

On Human Nature

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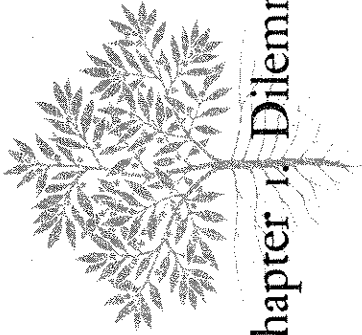
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Chapter 1. Dilemma

These are the central questions that the great philosopher David Hume said are of unspeakable importance: How does the mind work, and beyond that why does it work in such a way and not another, and from these two considerations together, what is man's ultimate nature?

We keep returning to the subject with a sense of hesitancy and even dread. For if the brain is a machine of ten billion nerve cells and the mind can somehow be explained as the summed activity of a finite number of chemical and electrical reactions, boundaries limit the human prospect — we are biological and our souls cannot fly free. If humankind evolved by Darwinian natural selection, genetic chance and environmental necessity, not God, made the species. Deity can still be sought in the origin of the ultimate units of matter, in quarks and electron shells (Hans Küng was right to ask atheists why there is something instead of nothing) but not in the origin of species. However much we embellish that stark conclusion with metaphor and imagery, it remains the philosophical legacy of the last century of scientific research.

No way appears around this admittedly unappealing proposition. It is the essential first hypothesis for any serious consideration of the

human condition. Without it the humanities and social sciences are the limited descriptors of surface phenomena, like astronomy without physics, biology without chemistry, and mathematics without algebra. With it, human nature can be laid open as an object of fully empirical research, biology can be put to the service of liberal education, and our self-conception can be enormously and truthfully enriched.

But to the extent that the new naturalism is true, its pursuit seems certain to generate two great spiritual dilemmas. The first is that no species, ours included, possesses a purpose beyond the imperatives created by its genetic history. Species may have vast potential for material and mental progress but they lack any immanent purpose or guidance from agents beyond their immediate environment or even an evolutionary goal toward which their molecular architecture automatically steers them. I believe that the human mind is constructed in a way that locks it inside this fundamental constraint and forces it to make choices with a purely biological instrument. If the brain evolved by natural selection, even the capacities to select particular esthetic judgments and religious beliefs must have arisen by the same mechanistic process. They are either direct adaptations to past environments in which the ancestral human populations evolved or at most constructions thrown up secondarily by deeper, less visible activities that were once adaptive in this stricter, biological sense.

The essence of the argument, then, is that the brain exists because it promotes the survival and multiplication of the genes that direct its assembly. The human mind is a device for survival and reproduction, and reason is just one of its various techniques. Steven Weinberg has pointed out that physical reality remains so mysterious even to physicists because of the extreme improbability that it was constructed to be understood by the human mind. We can reverse that insight to note with still greater force that the intellect was not constructed to understand atoms or even to understand itself but to promote the

survival of human genes. The reflective person knows that his life is in some incomprehensible manner guided through a biological ontogeny, a more or less fixed order of life stages. He senses that with all the drive, wit, love, pride, anger, hope, and anxiety that characterize the species he will in the end be sure only of helping to perpetuate the same cycle. Poets have defined this truth as tragedy. Yeats called it the coming of wisdom:

Though leaves are many, the root is one;

Through all the lying days of my youth

I swayed my leaves and flowers in the sun;

Now I may wither into the truth.

The first dilemma, in a word, is that we have no particular place to go. The species lacks any goal external to its own biological nature. It could be that in the next hundred years humankind will thread the needles of technology and politics, solve the energy and materials crises, avert nuclear war, and control reproduction. The world can at least hope for a stable ecosystem and a well-nourished population. But what then? Educated people everywhere like to believe that beyond material needs lie fulfillment and the realization of individual potential. But what is fulfillment, and to what ends may potential be realized? Traditional religious beliefs have been eroded, not so much by humiliating disproofs of their mythologies as by the growing awareness that beliefs are really enabling mechanisms for survival. Religions, like other human institutions, evolve so as to enhance the persistence and influence of their practitioners. Marxism and other secular religions offer little more than promises of material welfare and a legislated escape from the consequences of human nature. They, too, are energized by the goal of collective self-aggrandizement. The French political observer Alain Peyrefitte once said admiringly of Mao Tse-tung that "the Chinese knew the narcissistic joy of loving themselves in him. It is only natural that he should

have loved himself through them." Thus does ideology bow to its hidden masters the genes, and the highest impulses seem upon closer examination to be metamorphosed into biological activity.

The more somber social interpreters of our time, such as Robert Heilbroner, Robert Nisbet, and L. S. Stavrianos, perceive Western civilization and ultimately mankind as a whole to be in immediate danger of decline. Their reasoning leads easily to a vision of post-ideological societies whose members will regress steadily toward self-indulgence. "The will to power will not have vanished entirely," Gunther Stent writes in *The Coming of the Golden Age*,

but the distribution of its intensity will have been drastically altered. At one end of this distribution will be the minority of the people whose work will keep intact the technology that sustains the multitude at a high standard of living. In the middle of the distribution will be found a type, largely unemployed, for whom the distinction between the real and the illusory will still be meaningful . . . He will retain interest in the world and seek satisfaction from sensual pleasures. At the other end of the spectrum will be a type largely unemployable, for whom the boundary of the real and the imagined will have been largely dissolved, at least to the extent compatible with his physical survival.

Thus the danger implicit in the first dilemma is the rapid dissolution of transcendental goals toward which societies can organize their energies. Those goals, the true moral equivalents of war, have faded; they went one by one, like mirages, as we drew closer. In order to search for a new morality based upon a more truthful definition of man, it is necessary to look inward, to dissect the machinery of the mind and to retrace its evolutionary history. But that effort, I predict, will uncover the second dilemma, which is the choice that

must be made among the ethical premises inherent in man's biological nature.

At this point let me state in briefest terms the basis of the second dilemma, while I defer its supporting argument to the next chapter: innate sensors and motivators exist in the brain that deeply and unconsciously affect our ethical premises; from these roots, morality evolved as instinct. If that perception is correct, science may soon be in a position to investigate the very origin and meaning of human values, from which all ethical pronouncements and much of political practice flow.

Philosophers themselves, most of whom lack an evolutionary perspective, have not devoted much time to the problem. They examine the precepts of ethical systems with reference to their consequences and not their origins. Thus John Rawls opens his influential *A Theory of Justice* (1971) with a proposition he regards as beyond dispute: "In a just society the liberties of equal citizenship are taken as settled; the rights secured by justice are not subject to political bargaining or to the calculus of social interests." Robert Nozick begins *Anarchy, State, and Utopia* (1974) with an equally firm proposition: "Individuals have rights, and there are things no person or group may do to them (without violating their rights). So strong and far-reaching are these rights they raise the question of what, if anything, the state and its officials may do." These two premises are somewhat different in content, and they lead to radically different prescriptions. Rawls would allow rigid social control to secure as close an approach as possible to the equal distribution of society's rewards. Nozick sees the ideal society as one governed by a minimal state, empowered only to protect its citizens from force and fraud, and with unequal distribution of rewards wholly permissible. Rawls rejects the meritocracy; Nozick accepts it as desirable except in those cases where local communities voluntarily decide to experi-

ment with egalitarianism. Like everyone else, philosophers measure their personal emotional responses to various alternatives as though consulting a hidden oracle.

That oracle resides in the deep emotional centers of the brain, most probably within the limbic system, a complex array of neurons and hormone-secreting cells located just beneath the "thinking" portion of the cerebral cortex. Human emotional responses and the more general ethical practices based on them have been programmed to a substantial degree by natural selection over thousands of generations. The challenge to science is to measure the tightness of the constraints caused by the programming, to find their source in the brain, and to decode their significance through the reconstruction of the evolutionary history of the mind. This enterprise will be the logical complement of the continued study of cultural evolution.

Success will generate the second dilemma, which can be stated as follows: Which of the sensors and motivators should be obeyed and which ones might better be curtailed or sublimated? These guides are the very core of our humanity. They and not the belief in spiritual apartness distinguish us from electronic computers. At some time in the future we will have to decide how human we wish to remain—in this ultimate, biological sense—because we must consciously choose among the alternative emotional guides we have inherited. To chart our destiny means that we must shift from automatic control based on our biological properties to precise steering based on biological knowledge.

Because the guides of human nature must be examined with a complicated arrangement of mirrors, they are a deceptive subject, always the philosopher's deadfall. The only way forward is to study human nature as part of the natural sciences, in an attempt to integrate the natural sciences with the social sciences and humanities. I can conceive of no ideological or formalistic shortcut. Neurobiology cannot

be learned at the feet of a guru. The consequences of genetic history cannot be chosen by legislatures. Above all, for our own physical well-being if nothing else, ethical philosophy must not be left in the hands of the merely wise. Although human progress can be achieved by intuition and force of will, only hard-won empirical knowledge of our biological nature will allow us to make optimum choices among the competing criteria of progress.

The important initial development in this analysis will be the conjunction of biology and the various social sciences—psychology, anthropology, sociology, and economics. The two cultures have only recently come into full sight of one another. The result has been a predictable mixture of aversions, misunderstandings, overenthusiasm, local conflicts, and treaties. The situation can be summarized by saying that biology stands today as the antidisdiscipline of the social sciences. By the word "antidisdiscipline" I wish to emphasize the special adversary relation that often exists when fields of study at adjacent levels of organization first begin to interact. For chemistry there is the antidisdiscipline of many-body physics; for molecular biology, chemistry; for physiology, molecular biology; and so on upward through the paired levels of increasing specification and complexity.

In the typical early history of a discipline, its practitioners believe in the novelty and uniqueness of their subject. They devote lifetimes to special entities and patterns and during the early period of exploration they doubt that these phenomena can be reduced to simple laws. Members of the antidisdiscipline have a different attitude. Having chosen as their primary subject the units of the lower level of organization, say atoms as opposed to molecules, they believe that the next discipline above can and must be reformulated by their own laws: chemistry by the laws of physics, biology by the laws of chemistry, and so on downward. Their interest is relatively narrow, abstract, and exploitative. P.A.M. Dirac, speaking of the theory of the hydro-

gen atom, could say that its consequences would unfold as mere chemistry. A few biochemists are still content in the belief that life is "no more" than the actions of atoms and molecules.

It is easy to see why each scientific discipline is also an antidiscipline. An adversary relationship is probable because the devotees of the two adjacent organizational levels—such as atoms versus molecules—are initially committed to their own methods and ideas when they focus on the upper level (in this case, molecules). By today's standards a broad scientist can be defined as one who is a student of three subjects: his discipline (chemistry in the example cited), the lower antidiscipline (physics), and the subject to which his specialty stands as antidiscipline (the chemical aspects of biology). A well-rounded expert on the nervous system, to take a second, more finely graded example, is deeply versed in the structure of single nerve cells, but he also understands the chemical basis of the impulses that pass through and between these cells, and he hopes to explain how nerve cells work together to produce elementary patterns of behavior. Every successful scientist treats differently each of the three levels of phenomena surrounding his specialty.

The interplay between adjacent fields is tense and creative at the beginning, but with the passage of time it becomes fully complementary. Consider the origins of molecular biology. In the late 1800s the microscopic study of cells (cytology) and the study of chemical processes within and around the cells (biochemistry) grew at an accelerating pace. Their relationship during this period was complicated, but it broadly fits the historical schema I have described. The cytologists were excited by the mounting evidence of an intricate cell architecture. They had interpreted the mysterious choreography of the chromosomes during cell division and thus set the stage for the emergence of modern genetics and experimental developmental biology. Many biochemists, on the other hand, remained skeptical of the idea that so much structure exists at the microscopic level. They

thought that the cytologists were describing artifacts created by laboratory methods of fixing and staining cells for microscopic examination. Their interest lay in the more "fundamental" issues of the chemical nature of protoplasm, especially the newly formulated theory that life is based on enzymes. The cytologists responded with scorn to any notion that the cell is a "bag of enzymes."

In general, biochemists judged the cytologists to be too ignorant of chemistry to grasp the fundamental processes, while the cytologists considered the methods of the chemists inappropriate for the idiosyncratic structures of the living cell. The revival of Mendelian genetics in 1900 and the subsequent illumination of the roles of the chromosomes and genes did little at first to force a synthesis. Biochemists, seeing no immediate way to explain classical genetics, by and large ignored it.

Both sides were essentially correct. Biochemistry has now explained so much of the cellular machinery on its own terms as to justify its most extravagant early claims. But in achieving this feat, mostly since 1950, it was partially transformed into the new discipline of molecular biology, which can be defined as biochemistry that also accounts for the particular spatial arrangements of such molecules as the DNA helix and enzyme proteins. Cytology forced the development of a special kind of chemistry and the use of a battery of powerful new techniques, including electrophoresis, chromatography, density-gradient centrifugation, and x-ray crystallography. At the same time cytology metamorphosed into modern cell biology. Aided by the electron microscope, which magnifies objects by hundreds of thousands of times, it has converged in perspective and language toward molecular biology. Finally, classical genetics, by switching from fruit flies and mice to bacteria and viruses, has incorporated biochemistry to become molecular genetics.

Progress over a large part of biology has been fueled by competition among the various perspectives and techniques derived from

cell biology and biochemistry, the discipline and its antidiscipline. The interplay has been a triumph for scientific materialism. It has vastly enriched our understanding of the nature of life and created materials for literature more powerful than any imagery of prescientific culture.

I suggest that we are about to repeat this cycle in the blending of biology and the social sciences and that as a consequence the two cultures of Western intellectual life will be joined at last. Biology has traditionally affected the social sciences only indirectly through technological manifestations, such as the benefits of medicine, the mixed blessings of gene splicing and other techniques of genetics, and the specter of population growth. Although of great practical importance, these matters are trivial with reference to the conceptual foundation of the social sciences. The conventional treatments of "social biology" and "social issues of biology" in our colleges and universities present some formidable intellectual challenges, but they are not addressed to the core of social theory. This core is the deep structure of human nature, an essentially biological phenomenon that is also the primary focus of the humanities.

It is all too easy to be seduced by the opposing view: that science is competent to generate only a few classes of information, that its cold, clear Apollonian method will never be relevant to the full Dionysian life of the mind, that single-minded devotion to science is dehumanizing. Expressing the mood of the counterculture, Theodore Roszak suggested a map of the mind "as a spectrum of possibilities, all of which properly blend into one another . . . At one end, we have the hard, bright lights of science; here we find information. In the center we have the sensuous hues of art; here we find the aesthetic shape of the world. At the far end, we have the dark, shadowy tones of religious experience, shading off into wave lengths beyond all perception; here we find meaning."

No, here we find obscurantism! And a curious underestimate of

what the mind can accomplish. The sensuous hues and dark tones have been produced by the genetic evolution of our nervous and sensory tissues; to treat them as other than objects of biological inquiry is simply to aim too low.

The heart of the scientific method is the reduction of perceived phenomena to fundamental, testable principles. The elegance, we can fairly say the beauty, of any particular scientific generalization is measured by its simplicity relative to the number of phenomena it can explain. Ernst Mach, a physicist and forerunner of the logical positivists, captured the idea with a definition: "Science may be regarded as a minimal problem consisting of the completest presentation of facts with the least possible expenditure of thought."

Although Mach's perception has an undeniable charm, raw reduction is only half of the scientific process. The remainder consists of the reconstruction of complexity by an expanding synthesis under the control of laws newly demonstrated by analysis. This reconstruction reveals the existence of novel, emergent phenomena. When the observer shifts his attention from one level of organization to the next, as from physics to chemistry or from chemistry to biology, he expects to find obedience to all the laws of the levels below. But to reconstitute the upper levels of organization requires specifying the arrangement of the lower units and this in turn generates richness and the basis of new and unexpected principles. The specification consists of particular combinations of units, as well as particular spatial arrangements and histories of the ensembles of these elements. Consider the following simple example from chemistry. The ammonia molecule consists of a negatively charged nitrogen atom bonded to a triangle of three positively charged hydrogen atoms. If the atoms were locked in one position the ammonia molecule would have an opposite charge at each end (a dipole moment) in apparent contradiction to the symmetry laws of nuclear physics. Yet the molecule manages to behave properly: it neutralizes

its dipole moment by passing the nitrogen atom back and forth through the triangle of hydrogen atoms at a frequency of thirty billion times per second. However, such symmetry is absent in the case of sugar and other large organic molecules, which are too large and complex in structure to invert themselves. They break but do not repeal the laws of physics. This specification may not be greatly interesting to nuclear physicists, but its consequences redound throughout organic chemistry and biology.

Consider a second example, closer to our subject, from the evolution of social life in the insects. In the Mesozoic Era, about 150 million years ago, primitive wasps evolved the sex-determining trait of haplodiploidy, in which fertilized eggs produced females and those left unfertilized produced males. This simple method of control may have been a specific adaptation that permitted females to choose the sex of their offspring according to the nature of the prey insects they were able to subdue. In particular, smaller prey might have been assigned to the male offspring, which require less protein in their development. But whatever its initial cause, haplodiploidy represented an evolutionary event that quite accidentally predisposed these insects to develop advanced forms of social life. The reason is that haplodiploidy causes sisters to be more closely related to each other than mothers are to daughters, and so females may derive genetic profit from becoming a sterile caste specialized for the rearing of sisters. Sterile castes engaged in rearing siblings are the essential feature of social organization in the insects. Because of its link to haplodiploidy, insect social life is almost limited to the wasps and their close relatives among the bees and ants. Furthermore, most cases can be classified either as matriarchies, in which queens control colonies of daughters, or as sisterhoods, in which sterile daughters control the egg-laying mothers. The societies of wasps, bees, and ants have proved so successful that they dominate and alter most of the land habitats of the Earth. In the forests of Brazil, their assembled forces constitute more

than 20 percent of the weight of all land animals, including nematode worms, toucans, and jaguars. Who could have guessed all this from a knowledge of haplodiploidy?

Reduction is the traditional instrument of scientific analysis, but it is feared and resented. If human behavior can be reduced and determined to any considerable degree by the laws of biology, then mankind might appear to be less than unique and to that extent dehumanized. Few social scientists and scholars in the humanities are prepared to enter such a conspiracy, let alone surrender any of their territory. But this perception, which equates the method of reduction with the philosophy of diminution, is entirely in error. The laws of a subject are necessary to the discipline above it, they challenge and force a mentally more efficient restructuring, but they are not sufficient for the purposes of the discipline. Biology is the key to human nature, and social scientists cannot afford to ignore its rapidly tightening principles. But the social sciences are potentially far richer in content. Eventually they will absorb the relevant ideas of biology and go on to beggar them. The proper study of man is, for reasons that now transcend anthropocentrism, man.