

issue of Astounding Science Fiction.)

The original ENIAC crew had little to do with the EDVAC, since they had mostly gone off with J. Presper Eckert and John Mauchley to the Eckert-Mauchley Computer Co. and the Univac line of computers. The EDVAC crew, with the notable exception of Lubkin, went with John Travis to Burroughs to get them into the computer business. (Lubkin had been in charge of the ENIAC at Aberdeen before coming to the Moore School and on completion of EDVAC went first to Reeves and then to the Bureau of Standards to design the SEAC.)

After the EDVAC dispersal there were only a few remnants remaining at the Moore School, notably John G. Brainard. They tried to build a machine called the MSAC for the Signal Corps but this turned out to be a technical abomination and the Army cancelled the contract after only the timer and one other rack had been built, thus permanently terminating the Moore School's involvement with computer development.

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12/81
The photo was taken at Princeton; the machine was therefore probably not EDVAC.
The Editors.

Memories in Italy

I read with deep interest and nostalgia the article by Bruno Rossi "Early days in cosmic rays" (October, page 34), with so much about scientific life in Arcetri. Arcetri actually comprises an indefinite area just south of Florence. At the top of the hill (181 m above sea level) was established, in 1873, the astrophysical observatory, its director in the late 1920s being Giorgio Abetti, who is still living and will be 100 years old next October. Both Attilio Colacevich (1906) and Guglielmo Righini (1908), quoted in Bruno Rossi's article, were students or recently graduated in physics, but were already committed to astronomy. Colacevich became director of the observatory of Naples (1948) and died a mere 5 years later. Righini succeeded Abetti after his retirement as director of the Arcetri observatory (1953). I remember myself, as a freshman in physics, Bruno Rossi working at the Institute of Physics, as well as Gilberto Bernardini's stimulating lectures and the kind assistance of Daria Bocciarelli to all of us. My own destiny was to be an astronomer, remaining in Florence until 1954, to become director of the observatory of Catania.

I fully share Bruno Rossi's nostalgia for our time in Arcetri.

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1/82

Update on cryopumps

The history of vacuum technology presented by James Lafferty in November (page 211) is a substantial contribution to obtaining a broad perspective of the field. We would like to bring up to date the information on the development of the cryogenic vacuum pump. The initial installations of cryopumps cooled by liquid nitrogen and liquid helium demonstrated the high pumping speed and cleanliness attained by this technique. It was the substitution of closed-cycle helium-gas refrigerators for liquid cryogenics that resulted in the adoption of cryopumping on a large scale during the last ten years. Modern refrigerator cryopumps are widely used on vacuum systems including applications in basic physics research, surface science, optical thin film evaporation, and production sputtering in the semiconductor and automotive industry.

Refrigerator cryopumps condense gases on array surfaces held at 80 K and 15 K by the action of a helium gas-expansion refrigerator operating on the Gifford-McMahon or similar thermodynamic cycle. Activated charcoal, cooled to 15 K, is used to adsorb hydrogen, helium, and neon at very low partial pressures. Total system pressures in the 10^{-11} torr range are achieved without the complication or expense of handling cryogenic liquids.

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Medical imaging

Rowland Redington and Walter Berninger's "Medical Imaging Systems" (August 1981, page 36) was extremely informative. We were amazed by the nmr cross-section through the heart. However, a discussion of the damaged incurred by the patient in the different imaging techniques is largely absent. To determine the usefulness or to compare imaging systems, not only do we need to know the possible resolution but we also need a measure of the injury caused by the procedure. To make that beautiful CT in figure 5, what was the absorbed dose of the patient? And similarly, for the CT of figure 1?

CHRIS HODGES

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9/81
THE AUTHORS COMMENT: Computed tomography doses are typically 1 to 5 Rads, and the image in figure 5 was taken with a dose at the low end of this range. The dynamic study illustrated in figure 1 required multiple scans at the same level and the dose was approximately 10 Rads. In both cases only the 10-mm-thick slice was irradiated. Comparable angiographic studies

would have required at least as large a dose.

Patient risk is an important consideration, but it must be weighed against patient benefits. This makes a meaningful comparison of a new imaging method with an established modality very difficult, if not impossible. The absence of known patient risk with the fields used in nmr imaging will be an attractive feature, but only if nmr is shown to be clinically effective.

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10/81

Interest of young physicists

C. H. Barrow's comments in his September letter (page 105) strike me as shortsighted and worrisome. Barrow appears to believe that physics exists primarily to provide jobs. The letter states "those young physicists who are so lacking in interest and enthusiasm as to need inducements, would not be missed in an already overcrowded profession."

But what about those young physicists who want to attend conferences but can't afford the fees, who want to study the journals but can't afford their expense, who want to do graduate study but are pressed financially? Interest and money are not well correlated.

If Barrow feels threatened by younger physicists, perhaps he should remember that at one time we were all just starting out.

Youth does not seek adulation, it seeks guidance. We do not seek worship, we seek help. In the end we are all only searching for knowledge.

ALEX MCKALE

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THE AUTHOR COMMENTS: On re-reading my letter, I do not see any remark which suggests that I "believe that physics exists primarily to provide jobs." I do, however, object to regimentation and to the double standards of an age of hypocrisy in which it is fashionable to make token gestures of "equal opportunity" and the like. Perhaps Alex McKale does not realize that in many parts of the world, notably in the underdeveloped countries, physicists of all ages have never had the opportunity to attend conferences or to subscribe personally to journals that are available in many libraries. I do not object to funds for helping needy physicists but I do suggest that these should not be compulsory, neither should they be discriminatory on the grounds of age or any other consideration.

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