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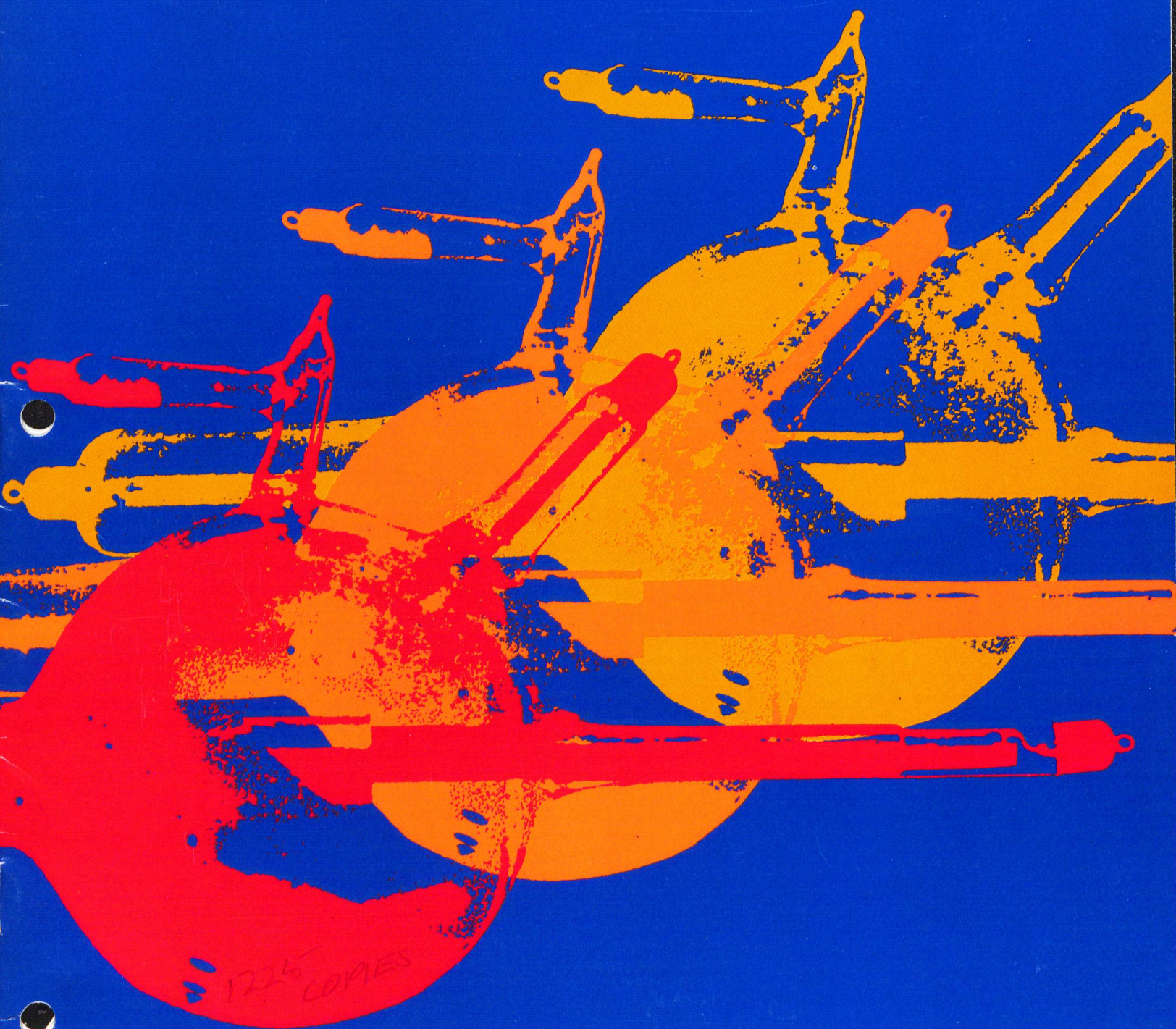
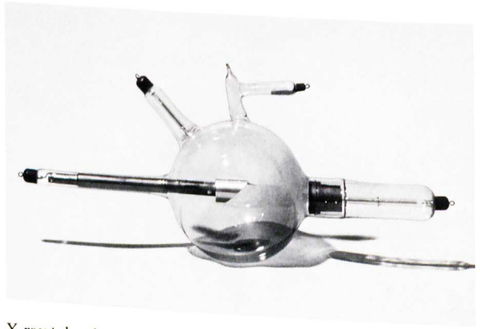


THIS ISSUE'S COVER SUBJECT

Our front cover features an artistic design inspired by an old glass x-ray tube, a photograph of which is reproduced on this page. The tube is but one of the more than 150 different types of x-ray tubes collected by William H. Shehadi, M.D., author of the accompanying article.

X-Ray Tubes and Other Historic Memorabilia



X-ray tubes have undergone many radical changes since Wilhelm Conrad Röntgen discovered x-rays, but the basic principle of producing these rays remains the same. X-rays are generated when fast-moving electrons interact with matter—usually the metal target of an x-ray tube.

The type of glass tube with which Röntgen was experimenting when he made his discovery of the heretofore unknown rays was one commonly used in most physics laboratories in the 1890s. Its operation depended on the presence of a small amount of gas. When electrodes in the tube were connected to a high voltage source (30 to 50 kV), this gas was separated into electrically charged particles called ions that bombarded the cathode and caused a small current (a fraction of a milliampere) to flow. The resulting stream of electrons struck the glass at the other end of the tube, thereby producing x-rays. These tubes were very susceptible to damage because the heat generated at the point of impact often melted the glass and destroyed the tube.

As the application of x-rays rapidly shifted from the physics laboratory to the field of medicine, larger tubes that were more powerful and more efficient than those used in the laboratory were devised. Subsequent improvements resulted in increased x-ray output from smaller tubes for medical and dental radiography, including radiography with a mobile unit, as well as greater safety. Among these improvements were the replacement of hanging electrical wires (the cause of electric shock to the patient, the operator, or both) with shockproof cables and insertion of the x-ray tube into a protective housing to restrict the x-radiation to the region of diagnostic interest.

Thanks to the brilliant work of William D. Coolidge, the gas tube (cold-cathode tube) was replaced by the hot-cathode tube (Coolidge tube), which had a tungsten filament for electron emission that operated in a high vacuum. The hot-cathode tube made possible the use of higher milliamperage and kilovoltage, accurate control of the intensity and the penetration of x-rays, and consistent duplication of radiographic results.

Concomitant and equally significant progress came with the development and the advances made for recording the x-ray image—glass plates, x-ray (radiographic) film, and fluorescent intensifying screens.

The 1940s were years of extensive changes in x-ray tubes and other kinds of x-ray equipment. It became evident that someone should begin to collect examples of various items used in the past while they were still retrievable. I had also discovered that an old x-ray tube I worked with in my early days as a radiologist was invaluable in helping young residents, interns, and technologists understand the difficulties encountered in carrying out a radiographic examination with the equipment then available. The tube was also instrumental in stimulating an appreciation of the much more sophisticated equipment available for their use.

For these reasons, in 1945 I started to collect and preserve x-ray tubes, glass plates, and other items. Seeking out and acquiring specimens for the collection was a long, sometimes laborious, but challenging and rewarding undertaking. Personal contacts with other physicians, gifts from hospitals, bartering with museums and other institutions—all were part of the task. Eventually, I had acquired more than 150 different types of x-ray tubes that trace the history of this particular piece of x-ray equipment from the time of Röntgen's discovery, along with 100 glass plates and sundry other items. Of the many other items of historical interest in the collection, mention should be made of the portable x-ray machine. In the early days of our specialty, an x-ray unit with hanging wires and unshielded tubes was packed and housed in two suitcase-type boxes—one held the tube, the other held the generator. The boxes were carried, one in each hand, to the patient's bedside in the hospital or the home. This truly portable machine was the predecessor of the present-day massive, wheel-mounted, shockproof radiographic unit with full protection from radiation.

For many years, the collection was housed in display cases in my office at the Westchester County Medical Center, New York Medical College, Valhalla, New York; it is now at the Department of Radiology, The Johns Hopkins University School of Medicine, Baltimore, Maryland. The collection is of inestimable value, not only to an understanding of the chronologic development of x-ray tubes and other memorabilia but also to an appreciation of the evolution of this equipment in terms of safety to the patient and to the users of x-rays.

With a determined effort to understand the past, we may gain some insight into the future. We are what we are today because of those who came before us. What we have here are precious treasures—gifts from those who preceded us. They are a trust—to be guarded, cherished, enriched, and then proudly passed on to those who come after us.

—William H. Shehadi, M.D., Greenwich, Connecticut.

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