Ontario Naturalist

MARCH 1973

The grey catalogue of environmental abuse has been well documented over the past ten years. The popular response to this documentation has been the seeking out of even more sophisticated technological solutions as the way out of our dilemma. Other observers however, have responded by examining those attitudes, values and perceptions which may permit a harmony of man with nature and with himself.

The Dunning Trust Lectures of Queen's University are dedicated to examining "the dignity, freedom and responsibility of the individual in human society". The 1972-1973 series examined the question of Western man's attitude to the natural world. We are pleased to depart from the traditional format of the *Ontario Naturalist* to publish the four main lectures of that series.

The procession of giant birds reproduced on the cover is a detail from a painting by Hieronymus Bosch (1450-1516) called "The Garden of Earthly Delights". The detail demonstrates how a new perception can alter one's reaction to even the most familiar subject. It suggests that paradise may be regained if we will only remember how prominent nature must be in our activities and reveals that a harmony of man with nature and with himself is in fact possible. As such, it will act as the metaphysical symbol for our inquiry into environmental ethics, the search for an ecological conscience.

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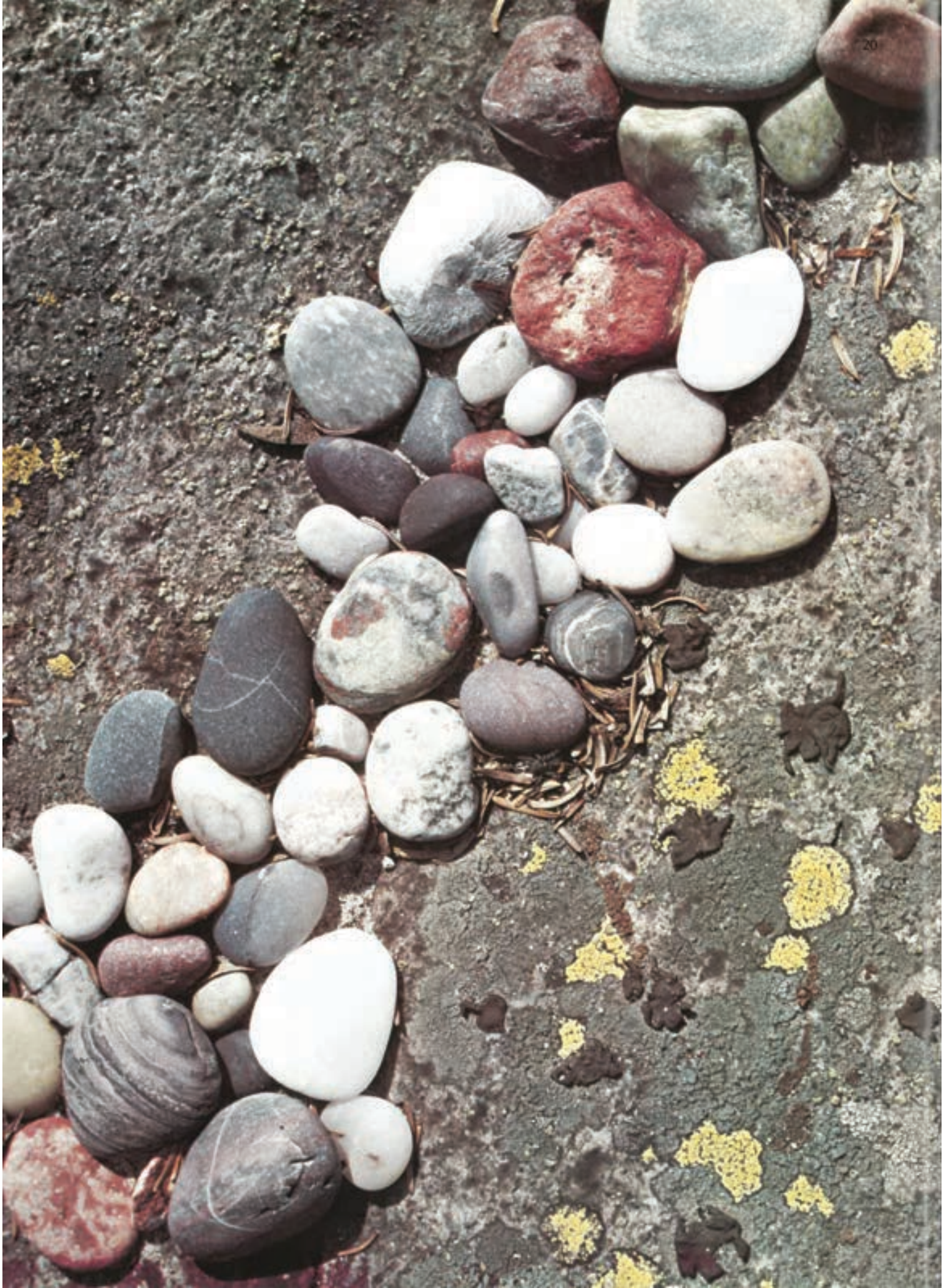


DESIGN WITH NATURE

BY IAN McHARG

In the opening portion of his address, McHarg outlined his list of 'excoreatables', those agencies or industries whose works may be likened to planetary diseases. This conception of man's artifices as planetary diseases had been prompted by an image conceived by Loren Eiseley more than a decade ago. The image was that of man in space looking down upon this tiny orb, the earth, our home. From this vantage he perceives it to be green: green from the maritime algae oceans, green from the verdure on the land. Seeing this, he concludes that the earth is a green, celestial fruit. As he looks more closely he perceives black, brown, and gray blemishes from which extend dynamic tentacles upon the green epidermis. He recognizes these blemishes as the cities and works of man and asks, "Is man but a planetary disease?"

Having elaborated on the American Defence Department, the Atomic Energy Commission, those involved in bio-chemical warfare, the captains of industry, the car manufacturers and the advertising agencies as planetary diseases, McHarg then began to discuss the Western view of man and nature as the most pervasive villain of all.

There is really only one Western view and we have it like a vestigial tail or a veriform appendix. It is not so much explicit as implicit in every single thing we do. Although it is as widely espoused by agnostics and atheists as by Christians and Jews, nonetheless, its most succinct form is in Judaic and Christian scripture, most succinctly and calamitously written in the first chapter of Genesis, where there are three horrifying lines. I addressed them to Paul Tillich and asked him his opinion and he said, "McHarg, McHarg, it is an allegory". What he was saying was that he wished Moses had been a better stenographer, or had written more obscurely. But in its literal form, it is a calamitous text. So too said Gustav Weigel, and so too said Martin Buber. These great Jewish, Christian, Catholic and Protestant theologians all shuffled their feet in embarrassment and wished it had not been said.

Anyway, there it is. Man is made in the image of God. The atoms cannot sing to God, neither the molecules, nor the cells, nor the unicellular plants, nor any other plant or animal, save one. Man made God in his own image, and in His own image made He him. St. Augustine clarified it for us all when he established the hierarchy: God, "space," archangel, "space", man, "space", everything else also-ran. Having done this, he established the relationship between man and the rest of the world. He said "Ye shall exercise dominion over all the earth, over every creeping thing that creepeth, every walking thing that walketh, every swimming thing that swimmeth, every flying thing that flieth, over every ifing thing that ifeth, hath thee dominion". Dominion is a non-negotiating relationship. It says, "I have power; you do not have power; you had better do or else." If there is any doubt about the burden of this text, then the last line does it for it says: "Ye shall multiply and subdue the earth."

Now, if you want to find one text of compounded horror which will guarantee that the relationship of man to nature can only be destruction, which will atrophy any creative skill, then you do not have to look any further. If you want to find one text which if believed and employed literally, or simply accepted implicitly, without the theological origins being known, will explain all of the destruction and all of the despoliation accomplished by Western man for at least these 2,000 years, then you do not have to look any further than this ghastly, calamitous text. Most sadly for Christians, it is impossible to find anything in the New Testament to rebut it. I have tried my hardest to get theologians to exhume and garner together an aberrant tradition of Duns Scotus, Johann Erigena, Francis of

Brains: Apex of evolution or spinal tumours?

Assissi, Tielhard de Chardin, Gerald Manly Hopkins and every single remnant they can of Wordsworth, Emerson and Thoreau, to put them together to see if there is another view within this great Western tradition which better corresponds to reality.

But apart from some sad, rather inadequate books which have come out in the last few years, there has been no serious attempt to try to organize some better view within this Judaic-Western tradition which does correspond to reality, and which also allows co-religionists to find some consistency with their conscience within the religious division. Insofar as this Judaic-Christian claim of supremacy exists, it is calamitous. It has no correspondence to reality. It has no survival value. And indeed is the very best guarantee of extinction.

There are two secular forms of this Western view of man and nature. One is economic determinism, and I shall not deal with that because it does not deserve attention. The economic model is perfectly adequate if you want to buy toothpaste, shoe polish or hair cream. But if you want to deal with anything more serious, then the economic model is utterly useless because it excludes all the realities of the biophysical world and all of the most important human aspirations. There is no place for love, compassion, beauty, justice, hope, or grace in the economic model. Moreover, it knows nothing about the sun, the moon, the stars, the inclined axis of the earth, the seasons, bird songs, harvests, atoms or molecules. It is absolutely unknowing of the realities of the bio-physical world. As a secular religion, it is not only inadequate, it is risably inadequate.

However, there is another secular form of the Western view which deserves some attention. If you were a planetary psychiatrist and looked down upon this earth and saw that one creature was multiplying at a superexponential rate and was destroying the environment upon which he lived, you would pick him up by the scruff of the neck and say, "Look Jack, who the hell do you think you are and what are you doing?" He would say, "Me? I'm man, don't you know?" and you would say, "What's so great about man, what allows you this assumption of superiority and distinction from nature, this assumption of dominion and conquest." He would say, "Don't you know?" He would then lift up the top of his head and say, "Look, — brain!"

If you were a psychiatrist and you saw this creature destroying the environment upon which he depended and that he was using this great corrugating organ as the basis for his assumption of superiority and dominion, you might ask whether the brain was the apex of biological evolution or whether it was a spinal tumour. I think perhaps there is better evidence to support the spinal tumour theory than the apex of biological evolution theory. I think brain really has got to be put back into man, and man back into nature. And so I have a small story about brains.

Once upon a time, one sepulchral lily-livered warrior, one of these overkill people living in a safe bunker, calculating overkill and destruction, decided to resolve some irrelevant, transient political squabble between two great powers atomically, and did. So he pressed whatever buttons he had and there fell upon the waiting earth a wealth of warheads and all life was extinguished. All life was extinguished save in one deep leaded slit where persisted a small colony of algae. These algae, these simple, unicellular photosynthetic plants, perceived that all life had been extinguished save they, and that if life had to develop, then it must develop from the earth's slender metaphorical shoulders with at least 2½ billion years of co-operation, competition, mutation and natural selection in order to recover. They came to an immediate, spontaneous and unanimous conclusion: "Next time, no brains."

That is a very serious question I think. If brains are our best justification, then obviously they will ensure our survival. If they ensure our demise, then they are without a doubt a spinal tumour. We must conclude that brain is on trial; that man is on trial.

Having gone through this calamitous catalogue and some random experiences over a period of time, I was desperately looking for some other way. The first view of this came from an experiment that I encountered in Baltimore about 10 years ago, carried out by the biological cousin of Werner von Braun. His "cousin" was working with Glenn L. Martin in the experiments to send a man to the moon with the least possible luggage. This was a real experiment and it consisted of a plywood capsule simulating a real capsule, on the lid of which was a fluorescent tube simulating the sun. In the capsule was some algae and some bacteria in a sort of helical aquarium arrangement, and of course, some air and a man.

The experiment was as follows: the man breathed in some air, consumed oxygen, breathed out carbon dioxide, which the algae breathed in and then breathed out oxygen, which the man breathed and so it was a closed cycle of oxygen/carbon-dioxide. The man became thirsty, drank the water, urinated. The urine went into the water solution with the algae and bacteria, the algae transpired, the transpirations

were condensed, they were collected and the man drank them and so it was a closed cycle of water. The man became hungry and ate some algae. (With 6 billion people in the world, most of us will be eating algae and a swimming pool will become an important unit of agricultural production.) Anyway, the man ate some algae and defecated, and the excrement went into the water solution with the algae and the bacteria reconstituted the excrement into forms utilized by the algae which grew, which the man ate.

Now, that is not a bad little system. Here we have one input, sunlight; one export, heat; a closed system of oxygen/carbon-dioxide; a closed cycle of water; and a closed cycle of food. In simple terms that is the way the world works. As you know, modern western education is a device by which this simple intelligence is denied to most students, certainly to undergraduates. The chances are very good that most graduate students do not understand it either. It simply is not understood and it certainly has not penetrated our consciousness, our literature, our art, our folkways. Any monuments to algae? Have you seen any around? Any sculpture to algae? No. Have you seen a plaque to Azobacter, Clostridium, Rhizobium or Nostoc? None at all. Absolutely no recognition for these absolutely indispensable creatures.

Now this experiment could be used in a couple of ways, one of which is benevolent and the other of which is malevolent. Let us start with the benevolent one first.

If I had anything to do with education, I should like to engage in educating very young children. I think I am supremely ill-suited for this, but this is my fantasy, and so I am going to go through with it. In my fantasy I would cause there to be designed the most beautiful and elegant closed ecosystem ever imagined. You can think of it in terms of a very, very large conservatory, such as you see in Kew Gardens, except that this would be elegantly calculated. That is, sunlight in, heat out, and everything in the system going around and round. This conservatory would of course be an eco-system; it could be a replication of a system, all systems, but it would be incredibly beautiful. It would be selected for the beauty of the plants, the flowers and their arrangements, the bees and butterflies, birds and fish: all incredibly beautiful. The person to be educated will be a beautiful little girl. I have no girls; I have two sons. So for me, the tenderest thing to think about is a very beautiful and tender little girl. Her education consists then of being led through this conservatory where her experience consists of understanding what the system is, who the creatures are with her, who the plants are and their roles, as well as the animals and the microorganisms and the interactions within the system.

Then the most important lesson of all is introduced: that it is possible even for a very sweetie-pie little girl to intervene in this system to the benefit of the system and to herself. That is, it is possible for her to modify the humidity ever so slightly to be beneficial, or the temperature, or the acidity or the alkalinity, or the atmospheric ionization. There are a number of ways she can intervene in order to maximize this system and herself. There is a place for understanding and solicitude. The evolution of the education continues by going from larger to more complex conservatories where the human population increases too, because the understanding of man in this environment is as important as understanding the relationships of plants to animals to microorganisms. So more and more children are added to this experiment and they begin to see the interaction between themselves and the environment, and begin to understand its complexities and the elegance and the miraculous beauty of this entire system. When the education proceeds far enough the walls will be an illusion. There will be no walls. The world is indeed the capsule which you have been living in and all the relationships which you have been observing are in fact the relationships which exist in this marvelous bio-phenomenal world. You have now enough understanding to leave. You are now educated. You can now enter the world at large.

If that experiment works, we could then use a simpler one for some of our unconverted planetary diseases. For this experiment we need every ossified red-neck General Overkill in the U.S., every manic Dr. Strangelove, every putrescence in biochemical warfare, all those captains of industry who are without any possibility of compromise or transformation, to be assembled on Cape Canaveral. Each one is given a Saturn rocket and a capsule. The algae and the bacteria in each capsule are equal exactly to the bio-mass of the arch destroyer. A million cheering school children wave flags, 500 high school bands play, President Spock presses the button, and off they go arching into space the greatest fireworks show on earth.

I then follow in my mind's eye the circumstance of General Overkill, the toughest overkiller of them all. He is in space, far off distant from home, very lonely for five weeks, nothing to talk to but algae and bacteria. And so he does. He says, "Algae, Bacteria, I'm divine, you know.", and the algae holds his little old hands to the sun, and the bacteria are mute. And he says, "Look, I have dominion over you.", and the algae holds his little old hands up to the sun and the bacteria are mute. Then he says, "Look, I'm licenced to subjugate you.", and the algae holds his little old hands up to the sun and the bacteria are mute. Five more weeks pass. The General, who probably has studied probability theory at West Point, then realizes that this is a recirculating system with the bio-mass of the algae and bacteria exactly equal to that of General Overkill. He also realizes that there is a very high probability that at one certain point in time, everything that started off as algae and bacteria will be General, and everything that started off as General will be algae and bacteria. The only difference between them will be the distapce of apertures and the DNA-RNA core.

Now this insistence on the exclusiveness of divinity on the basis of the distance of apertures is really a very slender basis for such a large protestation. Moreover, not only is it spatially slightly ridiculous, it is also temporally ridiculous because you have to insist upon divinity at any one point in time. That is you say, "Now! I'm divine." A second before you are not, and a second after you are not either, because this is a totally recirculating system. So the General contemplates this theological, philosophical argument and having nothing else to do comes to some decision. He says, "Look, this is really getting ridiculous, this insistence on exclusive divinity. I'll tell you Algae, I'll tell you Bacteria, if there is divinity in this capsule, then everything is divine."

Now, I think his conclusions hold for the world which is only a slightly larger and more complex capsule. So he says, "Look. Everything is divine in this capsule. Everything is divine. If divinity exists, then it pervades all matter and all life: divinity co-equally exists." And he says "Algae and Bacteria, I've just been contemplating this whole business about dominion. Dominion really is a very unlikely attitude, isn't it. Because, after all, you can accomplish photosynthesis and I can't. But I depend upon photosynthesis. And you, Bacteria, can accomplish decomposition. Not even sanitary engineers can accomplish decomposition, only bacteria. So here I am, absolutely dependent on you. Moreover, if I exercise any dominion upon you, I'm going to inhibit you and that's a very, very bad thing to do because generals have a limited capacity to shrink. So any exercise by dominion of me on you is, in fact, self mutilation. I just want to tell you Algae, I love you. No dominion in this capsule."

Of course if you conclude this about

There is a place for understanding and solicitude

dominion, you also conclude it about subjugation because if dominion is a punch in the mouth, subjugation is a knife in the heart. You go from mutilation to suicide. So he says, "There's just not going to be any subjugation. We're going to have no algae subjugated around here; there's going to be no bacteria subjugated around here; we're all going to live happily ever after, friends. I love you algae; I love you bacteria. Anything I can do for you? Best of luck to one and all."

I have been listening to this in Houston and I hear this imminent conversion. I say, "General, there's only one thing left. We just want to hear a

prayer from you. If you'd like to mobilize a non-denominational prayer addressed to the world at large, revealing your final understanding of the way the world works, I think we can let you back."

The General ponders a little and he is no more lyrical than I am. He gets this prayer out and says to matter, "Matter, of this is the universe, the world and light made." To the sun he says, "Sun, shine that we may live." To the atmosphere he says, "Atmosphere, protect and sustain us." To the oceans he says, "Ancient home nourish us with water." To the clouds, rain, rivers and streams he says, "Replenish us from the sea we erstwhile sea creatures who only escaped by the length of a single cell." And then to the plants he says with inordinate deference, "Plants, live, breathe and grow, that we may breathe, eat and live." And then finally to the decomposers he says, "Reconstitute the wastes of life in life and the substance of life after death in order that life may endure." When he has said these things we say to him, "General, come on home. Welcome back to this lovely, green, benign, beneficent, beloved world. Come back with this new deference born of understanding. Come back and exercise your creative will upon the earth, because with this deference you have learned, we can feel confident that your interventions upon the earth will become the maintenance of our survival and the promise of fulfillment.

This is, of course, a ridiculous caricature, and yet there is the beginning of a profound lesson there. But yet, it is ridiculous. We have got to have a better model than that. I think the natural scientists and ecologists have already made a gorgeous model. The tragedy is that it is so little understood and so little discussed. In fact, it does not exist in a single adequate form in any literature. And so I have put together McHarg's poor man's cheap fast

John Foster

Creativity is not something only for artists

paraphrase of the ecological model.

The first thing which was electrifying for me to discover was that there was something called creativity; that physicists knew about it; that it could be thermodynamically defined as the employment of energy and matter to raise energy and matter to higher levels of order; and that it had an antithesis called reduction in which matter moved from a higher to a lower level of order. This allowed one then to say that the evolution of matter and the evolution of life correspond to the evolution of the ecosystems. Furthermore, that creativity corresponds to this definition in every case whether we are talking about matter moving up the periodic table, or of creatures moving up the phylogenetic scale, or of the evolution of more complex ecosystems, including man. In every case energy and matter was used. In every case matter and energy did develop into higher levels of order. There were regressive processes, great calamitous events, but nonetheless, the sum of all movements from the pre-primeval earth to the present showed a profound change in the increase in the level of order.

If this is true, we can then say that physical and biological evolution have been creative according to this thermodynamic definition. That is marvellous because we can then use evolution as a synonym for creativity and say that evolution has moved, that it has attributes, and that it has directionality. That is, that it has tended to go from greater to lesser randomness, from simplicity to complexity, from uniformity to diversity, from instability towards dynamic equilibrium, from a low to a high number of parts or species, from a low to a high number of co-operative mechanisms. All this can be subsumed into the tendency towards entropy (degradation) on the one hand; or, the tendency towards negentropy on the other. Now if that is true, and it seems to hold, then this is an absolutely beautiful model. If we see any process at any level which is going from stability to instability, it is retrogressing; anything going from greater to lesser randomness, it is evolving. Evolution is then creative and retrogression is then reductive. I think that is a very, very useful model.

There are three essential components to creativity in life processes. One of them is that there has got to be some sort of mechanism, some sort of process which can temporarily entrap sunlight on its path to entropy. This is the miracle of the chloroplast. Here is a little chloroplast on a leaf that just holds his hands up to the sun and says, "Sun, can I have some sunlight? Can I have some of your energy?" And the sun says, "Certainly, you can have it, but you know the second law of thermodynamics; you've got to give it back." So the chloroplast says, "Certainly, I know the second law of thermodynamics. I'm not going to keep it very long." So in the presence of carbon dioxide and water, the chloroplast is able to transmute light into substance. This is the *sine qua non* of all biological systems. This is a fundamental creative act. Every person who sees a chloroplast of a plant should say "Thank you", right away. It is a first, final, absolute and indispensable miracle.

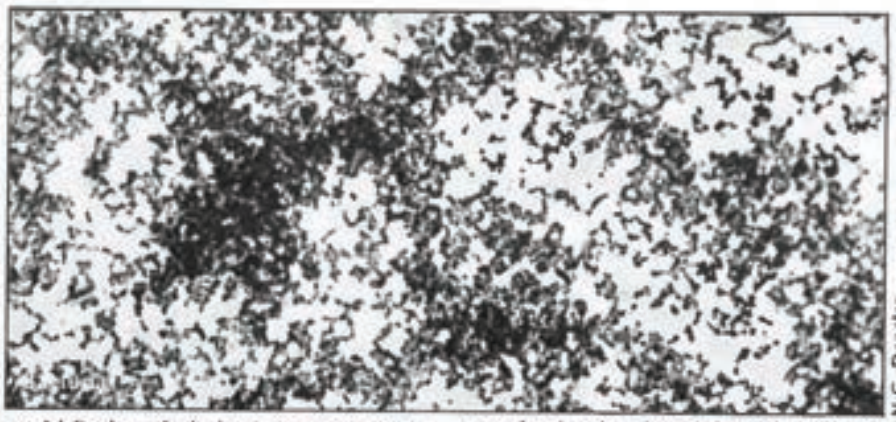
However this miracle is impossible without another attribute, called apperception: the ability to transmute energy into information into meaning.

The third part is absolutely the most intriguing part of all. This is symbiosis: the necessity of co-operation which has within it the necessity of specialization. For me, the best example of all this came from Hans Selye who spoke about symbiosis and altruism. He said that there is something called intracellular altruism and the example he used is simply you and me. For my purposes we shall assume the beginning in a fertilized egg, which begins to be you or me. The first cells are fairly generalized cells. They are sort of indistinguishable from our ancient marine ancestors, and they replicate for a while. Then suddenly somebody says, "Look, this is not going to work friends, we've got to stop doing this because we're not going to get a fetus out of generalized cells. We need a little specialization. Now, hands up for heart, kidneys, brain." Happily, this is all done without the intervention of brain which has not yet been created. You can just imagine the calamity a brain would advance: think about a nose sticking down a tube and organizing the glucose level, or production of neutrophiles. Just no way. Thank God the brain is not involved in these sorts of processes. But there is a miraculous thing going on because suddenly there is specialization, and a very well organized specialization it is. Moreover, there is a profoundly important theological thing happening in this specialization because the original generalized cells are antecedents which to all intents and purposes are immortal. They share some stuff along the edge and they added some stuff at the front, but effectively, they are immortal. But every step up the scale of increasing specialization is a concession of some part of this immortality, and also a concession of some part of autonomy. The old algae can accomplish reduction. It can accomplish photosynthesis. It says, "Thank you. I'm in great shape. I'm immortal. I can do everything."

But every step up the scale: algae, fungi, liverworts, mosses, one concedes immortality and one concedes autonomy. It is a very important thing. There is a concession here of autonomy, and the assumption of dependence upon others, which is a part of the specialization. This is a characteristic of the evolution of all subcellular systems, cells, organs, organisms, and ecosystems. Now you can call it symbiosis if you like, but this is really altruism. This is really, "I'll do this for you if you do that for me, but I do not insist that what you do for me is as much as I will do for you." There is no equality in this. That is, we are engaged in a co-operative enterprise which is thought to have some evolutionary advantage to offer all of us, and so each of us will do our part, however noble and humble. I can get along without some hair, but I cannot get along without a heart. So all of the roles are not co-equally important but all of them are thought to be co-equally valuable in the enterprise of producing whatever of cells, tissues, organs, organisms. Now that is altruism. That is the Golden Rule. That is 2½ billion years old. That is imbedded in subcellular processes. I think that is as moving as anything can be. Profoundly moving, and we do not have to be sentimental about it. The great thing about it is that it is indispensable to survival.

All right, that is a pretty nice model. We see that there is something called creativity and that there is something called reduction. Creativity has attributes, and evolution can be subsumed for creativity. We can see directionality in those attributes and they all can be subsumed in terms of entropy and negentropy. We can then go further and see that the indispensable components of these interdependent parts are: the necessity of something to trap energy on its path to entropy; the fundamental necessity of apperception for creativity in all biological systems; and finally, the absolute need for co-operative mechanisms.

How nice it would be if we could fit the whole lot into some simpler kind of criterion. Well, I think there is such a criterion which I have taken from two people, both of whom I shall paraphrase. One is Lawrence Henderson who wrote a magnificent book called *The Fitness of the Environment*, and the other is Charles Darwin.



N.G. Dengler

Henderson, I think, finally is probably the most important, in this connection anyway. Henderson says that the actual world constitutes the fittest possible abode for every form of life that has existed, and that will exist. He based this argument on the actual abundance and attributes of oxygen, carbon and hydrogen to which George Wald would add nitrogen. Darwin adds that the surviving organism is the fittest for the environment. I think you can put the two of them together because they are absolutely complementary, and say: In order to survive, any system, whatever scale, must find of all the environments, the most fit and/or adapt that environment and/or adapt itself in order to accomplish a fitting. This is a precondition for survival.

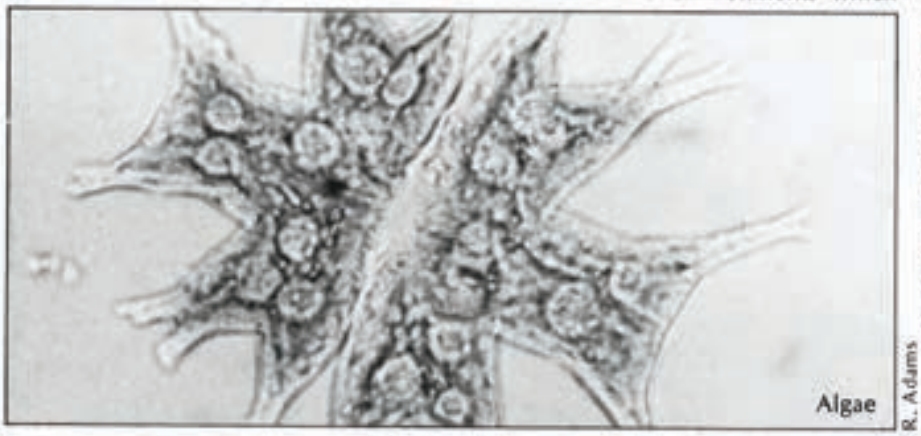
There is then something called a "fitting" and there is also something called a "misfitting". A misfitting is a situation where some system is unable to find of all environments the most fit and/or is unable to adapt that environment and/or is unable to adapt itself. It becomes a misfit and according to Darwin it will not survive.

This is a thermodynamic test. That is, if there are two environments which are absolutely identical, and two species which are by definition different, both living in the same environment, with the same amount of energy within the system, habitat, opportunity and so on, then one of these species will triumph over the other. One will be better able to find of all the environments, the one which is most fit, and also be able to adapt that environment to himself. It will survive and the other will succumb. If this is so, then the survivor is the least-work/maximum-success solution; i.e., it is thermodynamically more fit. That is to say, fitting is a creative process in thermodynamic terms. It is the least-work/maximum-success solution. Which is to say that there is something called creative fitting and something else called reductive misfitting. That is pretty powerful medicine. This is a very, very nice synoptic view.

The next question will be, is there something even larger which is even more simply observable and which could be used as a criterion for the evidence of creative fitting or reductive misfitting. And, of course there is.

If you looked back a couple billion years and said to the organisms which were living there, "Algae, how are you doing? Have you been able to find of all the environments the most fit and have you been able to adapt that environment or yourself?" The algae would say, "Friend, stand back. Look. We've been around here since the very beginning. Man, there is just no place that we are not. We are in every environment that you can imagine. We can do it all ourselves. You have to say that we are an evolutionary success, which is to say that we have been able to find environments which are the most fit, and/or we've been able to adapt these environments to make them more fit, and/or we've been able to adapt ourselves. You name it. We've done it. We are an evolutionary success. And the back of my hand to you, Jack."

You then look back about a million years and find man. He has been living around there for about a million



Algae

R. Adams

Creative fitting or reductive misfitting

years and you say, "Look. Have you been able by any chance to find of all environments the most fit and/or adapt yourself to the environment?" And he says "Yeah. It's been tough, you know. There was that embarrassing time when observers thought we were just baboons, but we were really Australopithecenes and had tools and fire. It was even worse when we were just amorous tree shrews. Altogether, it was very humiliating, but the fact of the matter is that we made it. Indeed, we're so bloody successful, we're proliferating all over the world. You have to admit we are pretty successful."

You then ask exactly the same question, but move the time down to now. That is, at this moment ask exactly the same question of those present as cells, tissues, organs, organisms, member of parts of an eco-system, members of a social system, and say "Have you, whatever you are, been able of all environments to find the most fit and/or been able to adapt that environment and/or adapt yourself?" The best way to pose that question would be to say "Are you healthy? Are your cells healthy; are your tissues healthy; are your organs healthy; are you healthy? Is the eco-system you are in healthy? Is the social institution which you represent healthy?" And if the answer is yes, then that is a great answer. I should add that the best definition of health is "the ability to recover from insult" and second, "the ability in a healthy man or woman to not only solve problems, but to seek them."

If you can answer any of these questions for your cells, tissues, organs, organisms, ecosystem, and/or the institutions which you represent, if you can say you are healthy, then you have presented incontrovertible evidence that you and all the parts you belong to are in fact accomplishing creative fitting and that you are in good shape. If, however, you find any pathology, then you find evidence of reductive misfitting. The fate, according to Darwin, of a reductive misfit is morbidity, and presumably extinction, whether it be subcells, cells, tissues, organs, organisms, ecosystems, social institutions.

So, the necessity of creativity permeates all matter and all life, and is not something only for artists. The measure of the accomplishment of creativity is this special vitality, this ability to recover from insult, this ability to solve problems and to seek them, which is called health, which is an absolutely gorgeous, beautiful, model.

We can start the other way around as well. Wherever you find anybody healthy, anybody vital, anybody able to recover from insult, you say, "Friend, will you tell me what you're doing, because you're doing it right. I don't care what your doctors say, what your architecture looks like, what your city planning looks like, or what your art looks like. You are doing it right. You have found the adaptive strategy. You have found the best of all possible environments and/or you've adapted them and/or you've adapted yourself. If we just knew how you were doing it, then we could tell other people, because this is a great system, that is a great model."

Our idea engaged in ecological planning is just that. It is a business of bringing together these views which might help any institution that wants to find of all environments the most fit, and/or how to adapt that environment and/or how to adapt themselves in order to accomplish a creative fitting. In these terms, it is a very, very simple exercise, and it seems to me a very, very wholesome one and a very, very, appropriate one. Let us use the best of all possible knowledge in order to find the best of all possible environments and to adapt them and to adapt ourselves to accomplish this creative fitting. That is the little lesson that the girl in the conservatory was learning: that there is a place for a deferential man or woman to intervene in this system, to maximize its fulfillment and ours. And that is a perfectly beautiful lesson.

This should bring me to my conclusion, which should start cyclicly from where it began with the planet earth and Eiseley's space traveller looking upon the earth and seeing the green life, this biosphere our home, and then observing the blemishes on it, and concluding that these are planetary diseases. I think that it is a beautiful image, and it is true. The remedy of course, involves this spinal tumour our brain, and this planetary disease which is some men. The remedy is somehow they and we must find of all environments, the most fit. According to Henderson, the world and all of the natural environment is in fact the most fit for natural orders that have, do, and will exist. The natural environment is available to each of us to find of all environments the most fit, to recognize the varied abilities of the creatures that will utilize part of it, and to realize the necessity of adapting that environment since it changes with our presence in it, and of adapting ourselves to accomplish this creative fitting. It seems to be a perfectly beautiful model. It should be doing work in law, art, government, and commerce. It certainly should permeate education. It is a most wonderful and glorious view and I recommend it to you. ■

Donald Gunn