Nor does Burnell's contribution seem to everyone to have been as routine as a hired scanner's. Hewish considers that it was. "Jocelyn was a jolly good girl but she was just doing her job. She noticed this source was doing this thing. If she hadn't noticed it, it would have been negligent," he told *Science*. Cornell theoretical astronomer Thomas Gold disagrees. Gold, who first came up with the accepted theoretical explanation of pulsars, points out that Burnell, unlike a photo scanner, understood the basis of what she was doing and, moreover, had not been told to look for pulsars. "She was told to plot scintillating radio sources, but she noted and pursued in her own way a different kind of signal," Gold remarks.

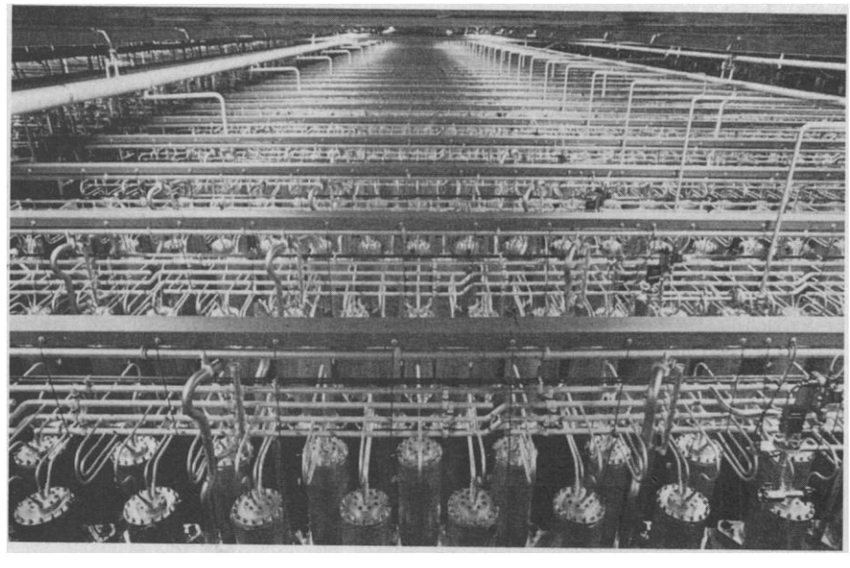
Hewish's point is that he had instructed Burnell to plot all signals on a graph; the genuine radio sources would reappear from day to day, interference signals would not. From this routine, pulsars would emerge automatically. The signal "didn't look very different in the record from anything else we were plotting. It's an absolute certainty that [if Burnell had not done so] someone else would have picked it up," says Hewish.

"I would not say it was 100 percent automatic, but I would think that it is reasonably likely that that telescope would have discovered pulsars sooner or later," replies

Problems with the Enrichment Program

While the Ford Administration is encouraging U.S. industry to get into the business of enriching uranium for nuclear reactors, the start-up of the first government pilot plant to test the centrifuge enrichment method has been delayed at least a year, to July 1976. Officials of the Energy Research and Development Administration (ERDA) cite inflation and modifications resulting from a dramatic centrifuge failure in October 1973 as the reasons for the delay. The pilot plant, being built at the Oak Ridge, Tennessee, laboratory* of ERDA is now expected to cost $31.8 million.

The 1973 accident apparently damaged much of an Oak Ridge test facility. When the ultrahigh-speed rotor inside one centrifuge disintegrated, that machine ripped loose from its mountings and dislodged two others. Many additional centrifuges in the facility were damaged by the shocks that propagated through the building. Redesign of the pilot plant is focused on strengthening the centrifuge mountings.



German centrifuge pilot plant at Almelo, Netherlands.

With the projected starting date for the pilot plant moved back to 1976, the U.S. program appears to be lagging well behind the program of the British–Dutch–West German combine that began operating a pilot plant at Almelo, Netherlands, in 1971. The European centrifuge combine is now operating three pilot plants, and is building two commercial demonstration plants at Almelo and Capenhurst, England, that are due to begin initial operations next year.

Until the first U.S. pilot plant is working, uncertainty about the centrifuge process may discourage companies from making the $2 billion commitment necessary to construct a full-scale plant. Last year the Nixon Administration failed in a bid to attract industrial participants to build new enrichment plants, and three major industrial firms, General Electric, Westinghouse, and Union Carbide, have signaled their lack of interest in building future plants by dropping out of the ERDA plan for sharing information on enrichment technology. Boeing and General Atomic have joined the arrangement for sharing the classified information about enrichment, and presumably they, along with the firms that have shown continuing interest—Electro-Nucleonics, Goodyear, Exxon Nuclear, and Bechtel—are the most likely bidders for a centrifuge plant.

The bill proposed by President Ford would authorize ERDA to grant contracts for several private centrifuge plants, as well as one plant using the older method of enrichment—gaseous diffusion.

Goodyear and Bechtel, as partners in Uranium Enrichment Associates, are the only U.S. firms seriously considering a plant using the time-tested but energy-inefficient method of gaseous diffusion. Diffusion plants, in which gaseous uranium hexafluoride is forced under pressure through a porous barrier, are estimated to use ten times as much energy as centrifuge plants.

Besides the reliability of the U.S. centrifuge process, another factor members of the corporate boards would like to understand better is the role that lasers will play. Laser enrichment methods are improving rapidly, and could conceivably leapfrog over the centrifuge process. Under considerable pressure from the companies participating in the information access plan, ERDA officials gave a briefing on the status of the closely guarded laser technology on 6 June in Livermore, California.—W.D.M.

*The famous Tennessee laboratory, briefly renamed the Holifield National Laboratory through legislation quietly effected by friends of the retired California congressman, Chet Holifield, is now being rechristened the Oak Ridge National Laboratory by a bill recently passed in the House.