The new discovery goes further than an identification with a particular star, however—astronomers were already virtually certain that the pulsar is part of the Crab—but includes the hoped for detection of light flashes matching the radio pulses.

The pulsar which is blinking is *NP* 0532, first detected as a rapidly flickering radio signal near the Crab by the National Radio Astronomy Observatory at Green Bank, Maryland, and discovered to be beating at thirty times per second by the Arecibo Ionospheric Observatory. As well as being the fastest pulsar, *NP* 0532 is running down more rapidly than any other pulsar, at a rate of one part in 2,400 per year. The latest discovery which bolsters its claim to uniqueness was made from Steward Observatory of the University of Arizona, Tucson, by W. J. Cocke, M. Disney and D. J. Taylor, and the light flashes and the radio pulses seem to be a remarkably good match. According to the telegram, the optical flashes picked up on January 15–16 have a geocentric period of 33·095 ms, with occasional secondary pulses 4 ms wide between the primaries, precisely what is picked up by radio astronomers. Integrated visual magnitude is 18—well within telescopic limits—and the peak magnitude in the flashes is 15. Taken together, the facts seem to indicate that, like the radio case, all the brightness is within the flashes, with nothing detectable between.

For several reasons Steward's team should not be suspected of crying "wolf". Associated with the Crab, *NP* 0532 is presumably the youngest pulsar, so more likely to be visible than the others, and the fit between the optical and radio pulses seems to rule out inherent periodicities in the measuring system, such as the wow in a tape recorder which bedevilled last year's measurements at Lick Observatory (*Nature*, **219**, 812; 1968). In any case the magnitude estimates suggest that confirmation from other observatories should be rapid.

One of the most enigmatic of celestial objects, the Crab nebula has somehow maintained its energy at a high level for 900 years. It now looks as if *NP* 0532 and a second pulsar which seems to be associated with the nebula could be responsible, the more so because the optical flashes mean that the radiating particles are more energetic than previously thought. This is one of the reasons why astronomers are looking forward to the range of optical measurements, which should be relatively simple to make on an eighteenth magnitude object. As for theories of pulsars themselves, Gold's rotating neutron star hypothesis (*Nature*, **221**, 25; 1969), which at present seems the most satisfying, does not rule out optical radiation.

NP 0532 may not be the only pulsar with detectable light flashes. A team of British and Irish gamma ray astronomers are toying with the notion that experiments in April and May last year to search for gamma rays from *CP* 1133 were picking up optical flashes (E. P. O'Mongain *et al.*, *Nature*, **219**, 1348; 1968 and W. N. Charman *et al.*, *Nature*, **220**, 565; 1968). Using mirrors to pick up the Cerenkov radiation generated when high energy gamma rays strike the atmosphere, their equipment is ideal for detecting very short flashes. The signals they detected were below the level of statistical significance, however—indeed, if they had been significant there would have been serious conflict with the radio measurements, with 10^4 times more energy radiated in gamma rays than in the radio band. The Arizona discovery now means that the weak signals, if not occurring by chance, could have been due to light flashes from *CP* 1133.

Professor N. A. Porter of University College, Dublin, has devised a theory based on Gold's model which he hopes could account for the sort of results which have been obtained. There seem to be several ways in which a pulsar could produce light—in short bursts lasting a few nanoseconds as electrons are thrown out of a co-rotating magnetosphere; in radiation produced after ejection by electrons which are out of phase with the rotation so that the radiation has lost most of its periodicity and by Cerenkov radiation generated near the pulsar by gamma rays. According to Porter, the signals picked up by the 36 inch telescope at Steward Observatory could be the nanosecond bursts. In any case, the gamma ray equipment used by the British and Irish teams has been moved to the clearer skies of Malta, where the chances of obtaining meaningful results should be greater.

SHIPBUILDING

Boom in British Shipyards

DIFFICULTIES about the commissioning of the Queen Elizabeth II do not hide the way in which orders for ships from British shipyards have been increasing in the past few months. The National Association of Shipbuilders and Repairers announced earlier this week that orders placed with British yards in 1968 amounted to £285 million in value—the largest amount in any year since the early fifties. More than a third of the new ships ordered will be supplied to companies overseas. At the end of 1968, the total amount of shipping on order amounted to 3·5 million tons.

SEISMOLOGY

New Map of Earthquakes

A NEW seismic risk map of the continental United States has just been issued by the Environmental Science Services Administration of the US Department of Commerce. The map is a revision of one first issued in 1948 which, after revision in 1951, was withdrawn in 1952 because "it was subject to misinterpretation

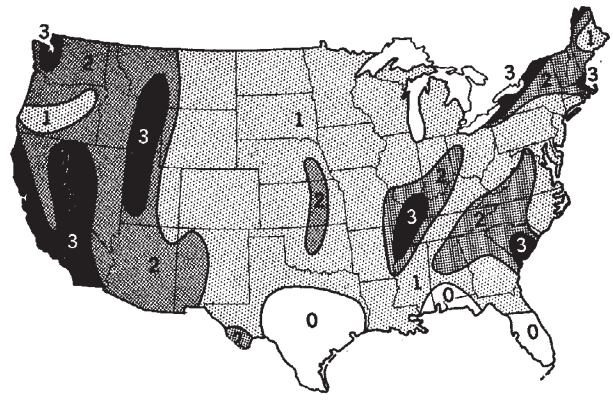

Fig. 1. Earthquake risks in various regions of the United States: Zone 0, areas with no expectancy of earthquake damage; Zone 1, only minor damage expected; Zone 2, moderate damage expected; Zone 3, areas where major destructive earthquakes may occur.