

from a vibrating neutron star—one of the earliest suggestions as the source of the signals. The problem with the suggestion up to now has been that observed pulsar pulses have been in the one-second range. This is far too long a period for a neutron star—theorists like Drs. Kip Thorne of California Institute of Technology and D. W. Meltzer and John A. Wheeler of Princeton calculate that the size and density of a neutron star would make it vibrate much faster than once a second if it vibrates at all.

Dr. Drake believes that a rotating, pulsating neutron star with a diameter of less than 30 kilometers can account for either of the two pulsars in question.

**The neutron stars** would be so dense— $4 \times 10^{15}$  grams per cubic centimeter—that the earth, if equally condensed, would sit in the 300 foot telescope at Green Bank like a scoop of ice cream.

Such a star, which would contain no form of matter but neutrons, would have a temperature of 10 million degrees Kelvin and be radiating energy predominantly in X-rays. But, Dr. Drake believes, something, quite possibly an orbiting satellite, could set the neutron star in vibration.

Searches are now being made for X-ray signals from the pulsar locations by a group at the Naval Research Laboratory under Dr. Herbert Friedman and at American Science and Engineering under Dr. Ricardo Giacconi.

**Optical astronomers**—as soon as they learn of the discovery of the sub-pulses—are expected to begin looking for light pulses in the 10-millisecond range rather than the one-second range where they have been looking and not finding any. However, if Dr. Drake is right about the neutron stars, the optical observations will uncover nothing at this frequency because neutron stars are not expected to put out light signals.

#### PERSONNEL CUTS

### Shuffle and phase out

For science administrators around the country this is the season of the personnel shuffle, the unfilled job and the trip not taken.

Although no senior scientist, a definition not so much of age as of achievement, is going to be walking the streets looking for work, budget cuts are forcing government laboratories and Federally financed researchers to find every way of cutting corners. At least one agency—the National Institutes of Health—is even asking its grantees for some money back.

Most of the personnel belt tightening, now averaging the replacement of only seven out of 10 who quit or retire,

is being done by normal attrition. Those who leave are replaced by other bodies, although quite often not driver for driver, but driver for secretary, or scientist for secretary.

**Further fund curtailment** for any individual unit or laboratory comes out of travel and equipment; the latter ranges from non-starts on new instruments to sharpening pencil stubs.

Another approach some agencies are taking is to make their contracts for 18 months, say, instead of the three or four years they would have specified a year and a half ago.

The firing of an estimated 1,900 persons in Naval research installations around the country (SN: 10/5, p. 340) appears to have no counterpart as yet elsewhere in the Government. It was done as part of the Defense Department's effort to trim \$3 billion in non-Vietnam spending to meet Congressional economy demands.

Most of the Navy dismissals will not be effective for at least two months after the employees receive notification; some will take a year to phase out. Selection of the individual to be dismissed is entirely at the discretion of the director of the installation, but the impact on the scientific community will not be either sudden or drastic.

**"A ripple, not a wave,"** was the way one manpower specialist in Washington pegged the situation, stressing at the same time that this does not lessen the hardship of any individual secretary, technician or scientist who has to make a move. Industrial employers in the Washington area, for instance, are delighted to have even this limited source of new employees.

It is, however, a ripple the effects of which will certainly be felt later if the budget squeeze continues. Some scientists argue that even the few doctoral and post-graduate students so far affected by firings or cutbacks are irreparably lost to the universities or the Government, either being absorbed by industry or leaving scientific research permanently.

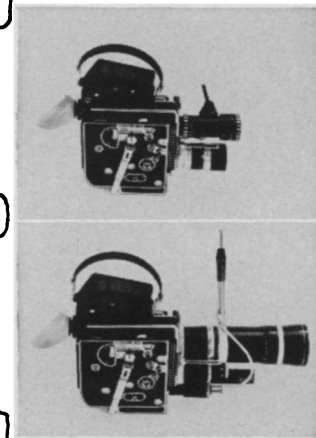
The new Ph.D. will find a job although he may have some difficulty getting exactly what he wants, especially if his goal is basic research for the Government. The graduate student, however, is in a more difficult position.

As an example, take the university professor who has planned his research for five part-time graduate student assistants. Whether the research is in biophysics, supported by NIH, aerodynamics by the space agency, nuclear physics by the Atomic Energy Commission or astronomy by the National Science Foundation, he may now have funds only for four. The student who is eliminated might then drop out of advanced training, never to return.

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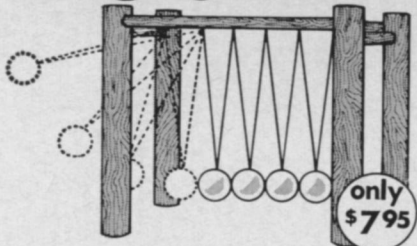
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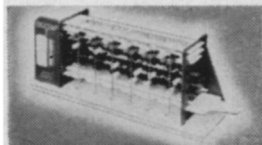
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hungry researchers or Ph.D.'s pounding the pavements. For example, at the placement service of the American Institute of Physics in New York, clearing house for physicists or astronomers changing jobs or new Ph.D.'s entering the research pipeline, applicants are being placed without difficulty. But they are not always landing in the jobs they rated as first priority.

An example of the effects of budget cuts in one of the smaller Governmental units with a highly scientific orientation was explained by its head: "It is slowing down our work but there have been no firings. We are doing it by attrition and have managed to maintain all of our post-doctoral posts, even though this has meant shifting a janitor or a secretary to do so." This unit is also cutting down on equipment and travel.

However, if budget cuts become more drastic than they already are, he is not at all sure what other measures, including dismissals, might become necessary.

At the wealthiest—and largest—of the highly science-oriented agencies, the National Institutes of Health, grantees are being asked, in effect, to give money back. The institutes are in the process of trying to renegotiate downward all grants approved for funding and awarded for the last fiscal year in an effort to recoup 10 percent of the funds.

The space agency has seen its troubles coming for a long time. The decline of the space manpower pool from its peak during Apollo's development stages two and three years ago would have taken place to some degree even without Vietnam budget cuts to squelch post-Apollo efforts.

In the past year, the National Aeronautics and Space Administration has reduced its own employee rolls by almost five percent and its contractor work force by more than three times that rate. This amounts to some 1,500 NASA employees and 42,000 in the pay of its contractors.

North American Aviation, prime contractor for the Apollo program, has laid off 1,000 employees from its Aerospace and Systems Group, and expects to continue on the same path unless proposed new projects miraculously come into better Congressional favor than seems likely.

The difficulties extend beyond manpower, however. Since August 8, NASA has been operating on an "interim financial plan" designed to second-guess the money-givers by planning expenditures to stay below an anticipated minimum budget of \$3.85 billion. The final appropriation, \$3.885 billion, hardly leaves the space agency rolling in riches, but because of the interim plan, there is \$45 million available that is not included in the present spending plans. Competition for the sum is, to put it mildly, stiff.