to do" continues further on:

"The main thing that it is necessary to learn is not so much the 'doing' but the availability of the "changing."

The true manager is he who is endowed with such mental elasticity that he can invent and reinvent continually the future of business. But this availability of change is not based so much on a specific preparation as on two fundamental elements: A sufficiently pliable personality capable, on the psychological plane, of rapid adaptation to new situations, culturally open to interests and information, to new aspects of the reality which surrounds us.

Time available to conserve this pliancy, that is a correct dosage between the time for learning and the time for working: between the time for living, and therefore keeping an adequate office of humanity and availability, and the time for utilizing it for the ends of directing the business.

Neither the school nor the firm prepare the manager to distribute his time in this way. Instruction is finalized, extremely specifically and sectionally. This in itself is structurally incapable of bringing out elasticity. Not even the firm helps the manager. After school the representative becomes a part of the firm at a certain historic phase of development (his own and the company's): quite often he "grows" with it. Finding it impossible to look about himself, through lack of time or other

reasons, the manager stops considering the almost universal significance of his primary business experience, and assuming it as a yardstick for judging and confronting situations and problems so often different."

The paragraph cited refers to the business experience of the "manager", but then it occurs to enlarge and deepen the investigation to verify how he feels his responsibilities in facing the world outside business, facing that world that is, which justifies the very existence of business and its search for profit.

Here it seems to me, we must apply our particular attention. We find ourselves facing the problem of finalizing and the responsibility of the end choice.

What is the <u>end</u> of the organization to which I belong, that, as manager, I must direct, lead and operate with efficiency?

The firm must be put into a challenge, that furnishes its very reason for existing, and thence a simple justification like the search for profit or "survival".

In analogy one can speak of any other "enterprise". The end of the state cannot be in the survival and expansion of that same state, and so of the Church, or a party at the limit of a populace (the people of Israel reached desperation when they identified themselves as "the people of God" and their goal as their own survival.)

There can be no engagement of management without its total availability towards evolution; and its evolution becomes realized by a complete availability and an obligation to develop that has not only grown (not growth but development) but also cannot ignore the necessity for an equilibrium in development.

We find ourselves therefore obliged to review totally the very functions of the "leader", even at not very high levels; we feel

ourselves obliged to put the future into his choice, but not his own future, nor the future of the group in which he is "leader" but that same future of the society in which the group works, from which it draws justification.

Evolution cannot limit itself to an enlargement of technical or scientific awareness; it must understand and moreover give absolute precedence to the research for the "end of research". The task of the management is not only to produce goods or services, but above all to define the choices which must indicate now, and first of all why, and for whom, they produce and distribute the products.

FUTURE AND SOCIAL SCIENCES

By Alberto Carzaniga
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1. The work of those who are occupied with the future is at present classifiable in 2 extreme categories.

   - Research on the objectives, on the 'utopia' to be adopted by orientating the action of whoever decides.
   - Research on the future evolution of the systems for study.

2. In the first case the problem has resulted through iterations involving three phases.

   - the invention of utopia
   - verification of its 'possibility' based on the ways available and the foreseeable external environment.
   - its acceptance or 'reinvention', based on a scale of values, on a 'metre' in continual evolution under the thrust of moral and social forces, which brings to be accepted or discarded as excessive the 'cost' foreseen for the realization of utopia.

3. In the second case the problem is confronted implying that the systems in examination possess an 'inertia', evolve governed by laws prevalently of a deterministic type, as if stars which furrow the sky and such like can forecast dawns, eclipses and sunsets.

4. In the first case the study of the future is born from a certainty that the future can be projected, within certain limits, as the engineer within the limits of the force of gravity and material resistance, projects a bridge.

   The certainty of the projectability of the future hides in effect two other certainties.
   The first is the same that hides itself behind the second category of studies described before: the certainty that is of having included the 'how' of the evolution of the system for study.

The second is even more pretentious than the first: it is the certainty of having included the 'why' of that same evolution.

5. These banal observations seem to me to represent the central knot of every debate on the future. In effect we must proclaim today in all humility that we are far from having included the 'how' and above all the 'why' in the evolution of the systems of our interests. As rightly one recalls the title of this conference, to study the future is to study the man, his needs, the society in which he lives and will live, and the social sciences are very far, in the present order, of being able to give an answer sufficiently univocal and precise, of the 'how and why' type to the social phenomena which are developing under our eyes.

The difficulties that the social sciences meet, and among the social sciences economy must be put in first place, in explaining and forecasting, with a modest margin of error, what is enough for the social phenomena, represent in my opinion, the ball at the foot of studies on the future, and the principal obstacle to the penetration and diffusion is which are the essential instruments for those who must take the decisions.

And, in fact, fundamentally we observe that the essential function, the first reason which justifies studies on the future, and meetings like this, is not that of designing 'utopias' but that of giving a dimension, a temporal scenario as profound and dependable as possible, to the decisions of today.

And, ones takes good notice, not indeed of the less urgent or compelling decisions, but of the urgent ones which cannot be put off. If this is true, as it is true, permit me now to symbolise the situation in which one must take decisions at a certain level, for example, the political one. This one finds in effect to be like a navigator who has in front of him a compass which provides indications with an average error of 90° (the social sciences) and has beneath his eyes

an unreliable geographical map with the port of arrival a location even more unreliable (the 'scenarios' and the 'utopia' of the futurologists).

6. One of the arguments of depth relative to the study of the science of the future must be therefore, in my opinion, the examination of the possibility of rethinking the fundamentals of social sciences and, above all, of promoting their progress in the scheme of the science of the future, solicited into that by the demand that pressurizes political forces onto "those things that count", for a progress whose efficiency and efficacy in terms of humanity be more elevated than the present one.

It is enough to think, for example, of the present inadequacy of scientific instruments which are at the disposal of the governments of more advanced countries to pilot the economic development, of the efficacy with which come the regulations of international exchanges, besides relatively new phenomena, such as the growing demand, unsatisfied by social services, presents always more gaily in public opinion.

And that silencing of problems unsolved and always more serious, on the human plane, here widely recalled, such are the problems of under-development.

7. Rethinking the social sciences in the scheme of the science of the future should be able to signify essentially three things:

A) To arrive at a cleanliness of the language of social sciences, in the semantic sense, to the goal of reaching a single body of knowledge, without suppositions, as is requested by the nature of the systems to which this knowledge refers.

B) To come through to a sort of social engineering, that is to a know how more complete and perfected than that at present, above all more unitary, in the method of applying knowledge already acquired, if the observation of Dror is true that the present absence of social sciences does not reside so much in the lack of knowledge as in the lack of knowing how to apply this knowledge.

C) Last but not leas -- is fundamentally raised that the social sciences, including economy, are sciences "sui generis", certainly different from astronomy, in so much that they are founded on value judgements, besides the observation of facts.

Rethinking the social sciences in the scheme of the science of the future assumes in my opinion its own significance, truly more important in the light of this observation, insofar as what is the science of the future, from this point of view, if not the knowing acceptance of a scale of values in all its present and future consequences?

SOCIAL FORECASTING, RATIONAL MOMENT OF MODERN SCIENCE

By Pier Giovanni Grasso
Professor
Social Psychology

It is all too likely that the word "futurology" and similar terms give the general public an impression of mystery and encourage people to expect magical or prophetic revelations on the future. I therefore believe that it is useful to state a brief confirmation of the facts -- that is, that futurology does not concern itself with para-scientific prophesies but rather with rational forecasting, based on the canons of modern science. In this discourse, I shall focus on the perspectives of the social sciences, especially social psychology, incidentally integrating this aspect of futures research within the framework of the subjects under discussion here at the Conference.

The possibility of making accurate forecasts is the fundamental objective of the scientist, both to convalidate a theory and to provide a basis for efficient technologies. Every science depends upon forecasting as an essential factor of its development. For example, the discovery that a given behavior pattern and given attitudes are constant in models of social interaction makes it possible to forecast future reactions, both individual and group.

But such forecasts advanced by social scientists are necessarily uncertain, moreso than those advanced by the natural scientists; therefore, we can only speak in terms of <u>probabilities</u>, never in terms of certainty. The main reason for this essential weakness of forecasts made in the sphere of the social sciences lies in the extraordinary multiplicity and complexity of the factors and variables involved in the situations studied.

In essence, these difficulties can be reduced to two: 1) the paucity of theories which make it possible to exploit and develop that multiplicity of variables (processes and mechanisms); and 2) the lack of adequate techniques to substantiate and simultaneously to develop the complex of variables (methodological difficulty).

scientific extension and precision are conditioned by the solid validity of a theory. Unfortunately, theoretical work in the social sciences is not very advanced. Yet, I should like to put ever more emphasis -- even though objectively less "decisive" -- on the methodological shortcomings that have made the analytical models thus far devised so structurally fragile and, by extension, the forecasts deduced from them so hazardous.

By all standards, the technique assuring the highest degree of scientific verification of the dynamics of independent and dependent variables is experimental. But we know that the number of verifiable variables, even in the most articulate experiment, is always limited; therefore, even adopting a good theory on the phenomena under study, it is never feasible to utilize all our possible theoretical knowledge when we experiment on it. Moreover, even in the most verified experiments, the dynamics of the phenomenon studied escapes us, either altogether or nearly. We perceive, for example, the effect of a change in human behavior, but we know very little, if anything, of the processes and mechanisms which have determined that change. If the unverified variables cannot be reduced to zero and if we have no precise, detailed knowledge of the processes and relations involved in the experimental situation, the experiment will lose a good part of its potential vigor, especially where discovery and forecasting are concerned.

What, then? Must we be content with the existing techniques, even endowing them with the "prophetic" contributions made by individuals gifted with extraordinary powers of perception (we psychologists, for example, asking for the help of para-psychologists)? Fortunately, the hope for a better prospects, still in the matter of a rigorous scientific research, exists and bears considerable promise. This is because of recent development in the past few years in what is called the simulation techniques with or without using the computer. The importance of these techniques is testified by the fact that a long chapter in the second of the five volumes in the new edition of Handbook of Social Psychology is devoted to them.

Simulation, interpreted as the complex of analogical models of phenomena,

reveals its power -- mainly with the formidable help of the memory and the computer's rapid calculations -- in synthesizing an indefinite number of elementary propositions deriving from the theory. Especially the dynamic processes, allowing for developments in time (and therefore predictive), would seem to lend themselves better to simulation. The first types of simulation experimented in the social field (for one, Harold Guetzkow's study on simulation of international relations) show that the simulation technique can describe situations which have never before existed but are wholly possible in the future, and develop specific hypotheses on the evolution of possible events and the dynamic of probable relations. These are applied to game situations, utilizing theories on individual and group behavior.

This is not the place to delve into more detail on the prospect of developing these new techniques (new in our cultural context) and their advantages, especially if they are combined with the strategy of the mathematical models and used with due discretion.

I wish to conclude by reassuring those who fear that taking recourse to simulation and to the computer might dehumanize man and figure in the behaviorist sciences as the latest expedient in the effort to snuff out freedom of behavior, as Skinner has described. R.P. Abelson, one of the foremost specialists in simulation techniques, declares that paradoxically, although not a few humanists tend to see the computer as a symbol of mechanized dehumanization, the computerized models of thought do, in fact, support a conception of man as intelligence directed towards certain goals and endowed with a strong dose of autonomy. The theoretical tradition from which such models of cognitive functioning derive clearly stem more from Tolman and Lewin than from Hull and Skinner.

This is equivalent to saying that even a gigantic computer is only a technical aid, not a dangerous monster or, so much the less, a new prophet. What matters is that, together with simulation, it gives us a new technique, from which we cannot expect miracles; but certainly it can make a notable contribution to the progress of futures studies.

TECHNOLOGY, COMMUNICATIONS AND NEW PROJECTS IN THE SCIENCE OF MAN

By Dott. Pietro Sergio Mauri

The clearest and most immediate consequence of the complexity of the reality is the impossibility for anyone to be able to dominate all the factors and relationships that variously develop in society and the rapport between man and nature.

Such "dominion" occurs with limitations and in the terms of political force, that is of power (also economic) and dominating groups.

It can therefore be held that today (maintaining the discourse at the level of the rapport between individual and society and omitting private and personal needs) the strongest and most deeply felt human need is the social need for democracy and justice. Of course nothing new is being dealt with, but today the degree of such awareness and participation is more diffused and much superior to that in the past, that is why "communication" between individuals has become richer in fluxes and channels of information. The emphasis assumed by studies on information and communication (we are in fact beginning to live in an epoch definable as the "cybernetic age") has, however, created a dichotomy of convictions, both erroneous, which are: 1) either exalting the information, 2) or being tragically frightened of it (the electronic brain). That is due not so much to the limits of scientific analysis as to the ideological confusion which exists in ideas and "humanistic" opinions: political and social. Overcoming this crisis is facilitated by the awareness of the lack and explicit existence of a new general theory for the science of man. Probably this can only be obtained by enriching the social political sciences in a rigorous and methodological way, with the content and organizing character actually of the technological sciences.

Reflecting on society we are bound to observe a number of different types of behaviour and needs. Diversity is the rule, it is an uncontestable reality for which it can well be affirmed that

"behaviour" or "the behaviour of man" does not exist (even if we wanted to consider only those belonging to the same category, for example a class or a work environment).

The unequivocable human reality of the existence of more types of behaviour imposes the process of communication and a knowledge of man in "operational and organizational" terms.

Communication gives significance to these types of behaviour only if they obtain "communal" solutions and organizations that permit the amelioration of survival in social life (this is the content of every political promise).

It would then be an error to base any study or research exclusively on the "micro individual" rather than to center the problems of man in a general vision, and, that is, on the totality and complexity of the interplay among behaviours, in terms of structure and organization. Shifting the discourse onto the choices of more opportune attitudes to civilian life, there is no need to remain prisoners of abstractions but to fix concrete operative links and interdependencies: 1) within unity and 2) between center and peripherary, in informative keys and mutual exchange (energetic and cultural).

The process of exchange and communication is presented therefore as an essential need to necessarily satisfy, for its collective importance.

Such a process deserves to be classified among those which are at the base of the hierarchy of needs; the primary satisfaction of these fundamental motivations imposes in its turn a certain particular type of communication (undersystem of the general process of communication).

Communication in its meaning of civilization is not used up in the speaking-listening relationship, but is above all a political rapport of power and a cultural rapport of knowledge. Here emphasis is assumed not only by the technology of communication in itself (in the sense of the theory of information) but also and above all by the semantic content of that which is said or transmitted, or rather, the ideas communicated.

The extent to which ideas and information are founts of persuasion and power is incontovertible, as are the consequences that become founts of legitimation.

In fact ideas and philosophies create the conviction, even institutional, that things should happen in a certain way and in that way continue. At this point it is useful to specify the real concept of technology in so far as its processes condition and develop the same ideas, fixing the confines and the sphere of their contents. Technology does not express something unitarian but is represented by more variables in so far as it is found in different sectors.

Technological progress expresses a growth evidentally linked to industrial dynamics (the artisan phase has now been overcome in the terms of macro-phenomenon, there no longer existing a sharp separation between science and technique).

The result however is a certain autonomous dynamism, with its own structures and lines of development, that are habitually studied for themselves, such as they are; it must not be forgotten however that the "technical sciences" assume complete significance only if put in relation to the problems of society.

This same evolution of technology is in strict relation to participation with the forms of civilization and culture, even if, apparently, it seems that technology itself places its own technical and social problems together, and then resolves them.

Pure technological needs however do not exist.

The request for technology to be a model of knowledge and interpretation is justified by the one fact that technology expresses the most positive results and findings that man has known how to produce.

The modern crisis derives largely, from the distance there is between the "exponential" growth of technological development and social-political developments.

The force of technological propulsion overcomes the degree of "democracity"

arrived at till now by various societies.

The solution however is found in the sector of political man and not simply in technological innovations, in so far as rational 'limits' and "confines" must be fixed to avoid the present prospects of the "self destruction of the world", actually of that same technology.

The social political discourse will be able to find, by answers and alternatives that do not play with the real terms but only remake guarantees of functionality and organization that the technological models already experimentally offer, what are the matrices of a new form of knowledge. Such models are translated by the term: "communication of man".

It will be necessary to substitute the variables and complexes of human behaviour for the quantitative answers of the cybernetic models such a thrilling general prospect must not permit the applicating difficulties to be forgotten, and above all the a priori necessity to individualize in man the processes and phases of communication, in terms of "operations and organizations of mental mechanisms", otherwise a homogeneous platform for meeting will be missing.

SOCIAL NEEDS AND NATIONAL SOVEREIGNTY

By Dott. Gianni Ruta

It is evident enough to everybody that the ideology of the governors has a determinating weight when a state stabilizes the order of priority of the social needs to be satisfied, the forms and measure of such satisfaction. But perhaps it is less evident that the insuperable difficulties that are met in wanting to satisfy the great social needs of humanity derive above all from its division into sovereign states.

Reason, nature and religion teach equality among all men, but in the sovereign state there exist clearly the two categories of citizens and foreigners. This distinction is instilled in the young by national education and is confirmed in every-day political practices, in which the State affirms its precise responsibilities confronting the social needs of its citizens and in the sphere of its territory, while such responsibility is generic or non-existent outside such categories.

Everyone recognizes the pre-eminence of the problems of economic development in the emerging countries, but the tentative move to employ 1.1% of GNP from industrialised countries for such a cause is shown to be completely utopian. And also states of any ideology don't have great difficulties in mobilizing large enough resources when it is a question of realizing diverse objectives of social solidarity in their sphere. Every sovereign state can not make less than a certain number of emblems, as an exercise, even in the cases of evident uselessness, and a certain number of diplomats, even when it is a question almost exclusively of financing worldliness.

Certain other symbols of the sovereign State, such as money, are

essentials to assure the satisfaction of the social needs of the citizens, but at the same time they render more troublesome the projection of great nation-state enterprises (problems of equilibrium of the balance of payments).

Finally the division of humanity into sovereign states limits the opportunity for certain states to confront problems such as the fight against pollution, in so much as if certain plants for purification were imposed on the industrial nations, the relative costs can compromise the competition of the country's industry with respect to that of the other countries that haven't held with imposing analogous measures.

PARTICIPATION OF ALL MEN IN PHYSICAL AND ECOLOGICAL SURVIVAL

By Ing. Vittorio Storelli

Before entering into this subject, I must point out with satisfaction, as one who has studied, and in my capacity as secretary to the Italian section of International Solar Energy (^) that the ecological global crisis determinating itself on the earth has become public dominion.

Irrepressible demographic increase, technological development, "indiscriminate exploitation of natural resources in the erroneous conviction of their inexhaustibility", urban concentration, transformation of many countries from an agricultural to an industrial economy, and pollution of the air impose, as it has already repeatedly been affirmed, urgent collective tasks for the survival of mankind.

Industry and nature appear at times to be irreconcilible. For example, a notable ecological transformation is probably due, among other things, to the great increase of anhydric carbon, coming from the combustion of carbons and hydrocarbons (in 2000 AD this should reach 386 parts per million of the whole mass of gases on the planet).

Technological development has asked for the investment of vast capital for the production of consumer goods; it happens now that efforts are tended towards the conservation of the more precious natural goods.

Technology has the capacity to remedy the damage in the existing environment. The whole problem is linked obviously, to that of energy and, more precisely, to the sources of energy employed.

In a world with limited natural resources and a maximum circumscribed limit for undesirable interaction with the environment of the systems

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(^) International organism which proposes to divulge science and technology relative to the applications of solar energy.

for the production of energy, the world increase in demands for this same energy constrains us to reexamine the various types of energy-giving sources, that are not renewable like combustible fossils and nuclear deposits, or even continue like "solar" or "aeolian" ones etc. And here it helps to repeat that, however, it would be indispensable to concentrate all attention on a spring of 'clean' energy, and not to provoke "ulterior increases of the thermic load on earth". Such a form of pollution is as preoccupying and heavy with threats as that of chemical pollution. Among the sources of energy, not one, to the notice of those studying the material, possesses a greater potential or represents, at least in terms of collectivity, a spring of energy more constant and inexhaustable than solar energy.

For obvious reasons, the real functioning of devices on the earth to convert solar energy into other forms of secondary energy, is limited to a favourable geographic locality, and requires extensive surfaces and systems to conserve the energy so obtained, to compensate for the periods in which the aforesaid solar energy is not available.

Under the 'economic' aspect it has already been pointed out in other places that solar energy resolves the problem of acquiring energy with an 'expense of capital' also an 'expense of management'. Other than that, the great regard for projects based on the employment of 'clean' solar energy, and gathered, for example, on the surface of our planet, is really that of not increasing the thermic load of the terrestial biosphere (systems for constant energy).

During the recent world congress of UNESCO (July 1973), having for its theme the sun at the service of man, a moment occurred in which the threats of the penury of combustible fossils and the degradation of the environment operated by man newly attracted attention to the sun, as a 'spring' of practically unlimited

non-polluting energy.

One can reaffirm: "more electrical energy, less pollution."

Without any doubt one will determine, within the next fifty years, a revolution in the field of energy. One can hold that, as a tendency towards "economic electricity" exists, there will simultaneously be also a tendency towards "economy of hydrogen". This gas, in a future hypothetical regime of energy, will be able to be drawn out, among other systems, by electrolysing water at a high temperature, storing it, transmitting at the point of distribution and thus employing it as a combustible (clean and non-polluting) to produce electricity, calories, and mechanic energy.

One must then take into account that as a by-product of the separation of water, oxygen is formed and that this gas could be used on a vast scale to purify polluted water, and to produce steel and so on.

In merit of the production of such an indispensable form of energy (electricity), one can point out that in the case of using solar energy, from the helio technical point of view, the problem of energy, at the more advanced stages of study, is that of getting into Space, or rather, whereas solar energy is continually available, there are rays that don't reach the earth and must be converted outside the earth itself, into another form of energy which is easily transportable (transmission of energy on the microwave).

The technology developed for the space programme can help to resolve the problem and find, in projects such as a "central solar electricity on the satellite" a logical application for the production of electrical energy in the advanced phases of study.

The extension of man's activity in space, initiated by launching the Sputnik in October 1957 and culminating in Apollo 17's moon landing fifteen years later, has laid down the basis for arriving at regular access to space, which will be essential if this new frontier has to have a beneficial significance to collective humanity.

In definition, I conclude affirming that science and technology should proceed, keeping in the debit account the repercussions, short and long term, which they can provoke in nature.

Solar energy, in relation to the characteristics possessed, should be considered in the general picture of energetic resources.

Scientists and technicians find themselves today in front of new imposing alternatives and possibilities.

Moreover, it is indispensable to review our way of thinking: there must be, above all, an awareness that man, in order to survive, must learn to refurnish the earth rather than exploit it.

"DRUG TAKING PATTERNS IN THE FUTURE"

By Livio Zeller Celso
Vice Direttore Gruppo Lepetit

In science it is well known that one discovery leads to another. We have certainly seen in the last thirty years that the pace of discovery is accelerating enormously. There are often what seem like discontinuities or lags in the applicable products of such discoveries but the process of accumulation of knowledge is a continuous one. During the quiet periods the raw material for the next explosion is building up.

It is, therefore, possible to make predictions that some time from now, let's say by the year 2000, very important discoveries will have been made which will change our lives, our life styles and our attitudes toward drug-taking practice.

It has been said that the period from 1940 to 1955 represented the "golden age" of drug discovery and that we would never see such

a period again. It is true that in recent years the well of drug discovery appears to be drying up and for the moment we seem to be in a lag period. I believe however that by the year 2000 we will be able to look back on the so-called "golden age" as a "bronze age".

It was, after all, based upon accidental discoveries: the sulfa drugs, the antibiotics, the diuretics and hypertensives, the antihistaminics and tranquilizers -- all, more or less, derivative of previous accidents; just as the impurities accidentally found in iron yielded bronze.

These were the years, too, when for the first time in the history of medicine, doctors had an effective armamentarium of drugs with which to prevent or treat a wide variety of ailments and symptoms. As a result we became a drug-taking culture. Doctors gave drugs to prevent or abort infections and they also gave drugs to relieve symptoms and make sick people feel better. Because of the existence of life-saving drugs the notion became prevalent that there must be something the

doctor can give the patient for every unpleasant pain or sensation. It was with this notion that "drug abuse" was born. By "drugabuse" I am referring to the overwhelming tendency of the average individual to overuse the new drugs and of the physicians to overprescribe useful drugs for non-useful purposes.

It has been shown that minor tranquilizers are the most often prescribed drugs and most prescriptions are written on the basis of non-psychiatric diagnoses. Rather, it is now evident that the tranquilizers are being used mainly to relieve or prevent emotional distress that might accompany or aggravate a physical disorder. It has also been shown that while tranquilizers are extremely useful in the custodial management of psychiatrically ill patients, the savings cost of hospital and nursing care is penalized for by the fact that at least 15% of the constantly tranquilized mental patients suffer irreparable neurological damage.

A second factor in the growth of drug-taking lies in the free

distribution of medicines as carried out in most of the countries either through a national system or through health insurance systems.

The gratuity of medicines is unfortunately a stimulation to the overconsumption same as exhorbitant cost of medicines is an even more unfortunate deterrent to application of therapy.

A third and most unfortunate fall-out of the "bronze" or "golden" age of drug discoveries -- drugs that really work -- has been a renewed interest in the taking of useless or placebo drugs. When cortisone was announced as a "cure" for arthritis, hundreds of older and discredited drugs saw a rebirth in the market place.

The inability of the average physician to understand the action of many of the drugs allowed for great confusion in the public mind and also led to a great deal of iatrogenic disease. Whether from cortisone and its derivatives or from renewed public interest in the older remedies, overmedication produced almost as much damage as the newer could repair. The new age of drug left us between the Scylla of remedy and the

Charybdis of overmedication.

Why will this be different in the year 2000? By then we will be able to look back and say that in the 1970's we already possessed the knowledge and the instrumentation to make a "golden age" of drug discovery possible. Instead of having to depend upon accident for drug discovery a critical mass of knowledge had become available and the launching pads were already in place.

The critical mass occurred when we entered the era of the chemical gene, the greatest conceptual advance in man's thinking since evolution.

The concept of the chemical gene, the key to the basic processes of life unified the varying disciplines needed to attack the problems of healthy and productive living. Both chemistry and biology were ready to take a giant step forward.

We had also developed exquisite instrumentation to permit dynamic study of cell biochemistry using measurements that had never before been possible.

It is now possible to predict that advances in cell biology (see Slide 1) will within 90% of probability enable us to prevent or cure many of the diseases which we now consider the plagues of the 70's (see Slide 2).

The prevention or cure of hypertension, edema, autoimmune diseases, obesity, hepatitis, dental caries and cell-specific therapy of cancers will all be realities. The development of clinically useful mechanical hearts and cardiovascular surgery, including replacement of veins and arteries, will be routine procedures; but most important of all, population control and the diseases due to overcrowding, pollution and poverty will represent our greatest advances.

How will this change our pill-taking habits? First we will have true and proven methods of prevention of our present plagues. As a result of growing knowledge of the true dynamics of body function, early diagnosis will be a reality and prophylaxis a practicality. Prophylaxis will require completely new psychological and sociological approaches.

This will involve an actual changing of life styles. This is not as unthinkable as it seems today. When prophylaxis is shown to be effective people will be willing to change their diets, give up habituation of alcohol, tobacco and life-endangering drugs. On the other hand, it will be necessary and possible to habituate people to the taking of new drugs which would be proven to be prophylactic even though there would be no immediate response felt by the patient when it was prescribed for him to take prophylactic drugs daily over his entire lifetime.

Secondly, with the recognition that really effective procedures will be available for the prevention and treatment of life-menacing diseases, and provided a sufficient education level is reached, the demand for placebo drugs, symptom relievers, or short-lived euphoriants or sedatives will disappear.

On the questions of mental disease, neurological disorders and narcotics addiction, newer advances in knowledge of brain chemistry, mental hygiene and sociologic reform will make our present approaches to these disorders seem primitive. The greatest emphasis will again be on early diagnosis and prevention. With greater knowledge neurosis, schizophrenia and genetic abnormalities will be able to be remedied much more effectively through prophylactic social adjustments than by

use of the presently available short-acting tranquilizer, sedative or euphoriant.

The use of addictive drugs has always been a concomitant of human misery based upon poverty and hopelessness and exploited by the criminal element who seek to profit thereby. We should by the year 2000 have effective chemicals for treatment of such victims, but again our greatest hope will lie in prevention.

But at this point a question arises.

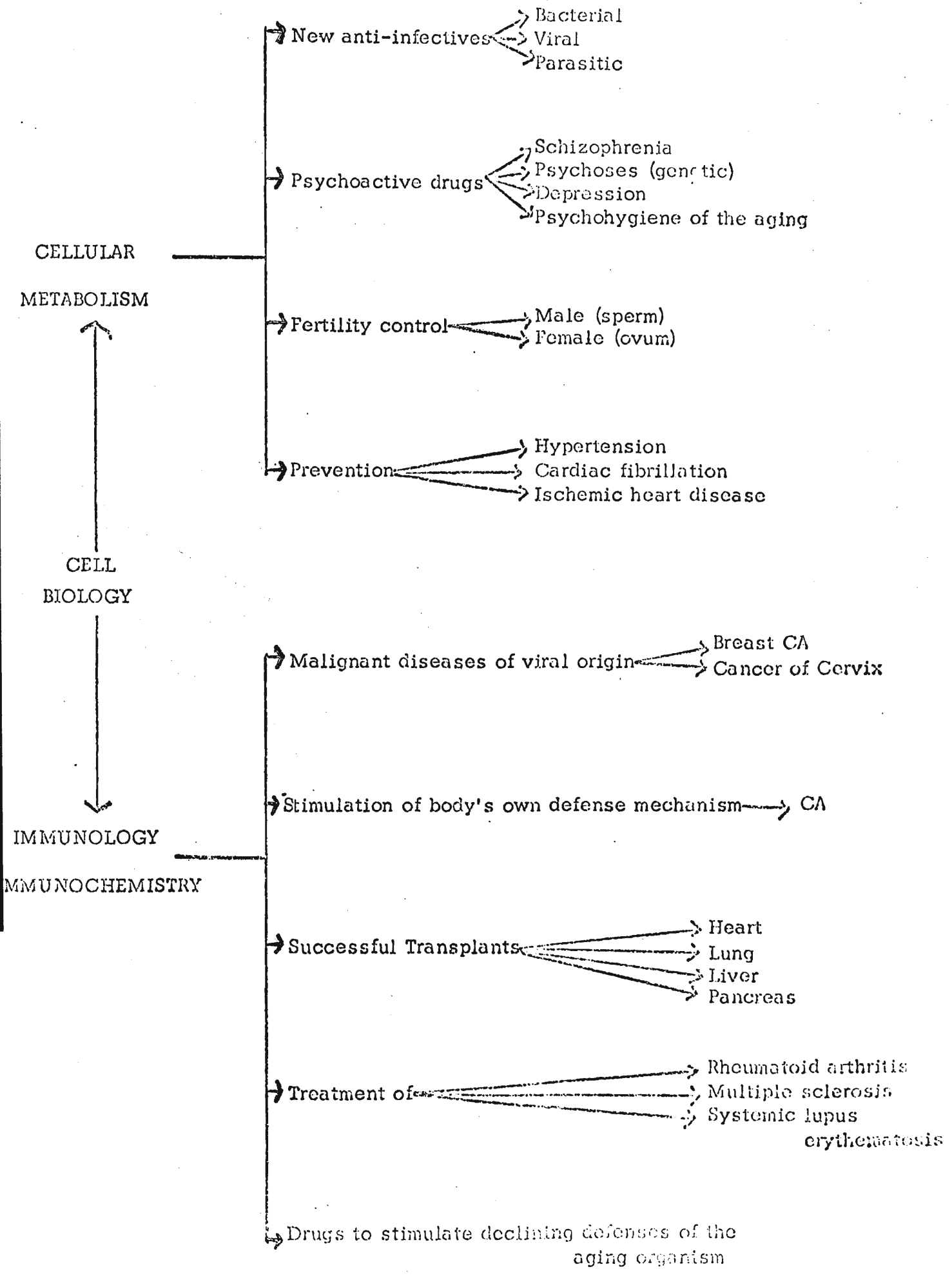
It has to do with the disrupture of the process of "darwinian adaptation" which is the ability of man of establishing an harmony between the species and the environment in which the species evolve. The man can certainly develop a tolerance to the changed environmental conditions, but the penalty will be a lower quality of life.

Will science's capacity to provide man with all the means necessary for the prevention and treatment of disease progress at the same rate as man's ability to adapt to the altered conditions of life caused by the over-increasing industrial revolution, by urban overcrowding and by exposure to substances and situations never previously known in the course of his biological evolution? The unevenness of pace between the evolution of science and technology and the biological

evolution of man is evident. If sociological measures do not intervene to protect man, it can become pathological for the human race. In other words pharmacology and medicine, cannot provide a better standard of life if other measures to protect man's environment from his birth to old age are not taken in parallel. Measures which include urbanism, schools, hygiene in work, health education, pollution control etc.

These different aspects of one problem are the object of the preoccupation and study and reform activity of the European Health Club (Club Européen de la Santé) a section of which is soon to be created in Italy, alongside the French and Belgian Clubs and those sections to be created soon in other Common Market countries.

SLIDE I.


New anti-infectives
Bacterial
Viral
Parasitic
Psychoactive drugs
Schizophrenia
Psychoses (genetic)
Depression
Psychohygiene of the aging
CELLULAR
METABOLISM
Fertility control
Male (sperm)
Female (ovum)
Prevention
Hypertension
Cardiac fibrillation
Ischemic heart disease
CELL
BIOLOGY
Malignant diseases of viral origin
Breast CA
Cancer of Cervix
Stimulation of body's own defense mechanism
CA
IMMUNOLOGY
MMUNOCHEMISTRY
Successful Transplants
Heart
Lung
Liver
Pancreas
Treatment of
Rheumatoid arthritis
Multiple sclerosis
Systemic lupus
erythematosis
Drugs to stimulate declining defenses of the
aging organism

2.

NEW THERAPY AVAILABLE BY 19[illegible]

(90% Probability)

DEVELOPMENT OF DRUGS TO CONTROL FERTILITY IN MALES

DEVELOPMENT OF DRUGS FOR THE PREVENTION OR CURE OF HYPERTENSION

DEVELOPMENT OF DRUGS FOR THE PREVENTION OR CURE OF EDEMA

DEVELOPMENT OF ACCEPTABLE, NON-NUTRITIVE FOODS FOR OBESITY CONTROL

DEVELOPMENT OF NEW MODES OF FERTILITY SUPRESSION OR ENCHANCEMENT IN FEMALES

DEVELOPMENT OF DRUGS FOR THE PREVENTION OR CURE OF SKELETAL MUSCLE SPASM

DEVELOPMENT OF A CLINICALLY USEFUL MECHANICAL HEART

DEVELOPMENT OF DRUGS FOR THE PREVENTION OR CURE OF AUTOIMMUNE DISEASES

NEW, MORE EFFECTIVE BROAD SPECTRUM ANTI-FUNGAL AGENTS

DEVELOPMENT OF DRUGS FOR THE PREVENTION OR CURE OF DRUG DEPENDENCE

GREATER USE OF [illegible]TOUS ROUTES OF ADMINISTRATION FOR DRUGS WITH MUCH LESS EMPHASIS ON THE ORAL ROUTE OF ADMINISTRATION

DEVELOPMENT OF DRUGS FOR THE PREVENTION OR CURE OF THROMBOSIS

DEVELOPMENT OF DRUGS FOR THE PREVENTION OR CURE OF OBESITY

EFFECTIVE AGENTS FOR LOCALIZED, CELL-SPECIFIC THERAPY OF CANCERS

DEVELOPMENT OF DRUGS CURATIVE IN ANXIETY AND TENSION STATES

DEVELOPMENT OF DRUGS CURATIVE IN DEPRESSION

DEVELOPMENT OF A HEPATITIS VACCINE

DEVELOPMENT OF DRUGS FOR THE PREVENTION OR CURE OF ASTHMA

DEVELOPMENT OF DRUGS FOR THE PREVENTION OR CURE OF DENTAL CARIES

PAPERS RELATED TO THE CONFERENCE IN GENERAL

SOME VARIED NOTES FOR THE PREPARATION OF A PAPER ON:

HUMAN NEEDS AND A NEW SOCIETY FROM THE POINT OF VIEW OF A PHYSICIAN/ PSYCHIATRIST (IN FOUR, PERHAPS DISJOINTED, CONFUSED SEGMENTS)

By Leonard J. Duhl, M.D.
Psychiatrist; planner; professor of Urban Social Policy and Public Health; Professor of Psychiatry

I.

The future may be more determined by the behavior of people, than by a technological capacity or the projections which currently exist within our human institutions and governments. To discuss behavior is to invade the realms of philosophy, religion, values, psychology and all the social and behavioral sciences as well as to make intuitive guesses as to what alternatives will be open for the future. One can and must make informed analysis of where we're at, and what is happening to people.

Briefly put and due to a variety of causes (including communications, transportation, new technologies, the speeding-up of the sense of time within human actions, as well as the world's relative affluence as compared to the past), all increasingly combine to disconnect humans from their ability to command the events which affect their lives. There is an ever-present sense within international and local levels of communities that our ability to respond to the needs of people and the concurrent failure of our institutions has led to a major crisis. This crisis-state may not be resolvable except by evolving new techniques of linkage connection, communication and governments.

Our dilemma is how to create a means - a precess - by which divergent pluralistic multi-identified people in groups maintain themselves as part of larger wholes. These larger wholes may be organizations, governments, small to large, value groups and other identifications that people make. To achieve the end of belonging to a group as well as having a unique identity requires an ability to accept and respect both other's views, values and way of life along with a joint willingness to maintain

belongingness in the larger society.

How to put this in terms we all know:

- the confused parent with a sick child who doesn't know where to go, or who finds fragmented responsibility in the healer, for example, the healer who sees a case of "suppurative otitis media" as purely infection of the middle ear rather than as an anxious mother, a disraught father, a crying baby with blood on the pillow, that requires the intervention which is much more complex than dealing with the infection only;

- the tight nuclear family whose child opts for alternative allegiance than those which bind the family, the child with new values, new attitudes, new concerns, a new standard of living and an unwillingness to accept what the family accepts in its own mythology, its own stories and its own values;

- the extended family which is mutually supportive and becomes broken up and its functions replaced by inadequate social institutions, the normal extended family or tribe performing a multitude of complex functions which cannot be supplied by institutions that deal with pieces and parts of responsibility;

- the confusion inside the heads of people being exposed to multiple inputs and not understanding or knowing the process of how to synthesize and integrate and piece together. This is a process - creating one's personal identity, of knowing who one is in a world of conflicting values and pressures.

These can but serve as examples which would suggest the priorities, the need for people, services, institutions to perform the linkage and synthetic function. These persons both have to perform the function and to educate each other to think in a different manner. A parallel emphasis is on the specialized skills oriented towards a single direction yet being able to be integrated into a whole.

The process of government, the creation of patterns of response, the ability of people to communicate and find new ways of understanding each other clearly, relates to the sort of world we want to live in, both world-wide and local. Can we accept diversity and live it? Or must we search for the only other alternative model of unanimity of single value and hierarchical control?

II.

In the following notes, I propose to explore some of the previously mentioned issues, to point out how the function of synthesis and pulling together of the whole by reorienting models, dealing with values and governance must be the most critical issue facing us at the present time.

I have chosen to continue my comments not from the broad concerns with the future, nor with the overall issues of how to humanize it, or even with humanizing our current perceptions about how to deal with the future. Rather, I've chosen to enter these concerns with very specific attention to a particular area - the area of health and illness, because in it are the kinds of concern that are prototypical of - and serve as a metaphor for - the larger issues.

If one concerns oneself with normal development of human beings as they face crises, stress, strain, and ultimately with the problems associated with breakdown, one is forced into looking at problems of illness and breakdown. Illness is the most obvious concern of the health professions, yet the broader issues of health, or human development which they tend to ignore is equally important.

What happens so frequently in our concerns in the field of medicine and health, is that we become rightly preoccupied with the notions of dealing with the presenting complaint or the presenting symptom. Therefore, when the cry of pain comes from the patient, whether it be headache or a more serious issue, we try our best to deal directly with the symptom. We attempt to reduce the pain.

Obviously, this is tremendously important, for no one I know (except the rare person who believes pain and suffering in itself is an end) wishes to be in pain. Indeed, much human energy is utilized by people in avoiding pain in their own body, and in relationship with the world. Though I do not propose to get into the philosophical question of the meaning of pain, the importance of it in one's own development is that pain is crisis and crisis serves as a stimulus to development. It is tremendously relevant to recognize that it is the propensity of most people to deal with issues by dealing with the "pain". What then tends

to happen frequently, is that the pain relief puts aside the critical issues of dealing with the underlying cause or complaint.

Here we come to an extremely difficult question: what is the cause? Or to put it more broadly, what is the cause, of the cause, of the cause of the difficulty. This is an extremely hard, complex issue, for by asking it we are faced with the issue of what conceptual models to be used. The use of a linear model, suggests that a particular "thing" (e.g. bacteria) causes a particular illness (e.g. pneumonia). If one believes in this model, one considers the cause to be the bacteria.

One can, however, use a stress model, which suggests that the human organism, faced by stress, breaks down at its weakest point. This accepts the idea that bacteria are always present; a given. At the point of breakdown, the bacteria then have an opportunity to multiply in areas of weakness, and thus lead to what is a "diseased state." One might go so far as to say that "weakness" or "illness" is there before the disease actually occurs. If this is true, one's focus is with the coping mechanism of the body to deal with any kind of stress and crisis. We start then with the human organism always having a drive toward its own health, growth, and optional development; often sabotaged by itself and others.

Here indeed we have parallels in our concern with social and community-wide issues. Do we have the coping and adapting skills for growth? Indeed, much of our social as well as health concerns are to help the existing system to cope. Using the body as an analog for the society suggests that systems are already available to self heal, to cope with "foreign bodies," and with the disorganization and stress.

Though the ability to deal with stress and crisis is there, the mechanisms used often perpetuate past perceptions, old patterns of reaction and non-healthy responses. Do we need new systems? If so, one must go further back in our search for cause to find whether the mechanisms the body has developed over time are indeed innately determined mechanisms for healthy growth or whether they are learned mechanisms; which are useful at the time they were originally learned, but that are now less useful. If it is true that older learned mechanisms are no longer useful, we must focus on aiding an organism to learn new techniques, create new internal "institutions" and recorder values to cope and adapt to emerging situations as they arise; how to free the human organism to deal with its unlimited potential.

I do not dare to suggest that any organism, human or otherwise, can be changed infinitely to an idealized state. Similarly, I believe very strongly that the process of change is an extremely difficult one. Tremendous resistances are created in order to maintain the way the body knows best °, or the "status quo;" even though that mechanism used may by its inadequacy cause harm to the organism. How often does a patient tell me that they would prefer to remain as a neurotic and not give up their well-known "friendly" symptomtotology, rather than go through the agonies of trying to find new methods of perception, modelling and coping. Potential change often puts us in difficult situations.

If change is related to the search for the original cause, what then are the basic causes? We find ourselves concerned with the givens of the human organism (e.g. the genetic, biological, heredity), the various kinds of psychological, social, and other nurturence; as well as learning what the organism requires in order to be at its highest form of coping, dealing, learning in society.

Thus we are faced with continually more difficult questions; whether, in finding and doing something about the ultimate cause of the individual's difficulty, (an individualized resolution of the unknown questions) is in conflict with the pressures of group and social conformity. Does the individual always have to give up its uniqueness?

The battle between individualized and population (or socially) oriented solutions with individual biological, psychological, and social behavior has been a continuing one. It occurs in the learned behavior of individuals as they grow through normal development. It occurs as people either consciously or unconsciously join groups, institutions, or society. More often social choice gains preeminance over individual choice. People need to belong - to believe - to be a part of something; a religion (!) °°

° Basically, I believe the body knows best - if it is free of hangups and counter pressures which maintain the status quo. We here are talking of planning for freedom; a structure and process that encourages change. Truly freeing the body permits it in its drive toward health. But we are not free.

°° When we don't have something to believe in - an overriding belief system - humans choose, as John Seeley points out, choose something else to believe in (be addicted to) e.g. drugs, etc. ... He says we need a religion (an addiction).

The answer may not be an either/or question; for its resolution requires both. The question becomes how to maximize individual needs in a society where many communal and "belonging" solutions; (in psychological, biological, social, religious, political, and other areas).

Implied in the concerns outlined are many questions requiring resolution. How can one find people who can assist in learning how to cope with the problems as defined by the patient? In the field of health and medicine, the physician has been given the legitimization by the community of both formal institutions of certification and the right to intervene with human beings. The physician, having that right, can therefore delegate to others part of the job. What has occurred is that this delegation has increasingly been given to people lower on the hierarchy; a variety of associated and sub-professional persons. How much responsibility must remain in the patient himself (to command events that affect their lives)? °

Since human concern (both patient and professional) is mainly with pain and the immediate causes of pain, the health and social solutions have primarily been symptom oriented. This has led to institutions and professions who are primarily preoccupied with this issue. This may leave by abdication the broader causation concerns to people outside the profession.

At the same time, the official "health" professional has deeply resented the intervention of others into an area they considered their own. Thus some more paradoxical concerns; on the one hand officialdom resents "outsiders" and on the other hand they themselves don't do very much about many issues. One example is the lack of concern with social population or public health issues by medicine which has always given these questions an extremely low priority. Usually, the only concern of the symptom-oriented specialist with the larger issue is a projection and extender of their perception of the person concerned with the individual symptom or pain into the larger sphere. Thus concern with planning, politics, and the like, becomes for the clinician a concern with allocating more social derived funds and resources to symptom-related

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° Self determination versus professional knowledge and skills? "Truth" vs. "feelings?" etc.

issues on the individual level. On the other hand, when there are population-wide or public health, developmental, nutritional, and general well-being issues, they become less and less a concern of the medical health professions. There is a void of others - non-medical professionals fill the gap. By extension less and less a concern with the big issues occur on the levels of governance, politics or planning.

Various populations, e.g. minorities, the poor, the outsiders and devients, do not fully get served. When the organizations and institutions are fixed and formalized, certified and in control of their profession, they become more and more concerned with the issues that they are preoccupied with. The profession, with the subtle help of the client, becomes fragmented, pre-Copernican, pre-occupied with themselves as the center of the universe.

Thus, as we get more and more complex, it becomes more and more difficult to deal with these complex issues; or to focus on the issues of the cause of the cause of the cause. One then finds increased specialization and preoccupation with fragments.

As a result of this apparent block towards "health resolution," two phenomenon seem to occur. One one hand, new people tend to enter the field with an entirely different value system responding to unmet demands. "Healers" find a resurgence, new therapists or caretakers take over functions heretofore the prime concern of the health professions. Specialists of religion make lateral shifts to new fields (for them). New people from borderline areas of interest enter the turf - and with them new models, new perceptions, new understanding of causes. All of which "disrupts" and distrusts the existing system. In no case do I believe that this to be bad. The influx of people from a variety of approved and unapproved areas are adding the kinds of dimensions that have been lost with increased professionalization. This leads to a need for experiments where groups have the freedom to try new solutions with limited interference by the system.

III.

For many years I have been concerned with putting together into a whole as understanding of man's behavior. My work took me from psychology and medicine to social science, politics and institutional behavior. With the ultimate failure by myself and others to achieve any basic changes in man's (woman's) humanism - his relationship to man/woman - I found myself returning to concern with much smaller-scale issues - and to looking at behavior itself.

My psychological search though not intensive has been extensive - I found myself concerned with further understandings of the self with change - and with basic needs. As Maslow clearly stated, it is not until man deals with his basic needs (bodily ones) can he go on to higher ones of the soul and moral values. It is these that are required before real change can occur. Though this has been stated by St. Paul and Marx, it is only now that we have achieved the technical, those not the social, skills to do so.

Psychologically the steps are hard. The ego/superego conscious self must when satisfied or (in the process) it will put down the unconscious drive toward health. When this is done it can come to terms with the unconscious, primitive and albeit historical self, and its desire for new development and health. This historical self is both personal,cultural, and universal as evidenced by the communal natures of the unconscious. The conscious self can not (except in those who have the gift), achieve the higher self - the truth - or moral values which can both heal and bring humanity to man. Thus I have increasingly found myself wondering how through deeper levels of the unconscious - and via higher consciousness - to achieve this moral state.

I have come across two opposing views - which to my naive mind are not currently reconcilable. In one there is separation of body and soul (pagan and Christian) which by denying the body the soul can find a higher form. This process is individualistic - and as one performs the chores of asceticism and denial (even meditation when to an exclusive concern) one can reach this higher place. However, in the other philosophy where body and soul can not be separated - it is clear that one does not find a God that exists, but through social action (love thy neighbor

as thyself) one can find and (?) create God. Thus it is through communal action that one finds ways of meeting man's needs. These two worlds differ thus on the notion of body/soul and individualism/communal solutions. The latter is a social view - and can be found in the early teachings of the Hebrews as well as in others - where one finds the higher values socially - in social action for the communal good, through justice. One's social behavior aids in finding God.

The Anglo-Saxon Christian view has become very individualistic. Faith (Luther) is related to individual and material achievement - and by denying the materialism, except with symptom relief, searches for ascension of the soul. Though faith is there, Marx and others through their teachings (though not necessarily action) has taught that only through social action (the reunification of body and soul) can the bodily needs be met and God found. Social action rejects fate - it suggests that man has the ability (and now the technologies) to achieve human ends; though perhaps not the will as yet. New forms of communal action thus are required for return to in order to achieve a higher state of being.

In the two views - in one, one finds oneself and then can proceed to social action; in the other, one finds oneself through social action, family, groups and new institutions. What is so different is that social action - to meet human needs is limited by institutions and social forms that now through "democratic processes" glorify individualistic achievement. For a long time it has meant the church. What excites me now is that among other groups some parts of the church through Vatican II and many newly emerging but old philosophies have reunited body and soul - and the call for social action.

Thus new non-church "churches" and some of the existing churches (e.g. Jesuits) as well, as those who set an example by their lives, are (maybe) leading the revolution of concept required to move on beyond the materialistic/individualistic situation we now have.

In my case - the historical contribution of Judaic background which has always been revolutionary in character and believed in the oneness of body/soul and communal behavior becomes increasingly an avenue to the new understanding. Thus post Vatican II-Catholic-Jewish-Neo-Marxist understanding paves the way in those societies not bound to individualistic

solutions for new answers. Only through society the community at large (and not the church or through individualism) will God be found. It is therefore no accident that the new solutions are being searched for communally. The psychological, the religious and socio-political are interrelated. What is essential is to reduce the fear (satisfy the needs) so that this potential can be utilized.

Nothing in what I say should be considered a reductionist argument for one position; for in truth my position is neither/nor - that individualism and communal solutions are interwined and related. They can not be separated. What may well be needed is the answer to the question what values can only be left to individuals; and what must be communally determined. What overall values (? religion) permit individualism to be respected? In Maslow's hierarchy of values - what are the critical ones for the individual? But what (?) new structures permit and encourage this process.

IV.

I take a few of these ideas a few steps further; and that is to that stage where creativity, innovation and change can take place. Again both the individual and the structure must permit, encourage or lay the foundation for such creation. By creation, I mean the possibility of coming up with different constructs for man and/or society. To create a society with more humanism and less materialism may require a major psychological/ philosophical jump.

What permits this to work? Basic needs that are met; of security, food, a sense of well-being and of self are essential. Beyond that is the seeping of oneself in the knowledge and experience, and then dropping the rules of rationality; permitting non-rational, unconscious, autistic thinking to pervade, allowing a jump to a new metaphor °. Individuals take opportunities for such experiences; yet societies may limit one's possibilities by preventing the non-rational, by encouraging the materialistic and the concrete.

It is the ebb and flow out of such personal, and even group experiences

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° See Pearse, "Crack in the Cosmic Egg."

that the potential for change can occur in the society at large. Solutions thus are not just communal, nor just individualistic; but a particular kind which encourages a holistic view of man's relation to society.

I find myself deeply imbedded in a very personal search, which reflects my concerns with the broader society and what it is currently faced with.

- external complexity and confusion, making it more difficult to live easily and "to get things done;"

- there has been a creation of persons and systems preoccupied with infrastructure; putting pieces together; making things work resulting in high social costs to cope with fragmentation;

- attempts are then made to decentralize functions more appropriately the responsibilities of individuals, groups and functional or geographic communities; and centralize the infrastructure activities;

- society becomes increasingly concerned with technical - and "hard science" activities; measurements, effectiveness, etc.;

- "soft values" - which are more philosophic, religious (in non-institutional) sense) and related to new levels of psychological awareness and consciousness become demeaned - and only part of underground discussion and concern;

- most attempts to cope with the future project modifications of existing systems values, and institutions. However, since we are at the point where a major change needs to occur, new processes should be encouraged;

- change occurs if there is a recognized desire - commitment and willingness to see new kinds of solutions. Thus an oppenness, an acceptance of the ambiguity of not knowing, and the reach through intuitive and non-rational processes, for new metaphors, constructs and patterns of solution. Such patterns happen in science; but are also part of religious value shifts (Reformation);

- permission and support from existing institutions and persons can not be expected; for though there is a crisis the tendency to satisfy old structures and the status quo. However, there are these living on the borderline of existing systems who willingly and consciously are looking for alternatives and these need support.

- a social philosophy which supports and encourages individualism - one form of which is for "each to do their own thing" ultimately is destructive - since we can not have everything that everyone wants and desires. In another sense, individualism of belief - has become in Western countries a most sacred right. Each has the right to express their own uniqueness, specialness of interest, skills, concerns - and even values. How then can some reconciliation or better yet, pulling together of a system where both are present.

- a rejected alternative is that an elite has the right of individualism while all others conform. The only answer seems to be in the realm of individuals learning and accepting a notion that in order to obtain individualism in some areas, they must give up to a "common good" - a responsibility for the whole.

A Final Comment

All of the above must be considered Notes; disjointed, and perhaps unformed. They ask questions - and if they accomplish only that it will be successful. Please do not consider this as an edited paper - but one offered to you as stage one in a process.

A Summary of

UTOPIA, AS A NECESSARY PRESUPPOSITION FOR EVERY SIGNIFICANT FOUNDATION OF ECONOMICS

By Bruno de Finetti
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(pp. I3-87 of the Proc. of a CIME-EINAUDI Summer Course, Urbino, I97I; a book in the Economic Series of Franco Angeli publ., Milano, 1973, which title is the same as that of Part II in the present paper).

I. Why Utopia?

1.- Descriptive and Normative

It is essential to start distinguishing - with Marschak - descriptive sciences (observation of what happens) and normative sciences (how to deal to attain a goal). Descriptive Economics is concerned with economic systems and human behaviour as observed in the past or the present; Normative Economics is concerned with the search of better or best ways to follow inside a given system, or of better or best economic systems for the future. Normative Economics is Economics seen from the viewpoint of an Engineer (not a Naturalist), that is, from the viewpoint of Operations Research. (O.R. in the usual or in an extended sense, according to more or less severe restrictions about what (conceptually possible) changes are considered forbidden.

2.- What an Utopia should be

In order to investigate about better economic situations or economic systems, it is necessary, first of all, to know what should be considered as better, as more desirable, for an individual or for the mankind. The answer, the Utopia, is a scenary of a desirable world (not technologically impossible, although impossible, maybe, under the present organization of society – politics, law, customs, existing distribution of wealth and power).

Utopia is the expression of the value judgements of somebody, about what seems to be desirable for the whole society; then, with this unique starting point, begins the problem of finding possible forms of organization

to implement the system which is - now - but an "Utopia".

3.- Utopia and taboos

Utopian thinking is usually opposed by taboos: that is, by a conservatism attempting to fight and ridiculize any idea of change threatening the evils of the present world; exploitation, speculation, monopoly, selfishness, violence, and other factors of injustice and inequality.

II. REQUIREMENTS FOR AN ECONOMIC SYSTEM, ACCEPTABLE WITH REFERENCE TO THE NEEDS OF THE COLLECTIVITY

4.- A preliminary question

Three different attitudes may be distinguished toward Economics (both Economics as a science and as a reality).

a) it is governed by immutable laws;

b) or by laws depending on historical circumstances, outside human will;

c) every technologically attainable position is attainable, if only men are willing.

Only attitude c) is constructive, and leads (or, at least, allows) to try improvements through utopian thinking. (Should we say: "Futurology"?).

5.- A first consequence

No institutional bonds can be presupposed, neither explicitly nor implicitly: whether some or other institutions (e.g., money, rationing, saving, trade, private property of capital goods, private enterprise, etc.) are compatible or not with the desired situation is but a side-question to be explored later, without preconceptions or emotional bias, towards any side.

6.- A polemical digression

The rejection of value judgement in classical Economics is per se such a bias: it is responsible to destroy any real possibility of discussing, in the framework or academic "Economics', about alternative types or models for a better economic organization.

7.- Neutral formulations

The formulations of problems should be neutral: the use of words implicitly suggesting limitations to the range of "possible" choices, must be avoided.

8.- The role of mathematics

Therefore, no notion like "prices" etc. may enter (primarily) in the mathematical framework. Only preferences in the space of welfare possibilities for the individuals are directly meaningful. Utility (in the technical sense, including Uncertainty) is the unique primarily meaningful economic notion.

9.- The usual contaminations

If notions like prices, aggregate quantities, all the "freedoms" in pursuing individual interests (touching others), etc., are included in a mathematical formulation of economic problems, the conclusions are therefore of no universal validity.

10.- Examples

Shortcomings (in the sense of n. 9) of capitalist economy are, e.g., external economies and diseconomies; futile consumptions induced by advertising or Veblen effect; disregard to ecology and other public interests; blind functioning of financial and monetary system and market, disregarding human, social, political, requirements; and so on. Extremely unbalanced development; poor and distorting aids to developing countries, etc.

11.- Shortcomings and Objectives

Objectives are sketched, as changes for the present situations, in order to avoid such shortcomings:

a. less inequality, more regulation;
b. less uncertainty, more social security;
c. less competitivity, more cooperation;
d. freedom as for individual choices not harmful to others;
e. easy functioning organization (without bureaucratic or other intricacies).

12.- Examples of ways of implementation

Usually the aims are expressed by indicating changes in the structure (e.g., public property of means of production; gratuitous distribution (by rationing) of goods for essential needs like housing, food, clothes....; abolition of individual saving and inheritance to be replaced by social security, etc.). According to the present premises, these are but possible (more or less proper according to the circumstances) means to reach the wanted situation (which is the only real aim, no matter by what a way it could appear more practical to attain it).

13.- The problems of production

It is therefore that the problem of the production (of its planning, developing, regulations, etc.) is not considered as concerning our present analysis, but as a practical problem, important only when a particular system and social program should be devised as to attain the desired improvements (in a given practical situation: a country with such and such resources, cultural and educational development, labor force, possibility of exchanges, needs, habits, and so on).

III. MEANING AND AIMS OF A MATHEMATICAL THEORIZATION

14.- Utopia, and Operations Research

We need to consider the space of the (technologically) attainable situations, characterizing them (the points) by the relevant parameters. If our aim is to attain a situation where some requirements must be satisfied (e.g. those of n. 11), or where they must be satisfied in the best measure (if they admit degrees), this is a problem of Operations Research (or, if one prefers, without changing the meaning, in "Social Engineering", or "Utopian Economics").

15.- Pareto Optimum

If other aims are expressed by a single function, Objective Function, f(P), of the point (situations) P, the problem is simply the one of his maximization, and the solution is unique (or, if these are several, they are equivalent, inasmuch as the same maximal value of it is attained).

But, in many cases, and surely in the present one, we have many Objective Functions, $f_h(P)$ (h=1....r), we wish to attain as high values as possible,

and the problem is that of Pareto Optimum. The solution is then no longer unique: there exist, in general, an (r-1)-dimensional variety of essentially different Pareto Optima: different because the different requirements (the r functions $f_h(P)$ are satisfied in different degrees.

The problem is then not determined until we do not specify a "Super-Objective", an overall preference function, $f(P)=f(u_1,\ldots,u_r)$ where $u_h=f_h(P)$: a function which embraces all particular Objectives giving a proper weight to any improvement (marginal improvement) of each of them, and for any "point" of the "space".

A WARNING! (added on the present Summary).

Our introduction of the Optimum is different (as for its place in Economics) from that of Pareto (although identical as for the mathematical definition), because it is introduced preliminarily without presuppositions concerning the kind of economic system. Pareto, at the contrary, presupposes the usual system of private "free" economics; moreover, he maintains (I disagree) that a "free" economy gets authomatically an Optimum, and is satisfied that it be so disregarding the question about the preferability of different Optimum point corresponding to a better social equilibrium.

See also the enclosed short communication of mine at the Meeting on Wilfredo Pareto, Accademia Nazionale dei Lincei, October 26, 1973, with the title: Pareto Optimum in a different Approach to Economics.

16.- Misunderstandings to be avoided

1) Grammar may suggest that optimum points are good ones; maybe, that all they are better than all non-optimal ones. Even Pareto (implicitly presupposing the laissez-faire principle and a known starting situation) seems to accept this idea. But "Optimum", as technical term, applies also to cases of extreme inequality: even to the ones where a single individual is the owner of everything and all others are dying (because the others cannot be helped without decreasing the wealth of this One).

2) Although, at an Optimum point(under usual regularity assumptions), "prices", as ratios of marginal utilities, do exist, it is not allowed to admit that such "prices" are interpreted as prices for trade or bargainings eventually leading to that Optimum (this could be right, perhaps, only in a neighborhood of this single point).

Misunderstandings 1) and 2) are the source of many distorsions of Welfare Economics and of many unjustified criticisms towards Welfare-like theories.

17.- Partial Objectives, individual and social

As functions $f_h(P)$, in our approach, we will consider, for h = 1,2,....,n, n functions of the usual Welfare Economics (with a slight different meaning) representing the utility of each one of the n existing individuals; the r-n further ones represent different requirements of social interest (aims concerning the collectivity,present and future; proper degree of equality; and so on).

Much more explanations are added, but cannot be summarized here.

18.- The Optimum with reference to the individual Objectives only

This is but the Optimum of Welfare Economics; misunderstandings (like the ones of n. I6) ought however to be dismissed.

19.- Marginal Utility, and the system money-prices

The first and the most dangerous (of such misunderstandings) is the idea that the Welfare Economic scheme may represent (in the way of Walras or Pareto) a model for equilibrium arrived at by bargaining. That is refuted (a mechanical objection is contained in a result of E. Volpe).

20.- The habit to measuring "values"

Multiplying prices by quantities (to get "values") is theoretically meaningless (prices are only meaningful for the marginal operations, for the last infinitesimal bit); so much more aggregate figures (like the "Gross National Product"!) are not so significant as it is maintained.

2I.- Uncertainty, probability, utility

Introduction of the (new) usual (correct) notion of utility (according to Ramsey, von Neumann and Morgenstern, Savage, etc., and earlier ideas of Daniel Bernoulli).

23.- Different kinds of social Objectives

There is no clearcut distinction between individual and social Objectives. For instance, the existence of a Subway (and of many similar services) is an individual benefit for each user but also a social benefit for not-users inasmuch as it diminishes the traffic-jam on the streets. Education is of interest both for the individuals (pupils, parents) and for society as a whole, and the like is true for all social institutions (e.g. health service!).

Social Objectives are also the ones connected with the future generations (e.g., preservation of resources, abstaintion from pollution, etc.)

Every social Objective should be translated into a function $f_h(P)$ $(h=n+1, n+2,\ldots,r)$ to be added to the individual ones $(h=1\ldots n)$ in the scheme for Pareto Optimum.

It happens often that some economists (or planning authorities) prefer to fix a bond for some objectives (like $f_h(P) = c_h = \text{const.}$; e.g., unemployment = 4%). That is however a bad ersatz for optimization, since it is not reasonable that any value larger than c_h is equally good, and any other (no matter how moderately under c_h is outright unacceptable.

24, 25.- Schemes for equality; Preferences about unequality.

As a particular social Objective, we may consider also that of better equality, or more realistically, less unequality.

Representations of situations of inequalities among individuals and preferences about them.

26, 27.- Discussion of examples of possible preference patterns for the cases of 2 or 3 individuals, and for large n.

Particular cases with countour lines; "Concentration" curve for larger n.

28.- How to reach the Objectives

Existing shortcomings must be overcome, but the technical details cannot be univocally established at once for ever. It is practical problem, and also a psychological one (involving education in social good will).

29. A variety of ways as remedy

The choice between many possible ways of remedy, or different forms of organization, should be pondered case by case, according to many different circumstances, without preconceptions. Leading idea, to arrive as near as possible to Thomas More's Utopia, compatibly with the constraints considered necessary to appear "realistic" in a given society at a given time.

30.- Where is the absurdity?

Utopia is usually ridiculized, charged of absurdity.

It seems however that our present systems would be more properly ridiculized as absurd if somebody coming from abroad (from Utopia, from a different planet, from a future restored state of the world) would visit it.

31.- Public and private; freedom and constriction

Relativity of such notions, especially of "freedom" when "equality" of abstract "rights", means, owing to differences in wealth and power, very different possibility of using them.

IV.- DISCUSSIONS ON OTHER SUBJECTS

32.- Repression in scientific thinking

Influence of conservativism in science, owing to several factors, like academic preconceptions; as for economic theories, owing, chiefly, to the economic interests of the "establishment".

33.- Comments on various topics

(on topics discussed in papers by other Authors at the Urbino Meeting, and printed in the same book).

34.- Opinions about the theses of some marxist colleagues

In my opinion, marxism is noways convincing as a basis for Socialism. Its criticism against capitalist economy seems poor and complicated. Building a project of a system free from the shortcomings of the existic ones at the contrary a very natural and reasonable task (even if strong opposition may be foreseen against its realization).

V. APPENDIX (added I972)

The problem of survival for the mankind, as presented in the MIT investigation on "The Limits to Growth" , must deserve serious attention (even if the quantitative conclusions are hypothetical).

The perspective (even starting from such new arguments) is convergent with the aims of the preceding writing: better quality of life, stop nonsensical purposeless lethal "growth"!

NEW NEEDS - NEW SOCIETY

By Roger Garaudy
Philosopher;
Professor of art forecasting

(1) We are heading into another 1968, even more excessive than the first. The present build-up arises not only from youthful agitation but also from the emergence of new needs, which are not being met by

- political structures
- school and university structures
- economic structures, or
- spiritual structures.

Will this new movement, signifying profound change, be once again negative, destructive and convulsive, or will it be pacific and constructive?

(2) Why was May 1968 a defeat for everyone?

Because:

a) it was a clash of opposing forces;

b) it was a clash of Utopias: the status quo, absolute negation and childish spontaneity.

No one held out a prospect envisioning a future with a human face as a concrete alternative.

(3) What would a successful 1968 be like?

- a dialogue of those who propose human projects;
- the common realization of a new civilization project that could meet the needs rooted in the vast changes of our century;
- a new conception of culture and education;
- a reorganization of labor;
- new goals for global society;
- new concepts of politics and faith.

With respect to faith:

(a) Man's prophetic dimension, i.e. self-determination in the goals of his life and of history;

(b) pluralism.

(4) The central problem is not to integrate the young generation or, more exactly, man's future needs, into the structures and present goals of society but, on the contrary, to imagine and realize new structures and goals of society which answer these new goals. Thus, only a new 1968 will be successful, i.e. not convulsive but constructive.

The common characteristic of these new needs is a rejection of all dualisms, not only of the body and soul (as the music and dances of the young attest), but all of those that split contemporary man in two.

First, the dualism of the spiritual and political. A new concept of politics is now taking form; it maintains that politics

do not mean adhering to one party or another or voting for a candidate, which always implies the delegation and alienation of power and critical thought on any project, but rather feeling personally responsible for the destiny of everyone, and to act accordingly.

Secondly, the dualism of the individual and the group. There exist at once a rejection of a society atomized by jungle individualism, and the aspiration to recover a sense of community which is not totalitarian -- that is, which recognizes pluralism and allows the person his prophetic breathing space, his opening to the future and his choice of goals.

Thirdly, the dualism of work and leisure, such as the separation between work, art and faith. One motive for periodic explosions is the more and more intolerable contrast between life as it is actually lived in the workshop or neighborhood and the splendors promised by theatrical entrepreneurs, travel agencies, air lines, speculators promoting "radiant cities" and real estate agents who sell apartments (the Club Méditerranée myths).

PROSPECTS FOR SOLUTION

All the world seriously questions today's fundamental educational, economic, political and spiritual structures.

A. The school and the university

It is now recognized everywhere that instruction cannot be blocked

at the beginning of life and then entrusted entirely to persons supposedly specialized in transmitting knowledge. The rapidity of technical changes, like vital aspirations, leaves this ancient system ever more anachronistic.

The main consequences are the following:

(1) The school's functions must permeate all national activities, particularly business, with the understanding that permanent education would not be utilized only for recycling or short-term needs, but that greater importance must be given to general culture, i.e. to that training which Kant called "the aptitude to reach any goal whatever."

A typical example is technical instruction. Disaffection with this branch of education is exacerbating its inevitable rift with reality. One can only agitate in vain to reproduce industrial equipment -- often obsolete after a few years -- artificially in the schools.

(2) There should be no full-time instructors who become knowledge-transmitting specialists during the course of their careers. It is highly paradoxical that a professor of physics or chemistry, for example, who has passed his examinations at the age of 25, can spend 40 years teaching his discipline without ever having any first-hand experience in production or setting foot in a real research laboratory. By way of reciprocation, it would also be good for engineering and cadres to teach periodically, so that they never lose personal contact with man. This could be a serious risk if their life's work is devoted exclusively

to technics or research and their only relationship with man is one of authority over him.

(3) No full-time students. From the age of 14 to 15, and even later during the university years, alternating study with work in a real situation is as obviously necessary in all branches of learning as is the division of a medical student's training between the classroom and the hospital.

B. Work

Flexibility in employment and training is the essential problem here. It is thus closely allied to the preceding problem of the school and culture. The overall lines of current change could be as follows:

(1) The end -- in the essential -- of assembly-line work over the coming decade.

(2) No full-time S.O., this to be achieved by rotation, not only by stages, since repetitive work is less mutilating for a man or woman already accustomed to think. Indeed, according to a report issued by the US Secretary of Health, dissatisfaction with work is the main cause for alcoholism, drug addiction, eroticism and delinquency.

(3) No full-time engineers or cadres (see above the need to fulfill periodically functions other than management or technics and to live a pedagogic relationship with the assembly-line worker).

(4) All this comes within the framework of permanent education in business or, as we have already pointed out, the essential aspect of technical recycling should in no case lose sight of general culture (see my definition above).

(5) Normative planning (as Gaston Berger outlines it) in terms of rising needs, goals and value systems of the future, must take precedence over strategic and operational planning and the technological forecasting of methods. Only thus will the problems of work integrate with the problems of free time, housing, the framework of life, social and cultural equipment, holidays, trips, and the cultivation of the self and the arts -- briefly, of all the dimensions of life.

C. Politics

Considering the irreversible rise of new needs, the worst Utopia is the status quo, since it can only lead to repression, both destructive and impotent.

The other maleficent Utopia would a Prud'hon kind of anarchysm activating the hoary 19th century "the factory-to-the-workers" formula. The damage done by this anarchism can be seen in under-developed countries which have tried to install self-management, with these consequences:

- new exploitation, this time by the group, impersonal and irresponsible;
- the impossibility of adapting self-management to planning and integration, which are nevertheless technical necessities;

- the abusive actions of the banks;
- disorder in investments, which have become not a public function but rather a private one, equally impersonal and irresponsible;
- a disordered race for exportation for the multinational corporation, and hypertrophy in the tourist industry.

No solution can be found for the prospect of a simple change in political power (change of the majority, change of government or even the seizure of power), because the question does not concern taking power but rather transforming it. The parties, from the extreme left to the extreme right, are founded on 19th-century problems and structures and copy the traditional parliament model, with its delegations and alienation of power. Even the unions, both labor and management, are infected with the same perversions; they are therefore naturally superseded by the most lucid and prospective elements.

Regroupments that can meet new needs and problems will transcend the age-old cleavage of parties, classes, unions and churches. Whatever this new regrouping is called ("historic bloc" or, in the words of Dom Helder Camara, "Abrahamic minorities"), its historical role, as in all past renewals, will enable us to see further ahead and permit the poetical emergence of man.

D. The spiritual

What underlies the youth movement is not only revolt and the will for rupture, but a need for transcending the one-dimensional and

for positivism.

The resurgence of Utopia is often merely the muddled expression of the need to conceive a new civilization project.

Scientific and technical change has inspired today's youth with a two-fold attitude: that everything is possible and that unlimited possibilities are being realized negatively by the destruction of man and his environment through pollution and manipulation.

Hence, they aspire vaguely to self-management, an ambiguous expression that consists of two essential factors:

- self-determination of goals; and
- self-management of means.

The common denominator underlying this aspiration is the hope of making every man a center of initiative, responsibility and creation -- this is the horizon of all the aspirations of today's youth. From this standpoint, it is easy to foresee that more and more, the avantgard of the revolutionary movement in the Western nations will consist of young Christians. Revolution will appear less and less as <u>class warfare</u>, given the incapability of existing socialist forms to face the emergence of new needs, and more and more the creation of a <u>new human civilization project</u>.

Thus, the element of faith will be profoundly transformed. With a growing number of young people we can see:

. faith not as resignation (opium) but as rupture (ferment);
. faith as the gateway to new goals (against society and the one-dimensional man);

faith as a true community of prophetic persons, inhabited by all the human epic and nurtured by dialogues with other faiths and other civilizations;

- faith as a continuation of the creative act (see Père Chenu's book on The Theology of Work).

The world will become revolutionary less and less for motives of rancor but more and more for the need of self-completion.

Communications. The Planner's Predicament

By Harold A. Linstone
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Futures research, forecasting, and long range planning have one feature in common with integrity, equality, and peace: there is little question about the principle and much question about the practicality.

In this paper I would like to focus on one major -- if not overriding -- dilemma for those who are both future-oriented and action-oriented. Let me at once note that I am referring to the problem of gaining a fund of precise information about the future. There are no "facts" to be derived from the realm of the future. And a deluge of facts would not "solve" the futurist's problem. In today's world wealth of data is no more synonymous with insight and superior decisionmaking than intelligence is with wisdom. Increasing complexity is a concomitant of shrinking space and time. Maintaining a balance between the whole and its parts, between significant and insignificant information, becomes ever more difficult. Communication is at the heart of such concerns and I will address two deficiencies crucial for futures research: incompatibility and discounting.

A. Incompatibility

(1) Inadequate linkages

Let us consider just a few examples of the inability to communicate:

-- The establishment intelligentsia and the scientist/technologist

As J. Coates has noted, the journals which are the "chief gatekeepers of public opinion among intellectuals" in the United States include not a single science oriented publication [1]. Most prominent and influential individuals are abysmally ignorant about science and technology. Conversely, most scientists and technologists know very little about social systems and issues. W.I. Thompson has quoted a former Dean of the School of Electrical Engineering at MIT on our urban problems: "I doubt if there is any such thing as an 'urban crisis', but if there were, MIT could lick it in the same way we handled the Second World War".[2] Thompson adds that the technologist "cannot hear us [the teachers of the humanities] for he moves in a world apart, distracted from his surroundings by his past success and his own invincible sense of power. Man and the humanities are out of hearing...".

-- Majority and minority social groups

Maruyama emphasizes that communication difficulties do not merely reflect different languages, but different structures of reasoning, with the parties involved often unaware of such paradigmatic differences. [3] Not all societies are hierarchical or anthropocentric or homogenistic.

-- Scientists

Today most scientists are acknowledged as specialists. As time passes they know "more and more about less and less". Systems scientists may label themselves as generalists but even they gravitate toward specialized groups which do not communicate with each other. Umpleby has reported that "I have yet to meet a political scientist who has heard of [one of the most fundamental laws in cybernetics, Ashby's Law of Requisite Variety] prior to my mentioning it to him". [4] Few RAND systems analysts have any familiarity with the work of von Bertalanffy; sociologists have little communications with engineers like Forrester. When a group of prestigious future-oriented interdisciplinary scientists meets, the result usually fits the words of novelist Arthur Koestler:

> "The moment you put them together in a conference room, they behave like schoolboys performing a solemn play...each of them possesses a small fragment of the Truth which he believes to be the Whole Truth, which he carries around in his pocket like a tarnished bubble gum, and blows up on solemn occasions to prove that it contains the ultimate mystery of the universe. Discussion? Interdisciplinary dialogue? There is no such thing, except on the printed program. When the dialogue is supposed to start each gets his own bubble gum out and blows it into the others' faces. Then they repair, satisfied, to the cocktail room". [5]

Thus we have a Modern Tower of Babel -- more people, more social and professional groups with access to vast communication channels yet unable to exploit them because of their separate languages.

(2) Excessive communications

Let us assume for the sake of argument that the weakness in linkages is removed. Does that solve the communication problem? I would posit that both extremes -- poor communications and excellent communications -- are hazardous.

There is much evidence that communication produces homogeneity.[1] The advanced countries today provide common technologies, corporations, television programs, advertising, and educational approaches. Their communications are leading to commonality in values and life style among similar social groups in these countries. It is exceedingly difficult to maintain a local identity in the face of effective intergroup communications. Thus the Japanese establishment today is already utterly Westernized.

Any social group develops a communication system to facilitate its development and creation of a unique identity is an essential aspect of this process. The Roman Catholic Church uses Latin, sociologists and mathematicians use a professional jargon. The founders of the State of Israel felt it vital to promote Hebrew as the official language; educators insist on a language of their own as do bureaucrats. Just as a negligee clad girl tends to be more provocative than a completely nude one, so the mystique associated with a "private" language is a valued property of the group. And it is easily destroyed by improving communications.

Aside from this we have, of course, the problem of information overload as a concomitant of excellent communications. The individual is only able to handle a limited amount of information at any one time. We are told that an executive can only effectively consider a relatively small number of alternatives in making a decision. Too much information either acts as a barrier to action or may prove as detrimental as too little information. In the case of the surprise attack on Pearl Harbor the analysis by R. Wohlstetter has shown that

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1. There is also ecological evidence that homogeneity reduces survivability of a system.

the popular conception of absence of clues resulting in surprise was erroneous: in fact, there was a superabundance of clues. The result was as fatal as a complete absence of clues would have been.

Thus the problems posed by (1) and (2) really coalesce into one of selectivity or filtering. The entire field of pattern recognition is of significance in alleviating these problems. One illustrative and relevant experiment is mentioned by Rhyne [6]. It involves a combination of maps and time-lapse motion picture presentations: the tempo-adjusted, animated display.

(3) Inappropriate menas

The complexity of the systems with which the futurist must increasingly concern himself creates another kind of problem.

Systems which involve nature, man, society, and technology are very different from those which are purely technological or purely economic.[2] The many variables, high degree of interdependence between them, and nonlinearity of the relationships lead to

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2. Note Holling's description of ecosystems:

> "There could hardly be another area with as much ignorance, as much confusion, and as much unknown. We have had a taxonomy of ecosystem structure for years and only now are glimmers of an explanation of the dynamics emerging. We also have 40 years of experience in modelling ecological and economic processes in a simplistically irrelevant way and at the best we have only found what not to do. But if our knowledge of ecological and economic systems is in a bad state, our knowledge of man is considerably worse...Wherever we look there are gaps -- gaps between methods, disciplines, institutions, and constituencies".[7]

fundamentally dissimilar behavior. Complex systems are stable in the face of most changes in input, yet exhibit catastrophic changes with a few gradual alterations in input. They have long lag times in accommodating to desired changes and historical as well as spatial linkages. The overall impact is often felt in the occurrence of unexpected or counterintuitive consequences.

Clearly the traditional scientific approach of structuring, partitioning into subsystems, and analysis of each element is inadequate for such systems. Rational microdecisions all too frequently lead to irrational macrodecisions. Even the bold work of Forrester and Meadows in system dynamics and the scenarios of Kahn and Wiener manage to treat only the tip of the iceberg. Holistic insights must be obtained and communicated. A narrative is not only an unsuitable means to communicate a painting by Van Gogh or Picasso; it also fails to communicate a future urban environment. A picture cannot communicate either an orgasm or a societal breakdown. The weakness in holistic communications is seen most glaringly in scenario writing, which utterly fails to transmit the significance of a projected future. In traditional fashion it tends to project a few currently meaningful parameters and neglects to consider many potentially crucial ones (which also change) as well as their numerous interactions. Our normal failure is not the inability to derive a "correct" scenario, but rather to derive <u>any</u> holistic representation other than "more of the same".

A novelist may have the talent to communicate the meaning of a complex future more effectively: Orwell's "1984" and Kafka's "Trial" are examples of such capability. I am convinced that we must explore communication concepts outside the range familiar to the academic community. I want to make it clear that I am not referring to simplistic devices such as placing Fuller geodesic domes, abstract paintings, or space vehicles on exhibit -- a procedure de rigueur at some future oriented meetings. The work of Holling, Johnson [8][9], Rhyne, and Scheele [10] is more indicative of the need. Among the innovative paths:

(a) Use of the computer as a high level communicator

The computer can give the individual a new ability to "play" with complex systems, to get the "feel" or experience which he relies on to comprehend such systems. It is possible to create an informal, intimate dialog which serves to conretize Gedankenexperimente. The key is the use of multiple sensory modalities in interacting with the computer (manual-visual, audio-visual). A first step is the workshop series developed by Holling and Goldberg for participative urban and regional planning at the University of British Columbia [7].

(b) Audio-visual taped scenarios developed by artists together with systems scientists and futurists

The joining of the arts and sciences may prove a vital step in communicating complex future alternatives. The "scoring" concept of Lawrence Halprin [11] is an example of a catalytic agent to effect the

melding of artists and non-artists in an endeavor of this kind. Audio-visual taping in turn may be the forerunner of three-dimensional multiple motor sensory environmental simulations.

(c) Vivified models of complex systems

The value of models which are true prototypes of new systems is recognized in technology-based industry. The most recent change in procedure for military aircraft procurement in the United States reintroduces the prototype as a key step before commitment to production. It is surprising that insistence on "living" models has been lacking in so many large-scale social system proposals. An individual who is able to physically live in several new urban environments is far more likely to make a meaningful choice than one who must do so on the basis of narratives, pictures, or architect's models.

B. Discounting

A bitter lesson which every forecaster and planner learns is that the vast majority of his clientele has a very short planning horizon as well as a short memory. Most people are really only concerned with their immediate neighborhood in space and time.[3] Occurrences which appear to be far removed from the present position are heavily discounted. Moreover, the degree of discounting may well vary with the individual's cultural and social status. A person at the bottom of Maslow's human values pyramid will discount environmental pollution

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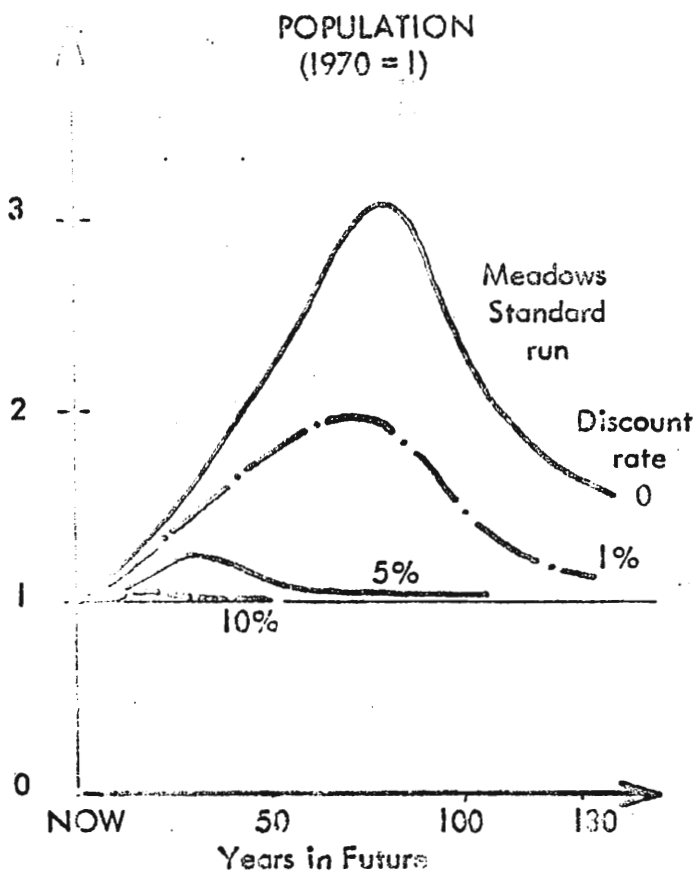
3. Cf. Fig. 1, "Human Perspectives", in [12].

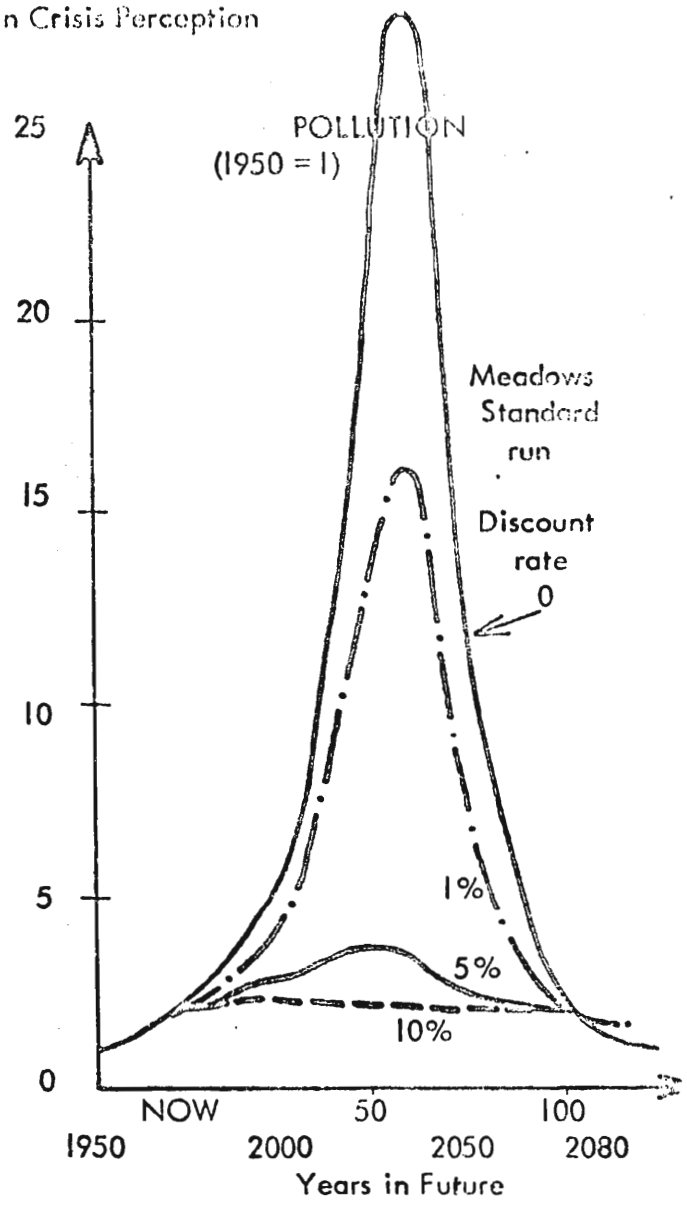
much more heavily than someone near the top. The poor, for whom survival is a daily challenge, are hardly going to lose much sleep over a pollution or population crisis twenty years in the future. A similar difference applies to space: a slum dweller worries about rats he can see, the jet set worries about depletion of wild game in distant Africa. Among nationalities Americans seem to have a particular penchant for discounting. They are raised on installment buying and "fly-now-pay-later" exhortations The writer is only as good as his latest book and the politician is attuned to the voter's persistent query, "But what have you done for me lately"?

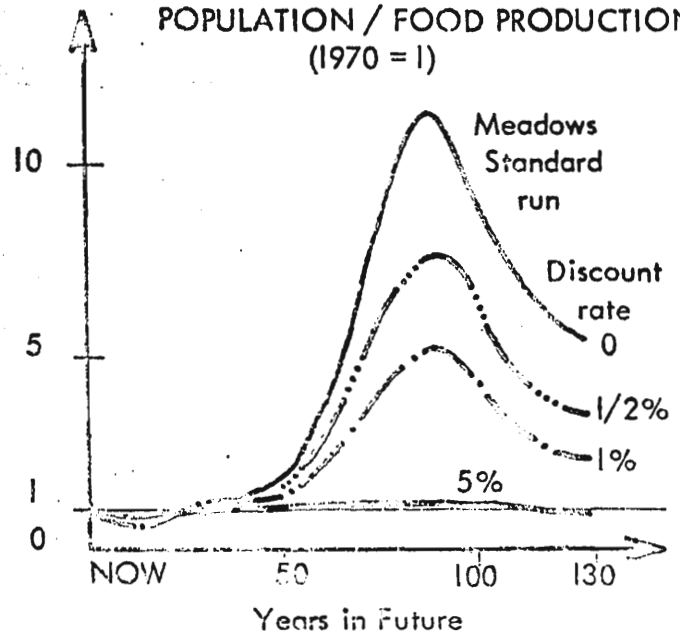
The massive impact of this personal discounting process on the Forrester-Meadows World Dynamics model is readily demonstrated. Consider an individual who was unconcerned about global pollution in 1950 and is still untroubled by current world population density and food availability. Normalizing these variables to 1950 and 1970 respectively, the Meadows "standard" run generated the pollution, population, and population/food production curves denoted in Fig. 1 by "0".[4] Crises peak in 60 years for pollution, in 80 years for population, and in 90 years for food production. Application of a discount rate equal to, or greater than, 5 percent reduces the population and pollution crises to minor significance, i.e., no dramatic worsening of the current situation is perceived by today's observer. Future food shortages may exert a somewhat stronger personal fear and possibly result in a lower

4. The "0" curves are based on Fig. 35, p. 124. [12]

Figure 1 - The Discounting Effect in Crisis Perception







discount rate for food production than for population or pollution data. But here, we find that no large-scale deterioration of the situation occurs for 50 years even without discounting; in fact, there is some improvement over the next twenty years. It is not surprising, therefore, that cries of crises fall on deaf ears.

Apparently discounting acts in both directions -- future and past. A crisis about to happen or just experienced is discounted little, while events a generation in the future or in the past are discounted severely. The historical pattern of national wars suggests that a war is discounted completely in the span of about one generation. There may, in fact, be a genetic basis for man's concentration on the present. An ability to maintain such focus probably enhanced his chances of survival in frequently hostile surroundings.

Unfortunately this space-time discounting phenomenon is usually poorly understood by the futures researcher and is a major reason for the ineffectiveness of long-range planning activities generally. The forecaster points to remotely located threats and opportunities only to find a frustrating and maddening unresponsiveness. Rarely does he try to come to grips with the basic communication difficulty. Yet we do have some clues. The most effective trigger to force installation of traffic lights at a dangerous intersection is the occurrence there of a series of fatal accidents in a short time span. Catastrophic fires spur the enactment of new fire safety rules and passenger aircraft collisions lead to improvements in air traffic control. The actuality of the Soviet Sputnik galvanized a dramatic shift from the low-key Vanguard space effort to the gigantic Apollo program.

The key to effective communication is a perceived crisis or opportunity of sufficiently serious proportions in the near space-time neighborhood of a sufficiently potent client or constituency. This can be brought about in two ways, schematically shown in Fig. 2:

(a) moving the distant crisis or opportunity well within the client's current field of perception or planning horizon, or

(b) extending the client's field of perception or planning horizon.

(a) The most obvious means to compress the time dimension is to create a minicrisis in the near-term. If a potential future catastrophe can be averted by such a strategy we are justified in considering it. Labor uses the concept in precipitating strikes; the military use it in creating "threats" (e.g., the non-existent "missile gap" in 1960).[5]

There are less obvious but equally intriguing approaches. We note that technology, in the shape of communications, has been far more successful in compressing space than time. Television has dramatically foreshortened the space dimension and brought distant crises and triumphs into the living room with forceful impact. The Kennedy assassination events and the Apollo manned lunar landing are examples of its capability.
Communication has been much less effective in similarly foreshortening the time dimension. Orson Welles' radio version of H.G. Wells' War of the Worlds is a rare example, again reflecting the importance of the artist.

We should not only study improved means of using communications to compress time (e.g., "All in the Family" set in 1990?) but ways to

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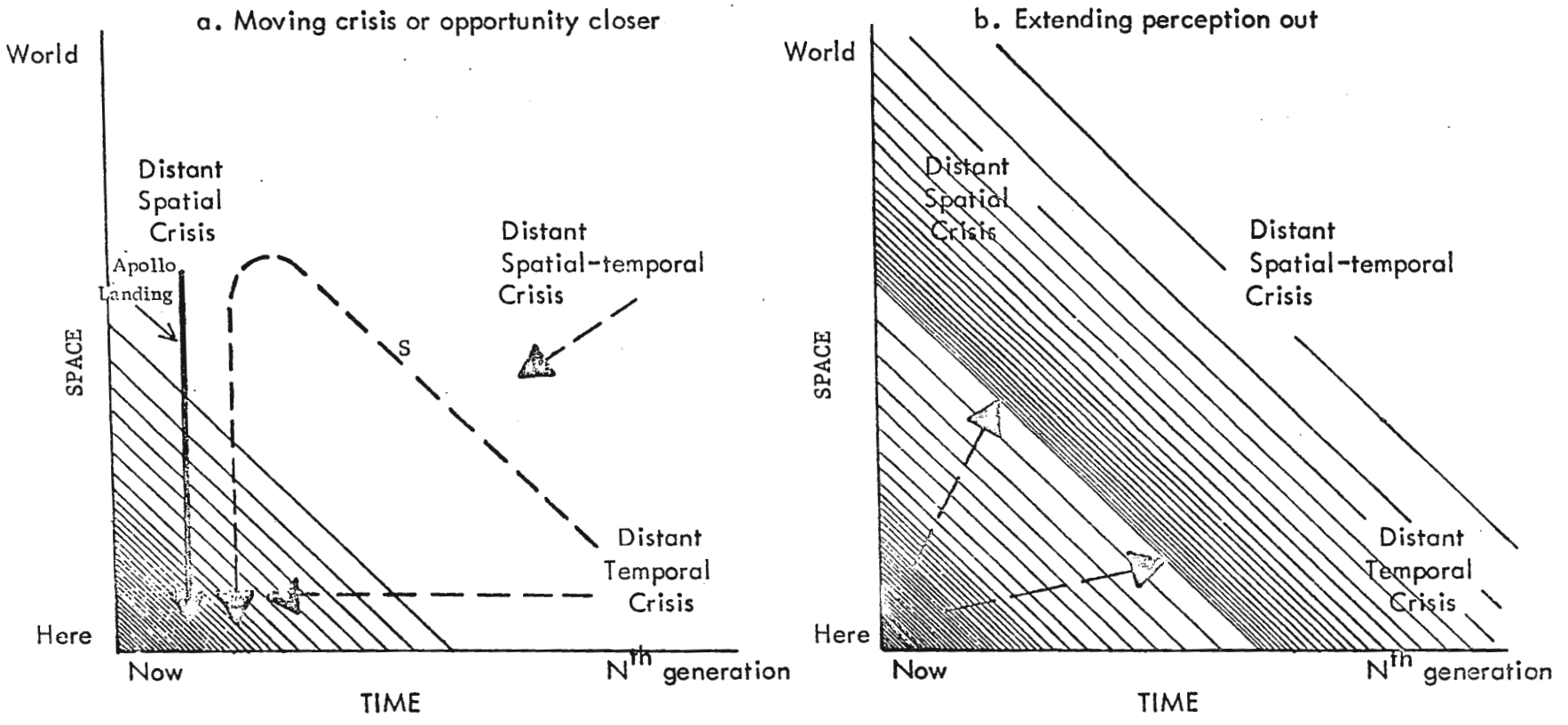
[5] Note added after Conference: The Arab oil embargo appears to serve the aim of a minicrisis in the United States (e.g., increased R & D Funding of alternative energy sources and technology, stronger support of public transportation).

Fig. 2: SPACE-TIME PERCEPTION



substitute space for time and then compress the space dimension (see arrow S in Fig. 2a). If we can recognize a future crisis for our society in a current or recent crisis of another society, we may be able to focus on that society and use communications to bring its perception vividly into our living rooms. Possible examples are the over-populated cities of India, the under-nourished poor of Africa and South America. Similarly we may find future life styles already casting their shadows in other cultures today. As 300 hours in the life of "An American Family" were filmed in 1972 and subsequently presented in 12-hour-long episodes on television, the family life in other potentially relevant cultures can be brought home to today's public.

There are, of course, also dangers inherent in a strategy of type (a): repeated creation of minicrises can dull the effectiveness (the "cry wolf" syndrome) and misuse by vested interests may cause harm.

(b) The other alternative, extension of the individual's field of perception or planning horizon, poses even more intriguing questions. Are the current limits physiologically determined or illusory? There is growing interest in the development of new concepts to condition the individual to a longer time horizon. The work of Drs. Jean Houston and Robert Masters on time distortion in altered states of consciousness is pertinent. We all recognize that five minutes can at times seem like an hour; conversely, individuals facing death but unexpectedly surviving (e.g., airborne parachutists with unopened parachutes landing safely in a snow bank) consistently report that their entire life unreeled before them in a very brief time interval. Masters and Houston

invoke altered states of consciousness to decondition the ordinary way of thinking about time. In this way an enormous subjective experience can occur in a very brief period of clock measured time. They have successfully used this accelerated mental process or time distortion with novelists who are blocked in their work. The use of "mind games" is only one of the techniques on a vast frontier [13][14]. It is obvious that our vast ignorance in this area can no longer be accepted.

In summary one point should be stressed. If the long-range planners and futurists do not address themselves intensively to and innovatively to these communication deficiencies, most of their labors will, like those of the court jester, be merely tolerated -- and only so long as they entertain.

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WHITHER THE MIXED ECONOMY? (1)

By Sir Geoffrey Vickers

Summary

Any estimate of future relations between East and West and between North and South must take account of the fact that the developed nations of the North and West are themselves experiencing a conflict of value systems, which in some of them already threatens their political, economic and social stability. The basic cause of this instability is that market mechanisms have become increasingly ineffective or unacceptable (or both) as automatic regulators of distribution, whether of goods, services, employment, earnings, land, capital or foreign exchange. Consequently, in all these fields market mechanisms are increasingly supplemented or supplanted by deliberate political regulation. This needs for its support a value system different from that which powered, guided and made acceptable a market-regulated world. And even if supported by an appropriate value system, it could not fully meet either the expectations which a market-regulated world encouraged and satisfied or the expectations which that world encouraged but disappointed.

The dominant problems of developed Western societies are problems of internal distribution - between individuals, between classes, between consumption and investment and between individual use and collective use. The need to make this complex budgetary choice more deliberately must increase the importance of government,

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(1) Based on an address given at the 4th International Management Symposium organised by the International Student Committee of the St. Gall Graduate School of Economics, Business and Social Administration in May, 1973.Published in Futures August, 1973.

which alone can satisfy mounting collective needs (including the planning and support of the whole physical and social environment) and alone can redistribute the probably diminishing share of resources at the disposal of individuals. These pressures may produce some convergence in the practices and value systems of developed states in West and East.

They are likely, however, to make more difficult and more political all international exchanges. The greater the responsibility accepted by a state for the economic well-being of its citizens, the greater must be its concern with the terms on which it can obtain abroad whatever real resources it lacks, and with the foreign markets from which it can derive international purchasing power. The defects of the market as a regulator, which have reduced its power and acceptability even in countries where it was paramount, are no less apparent internationally. Between rich and poor states, as between rich and poor individuals, market exchanges must increasingly languish unless they are sustained internationally (as they are nationally) by the unrequited redistribution of buying power.

The self-generated limitations of growth (whether large or small, quick or slo-acting, local or planetary) will help to accentuate these difficulties, however successfully they are met. Though they will alter the relative bargaining power of some states, they, like the other changes to a post-market world, will increase, rather than reduce the importance of national governments and national political systems, both as regulators of distribution and as mediators of the political dialogue which gives political choice its guide lines and sets its limitations, and, in doing so, helps to develop the value system which it expresses. So although powerful forces will work both towards linking national states in

larger units and towards the devolution of some powers to smaller ones, neither trend is likely, in the time span under review, to relieve existing political systems of the demands cast on them by the failure and rejection of market regulation.

Rival Systems of Distribution.

The development of Western capitalism over the last century has disappointed half the hopes of its advocates, even though it has transcended the other half. Its productivity and growth potential have exceeded the brightest expectations. But it has divided the world in ways its 19th century Establishment had not begun to fear. Developed societies are divided from the undeveloped world by a gulf which in most places grows wider rather than narrower. The developed world itself is divided between two fiercely antithetical systems. And across both the North-South and the East-West divides fall the shadowy implications of limits generated by growth itself. Each of these trends contradicts high ethical hopes which were held with assurance in the 1870's.

Even more significantly for members of the Western world the Western system is challenged by internal as well as external changes. The evolution of a "mixed" economy in characteristic forms by each of the Western states does credit to the elasticity of the system. But it also invites the question whither this development is leading, for no point of stability is yet in sight, practically or theoretically, in any of the states concerned, in the "mixture" expressed by their current economies and their corresponding political organisation. The system which set out with such sublime assurance to free the world from both poverty and tyranny is challenged from without and from within and cannot meet either

challenge without revising its basic assumptions in ways which its own history has made especially repugnant to it.

This paper is concerned with assumptions about the efficacy of "the market" as a regulator of anything which can be bought and sold. Although "everyone knows" that the free market postulated by classical economists, like the 'economic men" who dealt in it, were abstractions, never actualy realised in practice and increasingly modified by the course of history, the assumptions based on them persist and so delay urgently needed changes both in organisation and in the social value systems which make organisations work. The organisational changes are in the relation between the organs of political decision and those of entrepreneurial management and labour. The "appreciative" changes are in the expectations which members of Western Societies entertain of their institutions, each other and especially of themselves as regards the distribution of wealth, power and status. The breakdown and rejection of market regulation have ethical implications wider and more searching than are usually recognised! It is with these that I am concerned.

It is useful, I think, to see these new demands in a wide frame of both space and time.

Ever sin e human societies became sufficiently productive to generate more wealth than their day-to-day subsistence required, the distribution of the surplus has been a source both of conflict and of ethical debate. And since the powerful tend to get the lion's share of wealth and deference, the distribution of wealth has always been closely linked with the distribution of power and status. Every society develops its own ways of distributing wealth, power and status and its own standards of what is fair, right or proper, by which to judge these ways. These standards are part of its social value system, by which I understand the set of standards by which

members of a society judge what is due to them from other members and from them to others. These standards serve to legitimise the existing pattern of distribution and thus to secure both the stability of the society and the interests of its chief beneficiaries. But they are also agents of change, sometimes revolutionary change. For the actual distribution of wealth, power and status never corresponds exactly even with the current standards which are generally accepted. These are never wholly self-consistent and rest on assumptions which experience may falsify, as for example it falsified the assumptions behind the "new" Poor Law of 1834. Current disparities between standard and reality or between inconsistent standards work constantly to change reality or standards or both. I shall not explore here (1) the source of these standards, the degree of their autonomy or their development, but I have no doubt that they are significant as agents, as well as products in the regulation of any society, in its development and sometimes in its dissolution.

Most Western countries can note with some pride that their current social value systems reflect a continuing and not wholly unsuccessful struggle over the last century to make power more effective and more responsible, to make wealth more secure and more equally divided and to make a widening range of right, (such as access to justice, to education and to the ballot box) less dependent on wealth and power. These have been the political and social achievements of the West. They have had some connection both with the personal opportunities which the entrepreneurial system provided and with its overall success in generating wealth. But they have not flowed automatically from that system nor been wholly dependent on it. On the contrary, they have conflicted with it, never more than now. The assumption that they are necessarily linked, is one of those treasured beliefs which most needs a critical review.

Economic development, however it arises, vastly complicates the problem of distributing the resultant wealth; and it also disturbs the social value system which sanctioned earlier patterns of distribution. This is the root cause of instability in every political society of the world to-day, whether developed or undeveloped. But its incidence varies with each society's history and current situation.

In an undeveloped society -- and we were all undeveloped not so long ago -- much current production is consumed by those who produce it, without any buying or selling, or is absorbed by those whose position, usually through landowning, entitles them to claim it. The rest is marketed through the mediation of individual traders. Wealth accumulates slowly in personal ownership, largely in the form of land and artifacts, of which instruments of improved production (other than flocks and herds) form only a small part. There is little in such a system to generate rapid change either in social relations or in the standards by which social relations are judged.

Developed nations on the other hand, although their total product increases, have to meet an increased variety of demand on it. For every developed economy needs to withdraw from the total product an ever larger amount, if not a larger share, in order to sustain the ever increasing demands of investment. This is required not only to replace and expand productive equipment, but also to sustain and re-make the increasingly artificial and expensive physical environment (for example, the towns, roads and airports) and the increasingly expensive social environment (for example, facilities for education). The growth of this sector, commits ever more future resources merely to maintain it. The balance remaining for personal consumption and personal saving is distributed largely through earnings and then re-distributed through differential taxation and differential benefits. Wealth accumulates

largely in corporate and state ownership and consists increasingly of buildings, plant and equipment which is in some sense productive.

Whatever the system by which this mammoth distribution is effected, it is bound to place greater strains on the social value system which legitimises it than are involved in the traditional distribution pattern of an undeveloped society. Apart from the fact that it is more complex and extensive, it depends far more obviously on human decisions, usually taken at remote levels of large organisations. And about human decisions it is always possible to argue that they ought to be other than they are. Moreover, it is harder for the rulers of such a society to maintain that its order is divinely or naturally appointed, rather than being a human artifact which men can unmake and re-make. It thus invites the kind of criticism from which traditional value systems were largely shielded. We may expect that all developed societies will find it hard to evolve a social value system sufficiently comprehensive, flexible and strong to legitimise the distribution system on which they depend and that they will bolster it by appeals to "natural laws", such as the economic determinism of Marx, the no less deterministic assumptions of Western apitalism or principles of "natural justice" derived from a view of human nature. The course they take will vary greatly with the historical origins of their development.

In the type of society which we commonly label Western, development was originally powered by individual entrepreneurs and financiers, trying to make money in a more or less free market. This form of development was supported by faith in the power of competition in a free market both to stimulate the production and to regulate the distribution of anything to which it could be applied, whether goods, services, employment, differential reward, land, capital or

foreign exchange. A "free" market meant a market in which the supply of whatever it handled was sensitive to price changes, whilst prices were not sensitive to the actions of any one buyer or seller. In such a market, it was believed, competition would curb the rapacity of both buyers and sellers, distribute production between uses which corresponded to consumers' changing preferences and contain the whole development within the limits of its growing capacity.

Nothing could be more precious and desirable than a device which would regulate automatically the distribution of scarce resources between competing uses in a way acceptable to all concerned. But the market disclosed its limitations as it developed and its field was progressively curtailed for familiar reasons to which I will briefly return later. The sequel in the West, was the astonishing system which we call the mixed economy, consisting of a core of quasi-market activities, regulated by a huge political apparatus designed to make good their shortcomings. In most Western countries to-day the state recovers in taxation and social service contributions about 40% of GNP and applies this partly in supplying those collective services which the market cannot elicit and partly in supplementing low incomes.

The other type of development is powered by central governments, intent to develop the power of the state and the wealth of its people. The most conspicuous of these to-day are socialist or communist states, concerned to distribute wealth, power and status according to a more or less explicit system of social values, which is powerfully influenced by reaction against the social result of the Western type of development and especially against private property as a means to power or even to personal independence. I shall have these chiefly in mind when comparing the value systems of

Western developed states with those produced by the other type of economic development. But it is important to note that dirigiste states are not necessarily socialist or communist. All developed states are marked by growing reliance on political choice to determine, directly or indirectly, how the products of their activities are to be divided between their manifold uses and users. They differ greatly both in the policy which that division expresses and in the degree and kind of control to which the policy makers are subject. But these important differences should not obscure what they all have in common.

These two types of developed society have in fact much in common. Both have assumed the novel responsibility of keeping all their members alive. In both of them membership of the political society has become more important to the individual citizen, whilst family and other traditional memberships have weakened. Political membership has become more important not only to the poor, who benefit from supplements to their income, but also to the rich, who depend on the public sector for all the common services which keep viable the physical and social milieu, from sewers to diplomats, from monetary and fiscal regulation to law and order. Both types of society have made full employment a goal of policy and in both of them employment is the most important road to wealth, power and status. For both have institutionalised the entrepreneur and in both the only seat from which power and initiative can be exercised on a large scale is the seat of an employed official, whether commisar or corporation president. Both have large central organisations for regulating their complex systems and these grow in proportion to their scale of development, irrespective of their ideology. Thus in both of them most individuals to-day claim to share in their society's increasing wealth as employees and as political members,

rather than as property owners or entrepreneurs.

The most conspicuous difference in organisation is, of course the far more powerful and autonomous private sector of Western-type developed societies. The most salient features of this are, first, its organisation in privately financed but largely autonomous business corporations, often of enormous size, with a marked tendency to associate and merge with each other, and a built-in means of growth and urge to grow; and secondly the equally striking organisations of employees. Both autonomous business corporations and autonomous trade unions are of dominant importance as participants in the making of distributive policy, no less than as agents in its execution. And they present their governments with both problems and resources which are lacking in the socialist type of organisation. The central problem for developed states of Western type at the present time is to convert the uneasy relation between government, business and labour into a working partnership.

The most challenging feature of this need is to develop the responsibilities, as well as the rights which attach to employment, and to political membership to a level corresponding with their new dominant importance. Independence, for example, in the watchwork of the property owner and the entrepreneur, but inter-dependence that of the employee and the political member. How long can we maintain these rival ethics in a world where we all survive increasingly by virtue of employment and membership? Similarly, competition assumes that winners can be indifferent to the fate of losers. How long can they remain so in an inter-dependent world?

2. <u>The Limits of Market Regulation</u>.

The part which competition in a market plays or can play in regulating distribution is bound to diminish in developed societies

of Western type with the increasing complexity of the budgetary task. To assess its diminishing role in Western societies to-day, as compared with political regulation, it is useful to consider what role market choice plays, or could play to-day in distributing the product of a developed Western state between its manifold uses and users. My experience is British, but I hope - or should I say fear? that what follows has some application in other Western states.

In regulating the supply and distribution of goods and services which are personally chosen and paid for the market still plays an important part; but even this is shrinking. Professor Galbraith has been persuading his fellow economists for some time that the choices of individual consumers are a diminishing influence on what the few and mighty producers find it most profitable to produce. Except where a single consumer, usually the government, dominates the market, consumers who want to exercise that dominance with which they were credited by classical economists, need to behave like Ralph Nader, rather than like economic men.

In determining the relative rewards of employment the market is even more impotent, for the greater part of these are nationally negotiated. When two monopolists meet to re-negotiate the price of something which neither can do without and neither can get elsewhere, they are evidently doing something utterly remote from what men do in a free market. They are in fact fighting a battle (which is an exercise in mutual coercion) muted or sharpened by appeal to conflicting ethical criteria, of which there are at least nine (2). Since the most fully accepted, though the least justified of these criteria is that those whose productivity is multipled by machines shall have the benefit from their increased productivity, rather than the consumers, wages rise most rapidly in the capital-intensive industries. These set standards to which the labour-intensive industries appeal in the name of another and a stronger ethical

criterion, which evokes enough response to threaten those industries with penury, if not insolvency but not enough to satisfy the ethical claims of their employees. Meantime the pacemakers in the capital-intensive industries continue to over-price themselves in relation to the machines to which they owe their increased earnings and make it profitable, even necessary for their employers to replace even more of them by even more expensive machines. So corporations, public as well as private, redouble their efforts to eliminate the jobs which it is one of their prime social functions to provide, whilst the government redouble their efforts to make more jobs and the trade unions throw their overwhelming weight behind <u>both</u> these contradictory policies. Inflation, unemployment and inequitable reward are the inevitable result of a system so bizarre. But no-one should blame the market for these disasters, because a real market plays virtually no part now either in maintaining employment or in determining differential earnings.

Especially in crowded countries such as England, but also in the urban areas of countries far less densely populated, the market is even less adequate to determine between conflicting land uses; for the supply or urban land becomes ever less sensitive to price and invites speculation which multiplies its scarcity. Negative planning increasingly intervenes to express political choice. But merely negative control soon becomes insufficient to take account of all the costs and benefits to third parties, most of them unborn, which the parties to the transaction, if they know their economics, are supposed to disregard as "external disutilities". In a finite space occupied by a population expanding in numbers and activity market regulation is bound to give way increasingly to political regulation in determining the use of land.

Of capital investment in Britain, about half is made by

government or its agencies and expresses political choice. And though in state-controlled enterprises government at present fixes rates of return which it expects to get on its money, these, even when they are attained, are only conditions of operation, not criteria of success. The criterion of success is the success with which the enterprise carries out its statutory functions; and of this the earning of a given return on capital is, for a monopolist, no criterion whatever. For other sectors of government activity, such as health and education, the return on investment cannot even be calculated. In the private sector successful industries increasingly finance themselves out of retained profits. And in the area which still is regulated by a market, conditions are so distorted, largely by inflation, that the least attractive borrowers include the government itself.

Only in the regulation of foreign exchange are anything like the conditions of a market present - and there only because in this sector alone there is lacking an organ capable of expressing political choice. The resultant fluctuations are so embarrassing that the finance ministers of developed countries periodically spend much time in trying to stifle the last signs of life in the last living sector of market regulation. To this I will return in a moment.

I exaggerate and over-simplify. There is room for qualification and amplification. But the main conclusion seems to me to be crystal clear. In deciding who gets what the role of the market has diminished and must continue to diminish, whilst the importance of political choice and regulation is growing, and must grow.

We may regret this on political, even more than on economic grounds. Economically the free market system multiplies the abundance of all goods that are widely desired and can be supplied and enjoyed by a large population of producers and consumers, corporate or personal.

This is an achievement which none will wish to forego, especially the poor, including the relatively poor of rich countries. But the political boons of the system may have been even greater. So long as its ethic was accepted, it silenced ethical argument; for the impersonal decision of the market could be blamed on no human chooser. Moreover the market opened avenues of activity, indefinitely expansible, to all those ambitious, domineering men who would otherwise have gone into politics. There is always room for another millionaire, but never for another Prime Minister and seldom for another top civil servant. So the competition of the market mutes the far fiercer competition of political life. We may justly fear the enlargement of the ethical dimension which follows the enlarged need and scope for political choice. But that is the kind of world in which we have to learn to live.

3. The Scope and Influence of International Trade.

In mid-19th century international trade focussed the highest ethical hopes of liberal minds, especially in Britain. They believed as passionately as Marx that the State would wither away and with it both internal oppression and international war. But the agency to which they looked for this transformation was free international trade, which was to usher in a Great Commercial Republic as wide as the world. At the opening of the first great industrial exhibition in London in 1851, Prince Albert, husband of our Queen Victoria said:-

"Nobody who has paid any attention to the peculiar features of our present era will doubt for a moment that we are living in a period of most wonderful transition, which tends rapidly to accomplish that great end to which all history points - the realisation of the unity of mankind".

The exponents of Free Trade in Britain, crusading for the abolition of taxes on imported corn, preached a gospel not of competition, but of natural co-operation, based on the complementary nature of the world's skills and resources. They believed they had discovered a principle of in-built harmony as profound as Newton's laws.

It is significant of our changed assumptions that we in Britain have this year embarked on closer economic association not with countries whose economics are most complementary to our own, but with those which are most competitive. Among undeveloped countries the process which was to unify the world is called neo-colonialism. It is often hated by its supposed beneficiaries almost as much as political domination. And it is far more widespread. It is known in Canada and England, as well as in Chile and Brazil.

The world to-day is far more inter-dependent than it was a century ago. Many once self-sufficient though undeveloped countries have become dependent on the markets of the West; and Western countries have become dependent on the resources, if not the markets of the undeveloped world, not merely for growth, but to sustain their present level of affluence. Yet the result is far from the noble dream of the Great Commercial Republic.

What has gone wrong? Two things, I think, have gone wrong. Our great-grandfathers overrated the extent to which international trade could be self-balancing without being self-limiting. And they also failed to realise that the greater the responsibility assumed by any government for the well-being of its country, the more it must be driven to control the use of foreign exchange whenever it and its nationals want to buy abroad more than they can pay for. Useful as money is, it can only facilitate multi-lateral exchanges. It cannot transcend the basic fact that exchange takes place only to the extent that all parties expect to get what they will accept as equivalent

value to what they put in. The position of many states, not only undeveloped states, is far too precarious for them to allow market forces alone to decide how they should allocate their scarce resources for international exchange.

Undeveloped countries are of many types. Some are undeveloped for economic reasons; they lack resources or the means to develop them. Some are undeveloped for political reasons, because power is vested in a class which development would threaten or because they resist developments which would threaten their culture or their independence. Some, notably the oil producers, are extremely rich but in a limited and non-regenerative resource. And across this varied pattern falls the different division between those whose populations already threaten to exceed their resources and those which still have a margin.

The most common situation, however, is that the less developed countries want to buy more abroad than they can pay for - more, that is, than the world outside their frontiers wants to buy from them. Although the price mechanism, where it is allowed to work, helps to make more competitive whatever they have to offer, it cannot displace the general rule that internationally, as well as nationally, those in greatest need have least to offer. That is why they are in need.

Traditionally we have two ways of enlarging this limitation. One is by enterprises established by developed countries in undeveloped countries. The other is by loans. Both have changed in character. The "immigrant enterprise" is now often a branch of a multi-national company. The loan, is made, if at all, by national governments or by international organisations, notably the World Bank. A third and new way, still in its infancy, is the unrequited transfer of services or goods or the means to buy them.

What can we expect of these liberators of international trade? We might expect that investment would breed less conflict than lending. The host country incurs no debt to the foreigner who sets up business there. It exercises sovereignty over him, no less than over its own citizens. It benefits from the wealth which the enterprise generates in the country. And though the host country incurs the burden of transferring profits abroad, this is often more than offset by the exports generated by the investment. The greater the investment, the greater the power of the host government to bargain with the entrepreneur. It might be expected that foreign corporations would hesitate to commit themselves to undeveloped countries, rather than that host countries would resent their presence.

The reverse is often true and the reasons deserve most careful attention. My impression is that relations between immigrant enterprises and the governments and peoples of their host countries are largely governed by three factors. One is the degree of the immigrant's commitment. Companies with world-wide activities are far less committed to any one country of operation. And though the possibility of thus spreading their risks may enable them to make investments which would otherwise be too risky, the same fact must make them more suspect to the host country.

A further factor is the nature of the enterprise. These are of four main types. Most basic and historically earliest is the construction of transport and power facilities, railways, harbours, roads, generating stations. Next come two similar activities with sharply different psychological effects, one the exploitation of non-regenerative resources, such as oil, the other the cultivation of agricultural and farming produce for export, such as rubber, tea and meat. Finally and most recently is the manufacture, largely for export, of manufactured products from imported machinery, using cheap

local labour.

All these four kinds of development tie the host country to world markets - and to the same extent open world markets to it. All have social and psychological effects independent of their economic effects. The development of agricultural production often substitutes a mono-culture with an unstable money return for an established system of self-subsistence by small units. Mineral exploitation adds the sense of irreplaceable loss. Manufactures bring with them the routines and alues of urban, semi-skilled employment.

Yet another factor is the gap in personal wealth and the difference in culture between the representatives of the immigrant enterprise and local population.

It is not surprising that stresses should be at their worst where transient representatives of an alien culture, individually richer than any but the richest local magnates, supervise the export of a non-regenerative resource, the proceeds of which enrich only the upper strata of the host society.

Perhaps they are least acute - for underdeveloped countries - when their new urban proletariats, using Western plant under Western management, pour Western goods into Western countries at Southern or Eastern prices. They are corresponding unacceptable to the West, which protects its standards of living against the competition on which it is supposed to thrive. To do otherwise would admit the obvious but unpalatable fact that the gulf between North and South will be closed only by levelling down as well as by levelling up.

It remains to consider the future of international lending. For decades before the first world war, loans to undeveloped countries or to enterprises within them, were floated and subscribed on the money markets of the developed world. Many went unserviced. No

longer supported by the mythology of the market or by the relative stability of the colonial world, such loans have virtually ceased for many years. Outside the systems of the multi-lateral companies, loans are to-day made only by governments or by international or multi-national agencies. They are unlikely to be made primarily for financial motives. But if they are regarded as loans at all, the lender must have some credible prospect of receiving interest on his money and ultimate repayment, if not through a sinking fund, at least from the proceeds of further loans. Most Western states have huge funded debts which no-one expects them to repay. If inflation can be contained, this system may survive and may be extended to some states of the undeveloped world.

These assumptions, however, are most unlikely to hold for those parts of the undeveloped world which need most and have least to offer. Investment supported by loans will not suffice for these needs internationally, just as it fails to meet them nationally. As I have already stressed, even the most capitalistic, market-oriented societies of the West keep their mixed economies going by massive unrequited transfers of purchasing power. So it should not surprise us that the decades since the last war have seen the beginnings of unrequited transfers across national frontiers. History will, I think, salute the memory of those who saw the need for such an unprecedented course, and took the first exploratory steps.

But we are still a long way from securing for undeveloped countries even the 1% GNP which was proposed by the United Nations as an appropriate contribution from developed states. And even so we have discovered the sheer difficulty, even given the will, of transferring international buying power in a form useful to the recipient. For it is useful only in so far as it enables the recipients to get what they need. This requires competent government in the recipient country and willingness in the donor countries to

provide what the recipients want, whether they themselves can supply it or not.

To reduce inequalities of wealth internationally or even nationally will require sacrifices by the 'haves' for the benefit of the 'have-nots'. This will require a revision of Western, if not other value systems. Already the right to equality of opportunity, itself a newcomer among human rights, is being overtaken, nationally in Western countries, by the even more newly claimed right to equality of enjoyment - which is just what equality of opportunity does not provide. This will be even more true internationally. But the necessary inferences have not been drawn yet, because of the assumption that growth will take care of everything. This seems to me demonstrably false, even if the prophets of ecological doom are wholly wrong.

4. Rivalries derived from limits to growth.

International relations between East and West and between North and South, even between members of each group, are bound to be affected by the trends which we have come to call limits to growth, however successfully those trends are met.

Doomsters and expansionists alike agree that those countries which now use increasingly more energy to convert increasingly more materials to their use will soon exhaust their normal sources both of materials and of fuel. Both parties also agree that mounting pollution will have to be curbed. Both agree that the capacity for photo-synthesis is in theory limited. Both agree that multiplying populations will transform human societies and unless curbed will render all the other problems insoluble. The disputants differ only in the degree of confidence with which they expect the countries affected to devise alternative materials and fuels, to curb pollution, to extend photo-synthesis and to level off populations at a viable and

acceptable level. Few of them notice that the efforts which these challenges will elicit will transform both national and international patterns of distribution and their inherent value systems, whether they succeed or fail in meeting the limitation.

Undeveloped countries, already over-exposed to the vagaries of world markets, will protect themselves as best they may and will make the most of what advantages they can draw from the possession of scarce resources. Developed countries will have to divert ever more resources to substituting materials and energy supplies, controlling pollution and maintaining an ever more artificial environment. In general this means that they will spend more effort for the same or a diminishing unit of return. This will probably diminish the total available for personal consumption. It will also demand research and development on a scale and at a risk which only the State will be able to carry. For example, all our present sources of energy, except wind and water, are exhaustible or polluting or both. If future acceptable energy supply depends on a technology not yet invented, some at least of the developed states may now have an interest in its research and development comparable in urgency and importance with that which powered the Manhattan project.

Meeting the threats from "limits to growth" will hugely disturb international trading patterns, re-direct technology, reduce real productivity, reduce many personal incomes, alter the relations of the West to most of the South and East and speed within Western countries the already changing relations between state and enterprise. And it will do these things just as much if it succeeds as if it fails.

Some Implications

The course of history, it seems, will require all political societies to revise their value systems both in content and in extent. The second is the more important and the more difficult. The question - "What do I owe my neighbour?" is less searching than the question - "Who is my neighbour?" and answering the second often answers the first. Most changes of social valuation, such as the abolition of slavery or the treatment of insanity as illness, came from changing our definitions, rather than our valuations. We are required to extend the boundaries between self and other and between present and future to a degree which will certainly not be fully achieved. Let us at least avoid the easy option of polarised conflict, which is what we fall back on when the demands of our multiple memberships are too much for us.

We have only a small initiative in the management of our societies and even that we may lose for a time. We have no assurance of success and no clear sense of destination. In any case success cannot be won once for all and no destination is more than a staging point on an endless journey. But we can have a sense of direction and that should be enough. It is the direction of the more human, rather than the less human. Men may differ, even fight to the death about what this imperative requires of them in any given situation. But if they are honest and committed and as humble as committed people can afford to be, the result, I believe, will be more likely than not to move other societies as well as their own in what later generations will judge to have been the right direction.

This at least, is what I read in the moving and not wholly ignoble story of mankind.

Notes and References.

1. I have done so more fully in Values, Norms and Policies. Policy Sciences Vol. 4 No. 1, March 1973.

2. According to an analysis in Changing Ethics of Distribution, Futures June 1971.

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