

I-14. Ascertaining Nature's Veracity

[Quarterly Review of Biology, vol. 74, 47-49 (1999). Commentary on: *Consilience: The Unity of Knowledge* by Edward O. Wilson. New York: Alfred A. Knof, 332 pp. 1998.]

For an individual being purpose lies in chance, but the purpose of being as a group does not rely on chance.

Consilience is a strategy for successful behavior and sustainability of groups and societies. Consilience of scientific reasoning is the propensity for deriving conclusions by altogether different means. Distinguishing between more distinct inferences and probable premises (*a priori* or true opinion) forms the basis for establishing knowledge. Through such inquiry one endeavors to find not only the structure behind observations, but also to rationalize the worldviews connoted by the words that describe them. But Menno's question comes in the way of this inquiry: "How will you look for it, Socrates, when you do not know at all what it is?" Numerous solutions have been offered to the various incarnations of the how-do-you-know question, ranging from "anything goes" to game theory and Turing computational procedures.

By way of defining the problem in a 'solvable' way, analytical approaches necessarily build objectives into the starting assumptions. This approach is remarkably useful for tasks ranging from programming artificial intelligence into a computer to understand the intelligence of ants. Grand successes of the analytical worldview championed by physics have established the physical limits of reality. It has come with the conviction that all reality can be sensed, perceived, and interpreted ultimately in energetic terms related to the structure and motion of atoms and molecules. These insights have fundamentally changed the dogmatic and axiomatic view of Truth. On the other hand,

enormous material progress unleashed by physical insights has also led to the glorification of excesses. Narrow interpretations of the analytical approaches gave us bombs to incinerate the globe, misconstrued the survival strategy, and promoted a greed-and-grab mind-set that continues to perpetuate exploitation and war. The battles fought with arms, competition, dogma and *a priori* truths rarely resolve a conflict, let alone provide long-term solutions. The march of this flank of science has left much, if not most, of humanity drowning in information, yet starving for usable wisdom.

In a perverse way, the value of the analytic world-view is that it is value free. This has raised a call for holism and synthesis. Can rational insights and wisdom be obtained within the paradigm of biological reality with which we share some common goals? At a very basic level, evolutionary and survival paradigms connect us. Although the hierarchy and connectivity is based on chemical and molecular processes, it emerges into vast complexity evident in the evolutionary connections of flora and fauna, Gala of the ecological interdependencies, gestalt of Self and Mind, and of course the social, political and economic relations. It is a given, yet can we understand this complexity by starting with the fact that all the necessary information about an organism is in its DNA, and that all its functions are controlled by the gene products?

Having established the physical basis of biology in genes, one may ask how epigenetic variables control this apparently chaotic diversity. Since not a single organism can be described satisfactorily as a protein computer, biological complexity poses a challenge for analytical methods of interpretation; the number of possible variables is apparently too large, and there are too many energetic states to choose a few as a guide. At a very simplistic level, the difficulty is illustrated by frustrated attempts to predict the structure of a protein from knowledge of its sequence. We

know that all the information necessary for the higher-order structure of a protein is intrinsic in the primary sequence of the gene product. Yet we are not able to predict the structure, let alone the function. This is often attributed to a lack of defined criteria for distinguishing the isoenergetic states. In such situations, a response to small perturbations leads to chaotic behaviors that cannot be easily averaged by a single criterion. Mathematics and algorithms describing such states are beginning to emerge, as they mimic certain events or functions, but their predictive power and ability to provide insights into the underlying processes is far from satisfactory.

In this book, Edward O. Wilson guides us through his perception of unity in biological diversity. Since the diversity has emerged from a universal genetic code, the theme of the book is synthesis of an enormous range of human activities determined by epigamic variables. The arguments, although not based on belief and faith, appeal to understanding. A reader not too familiar with the material may get mired in what is said, rather than moving along with what is being said. One may be left with the impression that the search for analytical principles and laws is futile, yet the attempt is really to bridge the chasm between cultures of analytic and synthetic minds. The approach may not be convincing to an analytically inclined reader who seeks prediction and proof, which by necessity require constraining the variables. Yet patience can be rewarding, like a walk in the Delaware marshes, for its variety that imposes a Zen-like continuity. At times, one does get a feeling of communing with "Alef" of Borges, examining the "grain of sand" of William Blake, and peering into "*Indr's* reflective beads" for imaginings that reflect everything else in the self, and the self in everything else. It is an understanding of the continuity that brings us together in our enterprises and survival interests, and it guides us beyond predatory individualism.

Evolutionary and historical continuity in Wilson's arguments are certainly worth pondering. The philosophical premise of the book is that the knowledge of the inquiring self lies in the genetic reality of the physical self in the broader epigenic context. By musing about a broad range of knowledge-related activities the discussion wanders into issues of the human condition with glimpses of the intellectual endeavors and achievements of the last several millennia. The criteria for success of the various methods adopted in this search lies in the sustainability of the results and products. Thus written language, grammar, discourses, logic, mathematics, and physical sciences had their day in the hierarchy of knowledge. Although not necessarily genetic in their origin, such epigenic traces of human activities have orthogonal influences on human behavior. Now the on-going revolution in biology is an integral part of the technological revolution, and its influence on our collective behavior and conduct is an integral part of social discourse.

The challenge of integration of new insights and technological changes makes us ponder our basic precepts and assumptions about the human condition. The underlying process is probably primordial. Individuals, as well as the society at large, must elaborate implications to reconcile the changes until they are ingrained in the collective conscience as the epigenic behavioral trace. By emphasizing a need for consilience of a broad range of human activities, one hopes that, as we learn to live with new knowledge and antecedent technologies, the very biological collective instinct of survival-for-all will prevail. Wilson has also brought back the question of integrating the shifting boundaries of the knowledge base with a call for use of biological wisdom in the use of integrated knowledge. I am sure many deeper issues raised in this book will continue to stimulate discussion well into the next century.

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