A Sociobiology of Man

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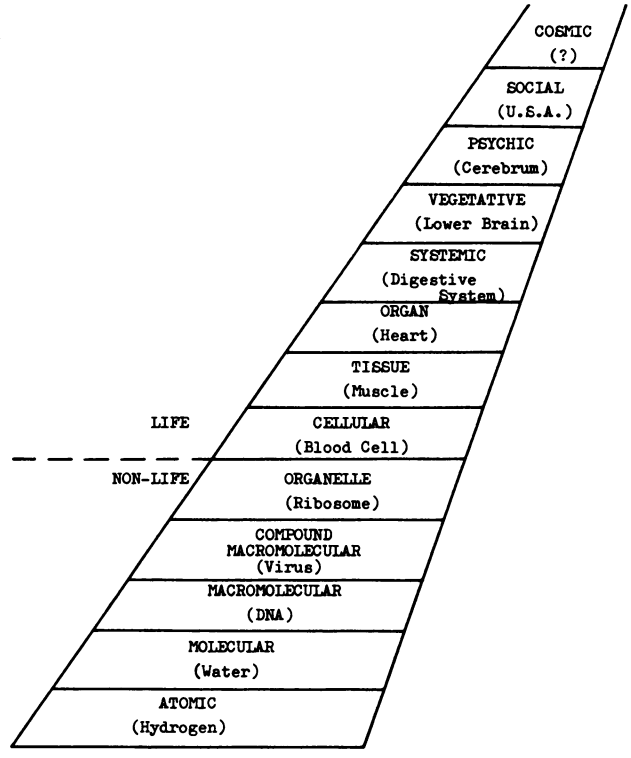

Fig. 1. All material existence can generally be ordered according to levels of chemical complexity.

IT IS CHARACTERISTIC of every scientific field, as its knowledge content increases, to progressively overlap its realm with that of other sciences or fields of endeavor. A recent example of such an overlap is psychobiology, a field that is becoming separated from its parental sciences, psychology and biology. Psychobiology is now a distinct science, with a body of knowledge that was born of the overlap between the behavioral and life sciences.

Similarly, there is evolving a distinct science of "sociobiology." The overlap between sociology and biology is not yet as broad as is that between psychology and biology, but the existence of such periodicals as *Social Biology, Journal of Biosocial Science,* and *Journal of Health and Social Behavior* does confirm the existence of a common ground between the social and life sciences.

Sociobiology may be defined as the search for those elements of social structure and social evolution that have their roots in the organisms that constitute a society. Necessarily, whatever a society does is done by the members of that society. Territoriality, grouping, hierarchies, bonding, and other social traits are implemented by mechanisms that reside within individual organisms. Such mechanisms include, for example, pheromone secretion, communication by sound or movement, and internal checks on population increase such as gonadal regression and the resulting reduction of the sex drive.

It is becoming imperative that the biology student, at whatever level of education, be made aware of the growing overlap between sociology and biology, beyond an occasional glimpse at social problems that are somehow related to biology. There are at least two basic reasons for this growing need. First, several crucial dilemmas faced by our present-day human society can be quantifiably related to analogous phenomena in other animal species. Abortion, euthanasia, homosexuality, death and dying, all have many facets—medical, social, political, ethical, historical; but they all stem in the first place from our biology, from the fact that we are evolved animals. We age, we seek comfort, we feel pain. We have inherited, and still exhibit, the drives of aggression, hunger, sex, and survival.

Secondly, social structuring and behavior are sufficiently quantifiable at this time to warrant the offering of a course in sociobiology within a science curriculum. Animal grouping behavior, family and band structures, and bonding patterns have been investigated to an extent that warrants a survey of more than the traditional levels of life (via cytology, histology, systemic anatomy and physiology, population ecology, and so on); a course in biology should also survey the level of life that now can be accurately called "social life."

A course in sociobiology can be adapted to a high school senior class (as a second course in biology), to an undergraduate nonmajor course, or to an undergraduate upper-level majors' course. The content level and length of the course can easily be modified to suit one's needs, training, and interests.

The purpose of this paper is to introduce a general theory of sociobiology. Such a theory is prerequisite to a more specific analysis of sociobiological behavior in animals and man. It will be shown that a sociobiology of higher animals can be based on at least four primary concepts which serve as premises upon which to build a concrete frame of knowledge regarding the social aspects of biological behavior. Perhaps the

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biology teacher will find the following discussion useful as a basis for developing a course in sociobiology.

Levels of Chemical Complexity

All things, all material existence, generally can be ordered according to levels of chemical complexity. We can depict this spectrum of complexity by a "ladder" of increasing complexity (fig. 1), with the simplest material aggregates at the bottom and the most complex living things at the top. It must be emphasized, however, that the definition of life is arbitrary, applying only to those levels on the ladder that display certain minimal properties that man deems to be requisites for his definition of life.

A further difficulty arises from the variability of life; the life of a microbe is measurably different from the life of an ape, a bee, or an angiosperm. Life does not represent the attainment of a specific number of chemical subunits; it represents innumerable thresholds, with each kind of living thing requiring a definition of life that applies to it alone.

Since its earthly origin some 3.2 billion years ago, the life process has progressed through several simple and primitive states: cell life, tissue life (as can be exemplified by the sponges), organ life, and so on. A later arrival, more complex than the preceding, is that level of life displayed by the higher animals (as well as by the comatose, vegetative patient whose heart, lungs, and other bodily functions are still operating but whose consciousness and awareness are inoperative). A still higher level is that displayed in "psychic life." When, in the evolution of animals, there arose a self-awareness that was apparently centralized in a cerebrum, with the capability to supersede at least some of the body's vegetative functions, one might say that psychic life arose. Again, it is rather difficult to specify this threshold for there are different levels of

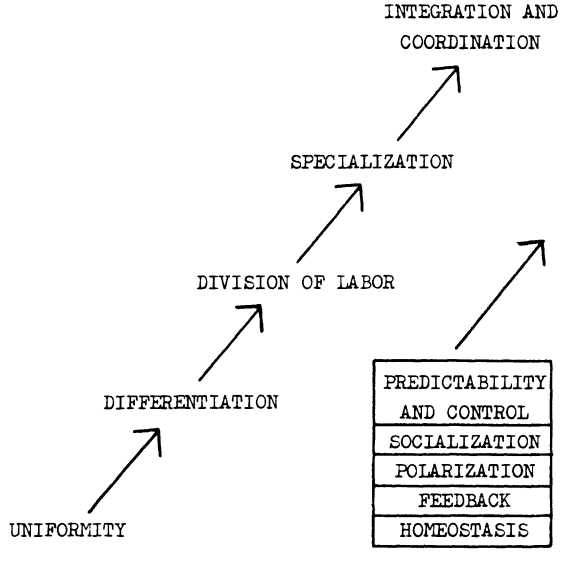

Fig. 2. Developing systems seem to follow the same general trends, progressing through five stages. In the process of increasing complexity, other forces gradually improve efficiency.

psychic consciousness in the higher animals, the most highly evolved being that found in man.

Further, along several lines of evolution, including that line leading to the psychic organisms but not excluding others (such as insects), the members of some species have evolved the ability to form integrated wholes in which the individual organisms have become more and more interrelated and interdependent upon each other. This new form of complexity, socialization, is not unlike the relationship of cells in an organism. Yet, it is a much more complex level of existence than these others; it is more complex than psychic life. Social life is sustained by a distinct and increasingly measurable biological bondage, a bondage whose existence is as real as that of chemical bonds or of gravitational attractions. The bonds that interconnect the organisms of some populations, if broken, can no longer sustain a survival relationship between the members of that population.

Finally, one may then ask if there is a level of life beyond the social level. Might it be possible that earthly social awareness is a prelude to a cosmic awareness, wherein man will be truly aware of being a member of a larger universal society, communicating with its various members, transporting himself about? Through our present space program, we may, in fact, be in the initial stages of developing a cosmic awareness at this time.

Evolution and Social Progress

Evolution may be considered analogous to "development" or "progress."

If we scrutinize carefully the development of a human society, or the world of baseball, or an expanding industry, or a human embryo, or a universe, we find that evolution and development seem to follow the same general trends. We may describe these in five stages (see fig. 2).

1. *Uniformity.* All parts are quite similar initially. For example, most children on an elementary school baseball team can play most positions on the field with equal ability; most men in primitive societies were hunter-gatherers or farmers; most production lines in a new factory produce the same product, for it would be unwise to diversify too quickly; most cells in an early embryo look alike and can even be interchanged without affecting their survival; most atoms (99%) in the universe are either hydrogen or helium, the two simplest elements.

2. *Differentiation.* As the evolutionary or developmental process continues, the subunits of an evolving system gradually become more and more different from one another.

3. *Division of labor.* Some players on a baseball team gradually develop a strong arm and come to be good pitchers but poor at other positions. The factory diversifies, the human embryo acquires muscles, bones, and so on. As a developing system or an evolving system progresses, the different subunits come to acquire different roles in the maintenance of the whole system.

4. *Specialization.* Once a division of labor has been attained, if a system progresses further we find that it does so because its components are becoming more and more specialized and perform their roles more and more efficiently. Their performance of other roles generally becomes less efficient and in many cases ceases.

5. *Integration and coordination.* If development continues, the evolving components finally become efficiently integrated. The same principle applies to any progressing system; the central agency may be a government, a national baseball commission, a labor union, a body's brain, or a computer in a computerized traffic system.

Although specialization, integration, and coordination are the ideal states of development in terms of continued and increased complexity, they are quite precarious states as well. Overspecialization in a fixed and rigid society, for example, can be maintained on one condition: the environment must remain stable. If anything arises to alter the suitability of specialized traits, the whole system may regress.

It seems obvious that systems do follow some standard pathway when progress occurs. And although many of the developmental processes described above are not conventionally regarded as evolutionary processes, to some extent the principles of natural evolution are indeed replicated, and accelerated, in the embryonic and maturing processes of a person or a society.

While the process of increasing complexity allows a greater integration and coordination, other phenomena appear. These do not appear suddenly, at any one stage in fig. 2, but can be observed at all stages, gradually improving efficiency.

The maintenance of a homeostatic balance is promoted if the mechanisms of feedback control become incorporated into a developing system. As a society, or an animal body, develops, there arises an increased ability to feed back information between the members of the system. This is demonstrated by the regulation of blood sugar in the animal body and by the law of supply-and-demand, on a societal level.

An intriguing phenomenon of development is the fact that while subunits are becoming more interrelated, they are also becoming more and more different from each other. As a society polarizes, with its members differentiating more and more in opinion and ability, it must integrate and coordinate its members in order to progress further. The only assurance of long-term adaptation is coordination in the face of polarization. However, this becomes more difficult as the society's variability increases. This is undoubtedly one of the factors responsible for the shorter duration of agricultural and technological societies compared to the extended existence of many primitive societies in world history. The more advanced society has the potential for long-term survival, but it becomes increasingly difficult to realize this potential in the face of increasing polarization.

A developing system gradually achieves a complexity at which the components become not only interrelated but interdependent as well. These two phenomena, interrelation and interdependence, surely define a society—the human society or the bee or ant society.

Predictability and control are forces influencing only the human society, for this is the only species capable of auto-evolution. As man progresses along the evolutionary spectrum, he becomes more proficient in his attempts to predict the future outcomes of his choices and actions. He is now becoming able to predict when he will have children, to determine what kinds of plants and animals he wants to breed, and to control more and more the expression of his own genes. And he is becoming increasingly able to predict when he will die and when he will cause it to rain.

Basic Animalistic Drives

Konrad Lorenz has theorized that higher animals possess four major drives: survival, hunger, sex, and aggression. The hunger drive promotes *personal* survival, and the sex drive promotes *population* survival (although in the psychosocial sphere of mankind the latter drive satisfies psychic as well as propagative demands.)

Perhaps the aggressive drive should be set apart from the others, since it is a trait that is necessary for the fulfillment of the first three. Aggression complements the search for food, mate, and survival. *Homo sapiens* is still very much endowed with this animalistic drive, as are most other higher animals; man, however, has added a psychic, voluntary component to the drive of aggression.

There is some confusion concerning the origin of human aggression. Lorenz says that we inherit it; Ashley Montagu counters that aggression is a human invention that did not originate with lower forms of life. I believe that it is both: we inherit from our animal ancestry a basic drive called aggression, which in mankind takes on entirely different dimensions, as do so many other traits we have inherited from the animals. We inherit this drive and then adapt it to suit our purpose.

At some point in evolutionary history when the four drives became sufficiently complex and interrelated, there probably arose a selection pressure to form a social structure in order to insure the fulfillment of these drives. That may be the reason for the onset of primitive animal societies. By socializing, animals became more capable of insuring the satisfaction of their drives, hence, more likely to survive.

Fig. 3 displays the various factors necessary for the formation and survival of a society. Following the primitive correlation of the four drives, a new biological trait, territoriality, arose and further improved the chances for survival. Whereas in the lower animals the basic drives could be satisfied by individual animals, territoriality evolved as a trait characteristic of the population level. Usually, territoriality is the combined venture of a *group* of animals. The first true indication of social formation is the onset of the territorial drive.

Territoriality may be viewed as a transition between

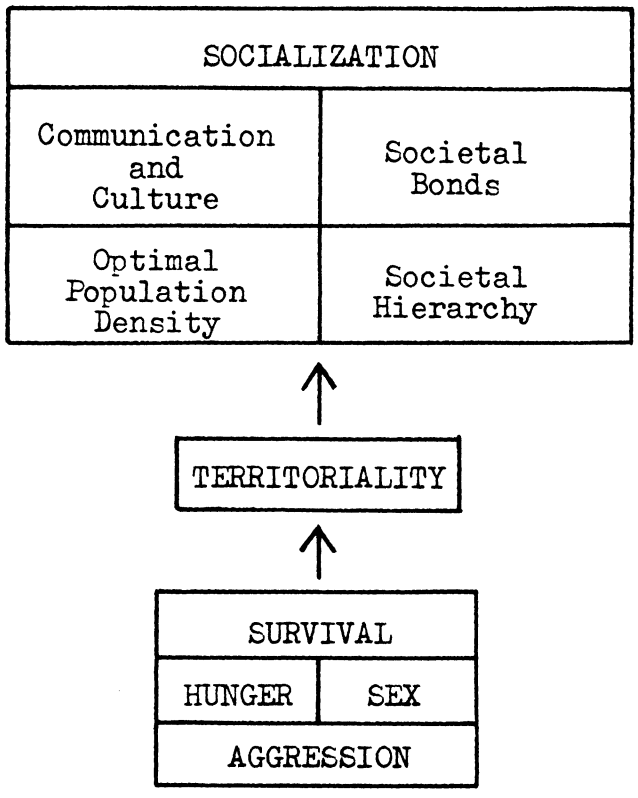

Fig. 3. Various factors are necessary for the formation and survival of a society.

the evolutionary stage in which animals were self-sustaining and largely self-regulating and the stage at which they became interrelated and interdependent. The onset of territoriality may have marked the transition between *individual* biology and *social* biology, by improving the means to acquire food and mates and by helping to reduce the risk of unfriendly competition.

Once socialization became a reality, animals evolved many population characteristics that permitted an increased complexity and stability within the society. First, there is an obvious need for bonds. If a society is defined as an organization in which the separate entities become tied together, become integrated and coordinated, then there must be some kind of "rope." There must be societal bonds. Examples of such are fear, respect, love, and compassion. We may limit the latter three to the human species, but I prefer to think that they are present, to a simpler degree, within lower forms as well but with different names, such as pair bondage. Whatever holds an ant society together must in part resemble human bonds; such bondage may be chemical and not psychic, but bondage there must be.

Second, it appears that most higher societies depend on some form of hierarchy. This is a natural outcome of species variation; individuals possess differing strength, leadership ability, and so on.

Third, if the members of an animal society are to retain their interdependence and interrelationship and if they are to benefit from being part of a society, they must communicate. And if the society is to improve its adaptability and proficiency, its members must pass their learned knowledge from generation to generation. Culture, the web of knowledge transmission that spans many generations, is a requirement for survival in human societies, and it may exist in several higher animal forms.

It appears that the more complex an animal society the more refined is its means of communication. Communication need not be vocal (indeed, that is the exception); many insects and mammals such as rabbits, rats, and mice produce pheromones as signals for marking territories or food sources, or as mating calls. Birds demark their territories through song, and man has speech, the media, laws, and international treaties.

A fourth mechanism that enhances the stability of an animal society is its ability to maintain an optimal population density, the ideal number of individuals capable of surviving in an environment. If a population exceeds the carrying capacity of the environment, the increased population size yields increasing competition, increasing aggressiveness, and an increased probability of destroying the intricately bonded society.

A deviation to a greater *or* lesser number than is optimal for an environment seems to lead to the following: (i) loss of personal bonds, leading to (ii) increased rejection of socialization, (iii) increased apathy, (iv) increased artificial sexuality in response to the reduction in natural sexuality expressed in stable bonding, and (v) increased aggressiveness and lack of inhibitions toward all stable social establishments and toward all organisms but those in one's immediate grouping.

Mankind is probably most comfortable in a cluster of 15 to 20 people, which is the average size of primate families. If that density is increased, people become more and more dependent upon those closest to them and less and less interested in others. According to the theories advanced by some social scientists, if in such a situation a child cannot find the care, love and respect that he increasingly needs, he will probably revolt against the society in general. Such pathological reactions to overcrowding or undercrowding are evident in many other animals as well. Try to keep a baby chick by itself for a time, especially after it has shared a home with its siblings. If an animal population grows beyond its optimal density, various built-in checks are activated. And if the species has reached the societal stage, some of these checks are initiated by group as well as individual action.

The four control mechanisms outlined above are in part responsible for social integrity and are undoubtedly influenced by natural selection. Hence, they are subject to evolutionary progression.

Analogy in Evolution

If one assumes that evolution is an addition to previous construction, then it must follow that a higher level of complexity must *include* the mechanisms of lower levels. For example, the

properties of a tissue must include the properties of the cells that constitute that tissue. Likewise, the properties of a human society must include the properties of the people constituting the society.

To investigate the analogy between cell biology and personal-social biology, let us compare the mechanics of the human learning process (as related to both personal and social growth and adaptation) with the mechanics of cell life (as related to survival, growth, and adaptation).

Fig. 4 illustrates in block diagram the interrelations between various personal and social factors and forces. Let the reader imagine himself to be located at the focal point of the illustration, as the "student." There are, we can assume, three areas of input into student awareness: (i) the demands and stimuli that affect our person and our social role by exposing us to constant pressure—mild or severe, real or imagined—to satisfy our basic needs; (ii) the formal teaching and guidelines to which we are exposed in academic and other circles; and (iii) the "raw materials" to which we are constantly exposed, through reading, observation, and experience.

The raw materials must be organized into a structured whole by the individual student, into a whole that is meaningful and specific only for that individual. Such an organization may be performed by the individual himself, or, more often perhaps, it may be effected by interaction with any or all of the many people upon whom we all depend to assist us in integrating, or making sense of, the information and

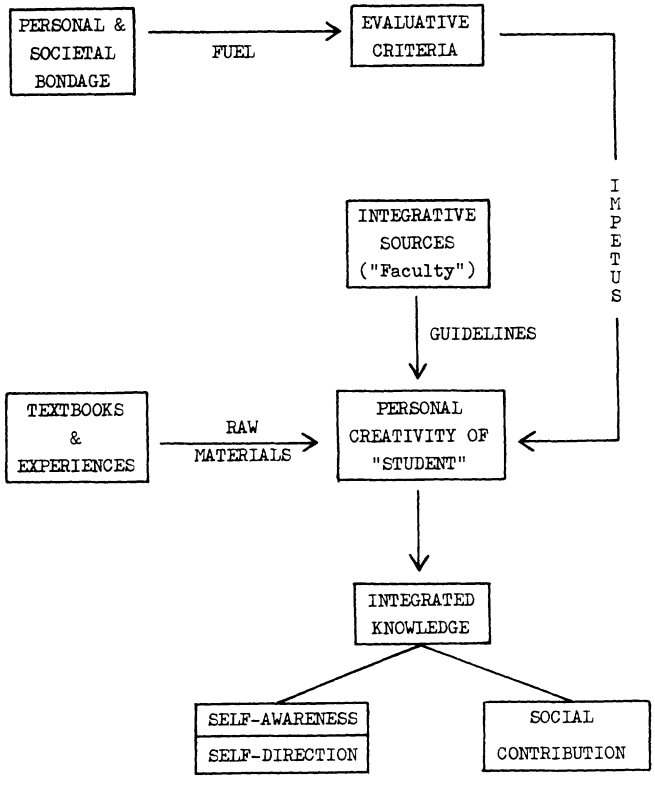

Fig. 4. The mechanics of the human learning process involve the interaction of various personal and social factors.

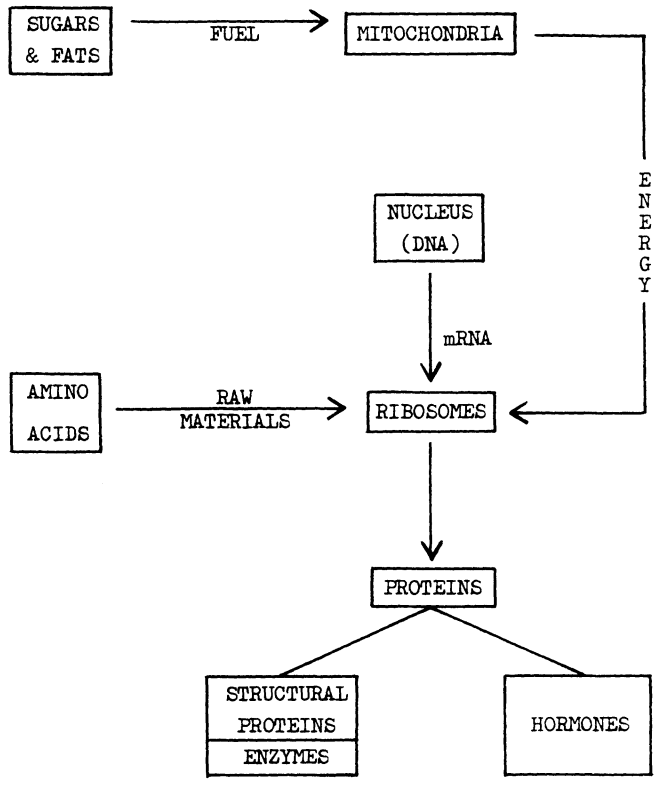

Fig. 5. The mechanics of cell life as related to survival, growth, and adaptation may be compared to the more complex inter-workings of socialization.

experiences to which we are subjected. In a sense, we could say that in our daily lives we are provided with the "codes" necessary to help us assemble the "raw materials" in a more structured whole that is unique to each one of us and necessary for our self-betterment, much as a cell's protein composition is unique to it and necessary for its survival.

Much of the impetus that fuels our drive for self-fulfillment emanates from the needs of our society as it is presently structured. Desirable or not, we are constantly evaluating ourselves, and we are constantly being evaluated. Such psychological and social stimuli to "do better," to "live better," to "be happier" prod us to organize our raw knowledge into an integrated knowledge by using some preset formulas or codes handed down through generations, in the form of culture. In a sense, the modifications that each generation applies to traditional codes may be called "sociocultural mutations."

Finally, once we organize our knowledge so that it yields an increased competence and an increased self-awareness, we can direct such competence and awareness toward (i) further self-survival and self-betterment and (ii) further *social* survival and betterment by increasing and improving our contributions to society.

This same kind of social (environmental) relationship, pressure, and response applies to the operations of a cell within a multicelled organism. Utilizing a code, raw materials, and fuel (see fig. 5), the cell manufactures proteins, some (structural proteins and enzymes) of which it retains for its own survival and

some (hormones) of which it sacrifices to the community of cells surrounding it, for the survival of the community.

Thus, it appears that the basic ingredients of socialization are merely more complex interworkings of the ingredients that permit the functioning of multicelled aggregates.

Conclusion

The social imperative is an instinctive drive. Man must socialize. If he is unable to do so, or if he is forced to do so beyond his optimal range of contact and sharing, his body may undergo such pathological responses as allergies, ulcers, asthma, digestive or sexual upsets, or cardiac distress.

The biology of social formation and evolution is now a real science. In a New York *Times* article, Resenberger (1975) states: "Sociobiology is the study of the biological basis for social behavior in every species from the lowliest amoeba colony to modern human society." Sociobiology is not the study of social problems and dilemmas, although these must be included in such a study. It is, instead, according to Rensberger, "the integration of Darwinian theory with the observations of animal behavior research, which have largely been descriptive."

A course in sociobiology must stress that the human social animal is (i) an *animal,* not yet fully polarized from his ancestry, (ii) a *social* being, dependent upon his fellow beings for his survival, and (iii) a *human* being, capable of modifying some of his basic, inherited drives.

The science of sociobiology must be expanded, for the study of man is incomplete if it omits the society of man. If we are ever to define man, and to improve him, we must determine the proportion of animal and of human in him. Which sexual practices are human, and which are animal? To what extent is the drive to territorial and economic survival instinctive? To what extent is man free to choose, and to what extent is he dependent upon his biochemistry and genetics? Is man becoming more human as he develops his technology, or less human?

However, as we attempt to quantify human behavior in this way, we must use extreme caution, for there are always those who would use such knowledge in order to promote a social stratification of opportunity.

Acknowledgement.—The section on evolution and social progress is an elaboration and extension of a similar outline I presented in the book *Evolution for Everyone.*

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Food for Thought

Learning is a kind of natural food for the *mind.—Cicero*