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. Kokernot**, 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 suggested 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