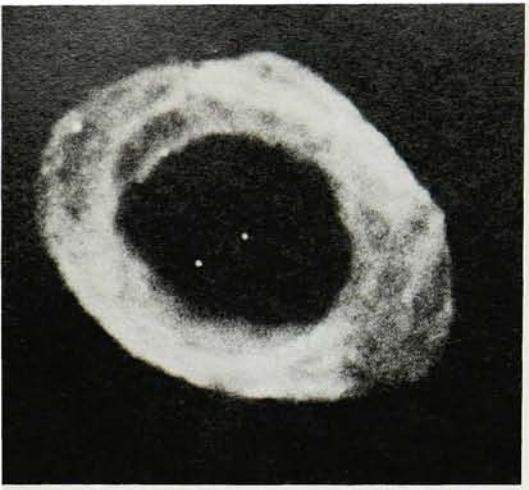


THE RING NEBULA is a slowly expanding mass of gas that is ejected by the central star.

quently reliable identifications between radio sources and faint optical objects became possible. It now appears that most radio sources are associated with distant, rather luminous galaxies. The power at which the more intense radio galaxies emit radio radiation is 10^{44} ergs/sec. The sizes of the emitting volumes are up to a million light years across; the ages of the galaxies must thus exceed 10^6 years, corresponding to a total output of 10^{58} ergs or more. The observed linear polarization again suggests that the radiation is due to the mechanism of synchrotron radiation.

The energy of the relativistic electrons responsible for the radio emission will be converted only partly into synchrotron radiation because of other energy losses. Thus it is not surprising that estimates for the total relativistic-particle content of radio galaxies run up to 10^{60} ergs or more, corresponding to the rest-mass energy of 10^6 solar masses. The ultimate source of this energy and the way in which it is converted into relativistic particles is still unknown, but in some radio galaxies there are indications that much of it is generated in the galactic nucleus.

X rays from the radio galaxy M87 have been discovered during the past year. It thus appears that radio sources and x-ray sources are aspects of one physical phenomenon. Present x-ray detector sensitives and resolutions are about equivalent to those of radio-astronomical instruments 20 years ago. Much progress can be expected in the near future.

About five years ago the quasistellar objects were added to our inventory of the universe. These very blue star-like objects are sometimes associated with radio sources with small angular-diameter components. Last year some groups in Canada and in the US succeeded in building transcontinental radio interferometers and have established upper limits of less than 0.01 sec of arc for some objects. The optical spectra of the quasistellar objects show nebular emission lines that have large red shifts with respect to the laboratory wavelength and, in some cases, also absorption lines whose precise nature is still nuclear. Some investigators hold that these red shifts are associated with the expansion of the universe, thus indicating that the quasistellar objects are distant, overluminous, highly condensed radio galaxies. Others believe that the red shifts have a different interpretation and that we deal here with an entirely new class of objects. In either case the release of energy per unit volume is large, thus straining existing theories to the breaking point. Some investigators believe that further studies of these objects may teach us fundamentally new things about the universe.

Among the many other areas of spectacular progress I shall just mention the development of theories of spiral structure in galaxies, the advances in our knowledge of galactic structure and evolution, and the discovery that an isotropic (probably thermal) radiation field permeates the universe.

As we survey the progress that has been made, it is not difficult to isolate the main factors that have been and can be expected to remain responsible: increase in knowledge in adjacent branches of physics, development of entirely new techniques of observations and measurement, and availability of fast computers that have enabled theoreticians to begin analyzing complex and confusing systems that constitute our universe. □

TWENTY YEARS OF PHYSICS TODAY

THE EARLY YEARS

By HENRY A. BARTON

WHEN, AT LAST, IN May 1948 the first issue of PHYSICS TODAY appeared, it ended a long stretch of wishing, dreaming, planning and figuring. Such a periodical had long been wanted to vivify the whole idea of the American Institute of Physics—bringing mutually unacquainted specialists in all branches of physics together into a kind of operational unity for enhancement of physics as an important field of human endeavor. We expected PHYSICS TODAY to provide a better cement than just a paper constitution or even the zeal of those few who served terms on the institute governing board. Part of the essential aim was to present the special fields in interesting terms that all physicists and most laymen could understand.

Early ideas

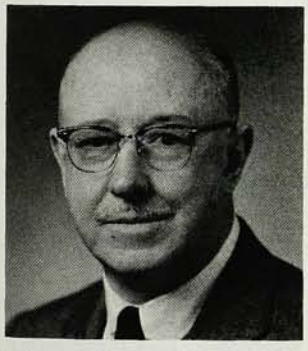
PHYSICS TODAY did not come from a vacuum but was rather distilled from several trial runs and various proposals from many interested people. The original purpose of *Reviews of Modern Physics* was to present relatively nontechnical articles, but its description as "nontechnical" rather quickly ceased to be valid. A journal of the American Physical Society called *Physics*—intended largely for articles in applied fields—carried for a while nontechnical notes written by Edward L. Hill. Then *Review of Scientific Instru-*

ments was transferred from the Optical Society of America to the American Institute of Physics for wider circulation, and for more than a decade it carried "physics notes and news." The problems of part-time (almost no time!) editing of these notes and the financial struggle for existence of the *Review* itself in the economically depressed '30's and early '40's made the effort relatively fruitless.

Of the ideas that began to be advanced about 1944, some were based on the American Chemical Society publication, *Chemical and Engineering News*, which had grown out of *Industrial and Engineering Chemistry* (1909–23) and the *News Edition of Industrial and Engineering Chemistry* (1923–42). This publication was credited partly for the greater unity of chemists compared with physicists despite the greater numbers and perhaps greater varieties of interests of the former. Another attractive idea, indeed exhibit, presented by Louis R. Ridenour was designed to appeal to a large public in a form roughly between *Life* and the present *Scientific American*.

Parenthetically, it was in the midst of this time of groping that Gerard Piel and Dennis Flanagan, who are still publisher and editor of *Scientific American*, visited AIP disclosing hopeful plans for their new version of that old magazine. We knew that success of what they proposed (since so abundantly achieved) would serve some of our purpose but would also limit the scope left for us in which to develop a viable magazine.

Proposals ranged from Ridenour's grand scale down to mimeographed news letters that probably very few would ever have read. In 1946 a representative of the *Atlantic Monthly* advanced the suggestion of a jointly edited section on physics (or science) as a part of the *Atlantic*, with reprints, if I recall correctly, for circulation to physicists. This was never a firm offer, and nothing came of it, but it caused a delay of several months.



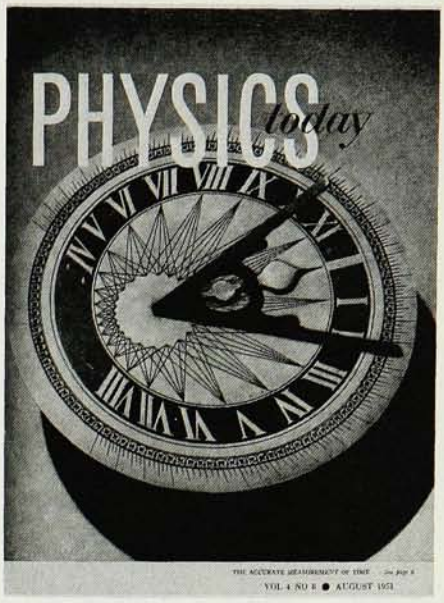
Henry A. Barton, after being director of AIP from 1931 to 1957, lives in retirement in Princeton, where he received four degrees including one in electrical engineering. He has also been president of the Scientific Manpower Commission, a teacher at Cornell and an engineer for the American Telephone and Telegraph Co.

The first issue

Finally in late 1946 it was decided to wait no longer but to look for an editor and try to raise a fund to carry the new journal through an initial period of a year or two. 24 nonadvertising pages per month, a stake of $60 000 and a starting date of January 1948 were the targets. David A. Katcher, first editor, was welcomed to the institute at an executive committee meeting 9 Sept. 1947. At his instigation the proposed name *Physics* (the earlier journal of that name had been converted into the *Journal of Applied Physics*) was changed to the present title PHYSICS TODAY. Lining up material of high editorial quality for several issues in advance and bottlenecks in printing delayed the first issue until May 1948, 20 years ago this month.

It is difficult to single out those who contributed most to the impetus and idea for PHYSICS TODAY, but Richard H. Bolt, Oliver E. Buckley, Karl T. Compton, Homer L. Dodge, Lee A. DuBridge, James B. Fisk, R. Clifton Gibbs, Gaylord P. Harnwell, George R. Harrison, Wallace Hill, Paul E. Klopsteg, Ridenour, John T. Tate, Wallace Waterfall and I spent a lot of time on it, and there were many others. Just as a man who wants to build a house does not usually have a clear picture of it until a professional architect makes drawings, however, so we would have to acknowledge that PHYSICS TODAY, as it came to the eye in mid-1948, was primarily the editorial creation of David Katcher—his concept of what would fit the specifications and aspirations laid before him.

The idea for the first cover was his Reproduced in the last October issue to illustrate Abraham Païs's contribution to the memorial on Robert Oppenheimer, it shows Oppenheimer's famous pork-pie hat on a cyclotron.



Only Katcher can say what this symbolized in his mind, but to many of us it signaled triumphantly the assignment of atomic-energy development to civilian aegis and not the military. This had been the hot issue in Congress for months. Subtly—perhaps too subtly for many—some degree of involvement of physicists in political issues was thus committed on the very first cover of the "official" journal of AIP.

As Katcher brought it out, PHYSICS TODAY was edited primarily for physicists (not the public) with emphasis on physics itself and on clarity. There was an avoidance of even simple mathematics—since given up as hopeless by subsequent editors.

Table of contents

Easily readible articles in the first several years covered the whole breadth of pure and applied physics including, for example, "Physics in Cancer" by A. K. Solomon; "Detecting Atomic Particles," Serge A. Korff; "The Reality of Neutrinos," George Gamow; "Formation of Stars," Lyman Spitzer Jr; "Faster Than Sound," Hugh L. Dryden; "The Physics of Metals," John C. Slater; "Solids," Frederick Seitz; "The Origin of Cosmic Radiation," Edward Teller; "Acoustics and Modern Physics," Philip M. Morse; "Magnetism," Francis Bitter; "Expectations of a Definite Form," Albert Einstein; "The Composition of our Universe," Harrison Brown; "Mesons," Ugo Camerini and Hugh Muirhead; "Holes and Electrons," William Shockley; "Millimeter Waves," John R. Pierce and "The Nucleus," Enrico Fermi.

FIRST EDITOR, David A. Katcher, was largely responsible for name, content and format.

Historians should find this an impressive list.

From the first issue the contents included news of physicists, their meetings and activities and other news of interest to physicists: honors, fellowships, laboratories, calendar of events, book reviews, obituaries. For a while there was a "Washington Letter" by Merriam H. Trytten. Digests of notable journal articles were begun at once. For a few months an attempt was made to cover physics news abroad. Nevill F. Mott, Edoardo Amaldi and Cornelius J. Gorter, among others, contributed. Colorful features included "Take Away Your Billion Dollars," words and music by Arthur Roberts; "Physics of Chimneys," Paul Achenbach; "Food Physics," Thomas M. Rector and A. Cornwall Shuman and "Physics in the USSR," a translation of a speech by D. N. Nasledov printed in *Leningrad Pravda*, 2 June 1950.

In late 1949 David Katcher's resignation as editor was accepted with regret. Fortunately he had acquired, as assistant to the editor, Robert R. Davis, who had been editor of the postwar "Technical Series" produced at Los Alamos. Davis was now made managing editor under Harnwell as editorial director. He got along so well that Harnwell was able gradually to reduce his participation until, in July 1953, Davis became editor.

By this time manuscripts had become a little easier to pull than teeth, and some even were volunteered. An editor's job never becomes easier for any cause, however. PHYSICS TODAY operated for years on a shoestring and with an almost incredibly small editorial staff. This may or may not have loaded the editor more, but I observed great concentration, hard and painstaking work, long and usually late hours, expectedly hectic deadline crises and much need for sandwiches and coffee. (Often the coffee was forgotten after it was brought in. I recall once seeing three coffee cartons at different stages of asymptotic approach to room temperature!) Physicists owe Bob Davis a great debt of gratitude.

A rough road

The early financial road of PHYSICS TODAY was really rough. First the journal was sent gratis to all members of the five founder societies. In 1950 money became too tight for this free circulation. Certain, but not all, of the societies then generously bought their members group subscriptions (half price), and many individual subscribers paid $4. In 1951 group subscriptions were abandoned, and the price to individuals who were members was set at $3.50.

These plans of 1950 and 1951–52 did little to help circulation, encourage the avidity of advertisers or otherwise improve finances. Moreover the main aim of having a medium going to all members was lost, and no one was happy. Fortunately by 1953 the overall finances of the institute had improved, and it became at last possible to start the since unbroken policy of sending PHYSICS TODAY to all members without cost to either them or their societies. As it became evident that this policy was firm and enduring, advertising support grew by leaps and bounds. The circulation became the largest of any physics journal in the world.

At the end of one decade PHYSICS TODAY was well established as a useful and informative service for physicists throughout America and many other parts of the world. Through publication of official reports and other news of the societies and the institute, it has focused the general attention of physicists on the affairs of the physics organization to a very desirable extent. It has helped much to foster a community of interest and to direct effectively coördinated efforts toward the advancement of our science. It should now continue increasingly to do so. □

TWENTY YEARS OF PHYSICS TODAY

THE RECENT YEARS

By ELMER HUTCHISSON

WHEN AT THE suggestion of the editors, Henry A. Barton and I each agreed to contribute a brief article for this 20th-anniversary issue of PHYSICS TODAY, we found it quite natural to divide the subject matter by decades since Barton was director of the American Institute of Physics during the first decade of PHYSICS TODAY and I was director for more than two thirds of the second decade. We were asked to look back over the issues for these years and, if appropriate, relate the development of PHYSICS TODAY to that of AIP. We probably would have followed this suggestion instinctively since from the beginning the basic role of PHYSICS TODAY has been to further the objectives set for AIP itself. Also, since the PHYSICS TODAY budget is an integral part of the AIP budget, financial support of the magazine is inextricably tied to that of AIP. However, since we are helping to celebrate