

his caution, Prof. Weber refuses to make a more definite statement pending further tests.

Up to now the search for gravity waves has been more or less at random. Although a number of astronomical systems have been suggested as possible sources, the search has been for any radiation the detector could find. The frequency searched for was chosen because it could be detected by equipment of a convenient size.

Now, in the pulsars, Prof. Weber calculates—in the Aug. 5 *PHYSICAL REVIEW LETTERS*—that he has a definite source of observable and identifiable radiation. Finding it would not only go to confirm the existence of the radiation but might also help decide among pulsar theories.

Gravitational radiation from a pulsar should have the same frequency as the radio pulsations—about 1 cycle per second. A detector for waves at this low frequency would have to be much larger than the ones Prof. Weber has been using. He calculates that a metal beam 50 meters long with a load of 100 tons on one end would be needed.

Such an object would not be easy to build. There would be problems with large scale refrigeration—such detectors are kept at cryogenic temperatures to minimize thermal disturbances. But Prof. Weber feels that the work that has been done on a superconducting linear accelerator at Stanford University (SN: 6/22, p. 599) shows the way to a solution to this problem.

There is also a money problem. A cost estimate awaits detailed plans, but Prof. Weber feels that it will be more than is customary for university grants, and the agency he applies to—probably the National Science Foundation—will have to go to Congress for a special appropriation.

"This is a time of austerity," he admits, "and one wants to do all possible spadework before going to Congress."

If Prof. Weber succeeds in observing gravity waves from a pulsar, he will throw on the scales of current astrophysical arguments some rather heavy evidence in favor of the view that pulsars are single, small, dense stars engaged in some kind of alternate expansion and contraction. "A pulsar model of a rotating double star doesn't fit," he says.

The reason is that radiation would damp the motion of the double star. As the system gave up energy to the radiation, the rotation would slow down. This should be observed as a change in the frequency of the pulsar's pulsations.

Such changes are not observed. Therefore the people who believe that only a rotational motion is precise enough to control the observed pulsar

pulses have to arrange their models so that they do not radiate gravitationally.

Both objects could be about the same size, so that one could block or focus the radiation from the other when it passes in front. But this would require gravitationally stable orbits in which these systems do not radiate even though theory says they should. Although a Cambridge University group postulated this (SN: 4/20, p. 374), the idea was characterized by one theoretical physicist as the "wildest I ever heard," because of the violence it would do to present gravitational theory.

More conventionally, the second body could be very small, in which case there would be no radiation and no damping. But in that model, the small body must produce the pulses. One such theory, published by Dr. F. T. Aldridge of the University of California at Los Angeles in the July *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*, has a small body orbiting so close to a large body that it causes plasma shock waves in the large body's outer atmosphere. These shock waves then produce the radio bursts.

REDESIGNING SCHOOLS

New form for early grades

Changes in elementary education, now envisioned by Federal innovators, could eventually separate the first three years of schooling from traditional education, and combine them with new preschool systems.

The idea is based on the theory that a child's first eight or nine years of life constitute a single unit and should be treated together in mental, social and physical development.

About the age of eight, the child changes. His mental equipment and personality become fairly well established. He has the basic tools for self-learning or for working in large groups, such as classes.

Jules Sugerman, former director of Head Start, is one of those looking toward radical changes in early education. He is joined by members of the President's Panel on Early Education, composed of representatives from the Labor Department, the Children's Bureau and the poverty war office.

Their plan for a new design in early education is still in the formative stage, but they have been trying out the idea on fellow professionals. The panel recently met with state welfare and poverty officials and some educators, who were receptive.

Sugerman himself tossed out the idea in a series of predictions to the World Organization on Preschool Education meeting in Washington. He predicted future pressure for preschool education

for all children, whether or not they are disadvantaged. "We will come to believe," he said, "that we need radical changes in early education."

The question of comprehensive treatment is no longer in doubt, according to Sugerman. "You simply cannot work with a child from the simple educational point of view."

The President's panel, headed by Sugerman, has worked up the outlines of a system called the 4-C program—Community Coordinated Child Care. It would not necessarily be run by the educational establishment, which many child development people consider too single-minded to adapt to a program encompassing medical, emotional and educational treatment and including both parents and children.

Ideally, says Sugerman, there should be an assessment of each child periodically, starting very early. As the child demonstrates his readiness to read, for example, he would be taught to read. For some this readiness comes at age two, for others at age four. Some children would be put in a class where they learn through hearing, others where they learn from movies, television or other electronic aids.

There are a number of obstacles in the way of radical change—the educational establishment for one. Another problem is the public's lack of familiarity with concepts of child development.

In its favor, however, is the fact that the 4-C system would benefit middle class as well as disadvantaged children.

Poor children need help just to function in life, Sugerman declares. They have medical needs and problems with motivation that the middle-class child does not face. But the middle-class child can use a more flexible educational system.

Parents put their children in nursery school for a head start on education, only to find them bored when they reach elementary school. Many college students no longer need the freshman year nor medical students the first year of medical school, says Sugerman. "Why are we sitting around and wasting two years of life?"

Another force pushing for change is technological. A range of new devices from computers to videotapes and educational TV offer individualized education that was not possible five years ago.

Still another is the fact that Federal programs are moving in the direction of comprehensive preschool education. Head Start began the movement; then came Follow Through in the elementary schools. Next fall parent-child centers for children under three will begin operation in 30 communities.

For the time being, the 4-C program is only a plan to unite these Federal preschool programs.