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The two civilizations and the process of development

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The two civilizations

Twenty years ago C. P. Snow wrote an essay on the ‘two cultures’, calling attention to the differences that exist between the scientists and the literary intellectuals, deploring the lack of communication and understanding between them, and making a strong plea for the emergence of a more integrated culture in which the humanities and the sciences would contribute equally, and grow through mutual interaction. His essay caused great commotion in intellectual and scientific circles and led to a spirited debate that lasted several years.

However important the differences and lack of communication between Snow’s ‘two cultures’ may have been, they have been overshadowed by the more profound and disturbing material and intellectual differences between the rich and the poor nations of the world. Indeed, Snow made reference to these glaring inequalities and attributed their existence in part to the inability of the West, with its divided culture, to grasp their magnitude and to understand the need for urgent and profound structural transformations of social, economic, political and cultural character.

A variety of studies and research efforts carried out during the last three decades brought greater understanding of the historical origins, the present manifestations, and the future prospects of the differences between developed and developing countries, and have shown that the growth of modern science and the emergence of science-related technologies are at the root of these inequalities. To a large extent these studies have been the product of the work of intellectuals and scientists from the Third World who managed to bridge the two cultures that, according to Snow, have been mostly isolated in the Western industrialized nations.
The social, economic, political and cultural scenes of the remainder of this century will be dominated by the growing chasm between the developed and the developing countries, to the extent that it is becoming possible to speak of 'two civilizations'. The 'first civilization' is based on the growth of science as the main knowledge-generating activity, the rapid evolution of science-related technologies, the incorporation of these technologies into productive and social processes, and on the emergence of cultural and appreciative forms deeply influenced by the Weltanschauung of modern science and science-related technologies. The 'second civilization' is characterized by the lack of a capacity to generate scientific knowledge in large scale and by a passive acceptance of scientific results generated in the first; by a technological base that comprises a substantive component of traditional techniques and a veneer of imported techniques; by a productive system whose modern segment is dependent on the expansion of production in Western industrialized nations and on the absorption of imported technology, and whose traditional segment vegetates and is based on an often stagnant traditional technological base; and by the coexistence of disjointed and even contradictory cultural forms.

The first civilization, corresponding to what are called the developed or highly industrialized countries, have an endogenous scientific and technological (S&T) base; the second civilization, corresponding to what are called the underdeveloped, developing or Third World countries, have an exogenous (S&T) base. While these concepts simplify to a considerable degree the diversity of conditions found in the real world, the existence of these two distinct civilizations is a phenomenon that cannot be ignored.

Unlike Snow's two cultures—which remained more or less in isolation in the industrialized West—these two civilizations interact strongly, although the interaction is one-sided: the second civilization is dependent and deeply affected by the first and lacks the capacity of influencing the first civilization to the same degree in return. For example, one of the most complex and disturbing forms of this one-sided pattern of influence is the existence in the developing countries of the second civilization of élites that reproduce the thought patterns, styles of life, and consumption habits of the first civilization, thus becoming alienated from their own context. This alienation renders them incapable of embarking in a creative search for alternative cultural forms and styles of development that may give rise to a 'third civilization' in which the pursuit of modern science, as well as
its material and intellectual manifestations, could be integrated harmoniously with the social, economic, political and cultural heritage of the developing countries of the second civilization.

The first civilization: endogenous S&T base

Whether as a result of an internal cumulative process (Western Europe) or of a transplant which later on grew its own roots (United States, Japan, the USSR), in the countries of the first civilization the systematic generation of knowledge and the production of goods and services were linked organically through the development of techniques related to scientific findings. New knowledge was transformed into products without the need of resorting to substantial external assistance, except for the normal process of contrasting scientific findings. The emergence of scientific and technological capabilities in the West can be understood by examining the evolution of ideas that led to science, the successive transformations of productive techniques, and the merging of these two currents.

Considering briefly the evolution of Western thought, it is necessary to go back as far as the Hellenic period. Starting with the pre-Socratic philosophers, who began to elaborate abstractions of the world surrounding them; going through Plato, who introduced the concept of ideals; and continuing with Aristotle, who formalized logic and the concept of method, the ability to build and relate concepts abstracted from reality was first developed in Greece. During the Roman era and the Middle Ages few new elements were added to the Greek conceptual edifice, although the concept that nature contained understandable regularities was related to the prevailing view of a certain divine order imposed on the world. Also, the influence that the Islamic culture had on Europe towards the end of the Middle Ages helped in the development of schemes for manipulating concepts and symbols (e.g. algebra), and motivated a return to the examination of natural phenomena (witness the concerns of the alchemists).

The Renaissance brought a revaluation of manual labour and of detailed observation, which would facilitate the full contrast between abstract concepts and physical phenomena, thus paving the road for modern science. Philosophers began to worry about machines, systematic astronomical observations helped navigation, and the reinstatement of manual labour (which had been looked down upon during the Middle Ages) reached its culmination with the work of
great artists such as Leonardo da Vinci. The contributions of
Copernicus and Galileo on the celestial order led to the triumph of
reason over dogma, and constituted a milestone in the transition from
religion to science as a way of explaining natural phenomena. Lastly,
Newton’s contribution, introducing the idea that the universe was
predictable and obeyed certain laws which could be known and
tested, changed radically man’s conception of the world, giving sense
to the Baconian statement that man can master and control nature
through understanding.

Considering now the techniques used in productive activities, the
Middle Ages and the Renaissance saw a cumulative evolution of the
crafts practised by artisans, which were gradually transformed into
manufacturing activities, and later, during the seventeenth century,
into industrial activities proper. The milestone marking this tran-
sition was the use of machines to manufacture machines, referred to
by Marx as the ‘emergence of large-scale industry’.

This took place concurrently with a gradual but relentless shift from a polytechnic era
of varied local technological responses, usually in harmony with the
environment (although there were exceptions such as the environ-
mental contamination in London due to coal utilization during the
thirteenth and fourteenth centuries), towards a monotechnic era in
which the variety of responses is reduced and a few specific production
technologies predominate in each field of activity.

The merger of both currents—the evolution of thinking and the
evolution of technology—constituted what has been referred to as the
‘scientific and technological revolution’. This was a complex process,
full of sinuosities and blind alleys, where science, on the one hand,
and productive techniques, on the other, interacted strongly and
conditioned each other, primarily in Western Europe. This process
lasted approximately 200 years, starting in the mid-seventeenth
century, and has originated strong debates on the relative contri-
bution of both currents. Broadly speaking, it appears that during a
first stage craftsmen and manufacturers made a greater contribution
to the growth of science (especially to its experimental aspects
through the construction of instruments), than that made by scien-
tists to the productive activities of artisans and industrialists. How-
ever, towards the end of the period mentioned, the findings related
to mechanics, chemistry, optics, thermodynamics, and other areas
of knowledge were making an equal or perhaps larger contribution
to the development of production techniques than the latter to the
development of science.
The point of inflexion marking the beginning of the predominance of science-related technologies over the techniques that evolved in a gradual and autonomous way, was the emergence of the first productive activities based on scientific findings: the electric and chemical industries. Since then the contributions of science to production have been growing at an accelerated pace.

The marriage of science and production took place while techniques of lower relative efficiency were being abandoned, in accordance with the economic criteria prevailing at the time. The process of reduction in the variety of technological responses, which started towards the end of the Middle Ages, was suddenly accelerated, to the extent that in many cases it totally disrupted the cumulative development of traditional technologies, and led to what Mumford called 'the loss of the polytechnic heritage'.

The subsequent evolution of the interactions among science, technology and production in the countries of the first civilization that count with an endogenous scientific-technological base is well known. The rapid pace of technological progress during the last 100 years has been extensively documented and we shall only point out some milestones, such as the replacement of the individual researcher by organized laboratories, which started towards 1890 and is now widely spread; the incipient use of warfare technologies based on scientific findings during the First World War, and the diffusion of technological knowledge and values brought about by the improvement of the internal combustion engine and the massive production of automobiles. The period between the two world wars witnessed the great advances in physics, which culminated with the development of the atomic bomb, and in chemistry, which led to the widespread production of new synthetic materials. Finally, the Second World War and post-war periods may be characterized as the age of the scientific explosion, in which the advances in electronics, biology, chemistry, cybernetics and many other fields, transformed science into the key source of changes and improvements in production techniques. In countries with an endogenous scientific-technological base, this was associated with an increase in the minimum critical mass of resources required to do science and by an unprecedented expansion in the scientific-technological effort, to the extent that Machlup could state that, in 1960, more than one-third of the economically active population of the United States was linked in one way or other to the 'knowledge industry' (research, teaching, information, etc.).
Retrospectively, in those countries of the first civilization the last 400 years have witnessed the emergence of the profession of generating knowledge in an organized and cumulative way, and have seen the evolution from science as practised by individuals, to that carried out by an incipient collectivity of scientists, and to that currently undertaken by a full-fledged scientific community. This community acquired legitimacy not only because of the increasingly coherent explanations it gave to natural and, to a lesser extent, social phenomena, but mainly because it demonstrated its usefulness for the development of production techniques, a usefulness anticipated by Bacon in the early seventeenth century when he stated that knowledge in itself is the source of power.

Perhaps the most important feature of the scientific-technological revolution, referred to by Kuznets as an 'epoch-making innovation', was the discovery and improvement of the methodology of invention, which, building on the foundations initially laid by the Greeks, allowed the limitations of the materials and procedures resulting from the slow and gradual process of technological evolution to be transcended. Once this barrier was crossed, the possibilities open were enormous and are bounded primarily by the advances of knowledge and the limitations of the human mind.

However, the illusion that this was a conscious, orderly and planned undertaking must be dispelled. The emergence of this key characteristic of the first civilization took place in a spontaneous fashion, covering a wide spectrum of areas, duplicating efforts, with many false starts, and showing a series of contradictions. Notwithstanding that, the self-corrective nature of science allowed for changes in course to be effected; although always within the broad directions determined by the conjunction of the interests of scientists and those of states and institutions financing scientific activities.

The second civilization: exogenous S&T base

The majority of underdeveloped countries of the second civilization, in contrast with Western European nations and others such as the United States and Japan, did not establish a basis of productive technologies related to scientific findings of their own. There was no linkage between the development of activities devoted to the generation of knowledge and the evolution of production techniques, with these two areas remaining isolated from each other.
The diffusion of Western science to countries with an exogenous scientific and technological base was an irregular process, entailing a partial acceptance of results, but without full awareness of the cumulative processes that originated them. The conduct of science in these countries, even to a greater extent than in countries of the first civilization, was an activity limited to the élites and to isolated pioneers who lacked organic links with their social environment, at least in what refers to their scientific activity. Their efforts were inherently out of phase in time, since the frontiers of knowledge were being explored in other parts of the world and they received information on advances and findings with unavoidable delays.

Thus, the pursuit of science did not grow roots in the countries of the second civilization until the first decades of the twentieth century, and even then it acquired a fragmentary and imitative character, divorced from the productive sphere. In some cases, such as India in the nineteenth century, the colonial power deliberately excluded the potential local scientists from research undertaken by the colonizers, thus retarding the development of indigenous scientific-technological capabilities.\textsuperscript{11} Science was mainly oriented towards the knowledge-generating world centres, and the concern for local problems arose in so far as it was necessary to know better the environment for a more intensive exploitation of resources, or in so far as curiosity and the possibility of contributing to the advancement of world knowledge would motivate scientists to focus their efforts on specific local problems.

The nature of productive activities was conditioned first by the interests of the colonial powers and then, after some regions became independent (particularly Latin America), by the way in which their economies were incorporated into the international division of labour accompanying the expansion of the capitalist system. Due to this, productive activities in these countries were oriented primarily towards the extraction of natural resources of interest to the colonizers or foreign capitalists, and to the generation of surpluses to be transferred abroad.

Most of the techniques used in productive activities were imported, and this meant that the associated technological base was alien to the local environment. When the implanted extractive and manufacturing activities began to acquire greater relative importance in the local economy, the corresponding technological capabilities were expanded through new technology imports. As a result the countries of the second civilization acquired a superficial layer of modern
technical knowledge, disconnected from their physical and social reality, and which depended on outside sources for its maintenance and renovation.

Considering now the traditional technological base, it is possible to say that after a relatively short lapse at the beginning of the colonial period during which colonizers learned to operate in an alien environment, the indigenous non-Western technological tradition, which had been developing slowly and cumulatively for a long time (through a process similar to that which took place in Europe during the Middle Ages), was eliminated or left aside, primarily because it did not serve directly the interests of colonizers and later of capitalists. This elimination process was particularly drastic in those regions that had achieved considerable progress independently of the West (e.g. the Andean world), and its social consequences were disastrous. Nevertheless, some of these traditional activities remained at the periphery of economic life, to the extent that they supplied in part the means of subsistence to those involved in the productive activities that were implanted.

The demise and substitution of traditional productive activities implied a reduction in the variety of indigenous technological responses developed through time, and led to the total disappearance of many of them. Since in these regions the European counterpoint between traditional techniques and those related to scientific knowledge did not take place, but rather the new techniques were implanted once they were highly perfected, the disappearance of traditional techniques took a more radical character than in Europe. The shift from what Mumford called the ‘polytechnic age’ to the ‘monotechnic age’ was particularly violent in the countries of the second civilization that have an exogenous scientific-technological base.

These three components—the scientific knowledge-generating activities, the technological capabilities associated with implanted productive activities, and the traditional or indigenous technological capacity—have had practically no interactions among themselves in the countries with an exogenous scientific and technological base. Their evolution (involution in the case of the traditional technological capabilities) has taken place in isolation, and the fusion of science and production, which characterized the countries of the first civilization with an endogenous scientific and technological base, did not occur. Moreover, the elimination of traditional technological capabilities was more traumatic and disruptive in the countries of the second civilization in comparison with those of the first civilization.
The prospects for a third civilization

The social, economic, and intellectual disparities between the countries of the first and second civilizations, which are the result of the historical processes outlined above, are too large and striking to be endured for a long time without major disruptions in the international scene. Noting that modern science-related technologies are at the root of the advantages enjoyed by the countries of the first civilization, the immediate temptation is to embark on a wholesale process of 'technology transfer' from industrialized to developing nations.

However, while acknowledging that modern science and technology are essential components of any development strategy, at least for the remainder of this century, a massive and uncritical process of technology transfer would lead only to a partial displacement of the material and intellectual fruits of the endogenous S&T base that characterizes the first civilization, but would not lead by itself to the development of endogenous S&T capabilities in the Third World. Furthermore, the overwhelming stock of modern scientific and technological knowledge, as well as the methods of scientific inquiry and the concerns that modern science responds to, are the product of four centuries of interaction between science and production in the countries of the first civilization. Therefore, it would be necessary to examine, screen and adapt these findings, methods and responses in order to use them as one of the starting-points for a gradual process of endogenization of the S&T revolution in the developing countries (another starting-point would be the selective recovery and reinstatement of their traditional technological and cultural heritage).

Taking into account the material and intellectual disparities between the first and the second civilizations, the essential character of modern science and technology as components of any development strategy, and the need to preserve the cultural identity and heritage of the developing world, it becomes imperative to embark in a creative search for a third civilization, within which to pursue new development paths and in which modern science and the cultural heritage of the Third World countries could be integrated harmoniously. This is an arduous and long-term task, requiring a collective effort on the part of the world community, and imposing the need for a careful appraisal of pitfalls and possibilities. The recent examples of Iran, where a forced 'modernization' process ignored the cultural values that prevailed for more than a millennium and led to an almost
inevitable wave of social unrest; and that of China, where an attempt was made to side-step the fruits of modern science and technology for nearly a generation, resulting in technological backwardness and leading to frantic efforts to ‘catch up with the West’ by the year 2000, indicate some of the problems that will be faced by the developing countries of the second civilization that do not maintain a balance between adopting modern science and technology and preserving their own cultural heritage.

The process of searching for a third civilization that would provide a legitimate and more viable framework for the pursuit of alternative development strategies, requires a change in the perspective from which the concepts of ‘development’ and ‘progress’ are viewed. Despite its unquestionable achievements, the Western scientific-technological culture of the first civilization should not be considered as the universal model to be imitated by the countries of the second civilization; it should rather be viewed as one of the many phases of a global and historical process of material and intellectual evolution. There is a need to discard the implicit arrogance of Western culture which makes the first civilization consider itself as the model to be followed by the developing world. A more ecumenical perception of the processes of development and progress is required, in which the potentialities of the many cultures that are part of the second civilization would be revalued and appreciated, particularly if we have the foresight to visualize what could be achieved if a harmonious integration of their cultural heritage with modern science were possible.

The emergence of a third civilization in the future is at present an intuitively justified necessity, even though the urgency of the search for a third civilization does not lose force because of this. The present and unacceptable predicament of the developing countries belonging to the second civilization, and their impossibility to fully join the first, indicate that the avenues for their future development lie in the direction of evolving towards a third civilization. However, the number and variety of tasks involved in this process of creative search is very large, and the intellectual and practical difficulties should not be underestimated.

Two of these tasks will be mentioned briefly in this essay: the development of new ‘ways’ or ‘styles’ of doing science more adapted to the needs of the Third World; and the recovery of the traditional technological base of the developing countries. The first is closely related to the debates on whether science is one and universal, or
whether it is possible to evolve local varieties of science; while the second overlaps to a certain extent with the debates on 'primitive' and 'modern' modes of thought. However, these two tasks will only be examined here from the perspective of developing endogenous scientific and technological capabilities as a step in the search for a third civilization.15

There have been many discussions on the question of whether it is possible to evolve a Latin American, Islamic, Asian or African science, in contrast with the supposed universal character of modern Western science which would not admit local variants. In a sense, this debate is an outgrowth of the much wider debate between the 'internalist' and 'externalist' schools of thought in the development of science, which attribute the main driving force of science to causes internal to the scientific enterprise and to the social context of science respectively.16

However, it is clear that the rate and direction of scientific progress is affected both by considerations of external and internal nature to the conduct of scientific activities. In the first instance, the social context and the way in which the economic surplus is generated and allocated for the support of science will influence the character and orientation of scientific research; the basic cultural patterns and the intellectual framework that characterize a given nation will have a bearing on the way problems are conceptualized and on the way scientific activities are carried out; and the way in which science interacts with the particular forms adopted by technology (and through it with society) will all give the conduct of scientific inquiry a 'local flavour'. On the other hand, factors internal to the conduct of science such as the cumulative character of the knowledge-generating process of scientific research, in which discoveries lead to new discoveries; the opening of new possibilities and the puzzle-solving character of scientific inquiry, in which is possible to identify precisely a gap in knowledge and focus on it; and the motivation of practising scientists, all give a certain 'universal flavour' to the scientific enterprise.

But if science were to be integrated with the cultures of the developing countries, so as to lead to the growth of endogenous S&T capabilities, it will be necessary to pay increasing attention to the factors that confer science a local flavour and condition the possibility of its being combined with the cultural heritage of the developing countries. Even though the debates among internalists and externalists are rather old, the efforts to assess the viability of science with a local
flavour from the perspective of the Third World are rather scarce.

As an initial approximation, the process of scientific inquiry can be said to proceed through three iterative and recurrent steps: identification and formulation of problems in ways amenable to be approached by the scientific method; postulation of hypotheses and tentative responses to the problems identified; and verification and testing of these hypotheses through rigorous methods.

The process of identifying, selecting and formulating problems so that they would be amenable to attack through scientific research is clearly influenced by economic, social, political and cultural factors. While the choice of an individual research project may be more affected by considerations closely linked to the conduct of scientific research, the overall thrust of the scientific effort of a given nation is clearly conditioned by the general context in which science is inserted. The postulation of hypotheses and the building of theories to be tested are also influenced by broader considerations of a cultural character. This is a process where creativity finds room for expression, and where there is room for the modes and habits of thought that characterize different cultures to manifest themselves. Finally, the process of testing and verifying hypotheses must allow for the possibility of independent corroboration, and should contrast rigorously the hypotheses—and the predictions derived from them—with the actual behaviour of the phenomena under scrutiny. This aspect of the scientific process is the least amenable to the introduction of 'local' considerations, and verification methods should, at least as a scientific ideal, be truly universal.

This implies that a 'local flavour' could be inserted in the conduct of science through the first two stages of problem identification and formulation of hypotheses, and that in the stage of verification it becomes necessary to maintain the universal character of the scientific enterprise. Therefore, it appears possible—at least in principle—to orient the growth of science in the developing countries in directions that would respond more to the local conditions and take into account their cultural heritage, while at the same time maintaining the crucial aspects of universality that are essential for the conduct of modern science.

The recovery of the traditional technological base of developing countries has received increasing attention during the last decade, with efforts focusing on the way in which traditional knowledge and techniques could be used as starting-points for the development of new technologies that would be more appropriate to the developing
countries of the second civilization. This does not imply a rejection of modern science and technology, but rather the selective use of traditional knowledge and techniques as a point of departure to introduce the methods, approaches, and products of modern science and technology for the systematic upgrading and improvement of the traditional technological base.

As mentioned before, it is a historical fact that modern science and technology were grafted into the Western European technological tradition, although in principle there is no reason why a similar grafting process could not take place in other cultures, provided that the socio-economic and cultural context were favourable. However, this process of selective recovery and upgrading of the traditional technological base should not be confused with the return to an illusory golden past, and with an uncritical valuation of all that is old in the countries of the second civilization.

These two components—the evolution of new forms of science with greater local flavour and the recovery of traditional knowledge and techniques—illustrate the elusive and difficult nature of the process of building an endogenous S&T base, which is an essential component of the creative search for a third civilization.

Some implications for the educational process

The industrialized West has began to realize that the scientific-technological character of the first civilization requires major changes in the educational process. Developing countries, confronting the challenges typical of the second civilization, have also began to experiment with changes in their educational systems, largely inherited from the West. Here I shall refer briefly to some of the educational implications of the two aspects of the search for a third civilization outlined in the preceding section.

Four general issues can be identified if education were to play an active and positive role in the development of endogenous S&T capabilities and in the search for a third civilization: emphasizing the teaching of science, its approach, methods and results; reasserting the importance of the traditional cultural heritage; organizing educational activities around problem areas where modern science and traditional culture could be integrated; and fostering a favourable climate for the social, economic and political transformations that are necessary for evolving towards a third civilization.
The first two are derived directly from the discussions of the preceding section. Without an understanding of the nature and role of modern science and technology, and without an acceptance and valuation of their own cultural heritage the developing countries of the second civilization can hardly be expected to engage in a collective search for a third civilization. The role of the educational process in this regard is evident: as the main vehicle for the transmission of knowledge and values it has the double responsibility of creating an awareness for the importance of modern science and the cultural heritage, while at the same time providing the conceptual tools and the knowledge necessary for society to engage in the development of endogenous S&T capabilities. These two issues have implications that affect the educational system at all levels, from pre-school to postgraduate education, for at each of these levels it is necessary to introduce the outlook of modern science and to emphasize the valuing of cultural traditions. Tensions and contradictions will undoubtedly emerge in the process of dealing with these two issues, and to a large extent they will mirror the broader and more acute tensions that exist between the first and second civilizations. Without diminishing their importance or ignoring their possible disruptive influence, it will be necessary to learn to live with these tensions and contradictions throughout the whole process of search for a third civilization.

The third issue refers to the organization of educational activities around problem areas of critical importance for development, in which the evolution towards science with a local flavour and the recovery of the traditional cultural and technical heritage could be possible. In a wider sense, this amounts to selecting problem areas where the gradual process of creating endogenous S&T capabilities could be carried out and where educational efforts could bear practical fruits. Ladrière\textsuperscript{22} considers that the development of combined cultural forms, in which science and tradition could coexist and grow through mutual interaction, would only be achieved through concrete material and intellectual human actions, and that in the process of acting the individuals in a society provide the stage for the integration of modern science and the traditional cultural heritage. Thus the third issue of importance for education could be interpreted in terms of the need to focus the educational process on problem areas where human action could provide the basis for such an integration. Not all problems faced by the countries of the second civilization would provide an equally suitable stage for the integration of modern science with the cultural heritage, and it is necessary to develop criteria for
choosing an initial set and a sequence of problem areas for the educational process to focus on.\textsuperscript{23}

The fourth issue with implications for education refers to the importance of socio-economic transformations to provide a context where endogenous S&T capabilities could grow and the search for a third civilization could take place. It is illusory to expect that the major changes in the process of generating and using knowledge that would accompany the development of endogenous S&T capabilities could take place while the social, economic and political contexts remained unaltered. On the contrary, not only will the context be changed by the process of endogenization of the scientific and technological revolution, but such endogenization could not take place unless major socio-economic transformations were put into effect.

For example, the recovery of the traditional technological base and its gradual improvement through modern science requires the coexistence of techniques of different productivity levels, at least during a certain period. This would require institutional arrangements of compensatory nature for fixing prices and determining wages, so that modern techniques with higher productivity do not displace those traditional techniques that have lower productivity, giving time to test whether the latter can be substantially upgraded. In most developing countries such dissociation of wages and prices from productivity would imply major transformations in the socio-economic system. Furthermore, values such as solidarity, conservation of resources, and living in harmony with the environment, all of which would entail major changes in the form and structure of the organization of economic activities in most developing countries, should provide an axiological context within which the search for a third civilization could proceed. Once again, the role of education as the main vehicle for the transmission of values and knowledge is of paramount importance.\textsuperscript{24}

**Concluding remarks**

The developing countries must move away from the condition of underdevelopment that characterizes the second civilization, for which it is essential to acquire endogenous S&T capabilities. Joining the few countries with an endogenous S&T base that belong to the first civilization is neither a possible nor a desirable option, for it would entail abandoning the cultural heritage and losing the cultural
identity that give sense to the collective destiny of a nation. Therefore it is imperative to embark in a process of creative search for a third civilization.

To a large extent searching for this third civilization is equivalent to pursuing alternative development strategies, to engage in the quest for 'another development'. The essential characteristics of these alternative development strategies can be summarized as follows: they should be need-oriented, in the sense of meeting material and non-material human needs, including the need for expression, creativity, equality and for understanding one's own destiny; endogenous, that is, stemming from the heart of each society, which defines in sovereignty its values and the vision of its future; self-reliant, in the sense of each society relying primarily on its own strength and cultural environment; ecologically sound, which implies the rational use of the resources of the biosphere, in full awareness of the potential of local ecosystems and the limitations imposed on present and future generations; and based on structural transformations, which would alter social relations, economic activities and power structures so as to realize the conditions for self-management and participation in decision-making by the entire population.

This process of collective and creative search for a third civilization is perhaps the most urgent task confronting the present generation of intellectuals, philosophers, scientists and artists in the developing countries. It is necessary that this process of search move beyond an intuitively justified necessity and be formulated in more rigorous terms, that the visions be portrayed in ways that would make them accessible and tangible, and that viable options be offered for the developing countries to forge their own development paths within the framework of a third civilization.

Notes

2. Ibid., pp. 44–52.
4. This section and the following are based on F. Sagasti, op. cit.
12. For example, the drop in population in Latin America, which followed the Spanish Conquest. See R. Konetzke, América Latina: la época colonial, pp. 93–8, Mexico City, Siglo XXI, 1972.
13. For a philosophical account of the possibilities to achieve such integration see J. Ladrière, Les enjeux de la rationalité, particularly Chap. 9, Paris, Unesco, 1977.
14. Furthermore it is possible to anticipate the appearance of more formal justifications as a result of research efforts now under way, mostly in the developing countries.
18. For a discussion of the socio-economic transformations that are necessary to provide this context, see note 3.
20. See, for example, the recent debates on ‘lifelong learning’, Convergence, Vol. XII, Nos. 1–2, 1979.
21. See, for example, the articles on ‘Another Development in Education’, Development Dialogue, 1978, No. 2.
24. Ursula Le Guin in her novel The Dispossessed, New York, Avon Books, 1975, provides a vivid portrayal of a society forced to organize itself according to an egalitarian set of values because of material scarcities. The contrast with the prevailing forms of social organization in the ‘first and second civilizations’ is rather interesting.