Book Reviews

Art as Response to Science

Behind Appearance. A Study of the Relations between Painting and the Natural Sciences in This Century. C. H. WADDINGTON. M.I.T. Press, Cambridge, Mass., 1970. xii, 258 pp., illus. (71 color plates and 136 black-and-white illustrations). $25.

When a biologist renowned for his understanding of developmental processes issues a testament to his lifelong love of art he directly confronts the caricature of the laboratory scientist as culturally impoverished and so absorbed in austere contemplation as to be forever lost to other mortals. Conrad Waddington has been an intimate friend of numerous artists and has gained a wide knowledge of 20th-century art. At the noisy, crowded opening of an art exhibit he is as much in his element as he is at a genetics congress. He has written an informative survey which may be strongly recommended as an introduction to modern painting, especially for readers whose education has centered upon the sciences. As the discourse proceeds, from robust appreciation of the erotic to urbane philosophical commentary, a reader's admiration may be expected to deepen. This book's first importance is as a major document of humane accomplishments that add lustre to the scientific career and testify to its potential for cultural involvement.

Charles Darwin, in his later years having become a recluse in a country village, found Shakespeare "so intolerably dull that it nauseated me. I have also almost lost any taste for pictures or music." Waddington quotes these remarks, but the stereotype they suggest is only partly true. Elsewhere in the same passage Darwin professed a continuing love for novels, especially if a pretty woman was portrayed, and recalled the great pleasure he had formerly taken in poetry. Darwin's sense of the dynamic profusion of ecological processes may have been grounded in this same esthetic faculty. The prose imagery in *The Origin of Species* suggests that visual metaphors played a primary role in Darwin's apprehension of evolutionary interactions. The importance of visualized patterns and positional rules in developmental biology perhaps helps to account for the deep interest shown in the visual arts by Waddington, a keen-eyed pioneer explorer of the epigenetic landscape.

Waddington concedes that the primary aim of the visual arts may be to portray and communicate subjective sensations and social comment. In this book he addresses himself to what might be considered a residual or ancillary aspect of works of art—their capacity to portray physical reality—and asks whether reality as conceived by scientists may lie behind such appearances in works of art. He has come to believe that scientific concepts have been one of the major influences on the course of modern painting. Such a belief may be expected to provoke objections, which Waddington's exposition does a great deal to anticipate and overcome.

Has not the tendency of modern painting been toward unrestrained expression entirely unrelated to the findings of the exact sciences? Waddington opens his book with a description of Cubism as an effort to expand upon ordinary sense data by portraying an object in several planes of vision, fostered in part by the widening gap between physical science and the commonsense view of reality. He convincingly shows that several artists believed that they had accounted for their work in regarding it as the expression of modern scientific concepts. But was that a process of rationalization after the fact? Can it be shown that changed scientific concepts of matter and space were the primary influence in the origin of nonrepresentational art? I think it not unfair to Waddington to avow that one simply does not know. But if the artists wish to acknowledge a relationship it had better be defined, which is what the book as a whole aims to do.

Doesn't painting celebrate the artist as a romantic figure, in contrast to the destructive technologist? On the contrary, one of the manifestos of Futurism waxed lyrical about "the beauty of speed . . . the nocturnal vibration of the arsenals . . . bridges leaping like gymnasts." Reproductions of works by Stuart Davis and Fernand Léger demonstrate their rapport with the mechanical environment of the machine age. The artists and designers associated with the Bauhaus mounted a very complex effort to devise an environment incorporating advanced technology in patterns responsive to human needs. The empty and threatening spaces of Giorgio di Chirico's compositions are interpreted as pessimistic comments upon this same theme. While Waddington mentions works, such as those of Erni, that directly portray the content and process of science, he deems this interpretation to be naive, quoting the French painter Hans Hartung:

> I have a horror of people who try to depict astronomical or physical facts, that's a new kind of representation which hasn't any sense. If these things penetrate into your spirit, if they take part in the formation of your thought, well and good. But if anyone sets himself to paint the microbes he sees down the microscope—he would do better to paint the pretty girls in Montparnasse or Montmartre.

Waddington considers the Surrealists to represent a magical tradition of subjective, invented images, making "no attempt" to draw upon modern science. He praises Jean Arp for his sense of immanent orderliness within nature but is reluctant to suppose that the curvilinear forms which are so predominant in his works, as well as those of Kandinsky, Miró, Wols, Tanguy, and others, may reflect indebtedness to the biological concept of organic form. In many of Paul Klee's compositions I think I find references to biological structures such as growth layers in plants. To Waddington Klee's paintings seem "not to be related to scientific analysis" but are instead exercises in pure form and symbolic expression. His reluctance to credit a biological origin perhaps reflects his judgment that artists rarely if ever copy scientific illustrations directly. This should not, I would observe, rule out indirect influence. But how can one know what to make of putative resemblances between elements in nonrepre-

sentational painting and the virtually limitless visual armory of modern science? Is there not a risk of arbitrariness? One recalls the dialogue between Hamlet and Polonius over the shape of a cloud, in which the latter agreed in turn that it resembled a camel, then a weasel, and then a whale. Without a simple, direct link between the formulations of science and the accomplishments of artists, no specific referent can be singled out for an abstract painting or the motifs within it. This question can only be resolved by an effort to situate science and art in a larger frame of reference within a concept of culture, which Waddington has made a noteworthy effort to do.

What is the view of science that Waddington urges his readers to take? He describes two styles of inquiry or, if you like, subcultures within science. The first is suggested by Eddington's statement that "the nature of the external world is inscrutable" and that science therefore consists only of such relationships as may be discovered in a smaller domain of measurable regularities. The second, exemplified in the treatise on the psychology of invention by the French mathematician Hadamard, maintains that the intelligence subconsciously conforms itself to reality, yielding insights to the scientist. As Waddington puts it, "Are scientists merely soulless men in white coats, good at recording pointer readings? Or are they some peculiar form of poet, whose unconscious mind throws up to them from time to time some unforeseeable but penetrating notion about the nature of existing things?" Waddington cites James Watson's adoption of the double helix as an instance of the latter procedure, adducing Whitehead's term, "perception by causal efficacy." He concludes that the mental elaboration of visual experience is the primary creative activity of science. Analytical diagrams of relationships and complex images to be resolved visually into patterns are characteristic working materials in key fields of contemporary science, which become increasingly concerned with systems of organization.

Waddington suggests that science entered a new era about 20 years ago in coming to address higher orders of complexity. And it was this transformation of the sciences, he contends, that caused paintings to change so drastically after the Second World War. The new painting demolished the coherent motif just as the new science passed by fixed objects of inquiry in favor of complex relationships. DeKooning and Pollock presented works without a single focus, restless vortices of action and energetic expression. He says of Pollock's "Autumn Rhythm" (1950) that

> [It] is not only the winter twigs of a forest against the sky, it is not only the veins of a heap of dead leaves whose substance has vanished; it could be the electrons buzzing around the atomic nuclei of a complex molecule, or the stars slithering along their orbits in the galaxy. You can see in it a macrocosm or a microcosm: the landscape of withered grass stems you would see if you lay flat on a winter meadow and looked through the eyes of an ant, the hair of the Virgin Mary falling over the crib of the infant Jesus, the whips of the Fates scourging man through the universe . . . the interconnection of everything with everything else, the flickering surface of evanescent thoughts just below the threshold of consciousness. You can explore it in a search for whatever you may bring with you to find.

Among numerous excellent discussions of individual artists Waddington's treatments of Pollock, Dubuffet, and Giacometti are the best, and the plates are especially well presented. In my judgment his exposition of their sense of contingency and texture sustains his argument that they are expositors of a new landscape of scientific thought. It is not that they have copied from technical journals. Rather they have reacted sensitively to concepts of reality of which they may have been only partly aware, through cultural linkages that may be highly tenuous and hard to trace. One of the most valuable sections of the book consists of a description of 11 attributes held to be characteristic of modern painting, each of which finds its counterpart in some aspect of modern science. The cumulative effect of Waddington's argument is to lend credence to the belief that artists have responded to scientists' experiences of reality in many important ways.

In an essay on art and science the Russian-born artist Naum Gabo wrote:

> [It is] a fallacy to assume that the aspects of life and nature which contemporary science is unfolding are only communicable through science itself . . . that would be to confine science and scientists to a new species of sorcerers, producing miracles which they alone can do and to which the mortal common man has no access unless he is initiated.

Waddington confirms the hope that the communication skills and empathy of artists may be enlisted in breaking the spell. Unremitting in honesty and beautiful to contemplate, scientific concepts may be given communicable form through the sensitive responses and expressive gifts of artists. A final service which Waddington performs in this distinguished and important book is to remind educators and other erstwhile well-wishers of the public understanding of science that they have too long ignored the arts, a social dimension of science that can reach the minds and touch the hearts of men where the feeble apparatus of publicism has so sadly failed.

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Report on the State of the Life Sciences

Biology and the Future of Man. PHILIP HANDLER, Ed. Oxford University Press, New York, 1970. xxiv, 936 pp., illus. $12.50.

François Arago (1786–1853), astronomer, mathematician, physicist, member of the French Academy at the age of 23, and later its permanent secretary —a post, *mutatis mutandis*, equivalent to that now occupied by Philip Handler as president of the National Academy of Sciences—once defined the life road of a scientist, which underlies the book under review. To be sure, there are piquant differences between Arago and Handler. The former was not only a scientist but also a political leader; he was head of the French Republican party (not to be confused with the U.S. party of the same name) and became navy and war minister in the provisional government of the second French republic after the 1848 revolution. Be this as it may, Arago's dictum may well form an epigraph to the book under review: "Connaître, découvrir, communiquer, telle est la destinée d'un savant."

A blue-ribbon committee of 175 distinguished American scientists (containing, curiously enough, only two of the U.S. Nobel laureates in biology) was convened in 1966 to work on some 20 panels in order to fulfill the third of Arago's functions of scientists; their task was to provide a "pithy summary" of the status of specific subfields in biology, to visualize trends for tomorrow, to identify promising areas, methods of