Not everyone is celebrating this year's fiftieth anniversary of Watson and Crick's achievement: the deciphering of the double helix structure of DNA. To some, the molecular biology of DNA is a symbol of the much-despised, modern, Western, reductionist science that is blamed for every conceivable ill from imperialism and male domination of women to environmental degradation.

**Break It Down, Build It Up**

In spite of the vast array of benefits that the world has derived from science (and technology), its critics denounce it by a number of pejoratives, such as "logophallocentric," that have little meaning except to the critics. Instead of science, we are offered postmodernist nostrums about the equivalence of various forms of inquiry such as holism, deep ecology, or "local knowledge." No "privileged" status is to be given to science and the scientific method.

Modern science is admittedly reductionist in many ways. The inquiry into cell structure that went on for three centuries, climaxing with the double helix discovery, was reductionist, analyzing ever-smaller units and using chemistry or physics to understand life processes. This does not mean however, that there was ever a prevailing view that all life should be understood entirely by physics or chemistry. Studying organisms at the molecular level has never precluded studying them at higher levels and integrating those higher levels into a truly holistic understanding but so-called holistic theories that are not founded on a base of reductionist facts are illusions and evaporate on any close examination. However aesthetically satisfying and politically correct such "holistic" theories may be, they simply lack the problem-solving capability that is the legacy of modern science and technology.

**History of Achievement**

"Reductionist" science and technology have played a critical role in advancing the life sciences and laying the basis for the discovery of the structure of DNA:

In the seventeenth century, the microscope allowed Hooke and van Leeuwenhoek to discover cubicles or cells in animal and plant bodies.

In the latter half of the nineteenth century, chemists such as Johann Friedrich Miescher were laying the foundation for the creation of molecular biology. Physicists played an important role in founding molecular biology.

Albrecht Kossel analyzed the cell nucleus and discovered the purines, adenine (A) and guanine (G), and the pyrimidines, cytosine (C) and thymine (T), in DNA.
William Henry Perkin's accidental discovery of the aniline dye color, mauve, in 1856 "changed the world," as one biographer put it, by creating a stain for slides in microscopes.

In a period from about 1878 to 1906, twenty of the microorganisms that were long the scourge of humankind were identified, and powerful drugs to combat them were developed over the next several decades.

In 1928, Frederick Griffith published an article on his work with bacteria in which he presented the first indication that nucleic acid carried the information for inheritance, or the "transforming factor," as he called it. Following in his footsteps, others confirmed the role of nucleic acid in the inheritance of traits in bacteria, and then the crucial role of A, G, C, and T combinations.

The x-ray-diffraction experiments of Franklin and Wilkins provided the final crucial step in paving the way for Watson and Crick.

The history of discovery leading up to Watson and Crick's double helix revelation is one of gradual, piecemeal contributions to knowledge, and an ever-broader group of scientists will continue to contribute to progress by adding bit-by-bit to the discovery process, not by abandoning it for some illusory, unscientific "holism." The structure of life and its functioning as understood by modern molecular biologists is far more complex, intricate, and detailed than ever imagined by "holistic" critics of "reductionist science."

In addition to their theoretical beauty, reductionist understandings are of practical value, leading to the creation of pharmaceuticals and improved foodstuffs, doubling life expectancies and making us healthier. Indeed, one of the primary reasons that medicine is becoming ever more effective is that it is becoming ever more specific in its targets; toxic or other adverse side effects are less likely as medicine becomes less "holistic." For instance, pharmaceuticals are being designed to use the body's peptide "zip codes" to seek out cancerous cells in a process called "molecular targeting," enabling us to interfere with cancer cells' reproduction without disrupting normal cells.

**A Note on "Eurocentrism"**

Criticism of modern science as "reductionist" often carries with it a belief in the victimization by science of women, the underprivileged, and ecosystems. Meera Nanda has suggested the opposite may be closer to the truth: awareness of DNA can be liberating. Nanda suggests it would be "interesting" to see the reaction of "untouchables" in India to the "knowledge that DNA material...has the same composition in all living beings, be it Brahmin or bacterium."

"Reductionist science" is a powerful argument against racial prejudice and bigotry of all kinds. Racial and gender prejudice are traditions of long standing in most cultures; the "local knowledge" touted by the postmodernists is not a cure for that prejudice but the basis of its perpetuation. Perhaps the theme song of this fiftieth-anniversary celebration should be (with apologies to the late Bob Marley): "one DNA...let's get together and be all right!"

The centuries of inquiry leading up to the double helix in some sense fits the postmodernist stereotyping of "Western" science, since it was largely carried out by white, northern-European and North American males. But today, a tour of the world's great research labs, including those in the United States, reveals that the old "Eurocentric" cohort is a shrinking one in most of them. For
a short time, Europe's technological advantage gave it the edge in scientific discovery, but science and its benefits now belong to the world as a whole, regardless of what the postmodernists say.

The Complexity of the Reductionist View

We live in a complex world, and however reductionist a theory may appear to be, it must generate and explain complexity and diversity to gain acceptance. Specificity and reductionism in science have been achieved precisely because researchers are aware of layers and layers of complexity and seek to understand it by gathering ever more detailed data. Little evidence is required for grand and often simplistic "holistic" theories and few useful predictions or discoveries come from them though their advocates insist on using them to describe the world. Few ideas in modern thought are more "reductionist" in the sense of absurdly oversimplifying things than the oft-repeated assertion that modern science is mere reductionism and thus fails to explain the world.