
APPOINTMENTS

Peter T. Flawn, acting president, University of Texas, Austin, appointed president of the university. . . . **George H. Vineyard**, deputy director, Brookhaven National Laboratory, appointed director of the laboratory. . . . **L. J. A. DiDio**, chairman, anatomy department, Medical College of Ohio, also to dean of graduate studies at the college. . . . **Henry A. Harbury**, chairman, biological sciences department, University of California, Santa Barbara, to chairman, biochemistry department, Dartmouth Medical School. . . . **David M. Kipnis**, professor of medicine, Washington University School of Medicine, to head, medicine department at the university. . . . **Leon D. Harmon**, staff member, systems theory research department, Bell Laboratories, to chairman, biomedical engineering department, Case Western Reserve University. . . . **Bruce W. Arden**, chairman, computer and communications sciences department, University of Michigan, to chairman, electrical engineering department, Princeton University. . . . **Roland J. Pellegrin**, professor of sociology,

University of Oregon, to chairman, sociology department, Pennsylvania State University. . . . **Robert H. Koker**, chairman, pathobiology and comparative medicine departments, University of Texas, to chairman, environmental health and veterinary and zoological medicine departments, Texas Tech University. . . . **Ugo Fano**, professor of physics, University of Chicago, to chairman, physics department at the university. . . . **Kenneth C. Rogers**, acting provost and dean of the faculty, Stevens Institute of Technology, to president of the institute. . . . **Edward M. Eyring**, professor of chemistry, University of Utah, to chairman, chemistry department at the university. . . . **Edward H. Smith**, director of cooperative extension, New York State College of Agriculture and Life Sciences, to chairman, entomology department, Cornell University. . . . **Henri S. Havdala**, former chief, anesthesiology division, Chicago Medical School/University of Health Sciences, to chairman, new anesthesiology department at the school/university. . . . **John F. Kelly**, vice president, Campbell Institute for Agricultural Research to chairman, vegetable crops department, University of Florida.

RECENT DEATHS

Armand J. Eardley, 71; former dean, College of Mines and Mineral Industries, University of Utah; 7 November.

Emma L. Fisk, 80; professor emeritus of botany, University of Wisconsin, Madison; 9 November.

Richard T. Frost, 45; former vice president, Reed College; 9 November.

George W. Heise, 84; retired associate director of research, National Carbon Co. Laboratories, Ohio; 28 September.

Frank S. Horvath, 80; former professor of medicine, Georgetown University; 9 November.

Arthur Lejwa, 77; former professor of basic science, Long Island University; 27 October.

Heinz H. Magendantz, 73; former associate professor of cardiology, Tufts University; 6 November.

Leroy K. Pinnell, 62; dean emeritus of education, Eastern New Mexico University; 25 October.

Clement J. Schneider, 44; vice president for academic affairs, Creighton University; 20 October.

RESEARCH NEWS

X-ray Astronomy (III): Searching for a Black Hole

Of all the objects conceivably traveling through empty space, nothing would be more difficult to detect than a solitary black hole. No light comes from it, and the odds against seeing a black hole pass between the earth and some distant star are impossibly great. No one ever expects to see an isolated black hole, but a black hole in the vicinity of a normal star might at least give some clue to its presence.

When it was discovered last year that unusual objects orbiting other stars were emitting x-rays, questions about how a black hole might be identified suddenly became urgent. In 1967 I. S. Shklovsky of the Shternberg Astronomical Institute in Moscow had suggested that a black hole might be detectable if it were drawing in matter from another, normal star. Ya. B. Zel'dovich and I. D. Novikov at the Lebedev Institute in Moscow had sug-

gested that if gas were drawn into a neutron star or a black hole the gas would become hot enough to radiate x-rays. The ideas of Shklovsky and Zel'dovich were only qualitative and fragmented descriptions of what might happen near a black hole. It is now becoming clear, from theoretical studies, how a black hole could radiate x-rays if it pulled matter off a close companion star. The matter would probably form a disk rapidly rotating about the black hole, and the x-ray emissions from the disk would be neither steady nor pulsed, but would probably fluctuate rapidly. In only 1 year the ideas talked about in the early 1960's have been examined, refined, and extended to the point that a coherent picture of how a black hole might radiate x-rays is emerging.

The satellite UHURU has discovered many x-ray sources orbiting other stars, but the source most often suggested as

being a black hole is Cygnus X-1. The x-rays from Cygnus X-1 fluctuate extremely rapidly and randomly, as might be expected for a black hole trapping matter. A series of related observations with optical and radio telescopes seems to indicate that the x-ray source is so massive that it is probably a black hole, according to current theories of collapsed stars (*Science*, 3 November 1972). Objections have been raised to the claim, but the case is fairly strong and its significance as a motivation for further experiments and further study of black holes has been enormous.

Questions about the mass of Cygnus X-1 may be answered by further experiments, but questions about the sort of x-ray emissions expected from black holes can only be answered by theoretical calculations. The properties of an isolated black hole are now fairly well understood (*Science*, 19 March