HUMANIZING THE NATURAL SCIENCES: A METHODOLOGICAL IMPERATIVE FOR A SOCIETY IN TRANSITION.

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ABSTRACT

In this paper I argue that most of the remedies suggested for the impasse of the social sciences and the humanities today do not take into account that the fundamental problem at the root of the impasse is the artificial dichotomy between the natural and the social sciences. Goals like relevance, Africanisation, contribution to the Reconstruction and Development Programme are all symptomatic treatments of the problem, if these approaches are not at least coupled with the recognition of the diagnosis of the so called "two cultures" by C.P. Snow are at the heart of the problem. If this is recognized one will have to acknowledge the need for an alternative holistic and integrated epistemology which will also lead to a thorough rethinking of the curriculum that channels the knowledge within the educational setting. I shall base my argument concerning the need for the humanising of the natural sciences on the following theses:

* Natural science knowledge is not only restricted to certain aspects of the physico-chemical and biological

world to the exclusion of so called "human facets". All knowledge, albeit natural science or social science, presupposes basic philosophical positions concerning reality, man, society, worthwhile ends to pursue and the meaning of life, ethical issues and the meaning of culture.

* Natural sciences are not as objective as has always been argued but are rhetorical and hermeneutical and are as bound to interpretation as are the social sciences.

* Recent developments in Pharmacy and Biomedicine show that there is a growing awareness that the fundamental Cartesian paradigm of these disciplines does not fully equip the student for the type of tasks required of him in his professional life.

* This trend has also been strengthened by the fundamental cognitive shift which has taken place in many social and natural sciences and in which a more holistic understanding of the nature of phenomena has been emphasized.

The solution proposed for the dilemma which the social sciences and humanities find themselves in will be sought according to the following lines:

* emphasis needs to be placed on the unity of the sciences on the basis of the fact that the structure of science is very similar in most of these disciplines, they all have a strong hermeneutical dimension and, because of

the basic metaphorical nature of scientific rhetoric, are open to many alternative approaches, perspectives and interpretations.

* If the foregoing argument is valid it would require a fundamental rethinking of the curriculum followed in tertiary education;

* consideration ought to be given to the development of some sort of core curriculum at undergraduate level which will make it possible for students to be exposed to and acquire both natural and social science insights and knowledge and skills;

* attention will have to be paid to the fact that knowledge is embedded in philosophical assumptions and thus the need for a Philosophy of (Social) Science must be stressed.

* One of the best ways in which these issues can be brought to the fore is a closer scrutiny of the History of Science which will make students conscious of the roots of ideas and their entanglement in socio-cultural and historical situations.

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INTRODUCTION.

The notion that the social sciences and humanities find themselves in an impasse and are struggling for survival has become quite commonplace in our society and most probably all over the Western world. In the recent past a number of conferences and symposia have been held and much written about the malaise of the social sciences. The diagnosis has varied from the lack of relevance, the inability of the social sciences and humanities to create jobs and wealth, to the poor employability rate of students trained in these fields.
The problem is often formulated as follows:

> * There are far more social than natural scientists seeking jobs and far more qualified Blacks trained in these areas who find themselves jobless. This state of affairs impacts on the economy in the sense that the service sector is overemphasized at the expense of the production sector – a sure sign of a Third World economy and a phenomenon which is also found elsewhere in the world (Harrison, 1982:207,8).

The solution to the problem stated in this way is then sought along the following lines:

* The situation must be reversed if needs be even with the implementation of some form of reverse discrimination utilizing the subsidy formula for university financing (Barker, 1992).

Obviously the diagnosis has some validity and obviously there are also other factors which influence the state of the humanities and social sciences. I mention but a few:

* External political and financial factors and restraints;
* The subsidy formula for university financing
* Human resource needs of the country and priorities concerning these needs as formulated in governmental policies.
* Employment possibilities;
* The demands of professional bodies
* The internal erosion and inflation of the social sciences
* The tremendous backlog in educational standards brought about by the political injustices of the past which often lead to students choosing social science fields of study by default.
* The differences in remuneration of social and natural scientists.

Obviously a responsible analysis of the malaise of the

social sciences will have to take all these factors into account. Moreover they will all also have to be dealt with against the background of a society in transition with its very basic needs for reconstruction and development. Having said this, I shall nevertheless single out one facet which I regard to be crucial in revitalizing the social sciences and humanities and humanising the natural sciences, viz. the fundamental dichotomy between the natural and social sciences. This has not been the approach taken by most analyses of the South African situation. The emphasis has fallen on:

* the need for relevance

; * the Africanisation of the curriculum over and against the one-sided Eurocentric approach

* the contribution of the university to development or the RDP programme.

Recently South African universities have become streamlined according to the criteria of big business, and in the process of managing universities along these lines, have decided to "rationalize" those disciplines that can not give quantifiable results or profit to the institution run as big business.

The societal and political transition taking place in South Africa poses a strong temptation to overemphasize the developmental role of technology and the natural sciences at the expense of the humanities and the social sciences. In the attempt to redress the enormous developmental and educational

backlog caused by the injustices of the past, many argue in favour of an educational and science and research policy which is to be guided by technological needs and natural science know-how. No doubt these disciplines will play a pivotal role in the grass-roots development required as the basis and fabric of a new society. The argument is often advanced that in the proposed societal transition the social sciences and humanities have a limited role to play because they are perceived as not producing tangible and visible results which lead to technological development or provide jobs for the unemployed. At the root of this truncated perception of the role of the social sciences and humanities is the false distinction labelled the "two cultures" by C.P. Snow. Yet, juxtaposing the "two cultures" of the natural and the social sciences/humanities inevitably leads to a false dilemma in which one of the two cultures has to be awarded priority status. This juxtaposition is based on an Cartesian epistemology which sanctions the subject-object divide; a dichotomy which requires radical rethinking that will inevitably lead to an altered understanding and view of both natural and social sciences and their role in a changing society.

The solution to this problem lies in the recognition of the human face of the natural sciences and the indispensable contribution of the social sciences and humanities to the humanizing of a new technologically-based society. When it is

recognized that most of the apparently "hard" sciences such as medicine, engineering and nursing are at core actually human sciences, then the way is paved for a new methodological understanding of the nature of natural science and its role within a society in transition. Insights from recent developments in Sociology of Knowledge and Cognitive Science show that the natural sciences are as embedded in social values and are as hermeneutical as the social sciences and humanities. This poses the challenge to demythologize and de-ideologize the so called "objective" and value-free nature of these disciplines in order to recognize their indelible human stamp. They are linked to philosophical and social ideals and values which determine their serviceability to the values of a society in transition, and thus require the broader framework of philosophy, the social sciences and humanities.

In a recent article A. Pouris (1991:14) argues that the subsidy formula ought to be utilized to rectify the disparity in the South African university situation which boasts more Social science universities than Technological universities. I agree with my colleague Venter who, under the pseudonym of "Anger", strongly criticized this notion. It is a symptomatic treatment of the problem , which does not recognize the basis of the problem to be the anachronistic dichotomy between the "two cultures". One of the main reasons why this basic etiology remains invisible is the large scale colonizing through technology and technological values that has become part and

parcel of the heritage of the Western University system

COLONIZATION THROUGH TECHNOLOGY AND TECHNOLOGICAL VALUES

Barnett (1993:34) says our modern society has a vested interest in the type of knowledge which is operational and strategic. By this he means not only mathematic, computerized and technological forms of knowledge, but especially the type of knowledge which makes management and systems planning possible. The critical issue, Barnett (1993:34) says, is whether this type of society does not also call forth modi of thought and action which require specific knowledge forms. Notions such as insight, wisdom, understanding and criticism are gradually being replaced by skills, information and flexibility, he says. He is referring to the same state of affairs that Habermas refers to as the colonization of large sections of society by means of instrumental, decisionist and controlling technological rationality. That is why modern society requires the university to provide the type of students trained in these technological skills in order to contribute and operate in this type of society. In this process crucial abilities such as criticism and communication are practically ruled out.

Barnett (1993:36) points to two interesting and yet opposing trends found in the modern technological society, a phenomenon he calls "cognitive drift":

* One-dimensionality required by the prescriptions of operational forms of knowledge;

* pluralism, brought about by a diversity of possible approaches to the interpretation of the world.

Yet, he argues, there is a strong tendency in modern society to favour the one-dimensional forms of knowledge. This is exacerbated by the fact that state policies favour and emphasize the need for types of knowledge which can serve technological operationalism. In the UK, he points out, this has been done by laying very strong emphasis on the skills required for entrepreneurship in the society at large - an emphasis heard here in South Africa too. Interestingly enough it is exactly the traits of post-modernism in our society that seem to make it impossible to fundamentally question such over-arching ideals of the "good society". Within the academy he claims, pluralism has given rise to cognitive fragmentation and specialization to the extent that communication and critical discussion have become problematic. So the modern curriculum clearly manifests the symptoms and trends present in our wider society.

The Canadian philosopher of Culture, George Grant, makes an important opposition between the ideals of "mastery" and "wonder" which inform the work and teaching in the academy. Grant, (1975:22) says:

> "... in science the motive of wonder becomes ever more subsidiary to the motive of power, and that those scientists still dominated by wonder have a more difficult time resisting the forces of power which press in upon

them from without their community".

This much needed unmasking of the one-sided dominance of our society by the technological and natural science ethos of mastery has also been emphasized by the neo-Marxists and Christian philosophers.

There seems to be a strong bias in favour of instrumental, operational forms of knowledge at the expense of hermeneutic, expressive, critical and communicative forms of knowledge. This becomes apparent in disciplines such as physics, chemistry and biology that need to function as basic disciplines for more and more specialized fields such as engineering, medicine, nursing, pharmacy, etc. These professions are all required to master the basic natural scientific disciplines in some form or other. The effect of this is the impoverishing, fragmentation and specialization of these disciplines and the broadening of the service of these disciplines to society with its technological ideals. The professions become emaciated in the process. Their know-how is technological know-how and once they come to implement this very "basic" knowledge they discover that it lacks the basic human trait which makes it worthwhile knowledge to implement in human situations.

The social sciences, too have been contracted into the service of this type of society. Quantitative, descriptive, experimental research provides the prescriptive parameters within which social science training often has to take place. Social scientists too, are regarded as well-trained when they

are imbued with the ideals and values of the technological society.

This trend is strengthened by the type of education a university graduate is exposed to. It is not the process of knowledge formation which is emphasized, but the provision of units of processed knowledge which can be utilized as finished product or commodity within society. Here a strong preference for mathematical, computerized and natural scientific knowledge becomes apparent. Barnett (1993:35) says:

> "The result is that even those forms of knowledge which might have sought a different orientation have succumbed to the dominant epistemic interests of the age. The humanities turn to information technology and quantification while programmes directed at the caring professions seek to derive an academic legitimacy by allying themselves to scientific and positivistic forms of knowing".

In 1969, at the height of the student protest in Holland, a Dutch philosopher Popma (1969:11) talked about this trend as "fabrilisme" and warned against the real dangers of cultivating one-eyed discipline idiots who never come to understand what the relationship could be between his or her own field of expertise and knowledge produced within other faculties. He also warned against the tendency to want to remedy this state of affairs with technological means. In the South African context the UNISA philosopher Braam Roux (1993) has also warned against the idea that employability of graduates is dependent upon the possession of all kinds of technical skills and abilities bur which does not acknowledge that it is a full human being who needs to be employed.

Most often the remedy for this situation has been to suggest that at least some form of interdisciplinary training ought to be implemented or the example ought to be emulated of North American Liberal Arts Colleges who require students to follow a core curriculum in which credits from both the natural and social scientific fields have to be incorporated. Both these approaches could be very helpful, but I do not think they actually address the fundamental problem of the dichotomy between the two cultures. I would like to argue that this can be overcome by at least recognizing the social and hermeneutical nature of natural science and the intrinsically "human" nature of many of the natural science disciplines. The

case study I chose, pharmacy and its roots in medicine, is a case in point. I would like to argue that these disciplines are at heart social science disciplines with such strong roots in human presuppositions that training of pharmacists and doctors need to be rethought along the lines of the human and social sciences. But before I argue this, a few remarks about the social and hermeneutical nature of natural science.

THE SOCIAL AND HERMENEUTICAL CHARACTER OF NATURAL SCIENCE

Natural science is as hermeneutic as the social sciences and humanities (Hesse, 1980: 185; Heelan, 1983a; 1983b) and Hesse, 1980: 185; Heelan, 1983a; 1983b). This becomes apparent when one looks at the role played by metaphorical models both in natural and social sciences, but also at the intrinsic textual nature of scientific work which requires as much hermeneutical interpretation in the natural as in the social sciences. Scientific instrumentation and apparatus is often what Cantor (1987:140) calls "a reification of metaphor". The role metaphor plays in instrumentation and experiment is twofold:

It is often exactly in so called "crucial experiments" that the instrumentation is employed as an experimental extension of a metaphor in order to "get at" as yet unknown aspects of reality. Metaphorical extensions, Cantor says, occur when the existing apparatus and instruments are used in non-standard situations. An example is the experimental attempt at "weighing light", which entails the implementation of the materialist metaphor for light.

A second more explicitly hermeneutic role is played when it is recognized that any experiment as reification of a theory constituted by a metaphor needs to be "read", "interpreted" as any other text in literature, science or reality in general within a horizon of meaning bounded by the symbolic universe of discourse provided by the parameters of the dominant disciplinary matrix. This is why Heelan (1972:495) can say:

> "...science is a hermeneutic of man-made signals produced in experimental situations and these get their meaning from and through the community of scientific enquirers".

This hermeneutical aspect is located in the heart of natural science: in observation and perception (Heelan, 1983:181). But there is also a wider context which provides the context of meaning within which the instrumentation, apparatus and experiments as "texts" are read: This is what Heidegger (1962) calls "Vorhabe", i.e. the culturally-acquired background of embodiments, skills and practices in which we hold/have the object of our understanding, even before we can recognize and name it as an object. It is metaphor which provides the connecting link between this "Vorhabe" of the wider culture and the context of meaning within which the scientist often works.

For this reason it will also be one of the most fruitful avenues to provide access to the interrelationship between deeply imbedded cultural convictions and those scientific beliefs which are dominant in the curriculum. Hesse (1980:186) says:

> " ...theories have always been expressive of the myth or metaphysics of a society, and have therefore been part of the internal communication system of that society. Society interprets itself partly by means of its view of nature"

So if scientists really want to understand the world in which their scientific theories attempt to explain reality, they will have to look wider than only the restricted view provided by technology-dominated natural science, and the curriculum will have to reflect this.

Fortunately there has been a growing consciousness of the need to humanise the natural sciences, but unfortunately the university curriculum in South Africa has been quite immune to these developments and insights. In various disciplines there has been a resistance to the mechanistic and dualistic subject-object epistemology so characteristic of modernity. It has been replaced in various disciplines with a more interactive, holistic and so called ecological view of reality. I know for a fact that this has been an important development within Psychology. The student of the future will require imaginative abilities to interpret text and context, an ability that French, 1992:32) calls "... a holistic bringing together of a broader and critical sense of purpose with a sense of the people and the places where the work would be applied...". In this respect I would like to agree with Nethersole that modern universities require an integration of the formal languages of the natural sciences with the so called "natural languages" of the social sciences. She says (Nethersole, 1992:14).

> "The old English metaphor of "the power of the word" needs to be translated into the power of significatory systems. For it is as much the figure of mathematics, the measurement of the physicist and the engineer, and the price of the share as it is the figure of speech which persuades, seduces, convinces, manipulates or in short leads to those actions which define our daily lives".

Obviously this will require a radical revision of the curriculum. Unfortunately Nethersole takes the natural sciences as model for the humanities and argues that what the Social sciences and Humanities need is a recognition that there are "basic sciences" such as linguistics, logical argumentation and language skills, history and the study of literature which are basic to these disciplines. I would argue that this suggestion is still too strongly based on the two cultures hypothesis, a hypothesis which stems from 19th-century neo-positivist philosophy which postulated an encyclopedia of the sciences based on the view that reality consists of "mind" and "matter"

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THE CURRICULUM AS VEHICLE OF A VALUE SYSTEM

George Grant (1975:31) says:

> "If we are to live in the modern university as free men, we must make judgements about the essence of the university –its curriculum. If such judgements are to be more than quibbles about detail, they must be based on what we think human life to be, what activities serve human fulfilment, and what place higher education should play in encouraging the realization of these activities".

An encouraging development where this insight has become apparent is in Pharmacy. I would now like to devote the last section of my paper to an exposition of the fundamental issues at stake in the training of Pharmacists and the encouraging developments in this field.

Mrtek & Mrtek (1991) develop an important argument in favour of a value-laden curriculum for pharmacists. They show how the training of pharmacists has developed through various phases. Two of these phases, the so-called phases under the guidance of the **technical and the clinical paradigm** are discussed. Under the first paradigm pharmacists saw their task primarily as dispensing. During this phase any argument in favour of the inclusion of so-called interactional skills would have been regarded as out of bounds. They say:

> "Human values subjects could not develop and would not be introduced into any pharmacy curriculum guided by the technical paradigm, even though the need for these subjects was repeatedly recognized by the profession's most visionary leaders".

(Mrtek & Mrtek, 1991:80).

With the shift towards the **clinical paradigm** and exposure of students to clinical practice, it soon became clear that the skills required were far more than only the technical skills. Patient information, counselling, revision of drug therapies and negotiation with medical doctors just required far more skills than the ones provided by the technical paradigm with its emphasis on operationalized knowledge. It became apparent that the pharmacist needed interactional, communicative and critical skills which would enable him to serve in the human context where problem solving of a human nature was the order of the day. Against this background they make interesting suggestions concerning the way in which these skills could be incorporated in the Pharmacy curriculum.

> " A human values education theme in the curriculum might include the following objectives: (i) to cause students to

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[1] Van Dyk, John. 1994:7

> reflect upon ethical issues before facing them in the clinic, on rounds and in general practice; (ii) to present background in the philosophical, ethical, and historical issues in health care that have led to present problems in moral decision-making; (iii) to emphasize the importance of personal values and preferences of patient and family, and the need to consider these in the development of treatment decision alternatives; (iv) to increase the knowledge of the historical and social conditions under which pharmacy has developed together with other health professions; (iv) to broaden the perceptions of students to various phases of life, health and illness, and death through the uses of the humanities in pharmacy education; and (vi) to understand the portrayal of pharmacists in drama, art, and literature as a basis for widely held perceptions and misconceptions about the roles of the pharmacist".

(Mrtek & Mrtek, 1991:81 refers to : McElhinney,T.K. 1981. Human values teaching programs for health professionals. Whitmore: Ardmore, PA).

A similar argument is developed by Reinsmith (1987) who argues for the need to take cognisance of the prevalent value systems of the society in which the pharmacist functions. It is just not possible to treat a patient without knowledge of the values of the society in which she lives (Engelhardt, 1986:3). I found it quite remarkable that the Philadelphia College of Pharmacy and Science included a course in **Philosophy and Values** in their curriculum. But is the problem actually solved by only introducing more Social Science courses into the Natural Science curriculum? Let's have a closer look once again at the science of medicine which is regarded as the "basic" science underlying pharmaceutical education.

THE BIOMEDICAL PARADIGM

In the work of Foss & Rothenberg (**The Second Medical revolution: From Biomedicine to Infomedicine**, 1988) they show that the biomedical paradigm which has characterized the so called medical revolution of the past three hundred years is based squarely on the "received view of philosophy of science" - the so called standard view of science.

> "Within this biomedical system only the biophysical factors have real status in the maintenance of health, the development of disease, or the application of therapeutics. Health is the absence of disease; disease is the presence of a lesion produced by a physical agent; and therapeutic results are obtained only by the alteration of biochemical processes by materials with pharmacological properties, physical agents such as radiation, or surgery. This is the main strategy of biomedicine, which has been dominant in Western medicine"

(Potter, 1990:353).

The central argument of this book is that the fundamental paradigm of the first medical revolution is not adequate to do research into the complexity of human health and disease. The strategy of biomedicine entails reductionism, dualism and the recognition of linear causality, whilst the paradigm required by post-modern strategies of science has to be non-reductionistic with ample recognition of the interaction between body and mind and the acknowledgement of mutual causality. The authors now propose an alternative paradigm to substitute the biomedical model: "infomedicine", a model based on the idea of self-organizing and self-regulating systems as it is found in quantum physics and information theory. It needs little argument that I would have great difficulties in accepting their solution to the problem, even though one could accept their diagnosis. What is needed is a humanized basic paradigm which will unmask the dehumanized mask of medicine. Jacques Kriel states in his paper "Removing medicine's Cartesian mask. The problem of humanising medical education", :

> "The dehumanised face of medicine is in fact an essential expression of the dehumanised and dehumanising framework of philosophical assumptions underlying modern medicine. It is therefore impossible to rectify the situation without questioning the foundations of modern medical practice - those very foundations which are the basis of its tremendous power and success, and its claim to being 'true'".

(Kriel, 1988:2).

One of these philosophical assumptions is the misleading one that medical science and pharmacy are natural sciences. This only becomes clear when one sees the consequences of the acceptance of such a statement in the definition of health and disease. It is exactly the dualistic and reductionistic view of man which regulates these discussions. It is not illness (the sick person) which is central to this type of science, but disease, and then understood primarily as a molecular phenomenon. This fundamentally misguided understanding is not remedied by adding only a couple of teaspoons of Ethics to the curriculum, but requires a restructuring of the curriculum in such a way that the fundamental assumptions are questioned and reformulated. This at least requires some understanding of the fact that knowledge is developed within paradigms or conceptual schemes that also implicitly harbour philosophical presuppositions about man, society, values, culture and the meaning of life.

Since the first publication of **The Journal of Medicine and Philosophy** in 1976 a strong interest in the philosophical issues raised by the medical and related scientific disciplines has developed (Potter, 1991). In the journal **Theoretical Medicine** a forum for interdisciplinary study in the methodology and philosophy of medical practice and research, it

becomes clear that research done in these areas can be organised into five groups:

* Research concerning the nature and image of man
* Issues pertaining to the multidimensional theme of the clinical encounter between the professional and patient'
* The diversity of views concerning health and illness with special attention to the opposition between reductionistic and holistic understandings'
* Issues of medical ethics
* Issues pertaining to the dialogue between medicine and the wider culture.

CONCLUSION: A TASK FOR THE HUMAN SCIENCES?

I would like to agree with Leatt (1992:5) that it is the task of the human sciences to humanize the process of transition, transformation and reconstruction of society. We cannot do this only through adding to the curricula of the natural scientific disciplines, but need to equip scholars with the critical and communicative skills which make it possible to discern an argument, trace its presuppositions and to deconstruct and unmask the key symbols, codes, myths and metaphors of the natural sciences in order to humanize them.

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