

Bank (*Nature* **221**, 27, 1969) found that over a nine-month interval CP 1919, CP 0834, CP 0950 and CP 1133 were slowing down (although the chance of a sinusoidal variation with a period much greater than a year is not ruled out entirely) with an apparent lifetime of about 10 million years.

In the same issue of *Nature* (**221**, 29, 1969), T. W. Cole of the Mullard Radio Astronomy Observatory, Cambridge, said in another report that CP 0834, CP 1919 and CP 1133 appear to be slowing down with lifetimes of the order of 10 million years, and CP 0808 shows a lifetime greater than 100 million years.

The most recent report of a lengthening pulsar period comes from an Australian group, headed by V. Radhakrishnan, who have reported that the pulsar in the Vela remnant, which has an 89-msec period, is lengthening at the rate of about 1 part in 20 000 per year.

— GBL

CERN Successfully Runs an Ultrasonic Bubble Chamber

An ultrasonically activated helium bubble chamber recently yielded its first photographs at CERN (*Nature* **220**, 1177, 1968). Although many laboratories have been working on the chambers, the CERN team, headed by Robin Brown, Hans Hilke and A. H. Rogers, is the first to show that they work and produce visible bubbles.

As in all chambers, momentarily lowering the pressure produces preferential boiling along particle tracks. Until now the necessary variations in pressure have been applied by huge expansion systems, which were in general slow to recycle (typically a few times per second at most).

In the CERN chamber the pressure variation is produced by two piezoelectric crystals, which set up a 110-kHz standing wave in liquid helium kept at 4.2 K. After 50 or 60 cycles bubbles grow to visible size. Such a chamber could presumably be almost continuously sensitive. Used along with an electronic counter system, the photographic flash might then be triggered only when interesting events occurred.

Near-Earth Study Program Proposed for 1968–1975

After the exploratory space surveys of the past ten years, it is time for co-ordinated satellite, space-probe and rocket sounding missions to attack

questions of fundamental physical mechanisms in the sun-earth system, according to a report issued by the Space Science Board of the National Academy of Sciences (*Physics of the Earth in Space: A Program of Research, 1968–1975*).

The report proposes specific missions for the period 1971–1976, putting high priority on co-ordinated spacecraft observations of the magnetosphere during the low solar activity expected in 1974–1975. Two new kinds of space vehicles are needed, the report says: clusters of simultaneously deployed small satellites to allow concurrent measurements at relatively short separations and special satellites capable of a variable orbit for sustained measurements

at lower altitudes than previously possible.

In surveying our knowledge of the sun-earth system, the report identifies many unanswered questions: How does the solar wind interact with the magnetosphere to form the boundary? How is solar-wind energy converted into electric currents, auroral light and radiation belts? What are the significant photochemical processes in the ionosphere? What causes geomagnetic storms, and how do they affect the magnetosphere and ionosphere? How do the density and temperature of the thermosphere vary with the magnetic activity? How does eddy diffusion affect gases in the atmosphere and transmit heat?

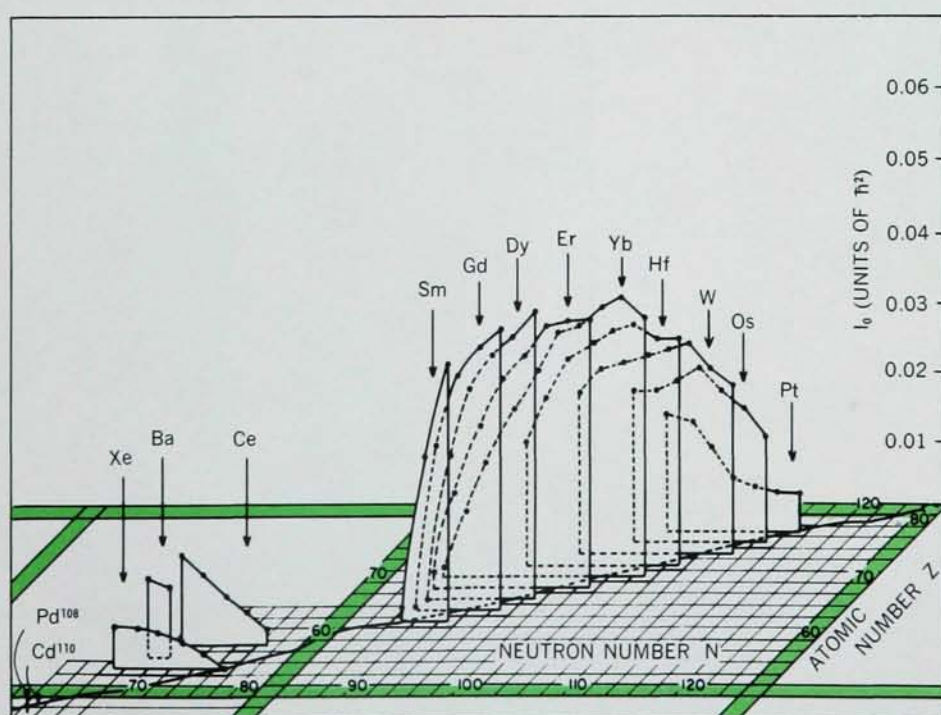
Variable Moment of Inertia For Even-Even Nuclei

By assuming that the nuclear moment of inertia is a function of nuclear spin, a Brookhaven group has developed a model for even-even nuclei that successfully predicts level spacings in ground-state bands, which are level sequences that have values of spin and parity $J^P = 2^+, 4^+, 6^+, \dots$. Such bands are found in both deformed and spherical nuclei.

To a first approximation well deformed nuclei have energy levels $E = (\hbar^2/2) [J(J+1)]/I$, which occupy a rotational band (I is characteristic nuclear moment of inertia). In spher-

ical nuclei ground-state-band levels are approximately equidistant, and are therefore usually thought to be members of a vibrational band. Energy-level patterns intermediate between the rotational and vibrational types are found, for example, in the regions of the osmium and xenon nuclei.

Recently M. A. J. Mariscotti, Gertrude Scharff-Goldhaber and Brian Buck (*Phys. Rev.* **20** Feb. 1969) showed that spherical nuclei can also be interpreted as rotational nuclei. Their model adds a new term to the rotational formula by assuming that I



VARIATION OF NUCLEAR MOMENT OF INERTIA I_0 as a function of neutron number and atomic number. I_0 reaches maximum midway between closed shells (color).