

EDWARD O. WILSON

Consilience

THE UNITY OF KNOWLEDGE



VINTAGE BOOKS

A DIVISION OF RANDOM HOUSE, INC.

NEW YORK

THE GREAT BRANCHES OF LEARNING

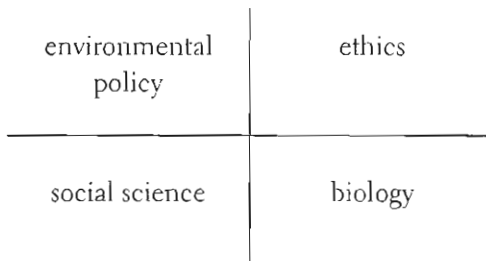
YOU WILL SEE at once why I believe that the Enlightenment thinkers of the seventeenth and eighteenth centuries got it mostly right the first time. The assumptions they made of a lawful material world, the intrinsic unity of knowledge, and the potential of indefinite human progress are the ones we still take most readily into our hearts, suffer without, and find maximally rewarding through intellectual advance. The greatest enterprise of the mind has always been and always will be the attempted linkage of the sciences and humanities. The ongoing fragmentation of knowledge and resulting chaos in philosophy are not reflections of the real world but artifacts of scholarship. The propositions of the original Enlightenment are increasingly favored by objective evidence, especially from the natural sciences.

Consilience is the key to unification. I prefer this word over “coherence” because its rarity has preserved its precision, whereas coherence has several possible meanings, only one of which is consilience. William Whewell, in his 1840 synthesis *The Philosophy of the Inductive Sciences*, was the first to speak of consilience, literally a “jumping together” of knowledge by the linking of facts and fact-based theory across disciplines to create a common groundwork of explanation. He said, “The Consilience of Inductions takes place when an Induction, obtained from one class of facts, coincides with an Induction, obtained from another different class. This Consilience is a test of the truth of the Theory in which it occurs.”

The only way either to establish or to refute consilience is by methods developed in the natural sciences—not, I hasten to add, an effort led by scientists, or frozen in mathematical abstraction, but rather one allegiant to the habits of thought that have worked so well in exploring the material universe.

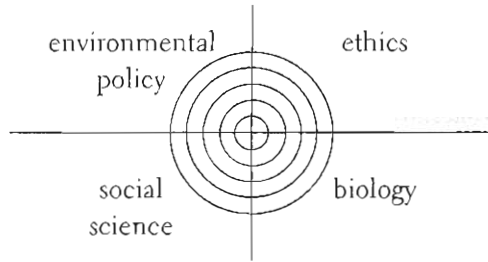
The belief in the possibility of consilience beyond science and across the great branches of learning is not yet science. It is a metaphysical world view, and a minority one at that, shared by only a few scientists and philosophers. It cannot be proved with logic from first principles or grounded in any definitive set of empirical tests, at least not by any yet conceived. Its best support is no more than an extrapolation of the consistent past success of the natural sciences. Its surest test will be its effectiveness in the social sciences and humanities. The strongest appeal of consilience is in the prospect of intellectual adventure and, given even modest success, the value of understanding the human condition with a higher degree of certainty.

Bear with me while I cite an example to illustrate the claim just made. Think of two intersecting lines forming a cross, and picture the four quadrants thus created. Label one quadrant environmental policy, the next ethics, the next biology, and the final one social science.



We already intuitively think of these four domains as closely connected, so that rational inquiry in one informs reasoning in the other three. Yet undeniably each stands apart in the contemporary academic mind. Each has its own practitioners, language, modes of analysis, and standards of validation. The result is confusion, and confusion was correctly identified by Francis Bacon four centuries ago as the most fatal of errors, which “occurs wherever argument or inference passes from one world of experience to another.”

Next draw a series of concentric circles around the point of intersection.



As we cross the circles inward toward the point at which the quadrants meet, we find ourselves in an increasingly unstable and disorienting region. The ring closest to the intersection, where most real-world problems exist, is the one in which fundamental analysis is most needed. Yet virtually no maps exist. Few concepts and words serve to guide us. Only in imagination can we travel clockwise from the recognition of environmental problems and the need for soundly based policy; to the selection of solutions based on moral reasoning; to the biological foundations of that reasoning; to a grasp of social institutions as the products of biology, environment, and history. And thence back to environmental policy.

Consider this example. Governments everywhere are at a loss as to the best policy for regulating the dwindling forest reserves of the world. There are few established ethical guidelines from which agreement might be reached, and those are based on an insufficient knowledge of ecology. Even if adequate scientific knowledge were available, there would still be little basis for the long-term valuation of forests. The economics of sustainable yield is still a primitive art, and the psychological benefits of natural ecosystems are almost wholly unexplored.

The time has come to achieve the tour in reality. This is not an idle exercise for the delectation of intellectuals. How wisely policy is chosen will depend on the ease with which the educated public, not just intellectuals and political leaders, can think around these and similar circuits, starting at any point and moving in any direction.

To ask if consilience can be gained in the innermost domains of the circles, such that sound judgment will flow easily from one discipline to another, is equivalent to asking whether, in the gathering of disciplines, specialists can ever reach agreement on a common body of abstract principles and evidentiary proof. I think they can. Trust in consilience is the foundation of the natural sciences. For the material world at least, the momentum is overwhelmingly toward conceptual unity. Disciplinary boundaries within the natural sciences are disappearing, to be replaced by shifting hybrid domains

in which consilience is implicit. These domains reach across many levels of complexity, from chemical physics and physical chemistry to molecular genetics, chemical ecology, and ecological genetics. None of the new specialties is considered more than a focus of research. Each is an industry of fresh ideas and advancing technology.

Given that human action comprises events of physical causation, why should the social sciences and humanities be impervious to consilience with the natural sciences? And how can they fail to benefit from that alliance? It is not enough to say that human action is historical, and that history is an unfolding of unique events. Nothing fundamental separates the course of human history from the course of physical history, whether in the stars or in organic diversity. Astronomy, geology, and evolutionary biology are examples of primarily historical disciplines linked by consilience to the rest of the natural sciences. History is today a fundamental branch of learning in its own right, down to the finest detail. But if ten thousand humanoid histories could be traced on ten thousand Earthlike planets, and from a comparative study of those histories empirical tests and principles evolved, historiography—the explanation of historical trends—would already be a natural science.

The unification agenda does not sit well with a few professional philosophers. The subject I address they consider their own, to be expressed in their language, their framework of formal thought. They will draw this indictment: *conflation, simplism, ontological reductionism, scientism*, and other sins made official by the hissing suffix. To which I plead guilty, guilty, guilty. Now let us move on, thus. Philosophy plays a vital role in intellectual synthesis, and it keeps us alive to the power and continuity of thought through the centuries. It also peers into the future to give shape to the unknown—and that has always been its vocation of choice. One of its most distinguished practitioners, Alexander Rosenberg, has recently argued that philosophy in fact addresses just two issues: the questions that the sciences—physical, biological, and social—cannot answer, and the reasons for that incapacity. “Now of course,” he concludes, “there may not be any questions that the sciences cannot answer eventually, in the long run, when all the facts are in, but certainly there are questions that the sciences cannot answer *yet*.” This assessment is admirably clear and honest and convincing. It neglects, however, the obvious fact that scientists are equally qualified to judge what remains to be discovered, and why. There has never been a better time for collaboration between scientists and philosophers, especially where they meet in the borderlands between biology, the social sciences, and the humanities. We are approaching a new age of synthesis, when the testing of consilience is the greatest of all

intellectual challenges. Philosophy, the contemplation of the unknown, is a shrinking dominion. We have the common goal of turning as much philosophy as possible into science.

IF THE WORLD really works in a way so as to encourage the consilience of knowledge, I believe the enterprises of culture will eventually fall out into science, by which I mean the natural sciences, and the humanities, particularly the creative arts. These domains will be the two great branches of learning in the twenty-first century. The social sciences will continue to split within each of its disciplines, a process already rancorously begun, with one part folding into or becoming continuous with biology, the other fusing with the humanities. Its disciplines will continue to exist but in radically altered form. In the process the humanities, ranging from philosophy and history to moral reasoning, comparative religion, and interpretation of the arts, will draw closer to the sciences and partly fuse with them. Of these several subjects I will say more in later chapters.

I admit that the confidence of natural scientists often seems overweening. Science offers the boldest metaphysics of the age. It is a thoroughly human construct, driven by the faith that if we dream, press to discover, explain, and dream again, thereby plunging repeatedly into new terrain, the world will somehow come clearer and we will grasp the true strangeness of the universe. And the strangeness will all prove to be connected and make sense.

In his 1941 classic *Man on His Nature*, the British neurobiologist Charles Sherrington spoke of the brain as an enchanted loom, perpetually weaving a picture of the external world, tearing down and reweaving, inventing other worlds, creating a miniature universe. The communal mind of literate societies—world culture—is an immensely larger loom. Through science it has gained the power to map external reality far beyond the reach of a single mind, and through the arts the means to construct narratives, images, and rhythms immeasurably more diverse than the products of any solitary genius. The loom is the same for both enterprises, for science and for the arts, and there is a general explanation of its origin and nature and thence of the human condition, proceeding from the deep history of genetic evolution to modern culture. Consilience of causal explanation is the means by which the single mind can travel most swiftly and surely from one part of the communal mind to the other.

In education the search for consilience is the way to renew the crumbling structure of the liberal arts. During the past thirty years the ideal of the unity

of learning, which the Renaissance and Enlightenment bequeathed us, has been largely abandoned. With rare exceptions American universities and colleges have dissolved their curriculum into a slurry of minor disciplines and specialized courses. While the average number of undergraduate courses per institution doubled, the percentage of mandatory courses in general education dropped by more than half. Science was sequestered in the same period; as I write, in 1997, only a third of universities and colleges require students to take at least one course in the natural sciences. The trend cannot be reversed by force-feeding students with some-of-this and some-of-that across the branches of learning. Win or lose, true reform will aim at the consilience of science with the social sciences and humanities in scholarship and teaching. Every college student should be able to answer the following question: What is the relation between science and the humanities, and how is it important for human welfare?

Every public intellectual and political leader should be able to answer that question as well. Already half the legislation coming before the United States Congress contains important scientific and technological components. Most of the issues that vex humanity daily—ethnic conflict, arms escalation, overpopulation, abortion, environment, endemic poverty, to cite several most persistently before us—cannot be solved without integrating knowledge from the natural sciences with that of the social sciences and humanities. Only fluency across the boundaries will provide a clear view of the world as it really is, not as seen through the lens of ideologies and religious dogmas or commanded by myopic response to immediate need. Yet the vast majority of our political leaders are trained exclusively in the social sciences and humanities, and have little or no knowledge of the natural sciences. The same is true of the public intellectuals, the columnists, the media interrogators, and think-tank gurus. The best of their analyses are careful and responsible, and sometimes correct, but the substantive base of their wisdom is fragmented and lopsided.

A balanced perspective cannot be acquired by studying disciplines in pieces but through pursuit of the consilience among them. Such unification will come hard. But I think it is inevitable. Intellectually it rings true, and it gratifies impulses that rise from the admirable side of human nature. To the extent that the gaps between the great branches of learning can be narrowed, diversity and depth of knowledge will increase. They will do so because of, not despite, the underlying cohesion achieved. The enterprise is important for yet another reason: It gives ultimate purpose to intellect. It promises that order, not chaos, lies beyond the horizon. I think it inevitable that we will accept the adventure, go there, and find out.