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TABLE OF CONTENTS

INTRODUCTION	Alan R. Drengson, Editor	1
CAREFUL OF SCIENCE: A FEMINIST CRITIQUE OF SCIENCE	Patsy Hallen	3
MODES OF TOTALIZATION: HEIDEGGER ON MODERN TECHNOLOGY AND SCIENCE	Drew Leder	8
THE LIMITS OF SCIENCE AND THE PRICE OF TECHNOLOGY	David Suzuki	14
SWEET DREAMS OF ARTIFICIAL INTELLIGENCE	Carolyn Masson	16
FROM PROTEUS TO PILGRIM: TECHNOLOGY IN THE EARLY WRITINGS OF KURT VONNEGUT	Joe Polisuk	18
HOMO FABER OR HOMO SAPIENS?	Andrew McLaughlin	21
DEEP ECOLOGY: AN ANALYSIS FROM THE PERSPECTIVE OF ECOLOGICAL SCIENCE	Frank B. Golley	24
PLAY	Robert Aitken	29
THE MAN WHO BECAME A BEAST AND THE BEAST WHO BECAME AN ANGEL ...	David Sparenberg	30
REVIEW	Michael Caley	32
POETRY	Jeff Poniewaz, Antler, Harvey Taylor	34

INTRODUCTION

Alan R. Drengson, Editor

When we reflect on the environmental crisis and such problems as ozone layer depletion, acid rain, or nuclear pollution, we might be impressed by the level of violence involved in so many human activities. There is violence even in our use of language. Violence is spread and magnified by many contemporary technology practices. In contrast, the technology practices of primal peoples are relatively nonviolent compared to those of industrial society. The British Romantic poets and other people of artistic and aesthetic sensibilities saw early in the industrial revolution the implications for Nature and the human spirit of the industrial organization of production, recreation, and daily life.

The philosophy of technology, as a critical and synthetic reflection on and inquiry into the nature and standing of human technology practices, also begins in the same period. In contrast to the novelists and poets, the first philosophers of technology were people from engineering backgrounds. They were technological

optimists. The general line of thought was that technology is an unqualified benefit. It is an extension of human nature, and human nature is an extension of the progressive evolution of Nature. Human cultural evolution is marked by the same "laws of Nature" that govern the world. These are laws that have to do with the superiority of those who survive, where the "fittest" to survive are those who "win" the struggle for survival. During the industrial revolution the emergence of homo technologicus was seen as serving the natural evolution of fitness.

The emergence of human domination of Nature was made possible via revolutionary changes in technology practices. Even at the dawn of historical civilization the implications of these kinds of changes were recognized. Fire gave us great power, and it was stolen from the Gods, who had power over Nature. Agriculture also changed human relationships to Nature in some fundamental ways. Later, machine production had profound effects on our

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relationships with Nature. All of these changes affected how humans conceived themselves and their relationships to each other.

At their apex, urban-agrarian societies like Rome were quite capable of wrecking havoc over large areas. The destruction of the North African granary by bad farming practices was regional in significance. However, the process was a gradual one, so the decline was not seen as a crisis. History is full of examples of ancient city-states that undermined their way of life by destroying the land, soils and other resources which gave them their power and wealth. The means used in this destructive process were also the means used to provide the state with its material goods. These means were the technology practices they created and employed. Thus, the means of production became the means of destruction.

In our productive and constructive daily practices there lurk destructive and counter productive processes. Today, more than ever, we must consider the **appropriateness** of our current productive, recreational and daily activities, as these are magnified and intertwined with the powerful technologies of the 20th Century.

Many have stressed the negative implications for the environment of total human numbers, and have pointed out that no population can grow indefinitely at a geometric rate. They stress human reproductive responsibility in relation to Nature and in relation to our collective capacity to affect the Earth. Human reproductive culture is something whose change we can undertake, but the full results of changes in practice are not going to show for a while, given current demographic realities. On the other hand, we have very little time to deal with the immediate threats of many forms of applied science and technology to the integrity of life and the ecological communities of the planet. This is because the science and technology practices of the industrial nations are being transferred everywhere, and these practices are large-scale, power and capital consuming, monocultures that involve an unprecedented destruction of diversity of every kind. In diversity is richness and the key to survival.

In all levels of production the drive is for world-wide standardization of large production and distribution processes that depend primarily upon technology, capital and energy, and not on highly skilled workers, tacit knowledge and an understanding of natural patterns of generation and change. In biogenetic engineering, e.g., the aim is to control living matter, not to work in harmony with the flow of natural systems. To see the biological communities as systems is already to take the first long step down the road of abstractionism and disassociation from Nature. Executives and researchers will manipulate genes to get uniformity of crop for tasty snacks, so they can sell a commodity that will return a certain percentage of profit, within a specified short period of time. They do not consider the ecological implications of this activity and its processes.

From the level of primary production on up, we have tried to build a powerful and secure industrial system that would deliver the goods. We have tried to rationalize our whole society according to the demands of the productive and consumptive markets, as these are reflected in the development of the corporation, which is itself an organizational example of the industrial paradigm. We now perceive the treats to our lives and our place by the wrong kind of uncontrolled applied science and technological development. But we are also now aware of the ecology of technology, that is, we now appreciate how technology practices are interrelated with all we do. We also know that they are composed of three major "parts." As Arnold Pacey (in **The Culture of Technology**) describes these, they are the organizational, cultural and technical aspects of technology practices. The three of these work together and also rest upon and interact with the natural world.

Under times of extreme stress, such as war or threat of war, our societies show remarkable flexibility and capacity for dramatic changes in technology practices through the development of new organizational, cultural and technical skills and knowledge. The global destruction taking place should galvanize us to action, for it is clear to almost everyone who has studied our impacts on Nature, we must change many of our science and technology practices, not just our techniques and tools, but whole practices. We have to consider economic development in relation to the limits and processes of ecological integrity. Our values and priorities in relation to peace, social justice and ecological integrity are all interrelated and should support one another. The understanding that this gives rise to must then be applied to examine our practices. The practices we must focus upon first are those that are the most powerful and destructive, but, of course, we cannot ignore other less dramatic ones.

We need to create a philosophy of science and technology practice that approves and allows the development of practices **only if they are appropriate to our total context**, where "appropriate" uses the concept of fitness not in the competitive but in the cooperative and ecologically wise sense. New technology practices must be, in short, **ecosophic**. The fundamental problems of industrial society are not the symptoms of the problems, as are such symptoms as rising cancer rates, urban violence and drug abuse. The fundamental problems will not be solved by symptomatic treatment. As followers of the Deep Ecology Movement stress, we cannot go on with business as usual. We must turn our attention to an understanding and alteration of our science and technology practices as well as our own personal life styles. Thus, in this issue we continue our focus on technology and science. It must be noted that in critique of science the main emphasis is on institutional practices, which today are, of course, inextricably bound up with technology. The next issue will focus primarily on trees, forests and forestry, but we will return in later issues to further discussion of a philosophy of science and technology appropriate to the Age of Ecology.

CAREFUL OF SCIENCE: A FEMINIST CRITIQUE OF SCIENCE

Patsy Hallen

The title of this paper, 'Careful of Science', was deliberately chosen for its ambiguity, reflecting in a small way the profound ambiguity of life. The title is a dialectical play on the word 'careful', embracing three meanings: (1) be careful of science or 'beware' of science because its capabilities are so life-threatening; (2) take care of or 'cherish' science because it is so precious, one of our most important ways of understanding; and (3) be full of care or do science with care and hence 'transform' science into a life-affirming pursuit by caring labour.

We need to be careful of science because of its life-destroying potential. Ninety percent of all scientists and technologists that have ever lived are alive today,¹ and 51% of these work on war-related research² while 36% work for large corporations, mainly in teams on profit-motivated research projects not of their own choosing.³ That leaves 12% of the scientific community relatively⁴ autonomous. The structure within which basic science is practiced has altered dramatically since World War II. As scholars such as Hilary and Steven Rose point out,⁵ science is not neutral and value-free; science has become incorporated into the military-industrial complex. This raises the questions: Whose science is it? Who pays for it? Who benefits from it? If we keep asking these questions we will see more clearly that scientific research often serves the interests of profit-making and social control. We practice what the historian, E.P. Thomson, has called 'exterminism',⁶ the extermination of other members of the biotic community, and science contributes to this, despite the fact that individual scientists might be motivated by the loftiest of personal goals and social ideals. We engage in what the philosopher Herbert Marcuse has called 'surplus repression'⁷ participating daily in unnecessary processes of cruelty, and science contributes to this. We commit what the existentialist Albert Camus has called 'premeditated murder'⁸ taking the lives of other creatures out of curiosity or for profit, and science contributes to this.

These claims appear blasphemous because the mind-set of our age is that science is neutral and value-free. But this very ideology functions as a smoke screen. The picture of science as pristinely neutral is very selective and succeeds in directing our attention away from facts about the social structure of science and its practices. The discourse of value-neutrality performs an ideological service in favour of the status-quo and prevents us for examining how science is actually organized (its take-over by the military-industrial complex, its social stratification, its exclusion of female practitioners, its culture, gender and species biases) and what science actually does (its practices of environmental degradation and the squandering of the earth's biological capital, its practices of social control and the deliberate cultivation of human greed).

Let me point out, however, that no matter how compromised or how deeply embedded in the military-industrial complex,

science is one of the most precious human activities. This is one good reason why it needs the talents of the other half of humankind. Science is precious. I learned that when I went to Nigeria. Fired by Feyerabend,⁹ I started out teaching University students about the limitations of science: "Save us from science". As a result of cultural inter-play, I ended up appreciating some crucial aspects of the scientific ideal: "Save us from fear, superstition and the dictates of personal power."

Measured against reality our science is childlike and primitive and yet it is the most precious thing we have.
Albert Einstein.¹⁰

But it is for the very reason Einstein articulates, its preciousness, that science needs to be criticized. In order to strengthen it, in order to take care of it, we need to understand its contemporary nature. We need to see that certain aspects of late 20th century science are repugnant, anticreative, life-threatening, devastating to biological richness and diversity and disruptive of dignity and freedom. We need to see the reality of the way, for example, even University science is actually practiced, and to understand the effects of excluding women. For as Sandra Harding notes: "Women have been more systematically excluded from doing serious science than from performing any other activity except perhaps frontline warfare".¹¹

We are prevented from seeing the way science actually works and whom it excludes because of the way we are educated about science and because of the way we are educated as scientists. Most scientists are not heroic adventurers working on the challenging frontiers of knowledge. They are, as Kuhn noted,¹² puzzle-solvers within normal science. Which scientist would choose to develop a new flavour of cat food? And even when the area of research and development is new and challenging, who sets the agenda? How many scientists would choose to genetically engineer flowers to be longer lasting and to bear the company colours?

Women scientists like Marian Nemenwirth, who works in developmental genetics at the University of Minnesota, are becoming more aware of the real nature of science because as scientists they do not want to be 'just like men' in an enterprise that in the U.S.A. devotes 72% of its federal funding for scientific research and development to defense, 'just like men', in an enterprise that undermines health and family life.¹³ In the 'publish or perish' syndrome of academic science, forms and symbols can become more important than content. Most scientists do not like this but the pressure of the system leaves little choice.¹⁴ Nemenwirth asks us to consider a not-too-unusual case:¹⁴ a young scientist moves into a laboratory and concentrates on accumulating the largest possible quantity of research funds, instruments, equipment, supplies and research

personnel as possible. Since the scientist becomes too busy administering, technicians are lured to do the actual work and potential graduate students are courted and assigned to sub-project within the scientist's research programme. The goal of the endeavour is the production of as many articles as possible with the scientist as senior author, responsible for the intellectual content of the research. The choice of research topics is dictated by what will yield publishable data and attract research funds, not by what is genuinely needed or important. So scientists are educated out of seeing the miraculous, seduced out of serving the interests of the biotic community and driven to choose avenues of research that are straightforward and that apply techniques and approaches developed elsewhere. Original approaches are avoided, novel territory is overlooked and unexpected results are suppressed: they are all too time costly. The fear of being scooped leads to secrecy, piracy and hasty publication. The results that are obtained are subdivided into small portions and a different article written about each one. This means there is far too much to read, let alone to properly analyse and assimilate. The objective is not truth nor 'the relief of man's estate'¹⁵ but to get as many symbols of scientific success as possible: new pieces of equipment, more research personnel, trips to numerous international conferences to oil the old boy's network. The pressure to publish is excessive and leads to an alarming number of instances of the fabrication of data never collected, the padding of data, the elimination of contradictory data and plain fraud in science.¹⁶ Recently a disquieting number of cases have come to light regarding prominent scientists in the capacity of reviewers: they advise journal editors not to publish a submitted article or advise a granting agency not to fund a body of proposed research, then quickly carry out the same project in their own labs and publish it under their own name.¹⁷ The internal ethic of science, heralded by theorists such as Karl Popper,¹⁸ as being a model of open, democratic, truth-seeking is thus severely compromised.

Scientists are prevented from seeing the way science actually works because of the powerful socialization process that a scientific education involves. And the public are prevented from seeing the way science actually works because of the way we are educated about science. Our educational system draws a distinction between science which is neutral and society which is value-laden. This dichotomy is convenient because it absolves scientists from taking responsibility for their work. A classic example of this dichotomy is encapsulated in the statement of the Italian physicist, Enrico Fermi, who declared, when working on building the atomic bomb: "Don't bore me with your moral scruples. After all, it's superb physics."¹⁹

Scientific responsibility is complex. For example, it is impossible to predict the results of one's work.² How was Albert Einstein to know that his equation $E = mc^2$ was to lead to the building of the atomic bomb? How was Arthur Galston to know that his work on tricodobenzoic acid and soybean, undertaken to aid under-nutrition, would be used to develop a defoliant in Vietnam, a war he morally opposed?²⁰ But to believe that science is value-free is to agree with Adolf Eichman who claimed that he was merely engaged on a technical problem of transport; as a technician he was not in any way responsible for the fact that it was a one-way transport of Jews, Gypsies and others to the gas chambers.²¹ I realize that this transport example relates to applied science and not to pure science but whether in transport, mechanical engineering, physics or theoretical chemistry, values

and interest-related biases such as class, gender and culture profoundly influence many scientific activities.

Human values and interests shape science in the following ways:

1. the selection of goals for science;
2. the choice of problems and research projects on which science concentrates;
3. the methodologies and knowledge-producing practices of science;
4. the choice of experimental design;
5. the way we behave towards our research subjects;
6. the language we use (for example, the terminology, the 'hard' sciences: are not women less well-equipped to penetrate nature's secrets?);
7. the very content of our theoretical formulations in science;
8. the evaluation and interpretation of scientific results; and,
9. whom we consider as scientists (depending on one's gender or class, identical work earns the label of lab assistant or scientist).

The argument that science functions to increase profit, to maintain social control and to exploit nature has been made many convincing times. But when feminists use gender as an analytic category, they face immense obstacles, for they touch new raw nerves. If science is neutral, the scientist is absolved from the complex social responsibility scientific work entails: we know how hard it was to fight this battle. If science is free of gender-bias, the scientist is absolved from giving up his privileged position: we can see now how hard it will be to fight this battle.

Science needs to confront head-on the problem of its biases: its masculine bias, its cultural bias. As Marion Namenwirth states: "Patriarchal science needs a coronary bypass and feminism is [helping to] provide it".²² We need to engage in the task of phenomenological bracketing. We need to stand back from science to recover its meaning.

Having considered how and why we need to both beware of science and to cherish science, I would now like to consider three strategies for transforming science:

1. ensure that more women enter science;
2. promote more equally recognized women in science; and,
3. metamorphose science by nurturing a world of difference.

Science it would seem, is not sexless; he is a man, a father and infected too. Virginia Wolff²³

We are taught that objectivity and neutrality are what distinguishes science from other pursuits of knowledge. But as I hope to show, each step in the scientific method is profoundly affected by the values, opinions, biases, beliefs, culture, class, gender and interests of the scientists. Moreover, this 'affected' science is not 'bad' science; it is science-as-usual. Values and beliefs affect what observations scientists make, what they believe needs explaining, how they explain, what language they use, what they see and fail to see, how they treat their experimental subjects, how they interpret their data. Two historical examples of how science is affected by scientists' situations set the stage for our contemporary illustrations.

Aristotle was an outstanding naturalist. He founded the fields of biology, botany, and zoology. His observations of dolphins, for example, have not been surpassed to this day.²⁴ Yet he

'observed' that womens' brains were smaller and spongier than mens'.²⁵

Another example of how there is more to seeing than meets the eyeball comes from the leading microscopists of the 17th and 18th centuries. When they looked through the microscope at male sperm, they claimed they saw minute men inside, with arms, heads and legs.²⁶ Their observations were askew not due to the limited powers of the microscope, but because of their firm belief, dating from the time of Aristotle, that women are only passive incubators, contributing nothing substantial to conception.

Such biased observations are not, unfortunately, a thing of the past. The observations of primatologists in the 1950s and 1960s regarding male dominance and initiative provide illuminating illustrations of how such bias persists.

Our culture takes as 'natural' the dominance of men and the subordination of women. And as Donna Haraway's work in primatology indicates, researchers in this field are seriously constrained in their hypotheses, observations and interpretations by these cultural constructs. As a result of what we assume to be 'natural', there were no records between 1950 and 1970 of female leadership and dominance, female sexual assertiveness and initiative among the primates.²⁷ A typical example of the researchers' observations during this period is:

The [primate] females were incapable of governing the group...the introduction of but one adult male into the group corrected the situation immediately... Primate females seem biologically unprogrammed to dominate political systems.²⁸

The (almost exclusively) male researchers exaggerated the extent and importance of male dominance, male aggression, male initiative and the role of competition in controlling troop behaviour among primates. This astigmatism seriously compromised data collection and theory construction in animal behaviour and evolutionary theory, until female primatologists entered the field in the 1970s. Until the 1970s, nothing had been written about the sexual initiative of female primates, or about the widespread involvement of males with infant care.²⁹ Such activities had not been deliberately suppressed; they had been invisible due to the gender of the researchers and the mind-set of culture.

These examples tell us about female primates (as initiating) and about the vital role of co-operation (versus competition) in our evolutionary history. But they also tell us about seeing and about the social construction of our scientific theories. The point is not that we can produce bias-free science, for all people bring biases to their work. The point is that we need to be as aware as possible of the omnipresent effects of such biases, not to mask it behind the 'neutrality of science' mythology. In addition, we need to encourage more women, more classes, more cultures to participate in science, since truth is multifaceted and more complex than we will or can understand. Hence our goal in science should be diversity and a multiplicity of discourses.

Donna Haraway, a biologist working in the Department of History of Consciousness at the University of California, Santa Cruz, calls primatology "politics by other means" because in the field of primate social behaviour, a drama is being played out: "a struggle for authoritative control in a field which tells of our origins".³⁰ Primatology is a powerful narrative of origin myths and as such, primatology is politics.

Ruth Bleier, a medical doctor and Professor of Neurophysiology at the John Hopkins University School of Medicine, shows how today's theories and studies of the brain are no less influenced by male biases. She carefully analyses studies concerned with significant cognitive differences that relate to sex differences, for example, women's supposed inability to do mathematics. Her studies³¹ reveal that these cognitive differences between men and women are given credence far beyond the quality and quantity of the supporting data. Moreover, Bleier tried to get her criticisms published in a leading journal showing how some of the most influential studies on sex differences in cognitive functioning were seriously flawed, but to no avail. So not only do ideological commitments determine scientific observations, which have the pretence of being 'neutral', they also determine ease of publication.³²

Bleier's work raises several important issues including the question: Why is so much time and money spent on the issue of sex differences in cognitive abilities, when the best experiments seem to show that these differences between men and women are trivial compared to the differences between people of the same sex? The full answer to this question must include the distorting effect of male bias.

This distorting effect can be seen, if less blatantly, in other areas. As Namenwirth indicates,³³ a preoccupation with domination and control has tended to distort biological research at the cellular and molecular level. Take the influential role played by the master molecule, DNA, in explaining biological processes. As a result of this gender-related paradigm, we tend to undervalue the self-sufficiency of the cell. We view the cell as dependent and receiving rather than initiating and we see the organism's genes as director, the information source. As Namenwirth points out, these sedimented assumptions limit our understanding of embryonic cells, where the cell is highly structured, information-packed and elaborately differentiated. Namenwirth cites several examples of how for years research was fruitlessly aimed at finding a director molecule in amphibian embryos, because scientists could not believe that the tissue as anything but dependent and receiving. This blindness was caused in part by fad, in part by foolishness but, Namenwirth claims, in part by too strong an attachment to a male authority paradigm.

We need more women scientists to overcome the distorting effect of patriarchy, which looms, not only in the social sciences, but in the natural sciences. But while this is necessary, it is not sufficient. As the research concerning womens' struggles to enter science shows,³⁴ even if horizontal segregation, whereby science is an exclusively male domain is overcome to some degree, we have yet to eliminate vertical segregation, whereby women scientists are confined to low status positions. We need not only more women scientists, we need women to be equally recognized practitioners of science. As Hilary Rose points out,³⁵ the majority of people actually practicing science are women (technicians) but their work is marginalized and trivialized. Technicians are not as important as 'real' scientists, the argument according status and pay goes, just as housework is not as important as engineering. To express it in Harding's words: "Until the emotional labour of childcare and housework is seen as desirable for men, the intellectual labour of science and public life will not be perceived as desirable for women".³⁶ In calling for women's equal recognition, we are touching deep areas that require revolutionary changes in the social relations between the

sexes. At the moment, our patriarchal society needs "inferiors".

Even when the scientific work done by women is objectively indistinguishable from men's work, it tends to be marginalized, trivialized, rendered invisible. Sayre's book on Rosalind Franklin tells that tale. The book is subtitled: "A Vivid View of What it is Like to be a Gifted Woman in an Especially Male Profession".

Rosalind Franklin was one of the four scientists whose work was most responsible for discovering the molecular structure of DNA. In 1962, the Nobel Prize for medicine and physiology was shared among Francis Crick, James Watson and Maurice Wilkins for their landmark discovery of the double helix structure of the DNA molecule. Franklin had tragically died of cancer at the age of 37 in 1958 so she did not share in the prize, although she had contributed substantially to the unravelling of DNA's spiral structure, with her X-ray photography of the crystals of DNA or deoxyribonucleic acid. Since only three people are able to share the Nobel prize, the question remains: Would Franklin have replaced Wilkins in the limelight, had she lived? As Sayre remarks, that Franklin missed the Nobel Prize is no great cause for concern. What troubles is the "slow and gentle robbery,"³⁷ the lack of other public acknowledgement of her work and its brilliance, and the robbery of her person by minimizing the importance of her scientific contributions and by distorting her character in the public eye.

In 1968, James Watson wrote a candid and lively account of the discovery of the structure of DNA in a book called *The Double Helix*. This widely-read narrative exacerbates the robbery of Franklin's achievements.

In the book, Watson consistently called Rosalind 'Rosy' and portrayed her as a willful, upstreperous, unbending laboratory assistant, who refused to emphasize her feminine qualities by not wearing lipstick, and who refused to think of herself as assisting Maurice Wilkins. To quote from *The Double Helix*:

She claimed that she had been given DNA for her own problem and would not think of herself as Maurice's assistant. I suspect that in the beginning Maurice hoped that Rosy would calm down. Yet mere inspection suggested that she would not easily bend. By choice she did not emphasize her feminine qualities. Though her features were strong, she was not unattractive and might have been quite stunning had she taken even a mild interest in clothes.³⁸

Watson got several items wrong in this representation of woman as an object for diversion, including the fact that Rosalind did not wear glasses and that she and Wilkins were co-workers and colleagues, in charge of their own research teams at St. John's, in London. Yet Watson's ill-informed account continues:

Clearly Rosy had to go or be put in her place. Given her belligerent moods, it would be very difficult for Maurice to maintain a dominant position that would allow him to think unhindered about DNA... Unfortunately Maurice could not see any decent way to give Rosy the boot... there was no denying that she had a good brain. If only she could keep her emotions under control, there would be a good chance that she could really help him.³⁹

As Sayre documents, Watson, Crick and Wilkins felt justified in using her extraordinarily fine analysis of the structure of DNA because, as they explained to the world, 'Rosy' was really good

at taking X-ray pictures, but would not have been capable of interpreting them. Thus, it was all for the best that they used her data and claimed the discoveries as their own.⁴⁰

Sayre's passionate defense of Rosalind Franklin compelled people to recognize her brilliance. Both Watson and Wilkins felt obliged to modify their accounts to the history of the discovery of DNA. In an epilogue to *The Double Helix*, Watson acknowledges that he was wrong about Franklin. He admits that he and Crick

came to appreciate her personal honesty and generosity, realizing years too late the struggles that the intelligent woman faces to be accepted by a scientific world which often regards women as mere diversions from serious thinking.⁴¹

Sayre's challenge of the accreditation system of science was crucial in that it helped to rectify past injustices and also allowed other accreditation scandals to surface, for example the graduate student, Jocelyn Bell's work on quasars for which Professor Hewish got the Nobel Prize.⁴² Furthermore Sayre's book revealed how Watson was able to minimize Franklin's work and distort her person: in our patriarchal culture, a woman is either not quite capable of first-class scientific research, or she must be abnormal as a woman. With white males holding most scientific posts and the majority of prestigious positions, the idea of a scientist becomes fused in people's minds with a white male. So to gain acceptance into the scientific community, women must demonstrate that there is no deviation from the norm in their attitudes and beliefs. As Elizabeth Fee, the historian of public health at John Hopkins University points out, because science has been so firmly identified as male, women in scientific fields have had to mediate between two worlds and a dual identity: to be a 'real woman' is to be non-scientific, to be a 'real scientist' is to be non-feminine.⁴³ For instance, if a woman scientist chooses to be assertive, she invites criticism since such behaviour is disconcerting coming from a woman; if she tends to be docile and supportive of others, she may be faulted and lose out for not pursuing her career with the appropriate drive. And, as many feminists point out, on top of this a female scientist has to deal with the real tensions and stresses of mediating the contradictory demands of professional work and the traditional female responsibilities for family and human relationships.

Hence, it seems correct to say that there will not be more equally recognized female practitioners of science until both science's relations with society and the relations between the sexes are altered. This is why we must work towards transfiguring science by caring labour.

One way both men and women can transform science is by incorporating both experiential knowledge and the personal dimension into their scientific explanations. One way to do this is to draw upon feminist epistemologies.

The sociologist of knowledge, Dorothy Smith,⁴⁴ investigates women's work and discovers that it often relieves men of the need to take care of their bodies or their homes. And the more successfully a woman performs this work, the more invisible it becomes. Meanwhile, men are 'freed' to be immersed in abstract concepts, and they begin to see these abstractions as real. Hence, they devise conceptual schemes which are incomplete, since they do not express women's actual experience. Women's labour becomes incomprehensible and inexpressible, and a 'line of fault' develops between our own experience as women and

the categories available to us with which to express our experience.

To rectify this situation, theorists such as Nancy Hartsock and Hilary Rose⁴⁵ have developed epistemologies grounded in women's lived experience. Both suggest that women experience themselves and tend to define themselves concretely, sensuously, relationally. This yields a new notion of power as reciprocal empowerment, the power to energize others. If a science can be generated out of such experiences, it is likely to help topple the edifice of dominance. These feminist scholars are engaged not in replacing one paradigm for another (male dominance with female dominance) but in moving the boundaries as to what counts as genuine knowledge. A necessary condition of this profound shift is for scientists to acknowledge that they, like everyone else, have values and beliefs, which will affect how they practice science. One goal, then, of a transformed science is to facilitate scientists' exploration and understanding of the ways in which their personal, social and environmental identities specifically affect their perspectives, approaches, methods, practices and scientific results. Other goals include: to reconceptualize the methods, theories and objectives of science without the language and metaphors of control and domination and to eliminate research that leads to exploitation and destruction. Other allied aims entail the willingness to be accessible rather than elitist and authoritarian, the ability to be humble, recognizing that each truth is partial, the facility to be more at ease with uncertainty, being aware of the wisdom of Socratic ignorance, the capacity to recognize the limits of human understanding and the true complexity of nature, and the desire to enhance the cultural diversity among the practitioners of science. For these goals to be aimed at, let alone realized, profound, political and psychological changes must take place at the structural, the collective and the personal levels. As this paper has attempted to indicate, these life-affirming objectives will require a tremendous shift, both in our collective consciousness, which is steeped in a mechanistic, patriarchal world-view, and in the structural organization of science, which is embedded in a vast military-industrial complex.

In spite of the overwhelming odds against such deep changes, feminism carries the seeds of an alternative metaphysics, epistemology and ethics and thus of a transfigured science. If we see beyond dichotomies, including the genderization of the world, if we see nature as active, incomprehensively resourceful and dynamic, and if we identify ourselves as continuous with nature rather than set over and against it, we will practice a science which will be qualitatively different from contemporary science. These abilities are not biological capacities exclusive to women, but are available to both sexes. This non-exclusive view is reinforced by the history of philosophy - from Plato to Polanyi the subject/object split is decried, and by the coincidence of feminist views with traditional peoples and other cultures - it is not just feminists (fortunately) who want to respect the integrity of natural processes. This means that it is not sufficient to deplore science because it is masculine: science is also to be criticized because it is market-ruled, ethnocentric, white and bourgeois. Gender is relational and to be realized it needs to be expanded to include categories such as race and class. But although one cannot critique science exclusively in feminist terms, feminism offers an irreplaceable tool of analysis. And women have a special entree to this new epistemology, not be-

cause of their biological difference, but because of their history of caring labour.

If we wish to uncover what is, rather than imposing what is not, if we wish to recognize and allow to flourish the complexity of interacting systems (including ourselves), if we wish to exist rather than insist, if we wish to 'let things be' in the Heideggerian sense⁴⁶ of concerning ourselves with subjects in the way in which they are, if we wish to unite our head, hand and heart,⁴⁷ we need to care.

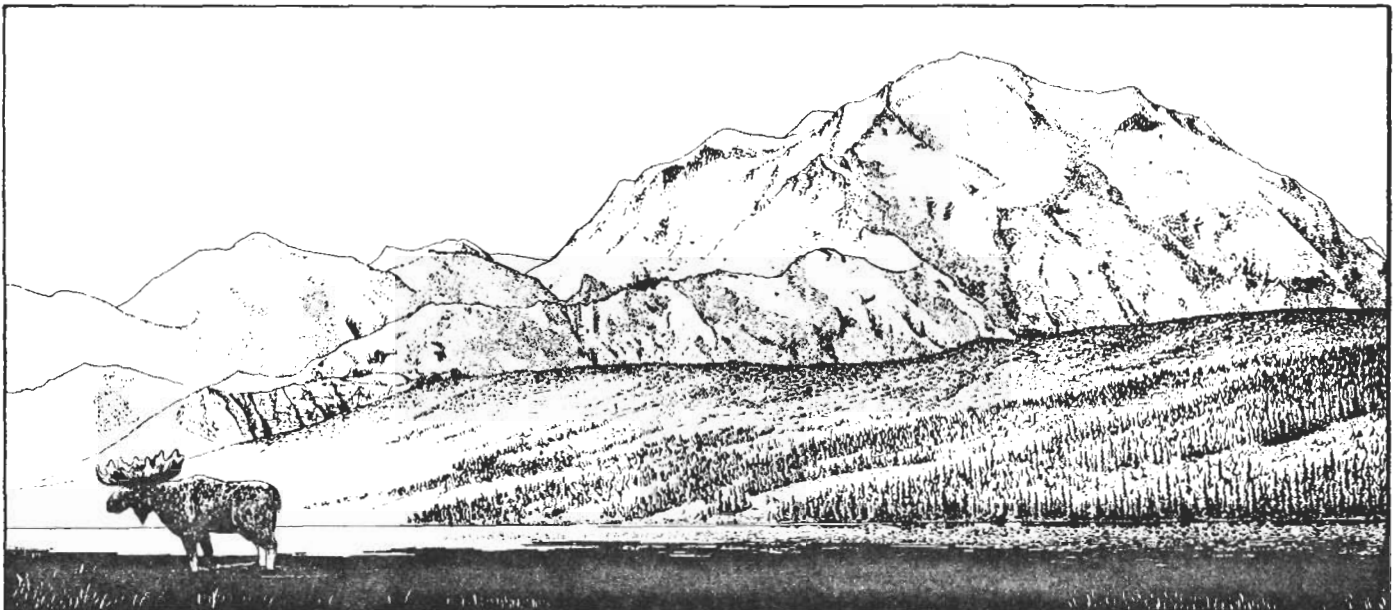
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MODES OF TOTALIZATION: HEIDEGGER ON MODERN TECHNOLOGY AND SCIENCE

Drew Leder

In his 1955 essay, "The Question Concerning Technology," Heidegger claims that, while the scientific revolution chronologically preceded the era of modern technology, this technology is ontologically-historically prior to modern science.¹ Such a science is always preparing the way for, standing in service to the essence of modern technology, even when the latter has not yet shown forth. This paper will focus upon

Heidegger's comments insofar as they elucidate, not just the history of Being, but the history of Heidegger himself.

That is, in Heidegger's own corpus, works such as **What is a Thing**, and "The Age of the World Picture," which address the nature of modern science, chronologically preceded his work on technology by some 15 to 20 years. The theme of the technological is not yet developed in his writings on science, and indeed there is little in the way of common terminology or historical dis-

cussions to link the work of the two periods. However, one might say that the *essence* of Heidegger's discussions of technology are historically already present in his earlier studies on science, in that the latter already prepare the way for, stand in service to the full analysis yet to come. I will try to illustrate this by employing a structure that systematizes Heidegger's observations on technology,² attempting to draw out the essence of his critique. (While such a prosaic systematizing of Heideggerian *poiesis* may itself appear technological in spirit, hopefully only moderate violence to the original will result.) I will then try to show how modern science, as taken up by Heidegger's work of the 1930s, exhibits the same structure of *presencing*. The unity of spirit underlying the phenomena of modern science and technology, or at least, Heidegger's writings on these, will thus be clarified.

Moreover, as Heidegger always seeks to uncover the essence of these modern phenomena by contrasting them with their ancient or medieval equivalents, I will contrast these discussions of the "later" Heidegger with the analysis of science and technology presented in his early work, *Being and Time*. Once again, Heidegger's later remarks provide a clue toward interpreting not only the history of Being, but Heidegger's own history: they suggest both certain deficiencies in the analysis of science and technology provided in *Being and Time*, and that these might have arisen precisely insofar as that work itself remains entrapped within the technological spirit.

The Essence of Modern Technology

As discussed in "The Question Concerning Technology," Heidegger views technology as first and foremost not merely a mode of producing or manufacturing, but a mode of revealing (QT, 12). This was evident in the Greek conception of *techné* as a way in which things are assisted to appear, brought forth into presence, revealed. What distinguishes *modern* technology is the particular way in which it reveals the world, namely as "standing-reserve;" Heidegger writes

Everywhere everything is ordered to stand by, to be immediately at hand, indeed to stand there just so that it may be on call for a further ordering. Whatever is ordered about in this way has its own standing. We call it the standing-reserve (*Bestand*). (QT, 17)

In the technological encounter the world is seen as fully available for use, ready to be appropriated. Rather than tending the world, assisting it to a completion of both natural and human ends, the world is "ordered," "set upon," "challenged" by modern technology. Heidegger contrasts the traditional farmer who watches over and assists growth with the operations of the mechanized food industry: here nature is not so much tended as overcome via hothouse environments, the creation of hybrid species, specialized shipping and refrigeration techniques, etc. It is not any of these particular techniques that distinguishes the challenging inherent in modern technology, but rather the general attitude which allows their invention and employment. This is the attitude taken toward the standing-reserve which seeks maximized, expedited output, stored and on call for utilization at any time. The object of such challenging demands can exhibit no autonomy, no personal rhythms or claims. The technician thus experiences no sense of responsibility toward the object, but does with it whatever is desired. The autonomy of the

object, the responsibility of the technician, are precisely what is concealed in the revealing characteristic of modern technology.

Yet, for Heidegger, every revealing must simultaneously conceal; to bring forth into one mode of *presencing* is always to close off others. Clearly, while technology conceals other approaches to the world, it has opened up a powerful disclosure space containing a myriad of possibilities, including that, for instance, of reading Heidegger. Yet he calls the essence of technology the "supreme danger" (QT, 26). There is something that sets off this mode of encounter from all modes which have previously held sway in the world, and makes of it a fundamental culmination, a crucial point of possible destruction or saving grace. What is it for Heidegger that makes the encountering involved in modern technology unique?

To draw together and systematize his reflections on this point I will introduce a somewhat artificial three-dimensional structure applicable to all encountering, all revealing. Loosely derived from the Husserlian analysis of intentionality, this structure is implicitly present in much of Heidegger's work, though never spelled out as such.

First, there is what in traditional phenomenological terms might be called the "noetic" (i.e. subjective) dimension, which presents the range of possible modes of encountering the subject can assume, such as the imaginative, the artistic, the technological, the scientific. Any given object, for instance a rock, can reveal itself through all these different modes. The experience of the rock as taken up by the artist is very different from that of the geophysicist.

The counterpart of this noetic range is the "noematic" (or objective) dimension which outlines the range of possible objects to be encountered *within* a given mode. Thus, remaining within the artistic mode, a painter could represent not only a rock, but an animal, an allegory, an emotion.

Finally, one might characterize an additional dimension that shapes and labels the encounter, along a continuum, as primarily noetic or noematic, subjective or objective. Undoubtedly, every encounter always arises out of the relational play of both aspects. However, an interpretation is also present, either implicitly embodied in the style of the encounter or explicitly stated in reflective analysis, of the extent to which subject or object are seen as determinative of the encounter and revealed by it. Heidegger is more interested in this "interpretive" dimension than classical phenomenologists, for variations along its range can, in his view, characterize different historical epochs. Thus, at one point in history the painting of a rock might be seen as primarily expressive of and valuable insofar as it reveals the essence of the rock as it is. At another time the painting might be seen as expressive primarily of the aesthetic intentions, the artistic style, of the painter-subject. It is likely that these divergent interpretations of the encounter would pre-shape it such as to result in very different paintings. However, even if the paintings were identical, the structure and meaning of the encounter embodied within them would have been transformed by this change in the interpretive dimension.

I will use this model to present Heidegger's description of modern technology. In addition I will introduce a term not in Heidegger's account - that of "totalization." What is unique and supremely dangerous about technology is its thrust to "totalize" itself along the three dimensions outlined.

First, Heidegger indicates that within the "noetic" dimension, technology **totally** reduces all modes of encountering to that of appropriation. An object revealed aesthetically need not close off the possibility that it will be seen at another moment as useful, or as an object of theoretical curiosity. However, the modern technological attitude threatens to block all other attitudes by assimilating and thereby transforming them.³ The aesthetic moment itself becomes **useful** as a source of relaxation, or perhaps in creating a commodity for the art market. The moment of theoretical curiosity becomes **useful** in its furthering of knowledge, control and careers. Thus the technological vision totalizes itself to incorporate within it all other modes of relation we could take to the object. "Where this ordering holds sway, it drives out every other possibility of revealing" (QT, 27). Once taken as standing-reserve, the world is entrapped firmly within this one relation as the dialectical play of different modes of presencing comes to a halt.

Next I will take up the "interpretive" dimension which characterizes the encounter as primarily revealing of subject or object. Here again the modern use-relation is very different from traditional ways of regarding the things of the world by virtue of the way the self is **totalized** within the encounter: there is no respectfulness or distance permitted as the object is thoroughly assimilated into our needs. Whereas the Aristotelian world-view recognized inherent potentialities and teleologies in the objects of the world, the challenging-forth engaged in by modern technology ascribes no intrinsic integrity to the thing. In Heidegger's example, the Rhine River is interpreted only as views for our enjoyment, energy for our needs. When taken as standing-reserve, the world is seen as a mere reflection of our desires and intentions. "Whatever stands by in the sense of standing-reserve no longer stands over against us as object" (QT, 17). With this depreciation of the object is a concomitant overvaluation of the subject. "In this way the impression comes to prevail that everything man encounters exists only insofar as it is his construct" (QT, 27). Thus we see this totalization of self within modern metaphysics whereby the Cartesian "*cogito*," the Kantian *a priori*, the Nietzschean "will to power," all look to found the physical or ethical world primarily out of the self. Modern philosophy, with its emphasis on the hegemony of the subject, is thoroughly technological in spirit.

Technology is totalizing along the "noematic" dimension as well, in that the use-relation which overcomes all other modes of encounter, which overcomes the autonomy of the object, seeks always to subject the **totality** of all objects in the world to this overcoming. The noematic range is fully set upon, as no object by virtue of its beauty, animacy, sacredness, can escape assimilation into the standing-reserve. Even the sun is merely the source of usable heat, the earth of coal, the rivers and wind, of convertible energy. All the elements are given over and set upon without remainder.

In a way that supplements Heidegger's account, works such as those by Merchant⁴ and Easlea⁵ trace out the historical progression of this assimilative process. As early as the 15th Century there were arguments for removing the normative constraints against such activities as mining, which was hitherto restricted as a violation of the living earth's womb.⁶ Francis Bacon, in the 1600s proclaimed the foolhardiness of any such limitations on man's dominion over nature, since this right had been granted by divine bequest. Nor was this license limited to the inanimate world. Descartes' redefinition of animals as insensate automata

was understood as making them fully available and on call for vivisection and the like. His conception of the human body as likewise a mere machine transformed it into a literally "standing" reserve ready to be used by the reason and will for their purposes. Furthermore, to some degree the entirety of the working masses and female gender were soon thereafter interpreted as bodily in this way, that is, as virtually unreasoning machines, and thus justifiably on call as a storehouse of labor and sexual power.⁷ In this progression, humankind which swallows the whole world into standing-reserve, ultimately swallows itself. People become useful as the operators and supervisors of various technologies, the occupants of housing, the producers of wealth, the makers of babies, all useful functions. Thus, Heidegger describes a paradox similar to that presented in the Hegelian master-slave dialectic: at the very moment when man "exalts himself to the posture of the lord of the earth" (QT, 27), he also finds himself thoroughly enslaved in the form of the standing-reserve.⁸

This then is the result of the threefold totalization of modern technology, where use is the sole and total mode of relation; self is total within the use-relation; all things in the world, humanity included, are totally assimilated into use. Yet for Heidegger this constitutes the supreme danger, for by virtue of this structure of encountering: "**In truth, however, precisely nowhere does man today any longer encounter himself, i.e., his essence**" (QT, 27). Indeed his essence is in the encounter itself: neither master nor slave, subject nor object, man is essentially the one who watches over, assists the unconcealment of Being. "But the unconcealment itself within which ordering unfolds, is never a human handiwork ..." (QT, 18). Man is not ultimately the creator and master of any form of revealing, even that which characterizes technology; such forms are given over to man as "destinings." To regard technology as an exclusively human activity and means to human ends, as do the "anthropological" and "instrumental" interpretations of technology is, for Heidegger, to miss this crucial point. His term for the essence of technology, "Enframing" (*Gestell*), seeks to express that humankind which sets upon the world is not the originator of this process, but was itself set upon, challenged-forth into this mode of revealing. But neither does this challenge, this destining given over to man enslave him, for "destining is never a fate that compels" (QT, 25). We are in freedom in that we listen to the destining and can receive from it the "saving power" which lies within it.

This essence of humanity as called into the revealing of truth is thoroughly concealed when the world is interpreted as mere use-value and when all meaning is understood as subjectively derived. Thus it is our very essence and with it the essence of truth and of the world that is concealed in the totalization characteristic of modern technology. This is the supreme danger.

The Essence of Modern Science

I now turn to an examination of Heidegger's essays on science. We remember his claim in "The Question Concerning Technology" that modern science, despite its chronological precedence, always stands in service to modern technology. This could be taken to mean that humankind sought to develop theoretical knowledge always with the intention of using it for appropriate ends. Thus Francis Bacon writes, as early as 1620: "Now the true and lawful goal of the sciences is none other than this: that

human life be endowed with new discoveries and power."⁹ However, Heidegger's claim goes beyond this, for he writes: "The modern physical theory of nature prepares the way first not simply for technology but for the essence of modern technology" (QT, 22). We have seen that this essence is bound up with a concealment of the very structure of encountering, of revealing itself, by virtue of a profound transformation in the relation between humankind and world. I will thus retrospectively examine Heidegger's 1930s essays on science to elucidate the ways in which modern science already effects this same transformation.

In his lectures contained in *What is a Thing?* and "The Age of the World Picture," Heidegger takes modern science to be essentially "mathematical." To reveal what it is to be mathematical, Heidegger characteristically returns to the origin of the word: "**Ta mathemata** means for the Greeks that which man knows in advance in his observation of whatever is and in his intercourse with things ..."¹⁰ Thus, "the mathematical, is that 'about' things which we really already know."¹¹ To think mathematically is to anticipate, to have in advance how the world is to appear, to posit fundamental presuppositions which then allow individual facts to be pursued and filled in. Historically, mathematics comes to be associated with the numerical only because this is the "most familiar" (WT, 75), "most striking" (AWP, 119) instance of something already known. We can count three apples or three of anything only because we already have the notion of threeness, thus allowing the world to exhibit examples of it. But the numerical is only one form of anticipatory knowledge, of the mathematical.

This pre-structuring of the world accomplished by science in virtue of its mathematical nature is reminiscent of the pre-structuring which lies at the heart of technology; namely, the taking of the world as always on call, already available for use. Science in its emphasis on establishing a world picture in advance already tends toward the technological enframing mode of encounter. Of course, there are no presuppositionless encounters for Heidegger: in *Being and Time* he describes how all modes of encountering exhibit a fore-structure, including that which we "have," "see," and "grasp" in advance.¹² However, we may infer from our prior analysis that what sets apart the scientific encounter as technological is the extremism, or totalization of this fore-structure, delimiting the entire world into a restricted, uniform mode of presencing. Thus, I will attempt to show how, in Heidegger's account, science exhibits the same threefold structure of totalization previously described.

First, along the noetic dimension, the scientific encounter totalizes itself as the one true mode of access to the real. A particular way of envisioning the world, e.g. that provided by Galilean physics, is regarded as definitive of reality, to the exclusion of perceptual, aesthetic and ethical attitudes. These other modes of relation are either assimilated into, or dismissed by the scientific thrust to total explanation.

Furthermore, in contrast to those who take this explanatory power of science as arising from its lack of preconceptions, a noetic openness permitting neutral facts to emerge from experimental research, Heidegger argues that it is only the resolute adherence to restrictive presuppositions that makes such research possible. Facts cannot appear except against the background of a "ground plan" which determines what phenomena are to be examined and in what way, and how the results of this examination are to be interpreted. Thus, in *What is a Thing?*,

Heidegger traces out how Galileo's experiments with falling bodies, and the "facts" which he uncovered would have been impossible unless the very concepts of body, space and motion had been appropriately reworked from the Aristotelian versions. It is only after nature is represented as a collection of matter and calculable forces that it can be questioned "for the purpose of asking whether and how nature reports itself when set up in this way" (QT, 21). Nor could modern scientific research attain its precision of results without this rigorous restriction of the noetic attitude. "The more exactly the ground plan of nature is projected, the more exact becomes the possibility of experiment" (AWP, 122). Thus, in Heidegger's analysis, it is the totalization of a particular mode of encountering to "which the knowing procedure must bind itself" (AWP, 118) that permits scientific research to be experimental and exact.

Modern science is totalizing, as well, along what I have termed the interpretive dimension, which characterizes the encounter as primarily subjective or objective in its source and meaning. Just as technology manifested an essential tendency to interpret the subject as primary within the appropriate encounter, so the self is elevated to all-importance in the essence of modern science. This might seem paradoxical if modern science is conceived of as allowing the object to presence without anthropomorphic concerns or subjective preconceptions intruding. However, we have seen that this is not Heidegger's view: the "mathematical" project is always bound up in the preconceived. Furthermore, "In the essence of the mathematical, as the project we delineated, lies a specific will to a new formation and self-grounding of the form of knowledge as such" (WT, 97). Modern science cannot accept the merely extrinsic sources of truth pointed toward by Classical and Medieval thinking; the presencing of the world, the writs of the Church. Only if it can ground knowledge fully out of the self in advance of any encounter can the mathematical, that is, knowledge given in advance, achieve completion.

Thus, in Heidegger's view, mathematical science is essentially linked with modern metaphysics and its elevation of the subject. He gives the example of Descartes' famous turn inward to the "I" as the source of the fundamental axiom on which scientific knowledge of the world is to be based (WT, 104). The "**cogito**" moment is, as it were, an ultimate expression of the mathematical, and hence an ultimate ground of modern science, for in it all knowing is anticipatorily contained. Only what is known in advance in this way as the precondition of all encounters can be secured as certain. No experience could challenge the "I think" revelation, and any attempt to doubt it simply stands as another instance of its confirmation.

The ultimate outcome of the mathematical project is thus that, "Man becomes that being upon which all that is, is grounded as regards the manner of its Being and its truth. Man becomes the relational center of that which is as such" (AWP, 128). In "The Age of the World Picture," Heidegger traces out how the word **subiectum** comes to refer only to the human subject, whereas the Greek word of which it is a translation, **hypokeimenon**, meant simply a ground which gathers. In the modern age, the world no longer forms such a ground, and so is not called **subiectum**; in truth, it is no longer even a "world," but merely a "world picture." That is, the world is viewed as a pre-structured image produced by man and at his disposal, attaining its reality and Being only insofar as man apprehends it. "That the world becomes picture is one and the same event with the event of man's becoming **subiectum** in the midst of that which is" (AWP,

132). In our terms, the noema is robbed of independent import with this interpretation of the noetic pole as the source and central focus of the encounter. This is a move toward totalization within the interpretive dimension.

Finally, modern science is totalizing as well along the noematic range. As technology strives to convert the totality of all objects into use-value, so science seeks to bring them all without remainder under its explanatory axioms. Heidegger points out that Newton's first law of motion begins with the words, "**corpus omne**" or "every body" (WT, 86). Attempting to achieve unfettered universality, modern science lays down a unitary conception of the thing, taking the view that, "All natural bodies are essentially of the same kind" (WT, 86). As a result, all distinctions between noematic regions are obliterated. The Aristotelian division of the earthly from celestial realm disappears. Spatiality is no longer composed of "places," each with their own characteristics. Rather we inhabit a uniform grid. In such a world there is no separation of natural from unnatural motions, as all motions become the result of extrinsic forces governed by universal law, rather than arising out of the intrinsic nature of individual objects (WT, 88). The object is left as only an exhibitor of quantity, losing the innate qualities and teleologies that set it apart from others. In the drive to achieve universal characterization and explanation, modern physics leaves a uniform world in which the totality of things manifest themselves in but one way.

Furthermore, Heidegger suggest that this physics is normative for modern science as a whole. Whereas, for Aristotle, sciences were irreducibly different, reflecting difference in the natural order, it is often assumed now that, at least in theory, all sciences are ultimately groundable in a unity of explanation. It is accepted that from the rock to the human being the physical laws of motion hold, and as Heidegger writes, "Even where one permits the animate its own character, it is conceived as an additional structure built upon the inanimate ..." (WT, 51). Thus, this does not disturb what Heidegger terms, "this reign of the material thing (**Stoffdinges**), as the genuine substructure of all things ..." (WT, 51), which extends to even the "spiritual" realms of art, language, history. These are no more immune from scientific explanation than they were from incorporation into the standing-reserve.

Moreover, the characterization of the thing totalized in modern science is optimally suited to prepare the way for such an incorporation. I will take off from, but exceed, Heidegger's remarks in providing a brief discussion of the ways, both negative and positive, that this portrayal of the noema in modern physics stands in service to the technological project.

By negating the religious, the aesthetic, the ethical modes of apprehension, science removes those features of the natural world that have traditionally held exploitation in check. There are no inherent Aristotelian teleologies within nature to be respected; nor, as in the other 17th century rival of mechanical philosophy, Neoplatonic natural magic, is there a celestial and world-soul, endowing matter with occult forces, sympathies and antipathies. Even the Christian God is ultimately relegated to the status of a divine clockmaker who discreetly steps aside when his machine is completed. Thus nature is left devoid of any intrinsic purpose or sacred immanence that would defy technological tampering.¹³ The scientific striving for totalized explanation and prediction negates all this, leaving a universe of soulless, inert matter. Not only is there nothing in this inanimate nature

to prohibit human use; on the contrary, its mechanical motion, purely senseless in itself, invites the infusion of human intelligence and purpose. It is as if the very redemption of scientific matter can only be achieved via its conversion into the standing-reserve.

In addition to this clearing away of prohibitions, science renders an obvious positive assistance to technology by extending human theoretical knowledge. The basic principles of mechanistic philosophy all prepare the way for the full knowability of the world. As inanimate, matter will exhibit no spontaneities, and hence be predictable when antecedent conditions are calculated. As devoid of occult properties, objects are constrained to show themselves fully without hidden nooks and crannies. That which is only extension with no intention, is quite naked to inspection. Furthermore, as extension is fully divisible, nothing is hidden within an irreducible integrity: the atomistic tendencies of modern science assures that nature can be broken-down and examined even unto its minutest parts.¹⁴ In this totalization of knowledge science prepares the way for total prediction, and with it, total control. Its yields facilitate the unlimited technological securing of the world for our purposes. As Francis Bacon writes: "Human knowledge and Human power meet in one; for where the cause is not known - the effect cannot be produced."¹⁵

In summary, Heidegger's account of modern science exhibits it as effecting a threefold totalization: one restrictive mode of presencing is taken as totally representative of reality; this is totally grounded in the self; and is extended to cover the totality of objects and events. One can understand this structure from within the intrinsic telos of the scientific project. We have seen how, in Heidegger's description, the assumption of one restricted perspective opens up the possibility of rigorous experimental research; how the turn inward to the self for fundamental axioms is an attempt to achieve completeness and certainty; how the extension of scientific axioms to apply to all things in the world strives toward a universality of explanation. The ideals of rigor, certainty, universality, seem appropriate components of the scientific project.

Yet at the same time we see in this project a structure of totalization identical to that which characterizes modern technology. This is why, in Heidegger's account, science stands in service not merely to technology but to the essence of technology. By effecting the same totalization of a restrictive model of encountering, modern science effects the same concealment of the nature of the encounter that characterized the essence of technology. The result is a covering-over of the true being of man, of world, and of truth itself; truth not as correct science, but as **aletheia**, unconcealment.

Science and Technology in "Being and Time"

I will now briefly discuss how the essays hitherto under examination serve as an important extension and critique of themes already present in **Being and Time**. A main concern in this earlier work was to break the hegemony that the Cartesian worldview held over modern philosophy, with its notion of the subject as pure **knower**, the thing as pure "presence-at-hand" laid out before the detached, theoretical vision. Heidegger argued that a concerned relation with things as "ready-to-hand" equipment, grasped in their practical utility, was existentially prior to, and foundational for the scientifically thematized object. This stands

in important agreement with Heidegger's later claim that the essence of modern technology comes before and founds the phenomena of modern science: throughout his writings he goes against the prevailing epistemological focus of modern philosophy by emphasizing the ontological rootedness of *theoria in praxis*.¹⁶

However, in *Being and Time*, Heidegger regards the presence-at-hand of an entity as originally revealing itself out of a "deficiency in our having-to-do with the world concernfully" (BT, 88). Only when the ready-to-hand tool in some way becomes unuseable, missing, or stands in the way of our project, do we begin to "tarry alongside" the object. At this point, the object which had been largely withdrawn from direct examination by virtue of its ceaseless reference to the project it serves, first becomes conspicuous in itself. Removed from everyday involvements the object emerges in its bare, substantial, mathematizable "thingness," which Descartes was then to equate with the real as such.

In *Being and Time*, this presence-at-hand and readiness-to-hand are considered as foundational *existentiales* in what is essentially a static analysis of all Dasein. However, in his later work Heidegger comes to recognize crucial differences in the modes of presencing which distinguish historical epochs. As we have seen, he becomes centrally concerned with articulating the essence of presencing specific to the modern world. One might rephrase his insights as follows: in the current age, presence-at-hand, in the form of mathematical science, lies crucially in service to, and prepares the way for the readiness-to-hand of the world viewed as standing-reserve. Far from being a mere deficient mode of readiness-to-hand emerging when objects become unuseable or resistant, the modern scientific exploration of presence-at-hand plays an essential role in preparing objects for use, envisioning them in a way which allows them to be subsumed into equipmentality, as well as giving us the theoretical and predictive power to ceaselessly extend our utilizations. Indeed, in its very totalizing thrust, its will to completed knowledge and power, the modern attitude toward the present-at-hand is essentially one and the same with that directed toward the ready-to-hand.¹⁷

We fail to see the transformation effected by history and the hallmarks of our own historical epoch when we stand too firmly within this epoch. Thus, Heidegger's incomplete characterization of the contemporary linkage of the present-at-hand and the ready-to-hand suggests that he still stood within certain uniquely modern paradigms even while claiming something like an *a priori* status for his analysis. Therefore I will conclude with a discussion of how *Being and Time* itself remains partially within the totalizing structure of the technological which Heidegger was later to recognize as dominating the modern age.

In this work, presence-at-hand and readiness-to-hand are brought forth as the *only* fundamental modes of encountering the non-human world. There is, for instance, no mention of the poetic vision, non-theoretical, non-appropriative, which was later to assume such importance in Heidegger's thought. In seeing only these possibilities of approach to the natural world, i.e. the proto-technological and proto-scientific, Heidegger effects their totalization within the noetic dimension, concealing all other possibilities of encounter.

There is, as well, a totalization within the noematic dimension, insofar as Heidegger speaks of *all* non-human objects as presenc-

ing themselves through these modes. Modern metaphysics has already clarified how the totality of the world can be regarded as presence-at-hand. More important to Heidegger's project is his attempt to show how all things first reveal themselves as equipment, as ready-to-hand. This is not restricted to man-made artifacts, but is taken to characterize the natural world as well. Heidegger writes: "The wood is a forest of timber, the mountain a quarry of rock; the river is water-power, the wind is wind 'in the sails'" (BT, 100). We see here Heidegger effecting precisely the assimilation of nature into standing-reserve that he will later come to recognize as constituting a supreme danger.

It is true that Heidegger allows for a different mode of encounter with the Dasein of Others, who are taken neither as present-at-hand nor as ready-to-hand. Thus the noetic and noematic range are not fully totalized along scientific-technological lines, as the attitude of "solicitude" and the presence of other human beings resist these dominant modes.

However, this sharp split in the "care" structure, separating the modes of encounter possible with natural things ("concern") and with other people ("solicitude"), itself remains within the spirit of the modern era. The subjectivism of modern metaphysics, as we have seen, draws a radical distinction at the start between the being of humankind and that of mechanical thinghood, *res extensa*. An Aristotelian or Neoplatonic cosmology, recognizing telos and soul within nature, does not effect as sharp a division between the human and natural world, and thus between the types of encounters one might have with each. Heidegger's assumption that one could not feel solicitude toward things and animals, experiencing with them a sense of reciprocity and communality, reflects the modern characterization of the human subject as the *only true subjectum*.

This brings us to a final point: along what I have termed the "interpretive dimension" Heidegger tends to totalize the import of the human subject within the confines of *Being and Time*. He traces out how an investigation of the equipmental totality in which we dwell always leads back to Dasein as the "for-the-sake-of-which" all projects arise (BT, 116). Dasein is taken as the relational center of the world, a position Heidegger will come to profoundly question in his later writing. Admittedly, even in *Being and Time* he characterizes Dasein in a non-subjective fashion: as Being-in-the-world, Dasein is not the isolated self, but contains a relatedness to the thing, the Other, to the worldhood of the world. Yet by pursuing the question of the meaning of Being solely by interrogating this Dasein, a particular entity understood as evidencing a certain "priority with regard to its Being" (BT, 28), Heidegger remains within the modern interpretation of the *human* being as central to all presencing.

Thus, while never falling completely within its confines, *Being and Time* exhibits a tendency toward the threefold structure of totalization that characterizes technological thought. There is a dominant focus on the use-relation, the assimilation of all objects into equipmental and scientific modes of presencing, the centrality of Dasein in the interpretation of all phenomena. Insofar as Heidegger still wrote from within the technological spirit, his incomplete characterization within *Being and Time* of the essence of modern science and technology is understandable: as we have seen, it is the very nature of this essence to conceal itself.

NOTES

1. Martin Heidegger, "The Question Concerning Technology," translated by William Lovitt, in **The Question Concerning Technology and Other Essays** (New York: Harper and Row, 1977), p. 22. This essay will hereafter be cited in the text, as **QT** and page number.
2. Unless otherwise indicated, "technology" will be used here (as Heidegger frequently does) to refer specifically to the phenomena of modern technology.
3. The process whereby the technological enterprise totalizes itself, not by battling the alien elements in culture, but by celebrating and assimilating them, is described at length in Herbert Marcuse's **One-Dimensional Man** (Boston: Beacon Press, 1964).
4. Carolyn Merchant, **The Death of Nature** (New York: Harper and Row, 1980).
5. Brian Easlea, **Witch Hunting, Magic and the New Philosophy: An Introduction to Debates of the Scientific Revolution 1450 - 1750** (New Jersey: Humanities Press, 1980).
6. See Merchant, pp. 29-41.
7. See Easlea, pp. 140, 236-245.
8. Works such as those by Easlea and Merchant, along with some in the tradition of "critical theory," draw attention, like Heidegger, to the exploitative tendencies inherent in modern technology and science, while emphasizing to a greater degree how such phenomena were used from the start to facilitate class and sexual oppression. The phenomena of modern technology and science, they suggest, is not so much the call of Being in the modern age, or even the project of humanity per se, as the project of ruling-class white males. Taking this view, the domination of humans over other humans emerges as an essential preliminary to the establishment of an appropriative attitude toward the natural world. Furthermore, there remains the possibility that if economic and sexual oppression were overcome, a more holistic and truly humanized technology and science could emerge.

I take Heidegger to be less sanguine about such matters. It appears that in his account human oppression would not be the grounding phenomenon, but merely a further expression of the "enframing" which leads us to seek totalized domination over all things. Thus, for Heidegger, a better society in which science and technology were used rationally and equably would not escape the modern hegemony of the standing-reserve and would remain within the supreme danger. Heidegger

does not stress political action for this would presumably represent something like a technological "fix" of the situation: rather, he writes of language, *poiesis*, the need to wait on a new call of Being, all of which must in turn sound far too quietistic to his more political critics. Nevertheless, this promises to be a fruitful argument and should not obscure several points of profound agreement in these accounts of the modern technological age.

9. Francis Bacon, "Novum Organon," in **Selected Writings of Francis Bacon** (New York: Random House, 1955), p. 499.
10. Martin Heidegger, "The Age of the World Picture," translated by William Lovitt, in **The Question Concerning Technology and Other Essays** (New York: Harper and Row, 1977), p. 118. This essay will hereafter be cited in the text, as **AWP** and page number.
11. Martin Heidegger, **What is a Thing?** translated by W.B. Barton, Jr. and Vera Deutsch (South Bend: Regnery/Gateway, Inc., 1967), p. 74. This work will hereafter be cited in the text, as **WT** and page number.
12. Martin Heidegger, **Being and Time**, translated by John Macquarrie and Edward Robinson (New York: Harper and Row, 1962), p. 191. This work will hereafter be cited in the text, as **BT** and page number.
13. See Merchant and Easlea on these points.
14. The conflict between the Cartesian doctrine of the extensive continuum and the Newtonian atomistic theory should not conceal a point of essential unity: both theories permitted the thing to be understood via a breakdown and analysis of its component parts, in contrast to the more "organismic" and "holistic" approaches favored by Aristotelian and magical views of nature.
15. Bacon, p. 462.
16. On this point, see Don Ihde's **Technics and Praxis** (Dordrecht, Holland: D. Reidel, 1979), pp. 103-129.
17. See Ihde, p. 128.

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THE LIMITS OF SCIENCE AND THE PRICE OF TECHNOLOGY

David Suzuki

Part I. Science

As the French Nobel laureate Francois Jacob wrote years ago, the human mind has an innate need for order. The great survival attribute of our species is our brain's ability to recognize the existence of regularities in nature. By noting the cycles of day and night, tides, seasons, changes in the moon, animal migration or plant succession, our distant ancestors were able to predict the future and act on those expectations. This ability more than compensated for our lack of strength, speed or sensory acuity. Blessed with consciousness, the human mind demanded to know how things worked and developed "world views" which were comprehensive explanations of everything in the universe. In a world view, all things are interconnected; the entire fabric of the cosmos is interlocked. The birth of a two headed child may be read as punishment for something in the past or a portent of events to come. Of course, most world views have a huge fudge factor in the explanations of everything - namely, some almighty force or being.

Scientific explanations stand in sharp contrast with world views. Science eschews the comprehensive, focussing instead on specific aspects of the world around us. The strength of science is that it makes no pretense at being able to deliver the "big picture" and concentrates instead on a part of nature, isolated and therefore controllable. It has been assumed since Newton's time that the whole is equal to the sum of its parts, so that if enough isolated parts can be investigated, eventually they will add up to a complete whole. I remember vividly discussing the question of whether biochemists would be able to reconstruct a living cell by their knowledge of its molecular constituents. When I said I believed there were properties of cells that could not be predicted by what was known about the molecules that constitute them, a grad student shouted, "You're a vitalist!" I think his assertion is the assumption of most molecular biologists today.

But science itself may stand in need of something like a world view: Modern physicists have long known that Newton's concept of the universe as a giant clockwork mechanism, which would be completely understood when its basic components

were discovered and described, is no longer supportable. Heisenberg has informed us that in order to "see" nature, we have to modify it; thus we can never know nature as it really is. At the level of elementary particles, nothing is absolutely predictable. Quantum theory shows us that there is nothing absolute about the orbits of electrons, for example: we can describe their behavior only by probabilities. Further, the properties described at one level do not provide much insight into characteristics of matter at higher levels of complexity. Although the properties of atoms of elementary hydrogen or oxygen may be completely known, these are of little help in predicting their behavior when they have combined into a molecule of water.

While physicists learned these lessons early in this century, biologists have been much slower to come to this point. Now, most of the disciplines within the life sciences operate on the assumption that by studying nature in bits and pieces, eventually we will be able to describe it all. It may be that many biological defects (if we can come to agree on a non-value-laden definition of 'defect') will be explicable in terms of base sequence changes along DNA, the genetic material. But surely the enormous range of human development and behavior will not be so easily described. In the same way, defective neurocircuits may lie at the base of some mental problems; but simple tracing of cranial wiring diagrams will never explain the essence of mind and consciousness.

Unfortunately, this has not held us back from a sledgehammer approach to human and environmental issues. We have powerful treatments for **symptoms** that do nothing for the fundamental causes, whether biological, social or ecological. Some of us fear that DNA technology will prove to be only another sledgehammer.

If we are far from cautious about what we do to ourselves, we are completely reckless with the environment. Our culture has evolved with the notion that air, water and soil are nearly limitless, perpetually self-cleansing and self-renewing. When we humans were few in number with primitive technology, we **did** live lightly on the land. But much has changed this century. Armed with the powerful tools that science has provided to technology, we now exert a major impact on the surface of our planet. While we are extinguishing species at an unprecedented rate, we apply the knowledge we have gained in our fragmented way to the "management" of trees, fish, birds, animals, and water.

What I find remarkable is that although our species is the dominant element in the decimation of much of the environment, including both habitats and species, nevertheless we are quick to point to other species as the cause of declining yields of a "natural resource." Thus seals, whales, wolves, spruce budworms, mosquitoes have all carried the can for environmental problems we've encountered or helped create.

As a biologist, I have been appalled at the way we've tried to "sustain the yield" of ducks, trees and salmon. We behave in a way that gives support to Ronald Reagan's belief that if you've seen one redwood tree, you've seen them all. Our management policies are predicated on the notion that a tree is a tree, a duck a duck and a fish a fish. If we "harvest" these as mere identical units, then our management strategy is simply to replace them by injecting some multiple of human-reared animals or plants back into the environment. But in each case - with ducks, trees and salmon - we've learned that it is a tragic mistake to assume that all a species' members are alike. Over thousands of years, genetically-distinct population pockets have evolved to ex-

quisitely exploit very specific parts of the ecosystem. Once wiped out, such races will never be recovered again. Rather than enhancing our yields, we have simply made parts of the ecosystem inaccessible to those species by curtailing their diversity.

I do not advocate that we stop doing scientific research. But I do think we ought to examine some of our basic assumptions and recognize the strengths and limitations of this powerful activity.

Part II. Technology

Ever since I became involved in the electronic media 23 years ago, I have assumed we need a general public that is more scientifically informed. In the long run, I had hoped, an educated public would elect politicians who themselves were scientifically literate, and hence able to make more informed decisions about scientific and technological issues. I still believe that, but recently I've wondered about the many examples of the negative effects of technology, and I realize that there is a far more fundamental stumbling block to the wise use of new technologies.

What I had foreseen was a society in which there would be mechanisms for people with a broad spectrum of interests and expertise to assess a new technology for its benefits and detriments, **before** it would be allowed to be used. The history of science and technology informs us that no matter how beneficent they seem, they always have a cost. The technocratic optimists who look to technology to solve technology-created problems must accept that this cannot be expected to continue indefinitely. So my assumption had been that panels of people would assess benefits and costs - and where there were potential hazards that could not be documented, that the burden of proof would rest with those who wanted to use it: not the potential victims.

I still believe that this would be a good way to look at new techniques and products before making them available. But again, the history of technology reveals a major problem that cannot be handled this way. In most cases, the benefits of a new technology are immediate, obvious and enormously desirable. We like technology because it makes life easier or richer. And once a new technology has been found to be effective, we can't conceive of doing without it. Thus, although I find that 99 percent of the copied material I now receive at work is garbage, I cannot imagine living without a Xerox machine. And my life has been revolutionized by word processing with my portable computer. But in trying to assess the costs, we should realize that often they may be revealed only after the technology has been in use for years or even decades. Let me give you some examples.

Perhaps one of the striking cases is the story of the synthetic hormone diethylstilbestrol (DES), which was used to stop premature labor in pregnant women. It was only after a generation of use of the drug that epidemiologists discovered that girls who were **in utero** at the time of their mothers' exposure to DES had a much higher risk of developing a rare form of cervical cancer. Yet here, no amount of pre-testing could have detected these effects.

The same must be said for the oral contraceptive. The benefits of the Pill were obvious; control of fertility, and enormous profits for pharmaceutical companies. Extensive tests were done to show that it was an efficacious and safe contraceptive. It was only after **millions** of healthy, normal women had taken the drug for **years** that statistically-significant detrimental effects turned

up. Once again, no amount of solid experimental testing and careful consideration could have anticipated these results.

A third example is television. Once again, the benefits were immediate and obvious - profits from commercial revenue, and great potential for entertainment, information and education. But no amount of prior consideration could have anticipated the direction that programming and commercials would go, the number of hours viewed, the social ramifications. Now, generations after the advent of television, we have barely begun to realize the social costs of this technology in terms of illiteracy, boredom, violence, and warped world views and social values.

As a final case, we must look at nuclear weapons. Once again, the benefits were clear - initially a race to beat the Nazis, then a demonstration to the Japanese of the futility of continuing the war. In both cases, it worked. Of course, it turned out that the Germans weren't developing a bomb, but it certainly ended the Pacific war in a hurry. It was only years after the first atomic test, when the H-bomb was tested over Bikini Atoll, that we discovered fallout. Years after that, scientists learned that atmospheric atom blasts punched holes through the ozone layer that guards Earth's surface from sterilizing ultraviolet radiation. Later still, it was found that an electromagnetic pulse of gamma rays accompanies a nuclear explosion and knocks out electrical circuits over a vast area. Now, over 40 years after the beginning of the atomic age, we are realizing that a full-scale war will bring on a global 'nuclear winter' with devastating results. I have no doubt that we have new costs to learn. Yet even given these lessons, we are nevertheless rushing to exploit space with more technology.

I believe if we are to learn anything from history, it is that we cannot go on indefinitely inventing and applying new technologies as if we will always be able to handle all problems in the future. The issue of nuclear weapons poses a fundamental and terrifying dilemma. History tells us that we have **never** been able to pull back from a technology once it was in place and found to provide benefits. I know of no instance (even the banning of DDT and the U.S. supersonic transport) where we've pulled back. Yet we **must** do so with nuclear weapons. Perhaps the demonstration of the hidden costs of technology, illustrated so well by the history of nuclear bombs, will be the final trigger to get us out of our unrealistic faith in technology's efficacy. I believe we have come to a point where we have to rule out, consciously and deliberately, areas for further development out of our ignorance and a realization that we cannot afford to "find out the hard way."

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SWEET DREAMS OF ARTIFICIAL INTELLIGENCE

Carolyn Masson

To create a "thinking" machine modelled after human thought processes that can learn through "sensory" data inputs is a deep fantasy of some theoreticians and technicians. Joseph Weizenbaum calls them the "Artificial Intelligentsia." Their machines, they hope, may even someday surpass human intelligence. However, Michael Cooley, in *Architect or Bee?*, asks, "Why diminish the human intellect?" He is proud of the human capacity for intellectual activity, and contrasts humans with computers. He notes that people, with the combination of intellect and imagination, creativity, humour, political aspirations, and so many other traits, are capable of making up to 10^{14} synaptic connections in the brain. The most powerful computers can only manage about 10^3 connections (when his book was written). He believes that the reason for our society's tendency to diminish the human intellect through disuse, and then to work to enhance machine capacities has to do with the fact that human political aspirations and social consciousness are threatening to those who are presently in powerful controlling positions, upholding the status quo.

Cooley realizes that there is more to being human than merely following certain programmed logical patterns, which is what machines do. Tacit knowledge, the scope of imagination and creativity, a childlike awareness of the world, the capacity to hope, dream, play, and to visualize the future, these are all human characteristics that cannot be shared by machines. These are important points. However, the strange thing about Cooley's argument on machine and human intellectual capabilities is that he tends to emphasize "how much" (10^{14} versus 10^3) information processing they can do instead of "what kind" of processes they are capable of, even though, as noted, he is aware of the **qualitative** differences.

Joseph Weizenbaum thinks that the confusion exhibited by Cooley's argument is the common problem that has allowed the sterile debate, about whether or not computers can match human "intelligence," to continue for so long. Weizenbaum shows that our high regard for the "Intelligence Quotient" or I.Q. has been our downfall. I.Q. is inadequate as a measure of human capabilities for "success" for two reasons: First, it fails to account for modes of thinking other than linear, logical modes; secondly, it disregards the cultural and social context of intelligence. When we try to measure intelligence on an absolute scale, we fall into the trap of thinking that different sorts of intelligence can be compared in some exact way. Once we admit that intelligence, and thinking capacity, cannot be measured quantitatively, then we will realize, as the Artificial Intelligentsia refuse to do (it has to be "proven" to them), that the question, "Can computers become as intelligent as humans?" is moot, sterile, and ludicrous.

Weizenbaum wants to ask instead, "Which tasks can be appropriately assigned to computers?" Can they be used as psychotherapists? Are they capable of interacting with humans in a human to human or subject to subject (I-Thou) under-

standing way? Of course not. Although computers can be programmed to "learn" in some ways, their capacities are not human-like. They do not learn as humans do. They have to be fed pertinent bits of information. Also, humans, having human bodies, have certain physical needs (such as warmth, human contact, food) that machines do not share; they suffer and enjoy themselves, which machines cannot do. Because we are human, we are perceived as persons by each other and are treated accordingly (most of the time). Therefore, simply having human bodies makes us inimitable, and attempts to design machines to do work which requires human intelligence are misguided. In addition, the Artificial Intelligentsia assume we know how humans think and learn, when in fact there is a great deal that we do not know about ourselves.

Weizenbaum discusses at length the distinction between the two hemispheres of the brain in order to illustrate a fundamental flaw in the thinking of the Artificial Intelligentsia. Brain research has shown that the two hemispheres of the brain, the left (LH) and the right (RH), can function independently, but they can also interact through the corpus callosum. In most people the LH is the center for structured, sequential, linear thinking and language interpretation, while the RH is the subliminal, less rigid, metaphorical, intuitive-thinking side. Weizenbaum thinks that our efforts to build machine intelligence have concentrated only on one half of our brains--and only one half of our thinking--the domain of the LH, and even the model for that tells only part of the story.

Fenwick Holmes, editor of the *Journal of Systems Management*, wrote a cheerful editorial called, "Is there Any 'Art' in Artificial?," wherein he assures his colleagues that, although "A.I." is here to stay and we must learn how to live with it, humans will always be "quintessentially unprogrammable" because there are some things humans do that machines will never be able to do. In this line of reasoning he sides with Weizenbaum.

In a child, and in an adult who has not been trained too strictly as a one-side-of-the-brain creature, there is a free flow of information through the corpus callosum between the LH and the RH. This is an aspect of the processes of the "creative mind" of which Cooley speaks. The problem, I think, with artificial intelligence technology is that its technological practice reflects the kind of thinking that conceives the ideas. That is, the members of the Artificial Intelligentsia are wrapped up in a **particular way of thinking** about the world. They are primarily "left brained," or linear thinkers who follow a certain method, or at least they **think** that they are. It is part of the current technological ideology to place the highest importance on linear, information manipulation, on left brain activities. Therefore, all the Artificial Intelligentsia can hope to produce are technologies that have such left-brain biases.

It is unfortunate that Weizenbaum feels that he has to spell out arguments against the race for A.I., especially arguments that call on "science" for proof. The fact that these arguments con-

tinue serves to show how far removed from understanding our own nature we are. Why do people want to create artificially "intelligent" machines? If it is to free us from all toil, what will we be left to do? The meaningful living that natural farmer Masanobu Fukuoka practices in Japan, working toward understanding nature through natural farming, seems a more worthwhile objective. I think that the Artificial Intelligentsia must be engrossed and enamored with "technological sweetness"--the intrigue of the possibility of creating miraculous machines--and are forgetting to step back and ask if "sweetness" in itself is a good enough reason to pursue "artificial intelligence." Perhaps we should spend more time honouring and developing our total human capacities and less on our sweet dreams of artificial intelligence.

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FROM PROTEUS TO PILGRIM: TECHNOLOGY IN THE EARLY WRITINGS OF KURT VONNEGUT

Joe Polisuk

In a world where science and technology play an increasingly important role in our daily lives, few writers outside the realm of science fiction have bothered to expand upon the social and ethical consequences of a highly technical society. Most writers have avoided the theme of science altogether, directing their work at a world already defined by astronomers, biologists, chemists, physicists and mathematicians. Even fewer fiction writers have examined the psychological and sociological implications of technology like Alvin Toffler did in *Future Shock*. Yet, few would disagree that technology is an essence of today's society.

Kurt Vonnegut has concerned himself with technology as one of his dominant themes. Born in Indianapolis, Indiana in 1922, Vonnegut has combined a mid-Western mentality with his Second World War experiences to create over a dozen novels, nearly a hundred short stories, plays, essays and articles. Many of these reflect a negative attitude towards scientific progress and technology, which Vonnegut sees as an organizational metaphor for man's creative urges. He has expressed a keen interest in two aspects of technology; firstly, the strength and power of military technology and the amoral rationalization for technology misapplied for patriotic purposes and, more importantly, the moral atmosphere of science, and how scientists have become so glorified as to be nearly omnipotent, removed from any responsibilities attached to their creations. Who is willing to accept responsibility for the consequences of scientific research? Is it the theorists, who conceive what is possible, or the technicians, who turn complicated theories into practical reality? Or, are we all in some way responsible for permitting our society to evolve into a position where the destiny of man lies in the hands of people like *Cat's Cradle's* Dr. Felix Hoenikker, who asks "what is sin?".¹

Vonnegut was raised in a middle-class, mid-Western family, adhering to all the typical values that implies. His parents were both architects, but Vonnegut chose to pursue a career in the sciences. In 1940, he attended Carnegie Tech. and later, Cornell University. As a young student of biochemistry, he was quite idealistic about science and what it could accomplish.

I thought scientists were going to find out exactly how everything worked, and then make it work better. I fully expected by the time I was 21, some scientist would have taken a color photograph of God Almighty and sold it to Popular Mechanics.²

At the impressionable age of 21, however, he was forced to drop out of school due to illness, making him subject to military service. Not long after being sent overseas, he was taken prisoner of war, and interned in Dresden. Less than two months later, on February 13, 1945, Dresden was completely destroyed by an Allied air attack. This event was to be the focus of Vonnegut's most famous book, *Slaughterhouse-Five* (1969).

In the Dresden attack, Vonnegut witnessed military science demolish one of the artistic and architectural capitals of Europe. Coming from a family of architects and pacifists, Vonnegut was decimated by the senseless loss. He refers to Dresden as being "like a moonscape" after the firebombing. This event was Vonnegut's first realization of how technology can promote disaster, to be followed quickly by the bombing of Hiroshima. In his own words, Vonnegut describes his change of heart:

Scientific truth was going to make us so happy and comfortable. What actually happened when I was 21 was that we dropped scientific truth on Hiroshima. We killed everybody there. And I had just come home from being a POW in Dresden, which I'd just seen burn to the ground. And the world

was just learning how ghastly the German extermination camps had been. And so I had a heart to heart talk with myself. I have been a constant pessimist ever since, with few exceptions.³

After witnessing a World War and the atomic bomb, it became obvious to Vonnegut that science, in all its wisdom, had created an enormous capacity for death and destruction.

This new attitude immediately began to express itself in Vonnegut's earliest short stories. **Report on the Barnhouse Effect** (1950) is centred thematically around the concern that man's inventiveness may have outstripped his ability to control it to good ends. With the 1952 release of his first novel, **Player Piano**, his stance against a technological society became clearly apparent.

An admitted rip-off of Huxley's **Brave New World**, **Player Piano** dealt exclusively with a highly automated society where man had ceased to serve any function or have any inherent value. According to Robert Hipkiss, this novel took "the development of technocracy to its logical conclusion: rule of the elite (managers, engineers), displacement of workers by machines, conversion of nature to the rises of technology, and a gradual stifling of spontaneity and imagination, with the inevitable revolt".⁴ It is a cycle of evolution and collapse, a movement toward order and efficiency peaking, then dissolving towards anarchy, only to rise again and repeat itself.

In **Player Piano**, Vonnegut avoided any technical jargon, emphasizing instead the humanistic approach to what he saw as the planned obsolescence of man. Based partly on his experiences as a public relations man for General Electric in Schenectady, N.Y., (Progress is our Most Important Product!!), Vonnegut portrays a world after the Third Industrial Revolution. The first devalued physical labor, the second routine menial work, and the third devalued all creative human effort, leaving a wasteland of people and their meaningless lives behind. The challenge of being human had been removed. The protagonist, Dr. Paul Proteus, initiates a small revolt against all machinery, but after a few days the general population begins to repair the same machines that put them out of work. The book was intended to present a dystopia where rampant technology had created a blank, stagnant state. The point of **Player Piano** is that technological expertise unaccompanied by a clear understanding of human purpose endangers society. Technology cannot be created in a moral and ethical vacuum, without sound philosophical purpose. Any technology which is higher than the skills of the society in which it is placed cannot last. Like water, technology flows to the level of the people, and the human race seems to lack the moral, emotional and spiritual depth to match the rapid pace of acceleration set by technological progress.

By the time his fourth novel was published in 1963, Vonnegut had matured beyond his concern for automation in **Player Piano**, to emphasize the moral responsibility of science. **Cat's Cradle** is focused on the narrator's quest for information on Dr. Felix Hoenikker, one of the so-called "fathers of atomic science," so that he can write a book entitled **The Day the World Ended**, dealing with the bombing of Hiroshima.

Hoenikker fits the classic role of the slightly mad, tormented professor so often found in pulp science-fiction. He is described as being a muddled, confused genius, the stereotype of the mad scientist. Everything in his life is second to science. A failure in his personal life (he tips his wife after breakfast, abandons his car in the midst of a traffic jam), he is the typical childhood

wizard, tinkering with dime store toys and atomic energy with the same zealous dedication and curiosity. As a final gesture before his death, he invents 'ice-nine', a chemical which crystallizes all water, eliminating mud and swamps forever, but unfortunately freezing all water sources at the same time. (In a possible tribute to his brother, Bernard, a scientist with a Ph.D. from MIT in atmospheric physics who worked on the nucleation of supercooled liquids, Vonnegut offers a brief, yet highly technical description of 'ice-nine', which adds an air of authenticity to the possibility of its existence. This deviates from his general tone of avoiding any technical details.) However, when left in the hands of Hoenikker's children after his death, 'ice-nine' eventually leads to the destruction of the world. It is a perfect example of the effects of tinkering with nature and its consequences, and appears to be a close parallel to the atomic bomb.

Unwittingly, Hoenikker created a paradox with 'ice-nine'. **Cat's Cradle** examines the irresponsibility of the scientific community which insists on producing new inventions, yet fails to address the moral and social problems that each new invention brings. Science in the hands of men like Hoenikker, removed from any concern for humanistic values, denies the uniqueness of mankind. The scientific ideals of the laboratory researchers at General Forge & Foundry, where Hoenikker worked, is that "new knowledge is the most valuable commodity on Earth. The more truth we have to work with, the richer we become."⁵ Their only goal is to make life better, to triumph over any force through organization. But even though research and inventions are only reflections of man's quests for new knowledge, this information must be handled maturely and reliably. If not, the amazing discoveries of science, unrelated to human experience, become only "magic that works".⁶

In Vonnegut's next novel, **God Bless You, Mr. Rosewater** (1965), he returns to his earlier theme of human obsolescence, as Eliot Rosewater, an eccentric, guilt-ridden millionaire, develops the Rosewater foundation to help make technologically obsolete people feel loved and needed. This novel introduces one of Vonnegut's most famous characters, Kilgore Trout, who journeys across a polluted United States, wasted of its resources and littered with scrap cars and industrial debris, to defend his greatest fan, Eliot Rosewater, at his insanity trial. Trout paints a dismal picture of the future, similar to the vision of **Piano Player**.

In time, almost all men and women will become worthless as producers of goods, foods and services, more machines and as sources of practical ideas in the areas of economics, engineering and probably medicine, too. So, if we can't find reasons and methods for treasuring human beings because they are human beings, then we might as well....rub them out.⁷

Vonnegut also makes his appreciation for science fiction known in **God Bless You, Mr. Rosewater**. Eliot makes the following speech to a group of science fiction authors at a convention:

I love you sons of bitches...you're all I read any more. You're the only ones who will talk about the really terrific changes going on...you're the only ones with guts to really care about the future, who really notice what machines do to us, what big simple ideas do to us, what cities do to us, what wars do to us...you're the only ones zany enough to agonize over time and distances without limit, over mysteries that will never die,

over the fact that we are right now determining whether the space voyage for the next billion years or so is going to be Heaven or Hell.⁸

Although Vonnegut may appear to be a sci-fi writer, he shuns the title, preferring not to be too hastily categorized. His novels are more people oriented; as opposed to being just interested in the concept of technology, he concerns himself with how technology alters the social environment. When Billy Pilgrim and Eliot Rosewater meet in a hospital room in **Slaughterhouse-Five**, they discover a common appreciation of science-fiction. Both were dealing with similar crises in similar ways. "They had both found life meaningless, partly because of what they had seen in the war. So they were trying to reinvent themselves and their universe. Science fiction was a big help."⁹

Through the use of science-fiction, such as the creation of the strange, grim Trafaladorian world of mechanical wizardry in **Slaughterhouse-Five**, Vonnegut makes critical points about our own quest for research and discovery. We see how the Trafaladorian approach can go awry, when they blow up the entire universe while experimenting with new rocket fuels.

The theme of Armageddon has existed in literature since the Bible, but never before has man been the catalyst for his own destruction. **Slaughterhouse-Five** is set in the dawn of the atomic era, a time when people, like Vonnegut, began to seriously doubt the merits of military science. The new epoch was heralded by U.S. President Harry S. Truman's speech announcing the first use of the atomic bomb on Hiroshima. When **Slaughterhouse-Five** was written, Vonnegut felt that he could pinpoint this speech as the precise moment when he began to suffer serious doubts about technology and the direction it was following. The speech by Truman is so full of bravado and American oneupmanship that Vonnegut felt it fit to incorporate into the novel (**Slaughterhouse-Five**, pp. 185-186).

Sixteen hours ago, an American airplane dropped one bomb on Hiroshima, an important Japanese Army base. That bomb had more power than 20,000 tons of TNT. It had more than two thousand times the Blast Power of the British 'Grand Slam', which is the largest bomb ever yet used in the history of warfare.

The Japanese began the war from the air at Pearl Harbour. They have been repaid many fold. And now the end is not yet. With the bomb, we now have added a new and revolutionary increase in destruction to supplement the growing power of our armed forces. In their present form these bombs are now in production, and even more powerful forms are now in development.

It is an atomic bomb. It is a harnessing of the basic power of the universe. The force from which the sun draws its power has been loosed upon those who brought war to the Far East.

Before 1939, it was the accepted belief of scientists that it was theoretically possible to release atomic energy. But nobody knew any practical way of doing it. By 1942, however, we knew the Germans were working feverishly to find a way with which they hoped to enslave the world. But they failed.

The battle of the laboratories held fateful risks for us as well as the battle of the air, land, and sea, and we have won the battle of the laboratories as we have won the other battles.

We are now prepared to obliterate more rapidly and completely every productive enterprise the Japanese have above ground in any city....¹⁰

Thus began Vonnegut's disenchantment with science. He now advocates the complete abandonment of military science, and

has advised his sons not to take part "in massacres" or "rejoice in their news, nor are they permitted to work for companies which make massacre equipment and to express contempt for people who think we need machinery like that."¹¹

Vonnegut also offers alternative strategies for the future. He disagrees with Arthur C. Clarke's sentiments that "the Earth is our cradle and the solar system our kindergarten, and it is our destiny to go to the stars."¹² Instead, he quotes Isaac Asimov's conception of the three stages of human development: (1) Adventure dominant, whereby man made initial exploratory discoveries about his place in the natural world; (2) Technology dominant, whereby man began to conquer the natural forces of the World; and (3) Sociology dominant, where man will turn the focus of his natural exploratory nature within, and return our attention to "Earth and Earthlings." Vonnegut sees our current society as optimistically turning towards the third stage, or perhaps evolving into huge family support systems, like the karass of **Cat's Cradle** (a huge, extended family), which know no racial or geographical boundaries. These systems are designed to promote life on Earth, and ward off the threat of war through global unity, as Vonnegut feels that war will ultimately result in the destruction of the planet.

Vonnegut also defines the writer's role in the future. In an interview with Robert Scholes at the University of Iowa, Vonnegut said that "all writers are going to have to learn about science, because it's such an interesting part of their environment. It worries me that (student writers) know nothing about machinery, about the scientific method, and so forth - and to reflect on our times accurately, to respond to them - to the times reasonably - they have to understand that part of their environment."¹³

We are not evil, just too hilariously stupid to survive, says Vonnegut. Under the guise of fantasy and ironic humor, Vonnegut has addressed the basic philosophical questions of existence and purpose. He has found life's experiences contradictory and unsolvable, and can only shrug his shoulders and admit to confusion. Surely, this is a universal dilemma shared by thousands, which might account for much of Vonnegut's success. Obviously, we cannot continue to tamper with nature, perform genetic engineering, or create nuclear devices without addressing some of the basic problems Vonnegut discusses. We can no longer forge bravely into unexplored territory with the same pioneer impulse that has guided us to this point. Greater respect and care must be shown for our environment, and greater concern expressed for our most valuable resource, humanity. Clearly, we now understand that all technology is not always good, but we are far from reaching the stage of reversal that Vonnegut sees as necessary to return to a sociologically dominant world.

As an artist, Vonnegut recognizes his overriding responsibility to contribute in any way possible to shaping our relationship to the planet so we can assure the survival of nature and humanity, the least that can be expected of any responsible artist or scientist. Vonnegut, as an artist and a spokesman for the human race, has succeeded in transmitting an urgent message. Only by copying his example may we be able to prevent what many feel is our impending fate - the complete destruction of the living planet and the annihilation of the human race.

Notes

1. Kurt Vonnegut, **Cat's Cradle**, (Dell Publishing; N.Y., N.Y., 1963), p. 21.
2. Jerome Klinkowitz and John Somer, (ed.), **Vonnegut Statement**, (N.Y., N.Y.; Delacorte Press, 1973), p. 30.
3. Jerome Klinkowitz and John Somer, (ed.), p. 13.

4. Robert A. Hipkiss, *The American Absurd*, (Associated Faculty Press; Pt. Washington, N.Y., 1984), p. 43.
5. Kurt Vonnegut, p. 36.
6. Kurt Vonnegut, p. 147.
7. Kurt Vonnegut, *God Bless You, Mr. Rosewater* (Holt, Rinehart & Winston, N.Y., N.Y., 1965), p. 210.
8. Kurt Vonnegut, *God Bless You, Mr. Rosewater*, p. 128.
9. Kurt Vonnegut, *Slaughterhouse-Five*, (Delacorte Press, N.Y., N.Y., 1969), p. 87.
10. Kurt Vonnegut, *Slaughterhouse-Five*, pp. 185-186.
11. Kurt Vonnegut, *Slaughterhouse-Five*, p. 17.

12. James Lindquist, *Kurt Vonnegut*, (Frederick Ungar Publishing, N.Y., N.Y., 1977), p. 100.
13. Jerome Klinkowitz and John Somer, (ed.), p. 103.

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HOMO FABER OR HOMO SAPIENS?

Andrew McLaughlin

Kurt Vonnegut aptly joked that since we become what we pretend to be, we should be careful about what we pretend. Sometimes our beliefs become true because we believe them. This self-validating character of belief is especially true of our conceptions of ourselves, both at the level of individual self-images and at the more general level of our beliefs about "human nature." Thus, it is important to be careful what we suppose about human nature, as that is what we may become.

Unfortunately, discovering the nature of human nature is far from easy. The widely divergent doctrines of human nature proffered by various theorists and the difficulty in unearthing reliable evidence to resolve such disputes gives pause to anyone exploring this terrain. Discussions of the topic are often fruitless. Looking around at the way people "usually" are seems *prima facie* to be a reasonable basis for discovering human nature. Most people, in seeking an answer to the question of the nature of human nature, simply extrapolate from the typical behaviors of people around them, assuming that what "everybody does" is "human nature." Unfortunately, this process deceives by confusing the typical behaviors within a particular society for "human nature." What appears as "human nature" within a particular culture reflects **both** human nature and the habitual behaviors induced by that culture. Separating the two types of regularities is quite difficult, especially if one's experience is restricted to only one culture. In particular, people living within industrial capitalist societies typically believe that people are "naturally" self-centered, greedy, and "really" only out for themselves. Critical reflection on these opinions is often ineffective for this is, after all, how our culture trains us to behave, and it does correctly name a widespread behavioral pattern within capitalist societies. In short, within such societies, there is abundant experiential evidence that people are greedy and self-centered.

Without trying to resolve here the difficult question of what human nature really is, I want to examine the more constrained problem of the relations between our **image** of human nature and the technologies we have created. How we conceive of ourselves and our "natures" is extremely important in constraining or opening the domain of the possibilities we envision -- and the possibilities we imagine control the worlds we strive to create.

More specifically, I want to explore the consequences of adopting two competing images of human nature. Some have claimed

that the essence of humanity is found in our capacity to make and use tools. This capability does seem to distinguish humans from other mammals.¹ However, another feature which distinguishes us from other mammals is our development and transmission of culture.² Which of these two distinguishing features of humanity should we take as of central importance? This question has considerable import for our understanding of our history and our relationship to technology.

If we think of our nature as essentially **homo faber**, as a tool maker, then our history appears as a nearly linear progression forward in the domination of nature through the development of increasingly powerful technologies. Imaging ourselves as essentially tool makers leads to seeing progress as those technical and cultural achievements which yield an increased level of control over the vagaries of the external world. These advances appear as a progressive realization of human nature and yield a clear definition of human progress. Thus, we can look back over our history and evaluate the various cultural forms of human society in terms of their facilitating or hindering the progressive domination of the natural world.

An alternative image of our nature is as **homo sapiens**, as a symbol maker. Imaging ourselves this way suggests that our most essential aspect is our creation of symbols and, thus, culture. This gives us a rather different definition of progress. Under this image of human nature, progress can be defined as that which increases the richness of human cultural experience, for the creation and development of culture now appears as the essential human activity. This criterion, while more difficult to apply to concrete cases, retains the context of the texture of human life as lived, instead of the degree of successful technical domination, as the crucial variable in assessing historical change.

Thus, our image of human nature -- setting aside the question of what is really human nature -- strongly influences our idea of our collective history and what constitutes "progress." The idea of progress, in its turn, powerfully influences the changes we make now in constructing our future.

Several considerations favor taking the creation of culture as the most essential feature of being human. One reason is that the real development of technology requires the prior development of human culture. Fundamentally, technology is the result of culture, although as we shall see below, technology affects cul-

ture. If argument for this point is necessary, consider only that relatively similar "primitive" technologies yield widely divergent cultures. In other words, cultural variation seems greater than technological variation. But, since it is hard to operationally define either type of variability, this argument is not conclusive.

A more important fact is that the emergence of technologically oriented civilization does not proceed **automatically** from human culture. This point requires elaboration. There are many human societies which do not devote their principal energies towards the technological transformation of their worlds. The evidence for this are the many anthropological studies of cultures which do not focus upon such a transformation.³ Many so-called primitive societies focus their lives upon creating order and meaning in their lives, doing this through celebration, ritual, art, and belief systems giving sense and meaning to their origin and future. It seems safe to presume that when we look at contemporary primitive peoples, we are also looking back at something like our own prehistory. We can, by looking at the archeological record, further confirm this by noting the efforts that our distant ancestors put into the decoration of their bodies, the cave art found in Europe, and the development of myth and religion. In short, it seems fairly clear that we were first producers of symbols and culture, and only later did we become entranced with the creation of technologies aimed at transforming the natural world.

If we look for the origin of technology, I think we find its most decisive moment in what Lewis Mumford calls the development of the megamachine, itself a cultural creation. According to Mumford, about five thousand years ago, a fundamental shift occurred in human life, whereby technology changed from a subsidiary role in the project of giving order and meaning to life to having a primary role in the task of transforming the world with the aim of producing of material wealth. The megamachine was composed of human parts hierarchically organized "under the rule of an absolute monarch whose commands, supported by a coalition of the priesthood, the armed nobility, and the bureaucracy, secured a corpslike obedience from all the components of the machine."⁴ It was the development of this megamachine which allowed the collective human labor of many to be focussed upon mammoth projects such as flood control, building roads and elaborate cities, tombs for rulers, and so on. The megamachine organized daily life into a mechanical pattern whereby work at the direction of others for the ends set by others became the lot that befalls most humans for most of their lives. Work becomes a lifelong task imposed by a social order, instead of a sporadic event dictated by natural necessity. The state arises, developing institutions of socialization and control. A bureaucracy, a priesthood, and an army must be supported by the labor of the many.

Taking ourselves as primarily producers of cultural meaning leads to a notion of "progress" which measures progress by the degree of cultural richness present in daily life. Using this image of progress, we can see the increasing centralization of power and the loss of personal autonomy as a human calamity, neither "progress" itself nor a necessary adjunct to progress. Technology, at first an artifact of this process of increasing repression of spontaneous human activity, later became an instrument in maintaining and intensifying centralized control of human activity.

If we understand ourselves as primarily producers of meaning and culture, our history no longer appears as a linear progressive

development. Rather, it appears as a much more uneven and questionable development with great losses accompanying technologies which allow an increase in security from the vagaries of nature.

The cost of this increase in security has been substantial. Thus, we have lost the face-to-face societies of "primitive" peoples, which often involve proto-democracies, flexible sex roles, and the linkage of authority and competence to the tasks immediately at hand. Stanley Diamond captures at least part of this process when he notes that "Civilization originates in conquest abroad and repression at home."⁵ The spread of civilization has been a violent process and has met with significant resistance. The increasing control of life by bureaucratic regulation backed up by the power of police and armies has been resisted throughout history, as attested by the frequency of both wars resisting conquest and recurring internal revolt.⁶ Typical reflex reactions to such considerations are that "we can't all become primitives" or to sing praises of the material fruits of the megamachine. These "gut" reactions indicate the power of the spell under which we have collectively fallen and prompt the obvious response that the point of such considerations is not to suggest the impossible -- that we should all go "back" -- but to raise a critical framework within which we can reconsider the question of what human progress really means, and thus consider deeply the kind of future we should create.

Perhaps progress should be understood as an expansion personal development, a flourishing of human individuals, rather than as an increase in the domination of nature or the expansion of the megamachine. The question to be asked about our history is whether or not we have become more competent, happier, more capable of love and compassion, more developed in spirit, and more in control of our personal lives? Taking these questions seriously immediately opens the door to looking at the evidence about "primitive" cultures where it seems that their lives are generally less constrained by the need for daily labor, with more time for music and dance, and with greater equality and freedom. Asking these questions can help shed the blinders of the idea that human progress is constituted by increasing powerful technologies, an idea rooted in the notion that we are "essentially" tool makers. It is, I think, a fateful illusion that human progress is equal to the expansion of material production. Aside from the losses already mentioned, we now see signs of serious ecological stress, and stand on the brink of irreversible ecological changes. Rather than simply remaining entranced with technology and the illusion of power it brings, we need to begin assessing whether new forms of technology are truly progressive in human terms, which means that they must be evaluated within the context of human life and culture. This criterion for evaluation technology, although involving an enormous change from our current ways of assessing technology, is itself seriously limited. I think that further reflection on the idea of progress involves calling into question the anthropocentric bias of an exclusive focus on the interests of the human species to the exclusion of the rest of life.

At last we come to the question of technology. I have argued that technology is not a simple reflection of "human nature," nor is it the determining factor in human history. But looking at technology and its place within contemporary life, we can see that it has **become** a principal mode of constituting human life. Technology is a tool of the megamachine, and we experience it as something to which we must adapt ourselves. Indeed, some have

come to think of humans as if they were machines, a frightening and total inversion of the proper relation of humans to machines.

Looking at contemporary life, we can see that technology has become one of the main ways in which we structure our daily lives. One of the most obvious cases is the automobile, which has transformed our daily lives in myriad ways. In the course of effecting these changes, the automobile has become one of the principal contributors to the deteriorating quality of the air we breathe and the increasing acidity of rain. Computers now have begun to structure our work environments and have enabled multinational corporations to create an increasingly integrated world economy which eludes the control of nation states. Perhaps even more ominously, some now argue that we should conceive of ourselves on the model of a complex computing machine. The starkest example of our mistaken approach to technology comes from nuclearism. Treating technology as if it were autonomous and as if it develops with a logic of its own, we have made a major commitment of our social surplus to the construction of nuclear weapons and nuclear power generators. This commitment has had a fundamental impact upon our individual psychological and collective cultural lives. Nuclear power and weapons requires an increase in the centralization of social power, with a corresponding loss of local autonomy. We have become subjected to a technology which is open to disruption and malfunction, events which would have truly vast consequence. We have become subject to a profound distortion and deception in our public life "necessitated" by the nature of nuclear technology. And we threaten ourselves with mass annihilation. Indeed, we now stand on the edge of surrendering control over the decision to go to war to computers, an unadvertised but necessary consequence of any "Star Wars" technology. This is an ultimate and grotesque surrender of ourselves to technology and shows that our current relation to technology is fundamentally topsy-turvy.

In an age where there is a failure of imagination, it is important to stress that there are alternatives. Thus, technology, when understood as but one element within a cultural whole, can be appraised by its contribution to such values as democracy, decentralization of power, simplicity (so that people can control the technologies they live with), and the fostering of community. Instead of thinking of technology as if it were one thing, we should recognize that there are various technologies, each of which have consequences concerning the way we live. To grasp clearly that technology is a human artifact to be evaluated within a human context rescues us from the myth -- which threatens to become real -- that technology governs us.

Choices about technologies are often choices about whole ways of living.⁸ Particular forms of technologies enable and elicit particular forms of life. Thus, the primary question posed by various technologies is but a variant of the most central philosophical question -- **how shall we live?** It is this dimension of choice that must be recovered. We need to understand that technology is the product of our collective efforts, so it is possible for us to repossess control over our lives. The fact that we seem to sleepwalk from one technology to another does not falsify this thesis. Rather, it indicates that we have failed to make the choices consciously, instead leaving them to small sectors of society which tend to choose technological innovations on the limited ground of economic gain or social power.

Thinking about what is involved in regaining control over our lives leads us to recognize that we must restructure and revitalize our collective life. We now live within a culture constituted less and less by face to face interaction and increasingly mediated by forms of communication designed to integrate us into a consumer culture, itself becoming internationalized. Our sense of "reality" is increasingly defined by corporate cultural productions designed to yield profit. The political arena in the best of "democracies" is devoid of substance, being little more than carefully crafted images marketed like other products. In order for us to democratically determine the directions in which we want to develop, we must generate social institutions which enable us to collectively understand the issues and then make coherent choices. In other words, we must create political institutions which effectively allow the democratic control of technologies. This is, of course, a call for a substantial redirection of the drift of contemporary industrial civilization, but nothing less than our future history depends upon such a change.

Such restructuring and revitalization of our collective life may require a devolution into renewed local communities. What is needed is, in Ivan Illich's terms, a "convivial reconstruction." Illich means by this a constellation of changes centered around a change from a focus upon industrial productivity to the creation of autonomous and creative discourse among people. What is involved is an inversion of our contemporary dependency upon a technology seemingly beyond our control to a technology limited by the values of "survival, justice, and self-defined work." The crucial point is that we must regain control over the technologies which have come to dominate us. The judgments and appraisals of technology must be undertaken with a framework of values worthy of human life.

In this path, there is the possibility of great joy. We need to develop technologies which foster autonomy, which means that they are free from the control of others and facilitate self-determined creative activity. We need to rediscover the vitality of creative activity, in place of the mere pleasures offered to us as consumers. Creative activity allows a recovery of our most fundamental nature -- where we can invest our own worlds with meaning, rather than allowing tools to determine our images of ourselves.

Notes

1. But not completely. Apes, for example, have learned to use tools, e.g. to pick up a stick to get a banana otherwise out of reach. But such exceptions are not necessarily decisive to the thesis, since the most essential characteristic for being human does not have to be possessed only by humans. The issue is one of degree.
2. Again, there are other mammals which create culture, but not to the degree that humans create cultures. At least so far as we know -- we don't understand the songs of the whales.
3. For an easily accessible description of one such culture, see Colin Turnbull's **The Forest People**, N.Y., Simon and Schuster, 1962. For more comparative approaches, see Stanley Diamond's **In Search of the Primitive**, New Brunswick, Transaction Books, 1974, or Marshall Sahlins' **Stone-Age Economics**, Chicago, Aldine-Atherton, 1970. These latter two works are good introductions to the anthropological grounds for rethinking our understanding of "primitive" cultures. Sahlins' work is important in that it shows that the necessary labor for people in primitive cultures is less than the labor required of people living in "advanced" cultures.
4. p. 82, Lewis Mumford, "Technics and the Nature of Man", in Carl Mitchum and Robert Mackey, **Philosophy and Technology**, N.Y., Free Press, 1972.
5. p. 1, Diamond, op. cit. For a thought-provoking discussion of the dialectic of cultural evolution and the pathology of power and control, see Andrew Bard Schmockler's **The Parable of the Tribes**, Boston, Houghton Mifflin, 1984.

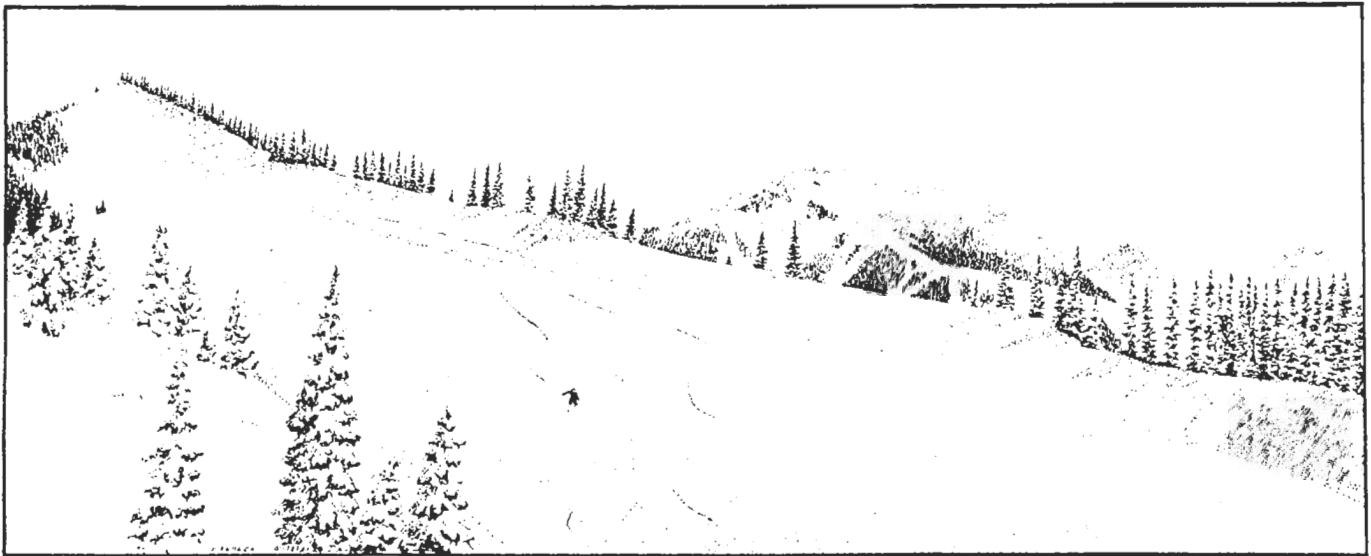
6. Schmookler's book is a particularly interesting effort to rethink the history of the expansion of civilization. He strives to discern an underlying pathology captured in what he calls the parable of the tribes. In short, his theory is that among a collection of tribes, one tribe learns to seek power. This presents the other tribes with a few "nonalternatives". They can either withdraw, be destroyed, or resist and thus become themselves transformed. One of his points is that the spread of a civilization entranced with power seems unavoidable.

7. For a discussion of the psychological and political dimensions of "nuclearism", see Robert Jay Lifton and Richard Falk, **Indefensible Weapons: The Psychological and Political Case Against Nuclearism**, N.Y., Basic Books, 1982.

8. This is the fundamental and well-argued theme of Langdon Winner's excellent study of the political dimensions of technology. See his **The Whale and the Reactor: A Search for Limits in an Age of High Technology**, Chicago, University of Chicago Press, 1986.

9. p. 12, **Tools for Conviviality**, N.Y., Harper & Row, 1973.

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DEEP ECOLOGY: AN ANALYSIS FROM THE PERSPECTIVE OF ECOLOGICAL SCIENCE

Frank B. Golley

Introduction

There is no need to describe the environmental problems we face at the end of the twentieth century. The literally thousands of environmental books, articles, and films produced in the past thirty years eloquently testify that the biosphere has been drastically disturbed by human activities. Although successes in environmental conservation and management can be observed, globally the situation is serious.¹ Clearly the conventional methods of managing human uses of the biosphere have not been adequate. A much deeper, different, even radical, approach

seems to be required. In developing such an approach, humans will have to reconsider their relationship with other living beings and with the non-living environment. That is, we must examine the philosophical foundations of our relations with nature and reform our value systems. Callicott² claims that the most important task in this essentially theoretical process is the development of a non-anthropocentric value theory. Such a theory must provide for the intrinsic value of both individual organisms and a hierarchy of higher order organismic entities, such as ecosystems and regional biomes, and be conceptionally concordant with modern evolutionary and ecological biology.

One movement in environmental ethics that has proposed a non-anthropocentric value theory is called "deep ecology". The term deep ecology was coined by the Norwegian philosopher, mountaineer, and environmental activist Arne Naess³ in 1973. Naess contrasted his deep approach with a shallow environmental approach⁴ that accepts the extant social value system and works within it to solve environmental problems. Since 1973 deep ecology has developed into a substantial movement. For example, two books⁵ entitled "deep ecology" were published in 1985 and it is claimed that deep ecology theory has contributed to such diverse organizations as the Green Party of the Federal Republic of Germany⁶ and Earth First in the United States.

My intention in this essay is to examine deep ecology from the perspective of scientific ecology.⁷ My justification for this exercise is two-fold. First, a philosophy or movement with the name "deep ecology" must naturally attract the attention of an ecologist. What exactly is meant by the word "deep" when applied as an adjective to ecology? And second, as Callicott suggested above, an environmental ethical system must be concordant with ecological knowledge.

In considering this second justification it is important to point out that I do not mean that deep ecology should be derived from ecological principles. Indeed, Naess explicitly denies this derivation for deep ecology.⁸ He states that while deep ecology was suggested, inspired and fortified by ecological knowledge, and the life-style of the ecological field worker, the norms of deep ecology are not derived from ecology by logic or deduction. Rather, my purpose here is to examine the premises of deep ecology in the context of my understanding of ecological principles to determine if a concordance exists or not. I will argue that if the premises of deep ecology contradict the principles of ecology, then we have a problem with this value theory.

Deep Ecology

Deep ecology refers to a "relational, total-field image of life and non-life in which diversity, complexity, autonomy, decentralization, symbiosis, egalitarianism, and classlessness are operative and which is clearly and forcefully normative". It involves both a philosophy, called an ecosophy by Naess,⁹ and a movement or program of action.¹⁰ These two activities are mixed in statements about deep ecology. For example, Naess in his original presentation of his ideas characterized deep ecology as:¹¹

1. rejection of the man-in-environment image in favour of the relational, total-field image;
2. biospherical egalitarianism - in principle;
3. incorporation of the principles of diversity and symbiosis;
4. an anti-class posture;
5. fight against pollution and resource depletion;
6. complexity, not complication; and,
7. local autonomy and decentralization.

In his most recent defense of the program, Naess described the tenets of the movement as:¹²

1. the well being of non-human life on Earth has value in itself;
2. richness and diversity in life forms contribute to this value and have value in itself;
3. humans have no right to interfere destructively with non-human life except to satisfy vital needs;

4. present interference is excessive and detrimental;
5. present policies must therefore change;
6. the necessary policy changes affect basic economic and ideological structures and will be more drastic the longer it takes before significant change begins;
7. the ideological change is mainly that of appreciating life quality rather than enjoying a high standard of life, and
8. those who subscribe to the foregoing points have an obligation directly and indirectly to try to implement the necessary changes.

Clearly the latter set of eight tenets differs from the first set of seven points. This inconsistency characterizes statements about deep ecology generally. However, my objective in this essay is not to consider the claims of the deep ecology movement in a formal way but rather to focus on the ecosophy that furnishes the premises which are the foundation of the programs of action. Naess presents two ultimate norms or intuitions that are the basis of ecosophy.¹³ These are self realization and biocentric equality. These two norms are the target of my analysis.

Self-Realization

Under this theme Naess is referring to a comprehensive, broad concept of self, not the narrow ego implied in the usual common usage of the term "self". The comprehensive Self (Naess employs the capital "S" to identify this meaning) involves "me", defined by the boundary of my skin, or "mine", defined by the relations between me and others, and a larger set of beings and influences that might be called a total field of interaction. Self-realization occurs by a "process of ever-widening identification and ever-narrowing alienation".¹⁴ Thus, the Self is as comprehensive as the "totality of our identifications". Through identification higher level unities are experienced, from identifying with "ones nearest, through circles of friends, local communities, tribes, compatriots, races, humanity, life, and ultimately, as articulated by religious and philosophic leaders, unity with the supreme whole, the "world" in a broader and deeper sense than usual".¹⁵ Thus, "Self-realization in its absolute maximum is the mature experience of oneness of diversity".¹⁶ "The minimum is the self-realization by more or less consistent egotism - by the narrowest experience of what constitutes one's self and a maximum of alienation. As empirical beings we dwell somewhere in between, but increased maturity involves increase of the wideness of the self".¹⁷

The concept of widening identification and narrowing alienation is coupled with the idea that "we can make no firm ontological divide in the field of existence".¹⁸ Warwick Fox¹⁹ terms this concept "the central intuition" of deep ecology. He states that "At the level of everyday life, the deep ecologist, as we have seen, intuits the same underlying structure of reality as does the "new physicist" at the quantum level and the mystic at the transcendental level. In Bill Devall's words "Deep ecology beings with unity rather than dualism which has been the dominant theme of Western philosophy". Like the mystic and the "new physicist", the deep ecologist is drawn to a cosmology of (in David Bohm's words) "unbroken wholeness which denies the classical idea of the analysability of the world into separately and independently existing parts". Thus, Self-realization grows across a network of organisms or a field of process and

action involving human, non-human life and non-life until it includes the universe.

As Fox²⁰ points out, this concept of Self is not unique to deep ecology. Throughout human history we have identified those who have progressed on the path of Self-realization toward identification with a wider field as mature and as wise. However, the idea that Self-realization unfolds in a total-field, in which individuals are knots in a biospheric network is different, being derived from ecological research, and will be a focus of our attention below.

Biocentric Equality

The deep ecologist asserts that every living and non-living thing has value. Every being has the right to live and flourish. And in some contexts the right to exist is extended to rivers, mountains, and other landscapes. These rights and values have no connection with instrumental use; they are intrinsic within the biospheric net itself. Humans have rights to satisfy their "vital" needs but not the right to dominate and exploit other species, and, we must add today, cause them to go extinct. Yet conflicts of interest must occur. For example, "our vital interests, if we are not plants, imply killing at least some other living beings. A culture of hunters, where identification with hunted animals reaches a remarkably high level, does not prohibit killing for food. But a great variety of ceremonies and rituals have the function to express the gravity of the alienating incident and restore the identification".²¹

Two rules seem to operate when we observe a value conflict. The more vital interest has priority over the less vital interest, in the sense of "vital" used above. And the near in time, space, culture, and species has priority over the more remote. The concept of vitality will be discussed more fully below.

The Perspective of Ecological Science

Do these premises accord with the observations of the natural world by the field ecologist? The concept of Self-realization is readily identified by the ecologist as calling for the self (the ego) to recognize its environment (all that is outside or beyond the self) through identification. Ecology was originally defined by Ernst Haeckel, a German biologist, in 1869 as the total relations of the animal to both its organic and its inorganic environment. One modern definition makes this definition even more general by stating that ecology is the study of the structure and function of nature.²² In the modern sense, organism and environment are understood to comprise a system, called an ecosystem.²³

There are two ecological concepts that follow from these definitions of ecology that are relevant to the deep ecology norm of Self-realization. First, the environment of an organism can be viewed hierarchically. The organism interacts directly with and acts directly on physical factors (such as temperature of the air or water), chemical materials (nutrients), and biological organisms (competitors or food).²⁴ This immediate environment is in constant interaction with the individual. However, environment in this immediate sense is embedded in a hierarchy of larger environments. For example, periodic catastrophic events, such as hurricanes, impact organisms on an infrequent basis. Organisms evolve to cope with these irregular events but the nature of the interaction is different from that of the immediate environment. And then, finally there are even more remote environmen-

tal phenomena in time and space which indirectly influence the organism. These environmental events might include phenomena such as glaciation which were present in the history of the organism. This hierarchy of environment parallels the idea of widening identification of Self-realization.

Second, ecology has developed a quasi-field theory similar to that of physics.²⁵ The concept of ecosystem implies flows of energy, matter, and information, with periodic storage (where the rate of flow abruptly changes) in organisms and physical structures. For example, as suggested by Morowitz²⁶ individual organisms may be conceived as momentary formations of energy in an energy field. As long as there is a flow of energy, individuals exist as an energy structure. However, as the energy flow ceases or the rate of flow changes, the organism is reformed, grows or dies, and new individuals form which fit the new flow rate. Similarly, individuals experience a dynamic exchange of chemical elements from the cells of one body to the cells of another or to the physical environment. Such exchanges occur minute to minute, day to day, and over the lifetime of the organism. The consequence is that there is a chemical coupling between organisms and environment that is reflected in the basic chemical structure of the organism. The mental, perceptual, conceptual character of the organism is also affected at each moment by its sensory inputs. We are what we experience and we constantly change our perspective as we experience new environments. Thus, all ecosystems are open to energy, materials, and information and no individual is an isolated entity in any sense. All individuals are exchanging energy, matter, and information constantly and are thereby linked to the other parts of the world.²⁷

The recognition of the temporality and interpenetration of the boundaries of organism, lakes and of landscapes by the deep ecologist has strong resonance with the experience of the field ecologist and the ecosystem theorist. Self-realization reflects these insights and concepts but expresses them in a more personal way. The deep ecologist premise begins from the self and expands through the environment. The ecologist's environment concept is objective and is applied to organisms and phenomena out there in the natural world. There is a close parallel between the two sets of concepts and one supports the other.

So far so good, the Self-realization intuition seems to fit closely the environment and ecosystem concepts of ecological science. What about biocentric equality?

Biocentric equality appears to have two meanings in deep ecology. The statement "all living organisms have an equal right to live and flourish"²⁸ may mean equality in a human political sense or equality of opportunity in an ecological sense. The first meaning makes no sense ecologically because the central phenomenon of existence is biological difference. Each individual, species, habitat and ecosystem differs from each other. Nature seems seldom, if ever, exactly the same. Mutation, gene insertions, deletions and rearrangements, and sexual recombination all create change in genotype. Natural selection acts upon these differences at the individual level producing adaptation and evolution. The field ecologist observes selection of such differences in subordinate-dominance relationships, in competition, predation, feeding, cooperation and other interactions. Clearly, organisms have no equality in the human political sense.

However, in another sense, biocentric equality does find support from the ecological sciences. Biocentric equality can mean

that all species and individuals have the right to play those roles that they have evolved. Ecosystems have a recognizable character because the individuals and species that compose them have, over time evolved networks of interaction and exchange that are persistent and predictable. Survival of the ecosystem, with its complement of species, depends on these species being allowed free opportunity to organize and operate within the environmental constraints. Species in such systems respond to natural disturbance in recognizable patterns of response. While one cannot say that species or ecosystems are stable, individuals, species, and ecosystems do exhibit consistent behaviour. Biocentric equality asserts that these systems should be permitted to display these behaviours.

This interpretation of the premise of biocentric equality may also be understood as a prescription of human meddling and manipulation in order that a human design may be imposed upon nature. Management of the natural world is best accomplished by working with nature. Ecological knowledge is insufficient to design and manage ecosystems as if they were engines or machines. For example, there may be a thousand species and a million individuals in a single, small patch of forest. With this complexity it is an unending task to understand all the flows and interactions within the ecosystem as we would in a machine. The abstract, machine design approach is not practical in this context. Biocentric equality admonishes us to keep our hands off and let the individuals and species function according to their evolutionarily selected patterns. Biocentric equality requires that man be part of the system and not a separated, God-like environmental force that acts upon nature.

The Ethical Perspective

In this brief analysis we have discovered that the two ultimate norms or intuitions of deep ecology coincide with ecological understanding. The language in which these premises are presented is misleading. "Self" and "equality" are employed in unconventional ways but with interpretation the meanings of these words can be understood in an ecological context. Thus, we conclude that these premises of deep ecology do not conflict with the observations and conclusions of the field ecologist.

However, the analysis raises a series of questions. The first question concerns the form of the biosphere in which we live. Naess recognizes the biosphere as a relational, total-field in which there is no ontological divide between object and environment. This insight is supported by ecological science which finds numerous physical connections between objects and objects and the physical environment. The objects we recognize in the world such as individual trees and lakes, for example, are linked to objects through flows of energy, materials, and information. For example, trees have connections between their root systems (root grafts) which couple different trees together allowing exchange of nutrients between apparent individuals. Lakes are a part of watersheds which furnish water, sediment and nutrients to the lake. Thus, while objects are convenient for human purposes, in another sense they are momentary entities in energy, matter, and information fields. Ecological science treats natural phenomena in both ways, as objects and as nodes in interaction fields.

The second question involves the value of ecological objects. Value is an attribute of an object, but it assumes a valuer, which may be the object itself or another object. Ordinarily, we would

expect an object to have value for another object when it is used by that other object. A seed, for instance, has value to the Savannah Sparrow which may eat the seed as food. Rolston²⁹ has discussed seven levels of meaning of value for wildlands. These meanings include individual preference, market price, individual good, social preference, social good, organismic, and ecosystemic. Twelve types of value may be recognized: economic, life support, recreational, scientific, genetic, diversity, aesthetic, cultural symbolism, historical, character building, therapeutic, religious, and intrinsic. The first eleven types are ultimately anthropocentric since they involve value to humans. The last form, intrinsic, may be interpreted to recognize the biospheric network, the lack of a divide between organisms and environment and reflect the relational-total-field theory of the ecosystem. Thus, we conclude that all entities we recognize in the biosphere have some form of value, these values are instrumental when they derive from the specific vital needs or desires of objects and they are intrinsic when they contribute to the performance and maintenance of the ecosystem through the biospheric field of interaction.³⁰

We are left with one final question. What do we mean, in an operational and theoretical sense, by the phrase "to satisfy vital needs" in the context of the sentence "all species and individuals have the right to act out their natural, evolved roles in ecosystems free of human disturbance, except where humans must satisfy their vital needs"?

I propose that there are two kinds of criteria of vitality. First are criteria concerned with performance of individual organisms. For example, vitality might involve the capacity to reproduce, grow, maintain one's self, and to survive. This is a familiar form and is the basis of adaptation and evolution of the individual. Second are those criteria that concern the ecosystem. These criteria include maintenance of the well being of keystone species, primary producing species, those species whose role in the flows and influences are poorly understood, and those who have an additive or synergistic impact on system function. For example, cutting old-growth forest destroys the trees which dominate the entire forest. Old-growth forests are very rare and unusual, they serve as a comparative basis for human understanding of forests, they support species that cannot live in young forests, they are a source of inspiration. Wood can be obtained so easily elsewhere that no excuse for this type of destruction is possible. The trees and the dead wood of old-growth forest are so vital³¹, such a key element in the forest, that it is of highest priority to maintain them. It does not matter that the trees will regrow; destruction of old trees destroys a fundamental aspect of the forest that cannot be recreated within our lifetime. These definitions are not rigid but rather are comparative, requiring understanding of the context in which value is defined. This is a very important point because it moves from a law-like, abstract system to a real-life, relative system of value.

Contrary to the assertion of some critics of deep ecology, a capacity to be practical exists in this approach. But the deep ecologist requires that action be based on knowledge, especially on knowledge of the context or the indirect effects of the action. As Ghandi showed us, with knowledge we can weigh the impacts of an action and determine if vital needs are in jeopardy.³² When there is inadequate information, the deep ecologist argues for no action. Organisms and the environment have the right to be free of ill-informed meddling by mankind.

More information about the relational total-field biospheric network is obviously needed for ethical as well as scientific reasons. There needs to be a free interplay between field investigation and philosophy. As Callicott³³ observed science and ethics seem to be moving in the same direction and this common focus gives us a reason for confidence in a time when conditions for the environment and the human race seem serious, indeed.

Summarizing, in one sense it appears that Naess presents us with a selfcentric, equalizing value theory to replace an anthropocentric, abstract theory. The self in this theory is defined as an entity in a biospheric network of energy, matter, and information relationships. Naess' theory is eminently practical since it begins with the ego and then extends outward through identification to encompass a larger and larger part of the environment of self. As the self begins this journey of identification, it encounters what it defines as objects. The norm of biocentric equality, as I've interpreted it,³⁴ tells us not to order these objects by some abstract system of value, but to order them according to vital need considering both the vital need of the individual and the ecosystem. Thus, Naess presents a theory that recapitulates our field experience of the life processes of birds or mammals. For example, the fox leaves the den and is alert to each event in its environment. No smell, sound, or item seems to be uninteresting. Then an object signifying food is encountered. This object is attacked and eaten. The next food item may be ignored since hunger has been satisfied and the vital need of feeding fulfilled.

This theory is set in a larger context - the total-field of biospheric relationships. Objects are recognized as momentary configurations, that are artifacts of human perception. What is fundamental is the unity of life and non-life in a widening circle of relationship, leading ultimately to the planet and the universe. Self-realization leads us to identify with this unity. This fundamental intuition answers the question one must raise about the need for humans to satisfy vitals needs to build dams and nuclear bombs. All life and non-life is linked into patterns of energy, matter, and information flow. It is a vital need for any organism to fit into this system and to maintain it, to the degree an individual can, in a predictable state so that at the next instant of time the individual can satisfy its vital needs. A radically oscillating system or a chaotic system is less predictable and an individual can easily lose its way and die. Thus, to maintain life it is essential to maintain the system in which one has evolved, developed, and was born. All individuals have this conservative tendency. Biocentric equality is a theory that strengthens this tendency.³⁵

Notes

1. *The State of the World*, 1986, by Lester Brown and Associates. A Worldwatch Institute Report on Progress Toward a Sustainable Society, W.W. Norton, New York is an excellent, overall summary of global conditions. Chapter 2, "Assessing Ecological Decline", is especially relevant.
2. J. Baird Callicott, "Non-Anthropocentric Value Theory and Environmental Ethics." *American Philosophical Quarterly* (October 1984) 21(4), 299-309. Richard A. Watson delivers a criticism of this type of theory in his paper, "A Critique of Anti-Anthropocentric Biocentrism," *Environmental Ethics* (Fall 1983) 5, 245-256. Watson quotes Webster's *New World Dictionary* as defining "anthropocentric" as the position "that considers man as the central fact, or final aim, of the universe and generally conceives of everything in the universe in terms of human values".
3. Arne Naess, "The Shallow and the Deep, Long Range Ecology Movement. A Summary," *Inquiry* (Spring 1973), 95-100.
4. Joseph Meeker, *Minding the Earth*, volume 6, number 4, December, 1985, deplors the polarization implied in the shallow-deep duality. He states (Meeker, letter March 28, 1986) "Deep ecology needlessly intro-

duces a power structure into its premises and an aristocracy into its structure by its mutually-exclusive contrast between deep and shallow." Meeker (in *Minding the Earth* Volume 7, Number 1, March, 1986) would prefer a focus on harmony or on "tempering". A well-tempered ecology would be like "a five-part fugue, developing the themes of proportionality, tempered hardness, lively tempo, contemplation, and temporality."

5. These two books are Bill Devall and George Sessions, *Deep Ecology*, Peregrine Smith Books, Salt Lake City, 1985, and Michael Tobias, editor, *Deep Ecology*, Avant Books, San Diego, California, 1985.
6. Fritjof Capra and Charlene Spretnak, *Green Politics*, E.P. Dutton Inc., New York, 1985. see page 30.
7. The only analysis of deep ecology concepts from the perspective of scientific ecology that I am aware of is the paper of the philosopher, A.A. Brennan, University of Stirling, Scotland, "Ecological Theory and Value in Nature", given at a conference on ecological thinking, University of Bristol, November 1984.
8. Naess, *ibid*, p. 98.
9. Naess, *ibid*, p. 99.
10. Bill Devall, "The Deep Ecology Movement", *Natural Resources Journal* (Spring 1980) 20, 299-322.
11. Naess, *ibid*, pp. 95-98.
12. Arne Naess, "A Defense of the Deep Ecology Movement", *Environmental Ethics* (1984) 6, 265-270.
13. Bill Devall and George Sessions, *Deep Ecology*, Peregrine Smith Books, Salt Lake City, 1985, p. 66.
14. Arne Naess, "Identification as a Source of Deep Ecological Attitudes". In, *Deep Ecology*, Michael Tobias (ed.), Avant Books, San Diego, California, 1985, p. 261.
15. *ibid*, p. 263.
16. *ibid*, p. 261.
17. *ibid*, p. 261.
18. Warwick Fox, "The Intuition of Deep Ecology" manuscript, 1983. Fox's paper was delivered to a conference on "Environment, Ethics and Ecology" at Australian National University, 26-28.
19. *ibid*.
20. *ibid*.
21. Naess, *ibid*, p. 262.
22. Eugene P. Odum, *Fundamentals of Ecology*, third edition, W.B. Saunders Co., Philadelphia, 1971, p. 3.
23. The term ecosystem was coined by Sir Arthur Tansley in 1935 in his book *Introduction to Plant Ecology*, London, George Allen and Unwin, Ltd. The concept developed from Tansley's interest in the plant ecological community but with the community as an analog of a physical system.
24. Bernard C. Patten, "Environ: Relativistic Elementary Particles for Ecology", *American Naturalist* (1982) 119, 179-219.
25. J. Baird Callicott, "The Metaphysical Implications of Ecology" manuscript, p. 30, 1985. This paper is a presentation of the history of ecological concepts and the linkage of modern ecology with modern theoretical physics.
26. Harold J. Morowitz, "Biology as a Cosmological Science", *Main Currents in Modern Thought*, 28 (1972), p. 156.
27. This concept of a field of energy, matter, and information does not imply that a unitary superorganism exists. Brennan, above, discusses the problems with the ecological idea of communities, ecosystem and the ecosphere as superorganismic entities. The emphasis of ecological field theory is on the dynamic flows, not on the objects, which are recognized as temporary configurations.
28. Naess, *ibid*, p. 266.
29. Holmes Rolston III in "What Sorts of Value Does Nature Have?", pp. 351-369 in *Ecological Consciousness*, Robert C. Schultz and J. Donald Hughes (eds.), University Press of America, 1981, discusses a variety of sources of value of nature, most of which are anthropocentric. The meanings of value are from Rolston, "Valuing Wildlands", *Environmental Ethics*, 7 (1985):23-48.
30. Holmes Rolston III in "Duties to Ecosystems", forthcoming in J. Baird Callicott, (ed.), *A Companion to the Sand County Almanac*, University of Wisconsin Press, 1987, suggests that when we are dealing with ecosystems there is a source of value beyond the instrumental or intrinsic dichotomy. He calls this systemic value.
31. See M.E. Harmon, J.F. Franklyn, F.J. Swanson, et al., "Ecology of Coarse Woody Debris in Temperate Ecosystems". In *Advances in Ecological Research* (1985, Vol. 15).
32. Arne Naess, *Ghandi and the Nuclear Age*, The Bedminster Press, 1965.
33. Callicott, *ibid*.
34. George Sessions, letter, March, 1986, commenting on this point emphasizes that biocentric equality tells us not to order objects at all.

35. Presented to the University of Georgia Environmental Ethics faculty and students on February 26, 1986.

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PLAY

Robert Aitken

Lin-chi (Rinzai) asked Huang-po: "What is the clearly manifested essence of the Buddha Dharma?" Huang-po hit him. This happened three times.

Lin-chi then went to Ta-yu. Ta-yu asked, "Where did you come from?"

Lin-chi said, "From Huang-po."

Ta-yu asked, "What does Huang-po have to say?"

Lin-chi said, "I asked him three times, 'What is the clearly manifested essence of the Buddha Dharma?' and he hit me three times. I don't know whether I was at fault or not."

Ta-yu said, "Huang-po is such an old grandmother. He completely exhausted himself for your sake. And you come here asking whether or not you were at fault!"¹

With this Lin-chi had great realization, and exclaimed, "Ah, there is not so much to Huang-po's Buddha Dharma!"

Ta-yu grabbed hold of Lin-chi and said, "You bed-wetting little devil! You just finished asking whether you were at fault or not, and now you say, 'There isn't so much to Huang-po's Buddha Dharma.' What did you just realize? Speak! Speak!"

Lin-chi jabbed Ta-yu in the side three times. Shoving him away, Ta-yu said, "Huang-po is your teacher. It's not my business."²

A lot can be said about this case, but I just want to take up a single point. How much is "not so much?" How is it that "not so much" gave rise to such a vigorous tradition that thrives to this very day?

Of course, Lin-chi was not the only teacher in our lineage who talked about the poverty of the Buddha Dharma. When a monk asked Chao-chou, "Has a dog Buddha-nature or not?" Chao-chou said, "Mu."³ The monk didn't need to ask what that Mu amounted to, he already knew that "Mu" meant "nothing at all."

According to the *Ts'ung-jung lu* (Japanese, *Shoyoroku*), the monk went on to ask, "All things have Buddha-nature, how is it that the dog has none?" Chao-chou said, "Because of its inherent karma."⁴

Karma and Buddha-nature, the substantial teaching of all Buddhas and its empty content--these sets of relative and absolute, the universe and the void, are one in our play as Zen students, thanks to our marvelous heritage.

Huang-po, Ta-yu, and Lin-chi, Ma-tsu and Pai-chang, Ju-ching, Dogen, and all the other great ones fooled with themes of essence and phenomena to enlighten us. One of my early Japanese teachers and I used to argue about "play." His under-

standing of English may have been a factor of our disagreements. For him, play was limited to children, baseball and theater. I understood play as the nature of interaction, not only human interaction, but all of it. Puppies are more frisky than dogs, but even an old dog knows it's a game.

Interaction is play because it doesn't amount to much, or even to little. On your cushions in the meditation hall, nothing impedes your interaction with thoughts. You view one thought-frame after another. When your thoughts wander, and you notice what has happened, then easily and smoothly you return to focussing on Mu. When the bell rings for the end of the period, you bring your hands together, rock back and forth, swing around on your cushions, and stand up.

In the workaday world, again, interaction is play. Nothing impedes your response to your child's demands. When the telephone rings, you "save" on your computer, pick up receiver, and say "Hello." When the bus reaches your station, you get off promptly.

Farmers sing in the fields
Merchants dance at the market.⁵

The Layman P'ang wrote:

How wonderful, how miraculous!
I draw water, I carry kindling.⁶

When Joanna Macey and I spoke at a Buddhist Peace Fellowship meeting in Sydney recently, we were challenged from the back of the hall by a group of evangelical Buddhists. Are you surprised that there could be evangelical Buddhists? Evangelism is a character trait, and is not limited to any particular religion. These people were born-again Buddhists, firmly convinced that "Dharma" and "Karma" are entities with certain fixed qualities and tendencies. Joanna and I told them, each in our own way, that no concept is solid or absolute, and that even "Buddha" self-destructs. Their Dharama is not ours. They became angry because they didn't know our interaction was play, an inning in the joyous game of time and space, giving and taking with empty universal nature.

"All the world's a stage," We play roles: Zen teacher, Zen student, parent, spouse, friend, worker, pedestrian, and so on. We play "as if," to use the Hindu term, as if we were Zen teacher,

student, parent, and so on. The child plays house, as if she were a mother. The mother plays house in exactly the same way:

He himself took the jar
and brought wine in the village;
now he dons a robe
and makes himself host.⁷

And when the play doesn't make you laugh, that doesn't mean it isn't play any more. Tragedy is play too, tragic to the very bottom, perhaps, but still play.

The Knight of the Burning Pestle by Francis Beaumont taught me that the audience creates the play, and the play is not confined to the stage. The druggist and his wife are patrons of the theatre, and she doesn't like the way the play begins. She stands up in the audience and starts directing things. Her paramour, the druggist's apprentice, is introduced as a new character, as the Knight of the Burning Pestle, with a pestle in flames inscribed as a crest on his shield. We then have a new play, and the separation between audience and actors is broken down. The inner fantasy of druggist's wife is acted out on stage, and thus inner and outer too, lose their barrier.⁸ This is only possible because matter is insubstantial, and there is not a speck of anything to interfere with our complete interpenetration.

In the world of play, a druggist's apprentice becomes a knight, a child becomes a father, a dog becomes a baby, and the insurance agent, throwing off his worries about declining sales, transforms himself into a prince and seduces his tired wife and the mother of his brood, who in turn becomes a ravishing, masked beauty at a mummers ball.

In a well that has not been dug,
water from a spring that does not flow is rippling;
someone with no shadow or form
is drawing the water.⁹

This is Zen play. Where is the person with no shadow or form? On the stage of the interview room, you dance your response.

That person with no shadow or form inhabits a dream world that is no other than this world. Traditional people confirmed their dreams in this world with ceremonies, and then re-entered the dream world again by re-enacting their ceremonies. We do the same with our ceremonies. We dedicate the merit of reciting our sutras to our ancestors in the Dharma, and to our parents and grandparents who have died. Are they listening? Of course they are. Nakagawa Soen Roshi once said to Elsie Mitchell, "Of course there are bodhisattvas and angels living up in the sky!"

This is all possible because there is not much to Huang-po's Buddha Dharma, or to anyone else's for that matter. And as to the Buddha-nature of the dog, or of you or me, "Mu!"

Notes

1. Robert Aitken and Koun Yamada, trans., *Shoyoroku*, mimeo., Diamond Sangha, Honolulu and Haiku, Hawaii, Case 86.
2. Ruth Fuller Sasaki, trans., *The Recorded Sayings of Ch'an Master Lin-chi Hui-chao of Chen Perfecture* (Kyoto: Institute for Zen Studies, 1975), pp. 50-52.
3. Robert Aitken, *Taking the Path of Zen* (San Francisco: North Point Press, 1982), p. 95 ff. "Mu" is the Japanese pronunciation of the pertinent ideograph, and "Wu" is the contemporary Mandarin pronunciation. However, I am told that "Mu" was probably the pronunciation in Chao-chou's time.
4. Aitken and Yamada, trans., *Shoyoroku*, Case 18.
5. Soiku Shigematsu, *A Zen Forest* (Tokyo and New York: Weatherhill, 1981), p. 100.
6. Cf. D.T. Suzuki, *Essays in Zen Buddhism*, Third Series (New York: Samuel Weiser, 1976), p. 86.
7. Isshu Mura and Ruth Fuller Sasaki, *Zen Dust: The History of the Koan and Koan Study in Rinzaï Zen* (New York: Harcourt Brace and World, 1966), p. 112.
8. Francis Beaumont, *The Knight of the Burning Pestle*, ed. Andrew Gunn (Berkeley: University of California Press, 1968).
9. "Miscellaneous Koans," mimeo., Diamond Sangha, Honolulu and Haiku, Hawaii.

About the author: **Robert Aitken** is a contemporary Zen teacher and founder of the Diamond Sangha in Hawaii. He is the author of numerous articles and of the very fine book on Zen *Taking the Path of Zen*, published by North Point Press. The article printed here originally appeared in *The Eastern Buddhist*, reprinted here with permission.

THE MAN WHO BECAME A BEAST AND THE BEAST WHO BECAME AN ANGEL

David Sparenberg

It is written that the descent is for the sake of the ascent. The following story is an illustration of this mystical teaching.

There once was a man who lived a quiet, humble life. He made poems in celebration of the flowers and the trees. He prayed to God and he longed for redemption.

Because he was who he was, the man's life was not a success. All of his wealth was in his inwardness. Thus the man lived his life without notice or worldly ambition.

One night the man dreamed a dream in which he saw a huge, dark giant lurking around his house. The giant kept making circuits around the house, trying to enter. Eventually the man over-

came his fear. Going to a second story window, he told the giant, "You must go away. It is unsafe for you here." And the giant left.

The dream, however, stayed with the man and his waking hours were disturbed.

A week later, the man had another significant dream. In this dream, he was himself a huge, dark giant, with a painted body and with bird feathers stuck into his hair.

The dark giant was hiding in a field of magnificently ripening wheat - tall stalks, gleaming golden in the summer sun. In his hands he held a bow and several sharp arrows.

Now and again, somebody from the town the man lived in would pass through the wheat field. At sight of the intruder, the giant would feel the pain of the earth in his heart, and he would glare wrathfully at the pale stranger trampling down the golden wheat.

Then the giant would take one of his arrows and shoot it. In this way, he killed many of the town's people.

More than the first dream, this dream of the giant with his murderous weapons upset the man. He resolved to leave his home town. And so he did.

He trekked across the valley and into the foothills of the nearby mountains. The farther he travelled from the society of men, the more alert and alive he became.

Eventually he was so far away from his town that the man underwent a peculiar transformation. He became a beast.

At first his mind was startled by this change. But it seemed so natural to him that he accepted it without much anguish. He had not, after all, completely lost his human sensibilities, nor been diminished in his human stature. Yet he was, notwithstanding, thoroughly different.

As a beast, the man roamed the forests and mountains, delighting in the plenum of nature. One afternoon, he came to a rustic house in a clearing, ringed in by tall evergreen and dense, primitive ferns. In this house there lived a young woman. She was as quiet as silk, with serene eyes and a delicate, perfectly made body. As soon as he saw her, the beast-man longed to be near her.

But before he could approach the woman, he heard an ancient voice speaking from the thick of the trees. The voice announced, "No man who is but a man may enter this place."

"But I am a man who has become a beast," the beast-man shouted back. His voice made the forest hushed and attentive.

After this, the man who had become a beast went to the woman and she caressed him tenderly.

That was their beginning. Following the first day, the beast-man stayed with the country woman for a complete year. Their hearts and their bodies converged, and on many occasions they made love.

In their lovemaking, the awakened beast in the man growled playfully and roared with expressive freedom. The man and woman were happy and at-one-ment with each other and with the earth.

When the circle of their year was rounded, the man who had become a beast left the rustic house and his beautiful companion. Again he took up his wanderings. As he left, however, he promised the woman he had made love with that he would certainly return to her at some time in the future.

Their parting was like a smile of two twilights, expressing regret and renewal.

After many weeks of solitude, one evening the beast-man arrived before an immense castle of cold, black stones. The castle was surrounded by bracken and enmeshed in a network of spindling vines.

When he drew near the castle walls, an ancient voice called out, "No man who is but a man may enter this place."

To which the beast-man replied, "But I am a man who has become a beast." So saying, he entered the castle through the opened portcullis.

Once inside he was astounded to see an exquisite young woman standing before him. Her eyes were the color of the sea and her hair was the color of sunlight.

When the man who had become a beast approached her, the woman laughed softly and turned about, quickly ascending the flight of stairs at her back.

Instinctively, the beast-man pursued. Yet each time that he caught up and reached out to stop the woman's flight, she would laugh and an article of her clothing would drop gently into his hands.

By the time the castle woman reached the uppermost landing of the stairs, she was naked. There, turning around in the roseate beauty of her nudity, she lay down on the marble floor and drew the beast-man to her.

Soon his body covered hers. Then the man who had become a beast and the woman of the castle made passionate love. The awakened beast inside of his human form growled and roared with expressive joy.

After this first day of their togetherness, the beast-man stayed with the beautiful woman for a complete year. They made love and were windows to creation in each other's eyes.

When the circle of their year was rounded, the man who had become a beast left the black stone castle with its genteel mistress, once more taking up his wanderings. As he left, he promised the woman he had made love with that he would certainly return to her at some future time.

They said good-bye in the expectation of this poignant-sweet vow.

Weeks followed, weeks of solitary travel, during which the man asked himself many questions, listening carefully to the responses of the living earth.

Finally, one morning, the beast-man came to a lake, at the center of which was a small island.

Although he was not a water beast, the man decided to swim over to the island. Immediately upon his reaching the shore, an ancient voice spoke from the dense jungle. "No man who is but a man may enter this place," the voice called out.

"But I am a man who has become a beast," the beast-man answered. The sound of his voice made the jungle hushed and attentive.

After this, the beast-man went into the jungle, with its moist odors of floral perfumes. There he met a young woman whose beauty exceeded all imagination. She was tall, refined, dark skinned, with nurturing eyes, and midnight hair descending the length of her delicate body.

She summoned the beast to her. On a bed of moss and tropical flowers, the two lovers made uninterrupted love, late into the afternoon.

Following the initial day of their union, the man who had become a beast and the island woman remained together for a complete year. The awakened beast in the man gained a new peace, as if a tree had been planted in the soil of his soul. The island of their communion was for them a Garden of Eden.

At last, when the circle of their year was rounded, the beast-man left his home and the jewel-like woman who lived there. Never before had his heart been so heavy at departing. He promised the woman he had made love with that he would surely return to her at some time in the future. With this, they said farewell, because they could not bring themselves to say good-bye.

Later, when he had gone a considerable distance from the island, the man who had become a beast lay down to sleep in the evening sun. With his head resting on a flat stone, he dreamed

that he was no longer a beast of the earth but a winged creature, soaring into the sky.

From a great height he could see the land, from the mountains near the ocean to the mountains whose furthest slopes precipitated to the eastern desert. Whatsoever his eyes saw, his ears heard. He felt wise and filled with power.

When he awoke, the man was surprised to discover that he was near the town he had fled more than three years before. Notwithstanding, he crossed the river and re-entered the town.

There the man procured a piece of canvas, some brushes and a selection of paints. With these materials, he painted a picture of a man who had become a beast.

This portrait the man showed to many of the town's people. But the outcome was not what he expected. Rather, the people were afraid of both the picture and the man. Angrily, they shouted, "We built this town in order to be safe from the likes of you!"

Then they tied the beast-man with ropes and chains of iron and proceeded to drag him to a place of confinement.

It was in this hour that a great power song awoke in the man's heart. He chanted to the earth and to the sky, to the mighty waters, to creatures, large and small, and to the Sacred Creator. His heart became like a bow; the blood in his veins became like liquid fire.

Filled with vital force, the man who had become a beast burst the iron chains, ripped loose the ropes that bound him. Standing free, he roared a terrific roar. All of the town's people were afraid for their lives, as they beheld the raging beast before them. In an instant, he could have leaped into the multitude, killing and wounding many. He was that powerful with the elemental force of life.

Rather than attack and strike them down, however, the beast-man turned away. Once more he left the society of men who were only men. He crossed the valley, ascended the foothills and began climbing the slopes of the land's highest mountain.

Part way up the slopes, the man encountered three doe deer. When they sensed his presence, the deer stopped and watched him attentively. He, too, stood still, returning their interest.

In those few minutes, the beast-man remembered having told each of the three women with whom he had made love that it was part of his mission in life to fight with the wolf pack for the sake of the deer people. That was why he had become a lion, a

holy protector. That also was why the three deer standing before him were not afraid, unlike the people of the town.

Thus he was integrated and calmed by this recollection.

The man next climbed higher up the mountain. As he climbed he underwent another peculiar transformation. He found that he was no longer a man who had become a beast, but also a beast who had become an angel.

At first this second change was even more startling than his original awakening. Yet because of the lessons he had learned from the three women who had loved him, the man accepted the angel inside as natural.

At last, when the angel reached the mountain summit, he beheld four magnificent thrones, stationed at the four cardinal directions. On three of these thrones sat three beautiful queens. And the man who had become an angel sat on the fourth throne among them.

All day long, the man and the three angelic queens conversed, delighting in one another's company. On the lap of each of the queens was a scroll, on which was painted a portrait of a man who had become a beast and a beast who had become an angel.

At spontaneous intervals, one or another of the queens would take up a pen and inscribe on her scroll the names of children. These names were prophecies for the future of the world.

It is said that a man's soul is of three possible gradations: the ruah, the nefesh and, if his stature grows close to that of messiah, neshamah. For such wholeness, I have been taught, all of creation, from the lowliest creatures of nature to the flaming seraphim of heaven, are watching, waiting.

About the Author: **David Sparenberg** is a writer and Jewish mystic. His essays, stories and poetry have appeared in a wide variety of periodicals and journals, throughout North America and Europe, including *Telos*, *Parabola*, *The Jewish Exponent*, *Response*, *Aim*, *Festivals*, *The Trumpeter*, and *Transnational Perspectives*. He has also published *Words on Fire*, *Not Bodies* (prose), and *The Name is Shalom* (poetry). "The Man Who Became a Beast And the Beast Who Became an Angel" is part of a book in progress, to be titled *Stories out of Dreamtime: Tales of Memory and Consciousness*. (His two books are available from him: 1717 - 14th Ave., Seattle, Wn. 98122.

BOOK REVIEW

The New Story of Science, by Robert M. Augros & George N. Stanciu, Regnery Gateway Inc. 1984 (republished as a Bantam New Age Book, 1987); **The New Biology**, also by Augros and Stanciu, Shambala Publications, 1987. Reviewed by **Michael Caley**.

Ecophilosophy, in its modern form, integrates the thoughts and writings of thinkers that span the centuries from Lao Tzu and Aristotle to the most recent theories of physical and social sciences, philosophy and other areas. It includes the theoretical and practical aspects of a diverse number of disciplines, such as agriculture, ecology, feminist studies, animal rights, R-DNA research, and transpersonal psychology, just to mention a few.

From my personal perspective, ecophilosophy is and will be, well served by the reconceptualization of the theory and practice of science that has been underway since about 1900. However,

understanding this dramatic reconceptualization is not an easy task, since we are asked to reject many of the major underpinnings of our worldview that are inculcated in both our formal and informal education. Augros and Stanciu have done all ecophilosophers a great service with these two books that deal with the reconceptualization of science.

While some of us in the Ecophilosophy Network are trained in one or more of the scientific disciplines, many are not. A major concern of those not so trained ought to be to develop an understanding of basic scientific principles and their relation to ecophilosophy. This is not to raise science above other aspects, but to be able to readily understand and integrate its contributions. For those with scientific training there is a real need to be better able to communicate the latest breakthroughs and reconceptualizations. We are not all skilled in such communications and aids are few and far between.

For non-scientists such understanding may not come easily. Fortunately, Augros and Stanciu have made this understanding much easier. Their books are exemplars of the kind of writing that is of value to non-scientists and scientists alike. Their contributions are two-fold. First, they have an uncanny ability to explain the most abstract and obtuse principles of physics and biology in easily understood terms and language. Second, they support these explanations with artfully selected and copious quotations from original sources.

Reading these books is akin to eavesdropping on a relaxed, informal conversation amongst the great scientists of the past 80 year, with many of the bright young researchers standing on the periphery. You get caught up in the excitement of discovery and the development of the theory.

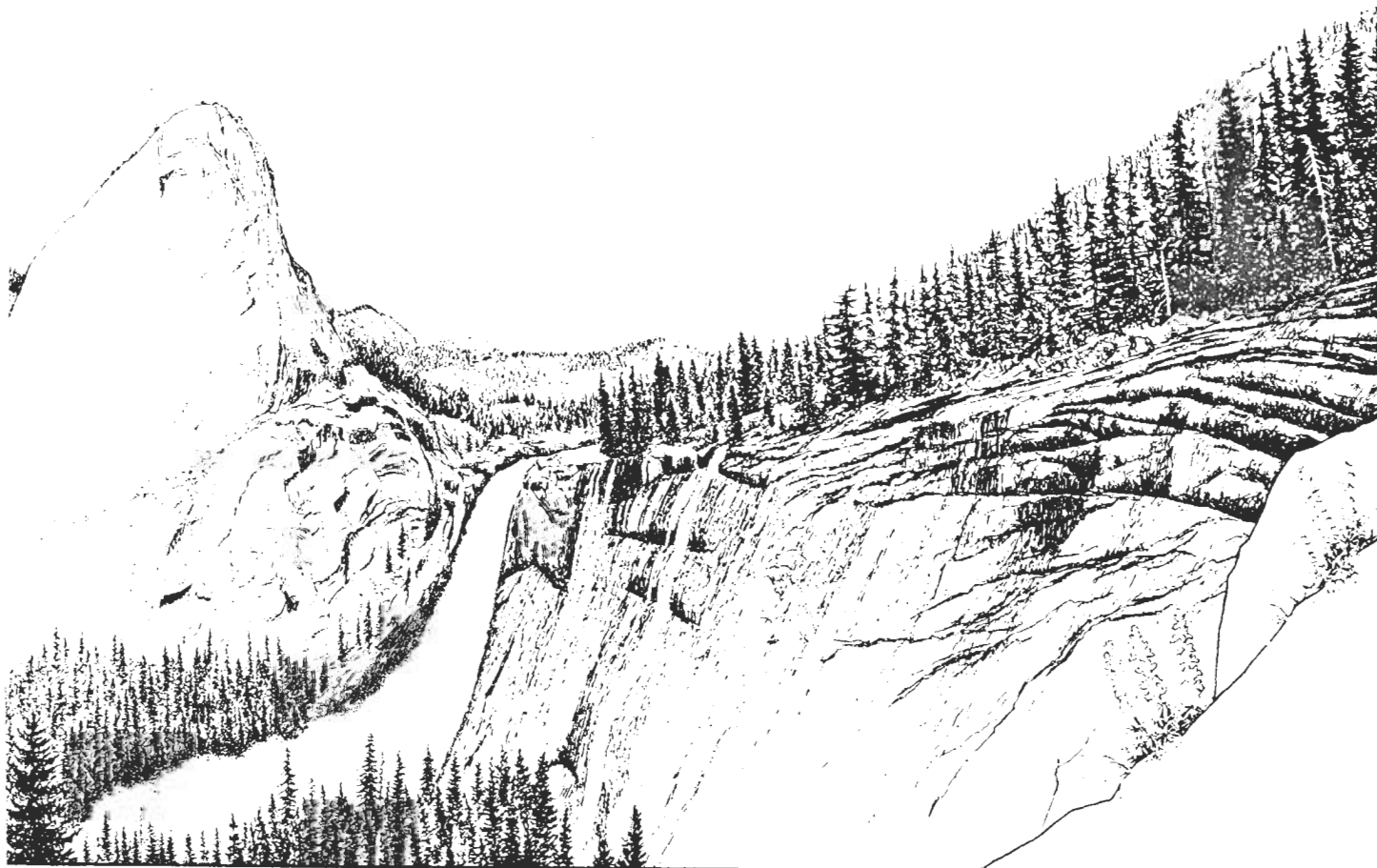
It is this relaxed conversational manner that makes these books extremely readable, and, in addition, serves to remove the mythical asceticism of science and scientists. The scientists in Augros and Stanciu's writings are warm blooded people with feelings and emotions, which are very much a part of the new conceptualization of physics and biology.

The decline of reductionist methodologies in science is coupled by the authors to the rise in holistic methodologies. In physics the dispassionate observer is no more and in biology competition has given way to cooperation as a basis of explaining life. Reduction as a paradigm in both physics and biology is shown to be not tenable in the light of new research.

Holism is a fundamental part of ecophilosophy. For ecophilosophers **The New Story of Science** and **The New Biology** provide a grand introduction to the re-shaping of science in our time. This echoes both the ancient Chinese curse "May you live in interesting times," and the Chinese ideogram for crisis, which is composed of the characters for "threat" and "opportunity." We live in interesting times of crisis. We will need new opportunities to respond to complex threats and challenges.

Augros and Stanciu have given us a serious, well-thought-out introduction to such new opportunities. We need these opportunities to aid us in dealing with the multitudinous threats. For ecophilosophers these books can provide the words and the arguments to help us in our personal reconceptualizations of the universe and the world we inhabit. In addition, they can aid us in our attempts to help others to their own ecophilosophical inquiry. I heartily recommend Augros and Stanciu's work to all in the Trumpeter network. While there are some arguments in the books with which I do not agree, I often do agree with the conclusions arising from them. This, however, does not distract from the basic value of the books.

About the reviewer: **Michael Caley** is a consulting editor of **The Trumpeter** and is in the Department of Elementary Education, Faculty of Education, University of Alberta, Edmonton, Alberta, T6G 2G5.



POETRY

WHALEWISDOMPEACE ILLUMINATION

Jeff Poniewaz

One way the world
could survive in joy
is if the whole world
worshipped whales.
If ancient Egyptians
worshipped cats,
how much more we
should worship whales!
I really believe
we should worship
the whales, &
regard them as
superior (if not
actually supreme)
intelligentsias
for they can nowise
hurt us. Unlike
most of the Gods
currently worshipped.
Their whole being
is exultation & play.
I believe we should
apprentice ourselves
to whales & dolphins
more eagerly than
to any human guru.
The whales sing &
play all day &
when they're hungry
all they do is
open their big mouths
(how can they help it
if millions of krill
happen to seep in).
Yes, the whales
sing & play all day
& don't have to mail
their songs to any
publisher whales
in order to be free
from factories & blow
geysers of ecstasy
all day long. The
whales have no factories
need no factories want
no factories & sing & play
& blow geysers of joy
all day. Their only
reason to go mad with
anguish or agony are

the lightening bolts
exploding unaccountably
into their brains,
harpoons expertly hurled
by beings made in image
of Jehovah -- the explosive
harpoons of humanmind.
Aikido those harpoons,
most whale-like human friends.

CAMPFIRE TALK

Antler

Birds don't need opinions
because they have pinions.
What is the opinion of the pinon pine
on whether Christianity is
for or against homosexuality?
A flower doesn't need a savior
to be able to bloom.
A waterfall doesn't need a guru
in order to gush.
A caterpillar doesn't need a Bible
to become a butterfly.
A lake doesn't need a Ph.D.
to become a cloud.
A rainbow doesn't need a fresh coat of paint
every year.
Worms don't need to study existentialism
to exist.
Mountaintops don't need to kneel
and ask forgiveness for their sins.
Capitalism and Communism mean nothing
to every tree that alchemizes light.
No whale will ever know who Christ is.
No chipmunk will ever follow Buddha.
No eagle cares about Mohammed.
No grizzly will ever consult a priest.
No seagull will ever become a Mormon.
No dolphin has to learn computers
if it wants to get along
in the modern world.
No sparrow needs insurance.
No gorilla needs a God.

PALEOLITHIC CONSCIOUSNESS ORBITED BY TVs

Antler

How close the closest TV to me?
My head seen from above
and then x-ray vision over
roofs of Milwaukee
showing turned-on TVs
with people glued to them--
Thousands and thousands in a one-mile radius from
my head,
dozens of channels, dozens of voices and plots,
endless commercials, endless actors
and actresses in costumes gesticulating,
endless images flashing on gazers' eyes,
While in the center--my poet head,
my meditating poetry brain
in silence at midnight
in candlelight in my attic
listening
to the foghorn and the rain....

SUBSTITUTES

Harvey Taylor

I used to see paper everywhere, on desks,
shelves, blowing around the streets...
i couldn't have guessed that one day
it would be all gone.
'Course, now that everybody watches tv
constantly, it's just as well production stopped,
considering what the mills dumped into our rivers & lakes.

Far as i know, there's only one person
who really misses paper,
& she's found some good alternatives:
in summertime, she camps at the beach,

writing poems in damp sand
with driftwood, or a big toe.
In autumn, she pours her breath on windows,
& inscribes the fog with a playful finger.
I don't have to tell you about winter,
'cause we've all made angels in the snow...
come spring, she takes birchbark peeled by the wind,
& scratches it with a sharp stone.

If she runs out of sand,
fog, snow, & bark,
there's always water...
& air

FULL CIRCLE

Harvey Taylor

The ground was scraped
barely level
by dull bulldozer blades,
then covered with concrete,
asphalt, &
cement,
as if the life-force could be
held down by
sidewalks,
patios,
back roads,
driveways, &
parking lots.

But,
little shoots break through,
tiny cracks widen,
air-borne seeds make themselves at home,
tree roots heave slabs aside ..

The world insists on being wild

About the poets: **Jeff Poniewaz's** collected eco-poems and meditations, **Dolphin Leaping in the Milky Way**, was published in 1986 by Inland Ocean Books (4540 S. 1st St., Milwaukee, Wis. 53207 USA). His many-poet anthology, **On What Planet--Poems in Praise and Defense of the Earth**, seeks a publisher. He currently teaches Literature of Ecological Vision at the University of Wisconsin's Milwaukee campus. "WhaleWisdomPeace Illumination" is reprinted from his published volume by permission.

Antler: In 1980 Lawrence Ferlinghetti's City Lights press brought out Antler's **Factory**, an epic invoking the end of the Industrial Revolution and the beginning of the Ecological Revolution. **Factory** is reprinted in Antler's selected poems **Last Words** published in 1986 by Ballantine (U.S. and Canada). Winner of the 1985 Walt Whitman Prize and the 1987 Witter Bynner Award, Antler lives in Milwaukee, but spends a month alone in the wilderness each fall and spring. He ekes out a living by performing his poems as far and wide as he can.

Harvey Taylor is the author of **Facing The Sky**, **Sacred Ground**, **Along The Shore**, & **Torch Song**. A frequent performer of poems & songs, he encourages creativity in school & prison workshops, & is occasionally employed as a longshoreperson at the port of Milwaukee.



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