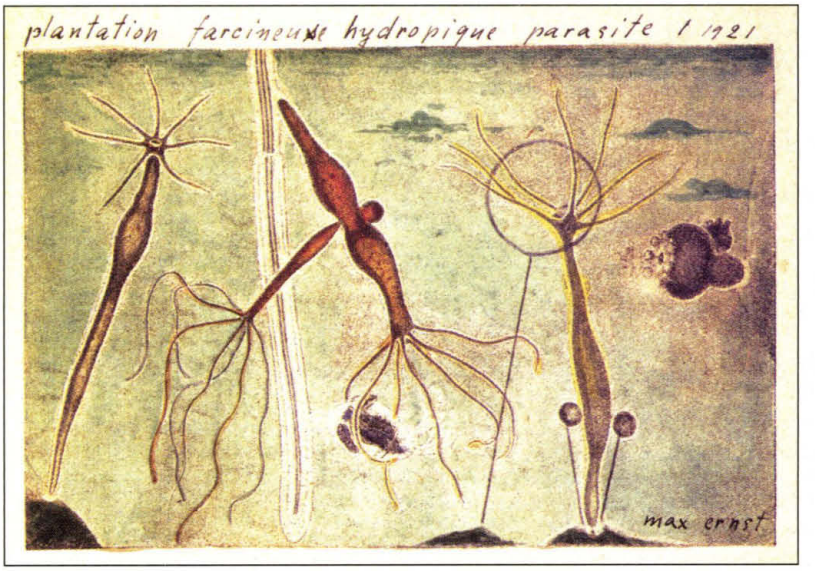
BOOKS: ART

Swept Into the Modern Along with Science

Ezra Shahn

Lynn Gamwell's *Exploring the Invisible: Art, Science, and the Spiritual* is an extremely handsome and well-produced volume. Just opening the book and thumbing the pages gives its own sort of pleasure. The juxtaposition of text and reproductions (simply calling them illustrations might not be quite fair) invites the eyes and mind to wander. In a sense, then, the book is itself a work of art. And as a work of art, although it may have a message, it is not intended just to be read but also to be studied.

The message appears in the first two sentences of the Introduction: "Mystery has shrouded abstract art since it emerged in the late nineteenth century. Where did it come from?" The idea that an answer will be forthcoming (one intimated by the title) is both the promise and the premise of the book. The work's significance, however, goes beyond the author's suggestion that a long-standing mystery will be solved. To the American reader, brought up on decades-long misunderstanding of C. P. Snow's Rede Lecture *The Two Cultures* (*1*), there is a bias to the effect that art and science are disparate and possibly irreconcilable. Of course, that was not Snow's message. He was describing and criticizing the educational system of England in the 1950s; in his view, the majority of people going into policy-making positions in government were being forced to choose too early in their lives between "the arts" and "the sciences." But on this side of the Atlantic, we read Snow as meaning there really were two cultures, and thus any coming together was seen as both radical and commendable. In the past dozen years or so, a number of books with the dialectically opposed words "science" and "art" in their titles have been published. There is almost a movement to bridge the chasm—or to show that it does not, and possibly never did, exist.



Surrealist biology. Max Ernst used science images in a series of collages that he labeled with absurd technical terms, such as *Boophilic Plantation of Hyberborean Ultramarine* (circa 1921).

Exploring the Invisible
Art, Science, and the Spiritual
by Lynn Gamwell

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So, how is this book different from all the others? That's not really the right question; answering it would require a thorough comparative discussion, one far beyond the scope of this review. Instead, it is appropriate to lay out the goals and plan of *Exploring the Invisible*. As noted, Gamwell limits the book to abstract art. She actually starts in the early part of the 19th century and then follows an organization based on "the history of modern science, tracing the major questions that have driven scientists and discussing related developments in the art world." Gamwell unfolds the story in 13 chapters, which emphasize such topics as the science of color, the emergence of a scientific geology, evolution, the human mind, Einstein's relativity, the expanding universe, and the nature of the atom. In each chapter, she includes reproductions of representative works of art that are visually related to the science in question. She strengthens the association between these images and science through references to the artist's writings and to artifacts of contemporary culture. Many of these images are so familiar that identifying them by name will provide a glimpse of the breadth of coverage. There are clouds by Constable, a *Starry Night* by van Gogh, Eakins' portrait of Rowland, Seurat's parkscapes, samples of Cézanne's views of Mont Sainte-Victoire, and Munch's *Scream*; selections by Miró, Dali, Bracque, Picasso, and Brancusi; and a painting by Ernst that looks like the work of Bosch. Selections from Haeckel's drawings and illustrations from a 1923 physics text show that images were on the minds of the scientists as well. Gamwell also includes works by many lesser known artists and researchers.

Gamwell, the director of the Art Museum at Binghamton University, New York, is an art historian who now teaches the history of science at New York's School of Visual Arts. Her truly ambitious undertaking clearly goes beyond the examination of a single discipline (chemistry) or coherent domain (optics) of science or of a single movement in art. When all is said and done, Gamwell succeeds in making her case that the science, the culture, and the art move and change together. Whether this is the same thing as answering the question "Where did abstract art come from?" is another matter. That issue depends on one's criteria for distinguishing between causality and correlation. As a student and teacher of science who has looked at art for many years, I find the associations Gamwell highlights interesting and the wealth of detail she has uncovered fascinating, but I am not persuaded that she has found a cause.

In part, I am reluctant to accept Gamwell's interpretation because the bases for her selection of both the science and the art—a necessary task in this sort of work—are not obvious. Although I cannot fully address the issue of selection, I want to mention briefly my reaction to her presentation of science. One problem is that Gamwell's narration includes frequent errors of fact and anachronisms. An example of both occurs early on when, in discussing the clockwork view that opened the 18th century, she writes

> In Newton's mechanical worldview everything is made of matter, which is inert and does not move unless acted upon by a

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force, such as gravity. Matter in motion follows strictly deterministic laws of cause and effect. In order to make room for free will and creative thought in this billiard-ball universe, the seventeenth-century French philosopher René Descartes posited that the human soul (the mind) is not material but spiritual; it exists outside the body and is independent of it.

This account bothers me for two reasons. Newton's first law (a hand-me-down from Galileo, actually via Descartes) says that bodies in motion will remain in motion; forces will change their type of motion but are not needed to initiate motion or cause it to continue. Gamwell seems to have attached Newton's name to what is essentially an Aristotelian view. Also, if read uncritically, one could easily conclude that Decartes' dualism was in some sense a response to Newton's mechanics; that Descartes views preceded Newton's (he died when Newton was eight) is not a necessary part of the story, but does make this interpretation problematical. Other examples of bothersome statements can be found throughout the book. Although I feel the author did a better job of summarizing the life sciences than the physical sciences, putting all of this between two covers is no mean undertaking.

Gamwell clearly shows that as science made advances (that, in retrospect, can be identified), the interpretations of these advances in different countries were surprisingly varied. She documents this variety with regard to evolution, the concept of the mind and its relation to science, and relativity. These are not new stories, but having them laid out all in one place for a nontechnical audience does provide a service to the broad field of cultural history. (Her conclusion has a long-standing history, which is not and should not be part of the book. In our haste as teachers to present science as a continually progressive endeavor, these national interpretations of science are often ignored, if not actively suppressed.) Gamwell also shows that the popularizations of the scientists' work made available to the general public through publications and expositions were both reflective of the country of origin and significant. I found this part of her story less familiar and equally valuable. And, having also demonstrated that artists in these different countries were engaged by the popularizations, she shows how the disparate interpretations of science found their way to canvases, sculptures, and several less traditional art forms. This theme may be a corollary of her major thesis, but in accounting for the different national manifestations of artistic movements I think that Gamwell has gone beyond her promised goal.

In following these stories as the theme is developed and repeated in each chapter, I had the feeling that frequently the popularizations cited as the cultural manifestations of the science somehow missed—and maybe still miss—the point and major achievements of the science. Thus, physicists' distinction between longitudinal (sound) and transverse (light) waves is usually ignored in an attempt to find similar modes of representation. Or, while relativity says "everything is relative" (there is no preferred frame of reference), it also demands that the speed of light be constant and constrains the form of physical laws. And the uncertainty principle is not the common notion that "nothing is knowable," rather it places a limit on what we can know. Also, although nerves conduct electrical signals, making a neural system analogous to a set of wires ignores the facts of refractory periods and synapses that wires do not have. Last, at the turn of the 20th century, biologists were not all of one mind regarding either evolution or genetics. The field biologists saw continuous gradations in natural populations while their lab-based colleagues saw discrete changes in pure-bred strains.

Superposed on a more classic view. Ben Shahn included stars, constellations, and faux representations of Einstein's equations in this sketch for an uncompleted mural.

Of course the popularizations were the visible part of the science, even (or especially) the science dealing with the invisible. Indeed, this had been the case at least since science moved from converting a heliocentric model of the planetary system into a geocentric one (Copernicus) to expressing significant findings in the form of laws (Galileo and Kepler). These laws could not themselves be seen, although observation and experiment could confirm them. But they were still basically descriptive. Newton's contribution of explanation via derivation only made the center of science (still mechanics and astronomy) more abstract, as did the next advances, which restructured the science in terms of energy. So, before the material objects of scientific study became either too large (astronomically) or too small (cells and atoms) to be seen with the unaided eye, the focus or intellectual substance of these disciplines had become invisible to all but the front-line investigators. Gamwell quotes Schrödinger's dictum, "If you cannot—in the long run—tell everyone what you've been doing, your doing has been worthless." Following that precept, both scientists and their popularizers have tried to use everyday language to describe concepts that are clearly anything but everyday. They have often come close in the process, but (perhaps of necessity) have missed the mark. Whereas the artists, concerned with reflecting on and reflecting their individual societies and their societies' concerns, have worked with what was available. I believe that this is the interaction Gamwell successfully documents.

In the later chapters, Gamwell goes beyond the considerations of art and science to which I have limited myself above. I do not feel on solid ground in trying to evaluate her development of a concept of the spiritual. She summarizes and describes contemporary movements—or fads? it may be too soon to tell—in art and in the verbal arenas of philosophy and theology as well as their relation to studies and theories in psychology and neuroscience. I found her discussion to be anecdotal and overly focused on individuals. As before, she demonstrates instances of influence or even inspiration, but it is hard to generalize from these.

Having developed a background of a continually changing world of scientific accomplishment and understanding, Gamwell convincingly demonstrates that artists do not operate in an intellectual vacuum. Indeed, the intellectual lives of the sample she presents in *Exploring the Invisible* are extremely full. And, as artists have always been free to refer to any aspect of their intellectual heritage, so they have continued to find inspiration and rationalization from philosophy, literature, and theology of the past and the present in addition to their everyday life surroundings, including science. Thus, to the extent that our world is more abstract, so too is the art it produces, for despite their individuality, artists and scientists are both part of and participants in the same society.

References

1. C. P. Snow, *The Two Cultures and the Scientific Revolution* (Cambridge Univ. Press, Cambridge, 1959).