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The Evolution of Science

When scientific scholarship is compared with scholarship in other fields, or with the arts, it sometimes appears to be distinguished by an important difference of kind. It seems to be additive in nature, to grow as the sum of facts accumulated by a multitude of workers and piled up from generation to generation like the fabrication, brick by brick, of some massive wall. Other kinds of scholarship, and the arts, do not seem to be cumulative in precisely the same sense. This distinction, indeed, has an element of validity. As discoverer, collector, and arranger of new facts about the world, science is indeed an activity of accumulation—sometimes even of simple summation. And when one looks at the explosive rate at which that activity has accelerated in our own nation and over much of the globe since the second world war, it is tempting to regard accumulation as a preeminent characteristic of scientific endeavor.

But if this additive and cumulative aspect of scientific scholarship were a true measure of its inner structure, the concepts of our universe would have changed in no such dynamic way as they have even over the last two decades. In a profound sense, the structure of science is no more that of an assemblage of facts, brought together in simple additive arrays, than is the living body a simple assemblage of cells, coexisting without interaction or integration. Rather, like a living body, the body of scientific scholarship is a highly organized entity. Its multifarious parts, to be sure, are sometimes so diverse and so separated in their various specializations that it is often difficult to recognize them even as components of any organized whole. Yet so long as the parts are developing dynamically, the essence of an integrated relationship is maintained through the whole vast structure of science. The intensity or the importance of the reaction of one part of the body on another seemingly far distant can never be foreseen, from one year to the next or even, sometimes, literally from day to day. But it is a permanent potential of health and vigor.

Furthermore, this interlocked character of scientific scholarship, across fields and over generations of workers, makes it far more than simply a static organic whole. In a very real sense it is a living and evolving organism. Its growth over three centuries has been marked, as in so much of actual organic evolution, by movement from the simple to the vastly more complex and at the same time by a correlated knitting and integration, transforming initially loose assemblages of hypothesis and theory and fact into more tightly woven, more inclusive, more efficient—and often superficially more simple—tools to achieve new orders of understanding.

As in organic evolution, moreover, the evolution of science is irreversible. In any literal sense, scientific scholarship can never go back. One thing must follow another: it cannot precede it. Without the work of Newton, the work of Einstein would have been impossible; even if it had been accomplished, it would have been irrelevant to the stream of our understanding. Science will continue to evolve and a deeper unity will be found among its parts. There will be many instances not only where specific information gained in one area will prove directly relevant in very different ones, but where major conceptual structures too will be found to underlie fields apparently very disparate.

[Adapted from the "Report of the President," by Caryl P. Haskins, *Carnegie Institution of Washington Yearbook 63*, 1963–64 (Washington, D.C., 1965)]