4

PARAMOUNT POSITIONS IN ECOLOGICAL ECONOMICS

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ABSTRACT

In data-rich ecology and economics, purely empirical research is inefficient, and even misleading. E. T. Whittaker has shown the necessity of such "impotence principles" as the Second Law of Thermodynamics These cannot be proved true; they place the burden of proof on those who deny them. They range from the Second Law of Thermodynamics to Parkinson's Law. Acceptance of them is the "default position" of a progressive science.

"No free lunch" belongs to a family of conservation laws that traces back to Epicurus, 3rd century B.C. The theoretical development that came to physics in the 19th century had to wait until the 20th in economics. The delay was caused by two factors: the apparent magic of technology, and the illusion that usury creates wealth. It remained for Soddy (who was championed by Daly) to show that only debt can increase exponentially.

Conventional measures of income and wealth are built on the myths of GNP and GDP. Many people are now working to replace these myths with material truths. Until this replacement is made, all economic policy is built on sand—hence the conflict between environmentalism and economics. This paper offers a concise roster of the default positions that should guide a truly ecological economics.

INTRODUCTION

We are told that the disciplines of ecology and economics are about to be married. We are not surprised. The two should be compatible: it has often been noted that they share a common etymology, a derivation from the Greek word for "house" or "household." Moreover, the disciplines have for some time been in a relationship of the sort defined by

the U.S. Bureau of the Census as POSSLQs—"Persons of the Opposite Sex Sharing Living Quarters." It's about time that the union be regularized. As we celebrate this new relationship it would be well to take stock of the dangers that lie in wait for the new couple. Chief among these dangers is language, which can divide as easily as it can unite.

"The official function of language is to facilitate thought and communication. One of its unofficial functions, just as real, is to *prevent* thought and communication" (Hardin 1972, p. 66). When language is used to discourage thinking, this fact is never, of course, announced by the speaker or writer (who may be honestly unaware of what he is doing). Repression rules. One sign of repression, long recognized as such by psychiatrists, is *logorrhea*—verbal diarrhea, the pathological multiplication of words. Since science is both literate and numerate, psychological defenses in the exposition of science can also take a form that we may call *arithmorrhea*—the multiplication of numbers and statistics beyond useful bounds. Both pathologies result in an information overload, where the word "information" is understood in the limited sense in which it is used in "information theory." Proliferation of narrowly defined information can easily interfere with the acquisition of real information. Simply put, information can be the enemy of wisdom.

An example should make the point clear. Less than a decade ago, the World Fertility Survey was completed. In scores of nations, women were polled to learn how many children they wanted, how many they expected to have, etc. The project cost more than 50 million dollars. One of the few people to publicly question whether the money was well spent was the editor of *Population and Development Review*, Paul Demeny, who (in the following slightly abbreviated extract) asked: "What differential policy implications follow from the finding that in Nigeria among women with 6 living children 8.2% did not want additional children, whereas in Kenya the corresponding percentage was 25.5 and in Morocco 68.8? Arguably none" (Demeny 1988, p. 470). In the "hard sciences" of physics and chemistry, even a slight change in a constant may produce great changes in practical conclusions, because physical constants are part of a tightly-knit theoretical fabric. Demeny's statement makes it clear that this is not the case in demography. In passing, we should note that the common habit of expressing demographic statistics to the first decimal (e.g., 8.2% instead of plain 8%) falsely implies a significance such statistics seldom have.

The uncertainty afflicting attitude statistics extends far beyond the well-understood uncertainties caused by sampling error. Demeny pointed out that an appropriate change in the way the polling question was asked, or a different set of instructions to the survey takers, could have produced a figure that was drastically different from the recorded figure of 8.2%—say, 30% or 55%. This devastating criticism applies to the entire World Fertility Survey. The general public is justified in concluding that the 50 million dollars was wasted.

Why, then, was the survey carried out? Perhaps because demographers were envious of "Big Science," in which physicists secure grants of hundreds of millions of dollars (Weinberg 1967). Perhaps they saw the WFS as a way to train graduate students in research (even research into the useless?). Perhaps they sought to diminish unemployment in the profession. Or perhaps they were afraid to ask, "What *is* the population problem?"

They may be running for cover because of the publication of a book with the title *The War Against Population* (Kasun 1988).

Most social scientists stand in awe of the physical sciences, in which (it is assumed) no statement is accepted without the most rigorous proof. Weighing in against this assumption are the statements of several of the most successful practitioners of physics and chemistry, which clearly show that some universally held scientific commitments would not stand up to the battering of a competent adversary in a court of law. Not only that, but the attitudes of respectable scientists include a generous measure of intolerance toward those who question the foundations of science. Since the physical sciences have prospered from this attitude, we need to know its justification. It is just possible that ecological economics can also benefit from adopting the same attitude.

THE MANAGEMENT OF PRODUCTIVE INTOLERANCE

By the middle of the 19th century, physicists were sure that perpetual motion machines were impossible. The argument was enshrined in the second law of thermodynamics, which said that in any closed system, entropy (disorder) always tends to increase. Professional confidence in this generalization did not discourage amateurs from proposing an endless stream of purported perpetual motion machines. Responding to such claims physicists had to choose between wasting their time and being rude. After a few experiences, most scientists chose to be rude. Legislators, less confident of the power of reason and experiment, sometimes wasted their time listening to enthusiasts.

In 1917, an Armenian named Garabed Giragossian, at the time of America's entry into the First World War, petitioned Congress to examine his perpetual motion machine. The House voted 234 to 14 to appoint a committee of experts in physics to evaluate the claims. They soon uncovered a childish error in the so-called Garabed machine, and the matter was dropped. The following year the U.S. Patent Office announced that henceforth it would refuse to consider proposals for perpetual motion machines (Alder 1986).

No doubt many laymen thought the bureau's announcement bespoke an unscientific orientation. Surely scientists are not prejudiced? Should not the minds of real scientists be open to all new suggestions? The distinguished physicist Arthur Eddington presented the case for limiting tolerance:

> The law that entropy always increases—the second law of thermodynamics—holds, I think, the supreme position among the laws of Nature. If someone points out to you that your pet theory of the universe is in disagreement with Maxwell's equations—then so much the worse for Maxwell's equations. If it is found to be contradicted by observation—well, these experimentalists do bungle things sometimes. But if your theory is found to be against the second law of thermodynamics I can give you no hope; there is nothing for it but to collapse in deepest humiliation. (Eddington 1928, pp. 74-75)

The physicist went on to say that this exaltation of the second law is not unreasonable. In 1877, Ludwig Boltzmann had shown how the second law could be derived from

the laws of probability; thus was its provenance moved from the world of empiricism (where doubt is always reasonable) to the mathematical world, where doubt is unreasonable. Said Eddington: "The chance against a breach of the second law . . . can be stated in figures which are overwhelming."

In 1942, the mathematical physicist E. T. Whittaker returned to this problem, making the entropy law a member of a special class of statements. He identified the following as supremely true statements:

> "It is impossible to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects"; or the postulate of Relativity, "It is impossible to detect a uniform translatory motion, which is possessed by a system as a whole, by observations of phenomena taking place wholly within the system"; . . . or the postulate of Imperfect Definition in quantum mechanics, "It is impossible to measure precisely the momentum of a particle at the same time as a precise measurement of its position is made." Each of these statements, which I propose to call *Postulates of Impotence*, asserts the impossibility of achieving something, even though there may be an infinite number of ways of trying to achieve it. A postulate of impotence is not the direct result of an experiment, or of any finite number of experiments; it does not mention any measurement, or any numerical relation or analytical equation; it is the assertion of a conviction of the mind, that all attempts to do a certain thing, however made, are bound to fail. (Whittaker 1942, p. 168)

A popular view of science surely holds that the attitude embodied in the views of Eddington and Whittaker is what one would expect of metaphysicians rather than scientists; but careful observation shows that the behavior of the most productive scientists is consistent with the Eddington-Whittaker model (Holton 1986, p. 8). Some scientific principles are so basic that scientists refuse to waste time giving a "fair" hearing to contradictory proposals. The most basic principles are held, as Whittaker said, as *"a conviction of the mind"* rather than a mere distillate of a wealth of experiments. In the statements of Eddington and Whittaker, we hear an echo of what Martin Luther said on April 18, 1521, on the eve of the Diet of Worms: "Hier stehe ich! Ich kann nicht anders. Gott helfe mir." *Here I stand! I cannot do otherwise. God help me.*

The connotations of the language used (or not used) need to be noted. There is something arrogant, and perhaps egotistical, about claiming to utter "self-evident truths" or "fundamental principles." A "postulate of impotence" is much less arrogant, less egotistical. Luther's claim to do no more than *stand* at a certain position is even more humble. Lutheran humility is detectable in the statements of Eddington and Whittaker, who admit that their hard-won statements are no more than convictions of the (human) mind. Some will say that scientists should not behave in this way, but creative scientists do. Their humility (from one point of view) and their inflexibility (from another) pay off.

This "conviction of the mind" can be traced all the way back to Epicurus in the 3rd century B.C.: "Nothing is created out of that which does not exist: for if it were, everything would be created out of everything with no need of seeds. And again, if that which disappears were destroyed into that which did not exist, all things would have perished, since that into which they were dissolved would not exist" (Bailey 1926, p.21). From the

Epicurean conviction, came the laws of the conservation of matter and energy, without which there would be no true physical sciences. Economics also draws on this conviction, which is embedded in the popular saying that "There's no such thing as a free lunch." From modesty (or diffidence?) economists have not yet, I believe, stated this law in formal academic terms, but it nonetheless guides—and should guide—economic investigations.

Can it be *proved* that there are no free lunches? That matter and energy are conserved? That a perpetual motion machine is impossible? Probably not, if one uses the word "prove" as it might be used in a court of law. But only fools and charlatans waste their time (and ours) claiming to have invented free lunches or perpetual motion machines.

PARAMOUNT POSITIONS AND THE BURDEN OF PROOF

We need a name for propositions that furnish the necessary foundation stones of a rational science. Like it or not, the connotations of a term affect the ease with which people will accept it. Whittaker's "postulates of impotence" has not been widely adopted, perhaps because both nouns are burdened with distracting connotations. It has been noted (by a man, if a sexist side-remark is permitted) that the word "impotence" is likely to arouse anxiety in 50% of the population.

The word "postulate" can also be objected to. As used in mathematics (Whittaker's first field of training) the word "postulate" is a weak word in the sense that it implies that we are free to accept it or reject it. Much the same may be said of the possible substitute, "axiom." But, by Whittaker's own description, postulates of impotence are rooted in a strong "conviction of the mind." A word stronger than "postulate" is needed. We note that the author himself later introduced a variation when he spoke of *principles* of impotence (Whittaker 1958, p. 59). (Was it just absent-mindedness that caused the substitution? Or a linguistic change of heart?)

"Law" is another old word that might do. Cicero spoke of *lex naturae*, the law of nature. The generalized term was given more specific meaning in the 17th century, beginning with Newton's "Laws of Motion." But the legalistic odor of "law" that met with favor in the 19th century came to be disparaged in the twentieth. The word seems designed to put a permanent end to doubt: this is more than most scientists intend, particularly when it comes to the laws (postulates, principles, or whatever) of the behavioral sciences. On the other hand, we don't want to encourage merely adversarial nitpicking.

The essential point of the naming problem is to place the burden of proof on those who might otherwise lead serious investigators down paths that have in the past proven unproductive. We need defenses against people who suffer from logorrhea and arithmorrhea, for they will always be with us. For their own sake, as well as for the advancement of science, they should be discouraged. The attempt to pursue analysis to its ultimate roots leads to an infinite regress. We must resist this Hamlet-like impulse in order that the world's work can be carried forward.

For those few statements that seem, after long acquaintance and many experiences, to bespeak a "conviction of the mind," I propose the term *paramount position*. Identifying a paramount position does not free it forever from examination: it merely announces, in firm tones, that *the burden of proof* falls on anyone who asserts a contrary proposition. The scientific mind is not forever closed: it is merely intolerant of wasting time on the proposals of attention-seeking amateurs who are too lazy to master the simplest fundamentals of a science.

ESSENTIAL PARAMOUNT POSITIONS OF ECOLOGICAL ECONOMICS

What follows is tentative. I have tried to arrange what I regard as the essential paramount positions of ecological economics in a hierarchy of importance; but I do not claim much for the ordering. The result cries out for criticism; and it needs to be enlarged.

To begin with, ecological economics must accept all the well-established paramount positions of the physical sciences, e.g., the laws of conservation of matter and energy. From biology it takes the idea of natural selection as a pervasive and inescapable process. To discourage logorrhea and arithmorrhea I have, for the most part, couched the positions in "folksy" language.

1. *The world available to the human population is limited to Earth.* Wishfully thinking men and women have, over the centuries, tried to escape from mundane problems by dreaming (in succession) of Heaven, of unoccupied frontiers, and (lately) of a science-fictional "Space." In the distant future, a few individuals may be sent off to inoculate some distant solar systems with *Homo sapiens*, but billions of human beings will have to be left behind to make the best they can of the limited resources provided by this planet. Such a conclusion is no doubt a great disappointment to science-fiction enthusiasts. Let us hope that "Space" is the last of the trans-mundane Providences to divert human beings from facing human problems on Earth.

2. *There's no such thing as a free lunch.* This is implied by Epicurus's remarks.

3. *The First Law of Human Ecology: "We can never do merely one thing"* (Hardin 1963). Economists have referred to the same idea under the title of the "Law of Unintended Consequences." A painful and constant awareness of this principle, vague though its statement may be, can save would-be reformers from many mistakes.

4. *The Second Law of Human Ecology: "There's no away to throw to."* Until the invasion of public consciousness by the environmental movement, many economists implicitly presumed an "away" for the disposal of "side effects." This presumption blinded people to seeing the obvious. Tacit features of the definition of private property also had a shielding effect; as Dan McKinley has pointed out, the conventional definition of private property "includes the smokestack but not what comes out of it" (McKinley 1969). When it comes to the wastes generated by nuclear reactors, rhetorical tactics succeeded in suppressing corrective action for forty years. (The difficulty is still not solved.) Malthus's problem of finding sufficient "subsistence"—food, principally—has been

replaced by the much more formidable challenge of finding sufficient absorptive capacity for the exponentially growing inventory of human-generated wastes.

It is worth noting that the preceding principles follow from the ecologizing of economics. Conventional economics has for long worked implicitly with an analytical universe of resources, forces and restrictions that included little more than man and his artifacts. The input of solar energy was taken for granted (that is, it was ignored much of the time). Within this intellectually limited world, it was easy to speak of the "creation of wealth," a concept completely at variance with the thrust of the second law: when the total system is taken into account, wealth continually decays (Soddy 1933). The thrust of 20th-century ecology into cost-benefit analysis has forced economists to admit that mundane wealth is never created; it is merely rearranged, with varying consequences. The required attitudinal change is still not complete. Paul Ehrlich tells how, at a planning meeting that took place in Stockholm, economists kept proposing solutions to the population problem that, on analysis, proved to imply a violation of the second law. Biologists and physicists were not backward in pointing this out. "Finally, in frustration, one of the economists blurted out, 'Who knows what the second law of thermodynamics will be like in a hundred years?'" (Ehrlich 1981, p. 28).

I have never encountered a biologist who thought that the solution of our problems required the confuting of the second law. Perhaps not many economists anticipate such a refutation either; but the assumption of textbook economics that growth will go on forever (or that growth is *normal*, while a "steady state" is *abnormal*) may well encourage subconscious repudiations of the conservative thought of Epicurus. The language of commercial economics is, of course, even more disturbing.

5. *The Third Law of Human Ecology: "(Population) x (Per Capita Impact) = (Total human impact on the environment)."* This can be called the *Impact Equation*. One might suppose that this principle is so obvious as to not need saying, but not so. For instance, a professor of philosophy has claimed that "Pollution results not from our numbers . . . but from our lifestyles and our rate of consumption" (Sagoff 1980, p. 315). I think this remarkable assertion can be understood only in the light of two attitudes now widespread among the self-styled "liberals" of our time. The first is the *ethnofugal* attitude, the preference for distant, bizarre and miserable cultures over our own. By condemning the using of resources by rich nations like ours while holding poor nations guiltless in generating larger populations, many liberals justify international charity. The ethnofugal attitude (which Edwin Arlington Robinson depicted so well in his poem "Miniver Cheevy") is the opposite of ethnocentrism . . . . The word "ethnocentrism" was coined by William Graham Sumner for use in his *Folkways* in 1907. "Ethnofugalism" has yet to make its way into any English dictionary.

Another attitude that is all too common among otherwise well-educated people today is a strong distaste for numbers. To such people, 1 is no different from 1,000,000,000; only by recognizing this assumption can one understand the philosopher's statement that the size of a population has nothing to do with the amount of pollution it generates. Innumerate critics sometimes go to astonishing lengths to make sure that no one takes population problems seriously. Taking the lead from intellectuals of this stamp, a

popular magazine recently published a 2600-word analysis of deforestation which concluded: "Ultimately, the only sure way to stop deforestation is to minimize the things that cause it—lack of fuel, fodder and farmland for the third of humanity that live on the edge of starvation" (Vanishing forests, 1980). There was not a word about population, the other factor in the Impact Equation.

6. *Scale effects, though sometimes compensable, are inescapable.* An example will make the point clear. For hundreds of years men tried to fly by their own muscle power, without success and some loss of life. The quantitative relations between muscle power, air resistance, gravity, etc., that make it possible for a bat to fly simply don't "scale up" to a mammal the size of a large man. The exponents of the variables are unequal. Ultimately, structural materials were created that were strong enough to permit a small man to fly (with difficulty). Compensation was found in the nature of the materials.

A given process may enjoy "economies of scale" over one range of variation and "diseconomies of scale" over another. For understandable reasons, economists have emphasized only the former. Political scientists are not yet sufficiently impressed with scale effects. When they become more so they may be able to draw up a calibrated schedule of successors to simple democracy, which clearly suffers from diseconomies of scale.

CULTURAL CARRYING CAPACITY, THE FRAMEWORK OF RATIONAL ANALYSIS

"Carrying capacity" is the fundamental basis for demographic accounting. Illiterate farmers and herdsmen the world over understand carrying capacity, but it seems to be beyond the comprehension of myriads of our own "animal lovers," highly "educated" though they may be (Hardin 1982). People who object to the rational solution of game management problems are not so much highly educated as highly *schooled*; and their schooling is narrowly urban and includes no daily experience with fields, pastures and non-human animals.

Many economists have totally rejected the concept of carrying capacity. Remarkably, a committee of economists, at the behest of the National Research Council, in 1986 issued a discussion of population growth and economic development in which neither the word *nor the concept* of "carrying capacity" played a role (National Research Council 1986). A careful (but uncritical) reading of the text would lead one to conclude, Herman Daly said, that "Apparently limited natural resources can be substituted by "artificial resources," which are expandable without limit," which leads to the final conclusion that "carrying capacity is infinitely expandable" (Daly 1986, p. 584). Epicurus must be turning over in his grave. The publication of the National Research Council committee is as astonishing as would be a textbook on accounting that stoutly maintained that there is no necessity for assets and liabilities to balance.

The error of the committee is understandable. The carrying capacity of a territory for a population of non-human animals can be fairly easily determined, because we demand only that the population survive indefinitely. But when we come to consider *Homo sapiens* our standards rise, we ask not only that human beings survive, but that they enjoy a

reasonable repertoire of amenities. But what is "reasonable"? Should the repertoire include meat? Automobiles? Television? Wilderness? Dune buggies? Rock concerts? Round-the-world cruises? Obviously, the question of "capacity" has entered the realm of *values*.

By long tradition, economists have avoided value questions like the plague. The evasion is prudent: but it does not justify an implicitly anti-Epicurean assumption that resources can be created out of nothing. The issue of limits must be restated in terms of the *cultural carrying capacity* of a territory for human beings, living the sort of life they want to live (which is, of course, a matter of opinion). The fact that there are as many "capacities" as there are opinions does not justify the presumption that the concept of capacity has no meaning, or that any capacity is infinite. The variation is encompassed by the following generalization:

7. *Cultural carrying capacity and the standard of living are inversely related.* The higher the standard of living, the fewer the number of people that can enjoy it. Amenities like solitude and wilderness can be enjoyed by very few, and this fact creates serious problems of distribution and justice (Hardin 1986, 1988).

Though human beings take account of much more than energy as they try to define the "quality of life," energy alone can be used to illustrate the importance of quantity. Remaining alive while working moderately requires about 2,300 kilocalories per adult per day. Americans use about 230,000 k-cal per person per day—some 100 times the minimum. If all the world's people lived at the American cultural level of energy consumption, the energetic carrying capacity of Earth would be only one one-hundredth as great as it would be if everyone lived at the absolute minimum level. Recognition of this fact leads most people to accept the next paramount position of human ecology:

8. *The maximum is not the optimum.* Calculus offers such a simple way of determining maxima that it is easy to forget that the mathematical answer has little to do with the problem of the human optimum. It is the rare economics paper that does not implicitly assume that the maximum Gross National Product is an optimum of some sort, though Kenneth Boulding, Herman Daly, and others have eloquently pointed out the short-comings of this measure of felicity. For a statesman to try to maximize the GNP is about as sensible as for a composer of music to try to maximize the number of notes in a symphony. Maximizing the "quality of life" is a deep and subtle problem. This problem lies in the domain of ecological economics.

9. *"The greatest good of the greatest number" is nonsense.* The theory of partial differential equations tells us that we cannot maximize for more than one variable at a time. Since the time-honored utilitarian ideal is mathematical nonsense it must be practical nonsense also. We need to find other approaches to the problem of the optimum. We must, in a word, decide whether we want to maximize the number of human beings on Earth, or to maximize their *average*—not their total—well-being.

The emergence of nuclear energy as a possible and quasi-unlimited source of energy led many to think that the average well-being might be moved upward, almost without limit. With a different emphasis it has been assumed that unlimited energy would solve all population problems. But the realization of nuclear energy's potential for creating long-lived and lethal by-products has changed our perceptions. Everything hinges on the

reliability of machine-human couplings. Half a century's experience has led to the following paramount position:

10. *Attempts to create perfectly reliable machine-human couplings are inescapably self-defeating.* At first, the spasmodic occurrence of nuclear accidents was explained away as part of the "learning curve" of the new technology. The role of human nature was largely ignored. But experience has shown that the more perfect a machine-human coupling is, the more boring the job becomes for people. The more boring the task, the lower the intelligence of those who will accept the job. The longer an operator continues in the same position, the less alert he is. The longer the record of accident-free operation, the more difficult it is to imbue new recruits with the necessary conviction that accidents *are* possible. Industrial education deteriorates. Thus it comes about that perfection in the machine selects for imperfection in human performance. *We get what we select for.* Therefore, sooner or later, the "unthinkable" accident happens. It can only be viewed as optimistic that, since Chernobyl, the "unthinkable" has come to be thinkable by an ever increasing number of people. (Another Chernobyl will probably clinch the change.)

What all this adds up to is a paramount position that is not descriptive but normative in nature, namely:

11. *The 11th Commandment of Human Ecology: "Thou shalt not transgress the carrying capacity."* Carrying capacity transgressed is carrying capacity reduced. Presumably the policy goal is to specify a sustainable carrying capacity, whether the subject be cattle in a pasture or human beings in a nation. In the animal example, too many cattle in a pasture trample the soil and selectively eat up the "sweet grass," resulting in a competitive advantage for weeds—"weeds" by bovine standards—the following year. Soil erosion progressively reduces plant growth in subsequent years. Unless the overpopulation is corrected the carrying capacity diminishes year by year. The same principles, *mutatis mutandi*, govern the human exploitation of cultural carrying capacity.

In trying to match environmental resources to the demands of populations, the language used makes progress either more or less likely. The final paramount position is purely a definitional one, but a definition chosen to bias perceptions greatly influences the probability of success in matching resources to demands.

12. *Every shortage of supply is equally a longage of demand.* According to the Oxford English Dictionary the word "shortage" was first used in 1868. The word "longage," still not in any dictionary, did not appear in print until 1975. (See Hardin 1978.) The difference is no mystery. Language is a weapon for controlling the thoughts of others; using "shortage" suggests that we should search for ways to make money by marketing a commodity. "Longage," by contrast, does not easily generate marketing opportunities. Those who offer help in reducing human demands are often regarded as marginal members of the community—ministers, psychiatrists, ecologists, and the like. Still more aberrant (and less welcome) are those who recommend an actual reduction in the size of the population that figures in the Impact Equation. Understandably, fears of draconian measures are aroused.

But a reduction in population need not necessarily involve the liquidation of people. The Impact product can be reduced by attrition, which takes place whenever a controlled

birth rate falls below the normal death rate. Of course, even this possibility is viewed with horror by conventional moralists and "Growthmanship" economists. The taboo operating against thinking in terms of longages is great. This is unfortunate because—*no "shortage" reported in a growing population can be cured by increasing the supply.* The only constructive action is a decrease in demand. The word "longage" is more than a mere inversion of the word "shortage." Using this hitherto unfamiliar word can prepare the mind to think creatively about the problem of reducing human misery.

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