

*STEPS TO AN
ECOLOGY OF MIND*

COLLECTED ESSAYS IN ANTHROPOLOGY,
PSYCHIATRY, EVOLUTION, AND
EPISTEMOLOGY

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Balinese Painting (Ida Bagus Djati Sura; Batuan, 1937)
[Analysis, p. 147]

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Ecology and Flexibility in Urban Civilization*

First, it will be convenient to have, not a specific or ultimate goal, but an abstract idea of what we might mean by ecological health. Such a general notion will both guide the collection of data and guide the evaluation of observed trends.

I suggest then that a healthy ecology of human civilization would be defined somewhat as follows:

A single system of *environment combined with high human civilization* in which the flexibility of the civilization shall match that of the environment to create an ongoing complex system, open-ended for slow change of even basic (hard-programmed) characteristics.

We now proceed to consider some of the terms in this definition of systemic health and to relate them to conditions in the existing world.

"A High Civilization"

It appears that the man-environment system has certainly been progressively unstable since the introduction of metals, the wheel, and script. The deforestation of Europe and the man-made deserts of the Middle East and North Africa are evidence for this statement.

Civilizations have risen and fallen. A new technology for the exploitation of nature or a new technique for the exploitation of other men permits the rise of a civilization. But each civilization, as

* In October, 1970, the author convened and chaired a small five-day conference on "Restructuring the Ecology of a Great City," sponsored by the Wenner-Gren Foundation. A purpose of the conference was to join with planners in the office of John Lindsay, mayor of New York City, in examining relevant components of ecological theory. This essay was written for this conference and subsequently edited. Section VI on the Transmission of Theory has been added and represents afterthoughts following the conference.

it reaches the limits of what can be exploited in that particular way, must eventually fall. The new invention gives elbow room or flexibility, but the using up of that flexibility is death.

Either man is too clever, in which case we are doomed, or he was not clever enough to limit his greed to courses which would not destroy the ongoing total system. I prefer the second hypothesis.

It becomes then necessary to work toward a definition of "high."

(a) It would not be wise (even if possible) to return to the innocence of the Australian aborigines, the Eskimo, and the Bushmen. Such a return would involve loss of the wisdom which prompted the return and would only start the whole process over.

(b) A "high" civilization should therefore be presumed to have, on the technological side, whatever gadgets are necessary to promote, maintain (and even increase) wisdom of this general sort. This may well include computers and complex communication devices.

(c) A "high" civilization shall contain whatever is necessary (in educational and religious institutions) to maintain the necessary wisdom in the human population and to give physical, aesthetic, and creative satisfaction to people. There shall be a matching between the flexibility of people and that of the civilization. There shall be diversity in the civilization, not only to accommodate the genetic and experiential diversity of persons, but also to provide the flexibility and "preadaptation" necessary for unpredictable change.

(d) A "high" civilization shall be limited in its transactions with environment. It shall consume unreplaceable natural re-sources *only* as a means to facilitate necessary change (as a chrysalis in metamorphosis must live on its fat). For the rest, the metabolism of the civilization must depend upon the energy income which Spaceship Earth derives from the sun. In this connection, great technical advance is necessary. With present technology, it is probable that the world could only maintain a small fraction of its present human population, using as energy sources only photosynthesis, wind, tide, and water power.

Flexibility

To achieve, in a few generations, anything like the healthy system dreamed of above or even to get out of the grooves of fatal destiny in which our civilization is now caught, very great *flexibility* will be needed. It is right, therefore, to ex-amine this concept with some care. Indeed, this is a crucial concept. We should evaluate not so much the values and trends of relevant variables as the relation between these trends and ecological flexibility.

Following Ross Ashby, I assume that any biological system (e.g., the ecological environment, the human civilization, and the system which is to be the combination of these two) is describable *in* terms of interlinked variables ' such that for any given variable there is an upper and a lower threshold of tolerance beyond which discomfort, pathology, and ultimately death must occur. Within these limits, the variable can move (and is moved) in order to achieve *adaptation*. When, under stress, a variable must take -a value close to its upper or lower limit of tolerance, we shall say, borrowing a phrase from the youth culture, that the system is "up tight" *in* respect to this variable, or lacks "flexibility" in this respect.

But, because the variables are interlinked, *to* be up tight in respect to one variable commonly means that other variables cannot be changed without pushing the up-tight variable. The loss of flexibility thus spreads through the system. In extreme cases, the system will only accept those changes which *change the tolerance limits* for the up-tight variable. For example, an overpopulated society looks for those changes (increased food, new roads, more houses, etc.) which will make the pathological and pathogenic conditions of overpopulation more comfortable. But these *ad hoc* changes are precisely those which in longer time can lead to more fundamental ecological pathology.

The pathologies of our time may broadly be said to be the accumulated results of this process—the eating up of flexibility in response to stresses of one sort or another (especially the stress of population pressure) and the refusal to bear with those by-products

of stress (e.g., epidemics and famine) which are the age-old correctives for population excess.

The ecological analyst faces a dilemma: on the one hand, if any of his recommendations are to be followed, he must first recommend whatever will give the system a positive budget of flexibility; and on the other hand, the people and institutions with which he must deal have a natural propensity to eat up all available flexibility. He must create flexibility and prevent the civilization from immediately expanding into it.

It follows that while the ecologist's goal is to increase flexibility, and to this extent he is less tyrannical than most welfare planners (who tend to increase legislative control), he must also exert authority to preserve such flexibility as exists or can be created. At this point (as in the matter of unreplaceable natural resources), his recommendations must be tyrannical.

Social flexibility is a resource as precious as oil or titanium and must be budgeted in appropriate ways, to be spent (like fat) upon needed change. Broadly, since the "eating up" of flexibility is due to regenerative (i.e., escalating) sub-systems within the civilization, it is, in the end, these that must be controlled.

It is worth noting here that flexibility is to specialization as entropy is to negentropy. Flexibility may be defined as *un-committed potentiality for change*.

A telephone exchange exhibits maximum negentropy, maximum specialization, maximum information load, and maximum rigidity when so many of its circuits are in **use** that one more- call would probably jam the system. It exhibits maximum entropy and maximum flexibility when none of its pathways are committed. (In this particular example, the state of nonuse is not a committed state.)

It will be noted that the budget of flexibility is fractionating (not subtractive, as is a budget of money or energy) .

The Distribution of Flexibility

Again following Ashby, the *distribution* of flexibility among the many variables of a system is a matter of very great importance.

The healthy system, dreamed of above, may be compared to an acrobat on a high wire. To maintain the ongoing truth of his basic premise ("I am on the wire"), he must be free to move from one position of instability to another, i.e., certain variables such as the position of his arms and the rate of movement of his arms must have great flexibility, which he uses to maintain the stability of other more fundamental and general characteristics. If his arms are fixed or paralyzed (isolated from communication), he must fall.

In this connection, it is interesting to consider the ecology of our legal system. For obvious reasons, it is difficult to control by law those basic ethical and abstract principles upon which the social system depends. Indeed, historically, the United States was founded upon the premise of freedom of religion and freedom of thought--the separation of Church and State being the classic example.

On the other hand; it is rather easy to write laws which shall fix the *more episodic* and superficial details of human behavior. In other-words, as laws proliferate, our acrobat *is* progressively limited in his arm movement but is given free permission to fall *off* the wire.

Not^e, *in* passing, that the analogy of the acrobat can be applied at a higher level. During the period when the acrobat *is learning* to move his arms in *an* appropriate way, it is necessary to have a safety net under him, i.e., precisely to give him the freedom to fall off the wire. Freedom and flexibility in regard-to the most basic variables may be necessary during -the process of learning and creating a new system by social change:

These are parades of order and disorder- which the ecological analyst and planner must weigh.

Be-all that *as it may*, it is at least arguable that the trend of social change in the last one hundred years, especially in the USA, has been towards an inappropriate distribution of flexibility among the variables of the civilization. Those variables which should be flexible have been pegged, while those which should be comparatively steady, changing only slowly, have been cast loose.

But, even so, the law is surely not the appropriate method for stabilizing the fundamental variables. This should be done by the processes of education and character formation —those parts of our

social system which are currently *and expectably* undergoing maximum perturbation.

The Flexibility of Ideas

A civilization runs on ideas of all degrees of generality. These ideas are present (some explicit, some implicit) in the actions and interactions of persons—some conscious and clearly defined, others vague, and many unconscious. - Some of these ideas are widely shared, others differentiated in various subsystems of the society.

If a budget of flexibility is to be a central component of our understanding of how the environment-civilization works, and if a category of pathology is related to unwise spending of this budget, then surely the flexibility of ideas will play an important role in our theory and practice.

A few examples of basic cultural ideas will make the matter clear:

"The Golden Rule," "An eye for an eye," and "Justice."

"The -common-sense of scarcity economics" versus "The common sense : of affluence."

"The name of that thing is 'chair' " and many of the reifying premises of language.

"The survival of the fittest" versus "The survival of organism-plus-environment."

Premises of mass production, challenge, pride, etc.

The premises of transference, ideas about how character is determined, theories of education, etc.

Patterns of personal relatedness, dominance, love, etc.

The ideas in a civilization are (like all other variables) interlinked, partly by some sort of psycho-logic and partly by consensus about the quasi-concrete effects of action.

It is characteristic of this complex network of determination of ideas (and actions) that particular links in the net are often weak but that any given idea or action is subject to multiple determination by

many interwoven strands. We turn off the light when we go to bed, influenced partly by the economics of scarcity, partly by premises of transference, partly by ideas of privacy, partly to reduce sensory input, etc.

This multiple determination is characteristic of all biological fields. Characteristically, every feature of the anatomy of an animal or plant and every detail of behavior is determined by a multitude of interacting factors at both the genetic and physiological levels; and, correspondingly, the processes of any ongoing ecosystem are the outcome of multiple determination.

Moreover, it is rather unusual to find that any feature of a biological system is at all directly determined by the need which it fulfills. Eating is governed by appetite, habit, and social convention rather than by hunger, and respiration is governed by CO₂, excess rather than by oxygen lack. And so on.

In contrast, the products of human planners and engineers are constructed to meet specified needs in a much more direct manner, and are correspondingly less viable. The multiple causes of eating are likely to ensure the performance of this necessary act under a large variety of circumstances and stresses whereas, if eating were controlled only by hypoglycaemia, any disturbance of the single pathway of control would result in death. Essential biological functions are not controlled by lethal variables, and planners will do well to note this fact.

Against this complex background, it is not easy to construct a theory of flexibility of ideas and to conceive of a *budget of flexibility*. There are, however, two clues to the major theoretical problem. Both of these are derived from the stochastic process of evolution or learning whereby such interlocked systems of ideas come into being. First we consider the "natural selection" which governs which ideas shall survive longest; and second we shall consider how this process sometimes works to create evolutionary *culs-de-sac*.

(More broadly, I regard the grooves of destiny into which our civilization has entered as a special case of evolutionary *cul-de-sac*. Courses which offered short-term advantage have been adopted, have become rigidly programmed, and have begun to prove disastrous over longer time. This is the paradigm for

extinction by way of loss of flexibility. And this paradigm is more surely lethal when the courses of action are chosen in order to maximize single variables.)

In a simple learning experiment (or any other experience), an organism, especially a human being, acquires a vast variety of information. He learns something about the smell of the lab; he learns something about the patterns of the experimenter's behavior; he learns something about his own capacity to learn and how it feels to be "right" or "wrong"; he learns that there is "right" and "wrong" in the world. And so on.

If he now is subjected to another learning experiment (or experience), he will acquire some new items of information: some of the items of the first experiment will be repeated or affirmed; some will be contradicted.

In a word, some of the ideas acquired in the first experience will *survive* the second experience, and natural selection will tautologically insist that those ideas which survive will survive longer than those which do not survive.

But in mental evolution, there is also an economy of flexibility. Ideas which survive repeated use are actually handled in a special way which is different from the way in which the mind handles new ideas. The phenomenon of *habit formation* sorts out the ideas' which survive repeated use and puts them in a more or less separate category. These trusted ideas then become available for immediate use with-out thoughtful inspection, while the more flexible parts of the mind can be saved for use on newer matters.

In other words, the *frequency* of use of a given idea becomes a determinant of its survival in that ecology of ideas which we call Mind; and beyond that the survival of a frequently used idea is further promoted by the fact that habit formation tends to remove the idea from the field of critical inspection.

But the survival of an idea is also certainly determined by its relations with other ideas. Ideas may support or contradict each other; they may combine more or less readily. They may influence each other in complex unknown ways in polarized systems.

It is commonly the more generalized and abstract ideas that survive repeated use. The more generalized ideas thus tend to

become *premises* upon which other ideas depend. These premises become relatively inflexible.

In other words, in the ecology of ideas there is an evolutionary process, related to the economics of flexibility, and this process determines which ideas shall become hard programmed.

The same process determines that these hard-programmed ideas become nuclear or nodal within constellations of other ideas, because the survival of these other ideas depends on how they fit with the hard-programmed ideas.¹ It follows that any change in the hard-programmed ideas may involve change in the whole related constellation.

But frequency of validation of an idea within a given segment of time is not the same as *proof* that the idea is either true or pragmatically useful over long time. We are discovering today that several of the premises which are deeply ingrained in our way of life are simply untrue and become pathogenic when implemented with modern technology.

Exercise of Flexibility

It is asserted above that the overall flexibility of a system depends upon keeping many of its variables in the middle of their tolerable limits. But there is a partial converse of this generalization:

“Analogous relations certainly obtain in the ecology of a redwood forest or a coral reef. The most frequent or "dominant" species are likely to be nodal to constellations of other species, because the survival of a newcomer to the system will commonly be determined by how its way of life fits with that of one or more dominant species.

In these contexts—both ecological and mental—the word "fit" is a low-level analogue of "matching flexibility."

Owing to the fact that inevitably many of the subsystems of the society are regenerative, the system as a whole tends to "expand" into any area of unused freedom.

It used to be said that "Nature abhors a vacuum," and indeed something of the sort seems to be true of unused potentiality for change in any biological system.

In other words, if a given variable remains too long at some middle value, other variables will encroach upon its freedom, narrowing the tolerance limits until its freedom to move is zero or, more precisely, until any future movement can only be achieved at the price of disturbing the encroaching variables.

In other words, the variable which does not change its value becomes *ipso facto* hard programmed. Indeed, this way of stating the genesis of hard-programmed variables is only another way of describing *habit formation*.

As a Japanese Zen master once told me, "*To become accustomed to anything is a terrible thing.*"

From all of this it follows that to maintain the flexibility of a given variable, either that flexibility must be *exercised*, or the encroaching variables must be directly controlled.

We live in a civilization which seems to prefer prohibition to positive requirement, and therefore we try to legislate (e.g., with antitrust laws) against the encroaching variables; and we try to defend "civil liberties" by legally slapping the wrists of encroaching authority.

We try to prohibit certain encroachments, but it might be more effective to encourage people to know their freedoms and flexibilities and to use them more often.

In our civilization, the exercise of even the physiological body, whose proper function is to maintain the flexibility of many of its variables by pushing them to extreme values, becomes a "spectator sport," and the same is true of the flexibility of social norms. We go to the movies or the courts—or read newspapers—for vicarious experience of exceptional behavior.

The Transmission of Theory

A first question in all application of theory to human problems concerns the education of those who are to carry out the plans. This paper is primarily a presentation of theory to planners; it is an attempt at least to make some theoretical ideas available to them. But in the restructuring of a great city over a period of ten to thirty years, the plans and their execution must pass through the heads and hands of hundreds of persons and dozens of committees.

Is it important that the right things be done for the right reasons? Is it necessary that those who revise and carry out plans should understand the ecological insights which guided the 'planners? Or should the original planners put into the very fabric of their plan collateral incentives which will se-duce those who come later into carrying out the plan for reasons quite different from those which inspired the plan?

This is an ancient problem in ethics and one which (for example) besets every psychiatrist. Should he be satisfied if his patient makes a readjustment to conventional life for neurotic or inappropriate reasons?

The question is not only ethical in the conventional sense, it is also an ecological question. The means by which one man influences another are a part of the ecology of ideas in their relationship, and part of the larger ecological system within which that relationship exists.

The hardest saying in the Bible is that of St. Paul, ad-dressing the Galatians: "*God is not mocked,*" and this saying applies to the relationship between man and his ecology. It is of no use to plead that a particular sin of pollution or exploitation was only a little one or that it was unintentional or that it was committed with the best intentions. Or that "If I didn't, somebody else would have." The processes of ecology are not mocked.

On the other hand, surely the mountain lion when he kills the deer is not acting to protect the grass from overgrazing.

In fact, the problem of how to transmit our ecological reasoning to those whom we wish to influence in what seems to us to be an

ecologically "good" direction is itself an ecological problem. We are not outside the ecology for which we plan—we are always and inevitably a part of it.

Herein lies the charm and the terror of ecology—that the ideas of this science are irreversibly becoming a part of our own ecosocial system.

We live then in a world different from that of the mountain lion—he is neither bothered nor blessed by having ideas about ecology. We are.

I believe that these ideas are not evil and that our greatest (ecological) need is the propagation of these ideas as they develop—and as they are developed by the (ecological) process of their propagation.

If this estimate is correct, then the ecological ideas implicit in our plans are more important than the plans themselves, and it would be foolish to sacrifice these ideas on the altar of pragmatism. It will not in the long run pay to "sell" the plans by superficial *ad hominem* arguments which will conceal or contradict the deeper insight.