PHYSICS

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ABSTRACTS

The $Si^{28}(n,\alpha)Mg^{25}$ Reaction—A Student Experiment. M. M. BRETSCHER and D. L. KOHLSTEDT, Valparaiso University.—To demonstrate some of the fundamental aspects of nuclear reactions, a solid state silicon detector was bombarded with 13.61 ± .08 Mev neutrons. With a depletion depth of about 260 microns, the pulse height spectrum from the detector revealed nine alpha particle groups associated with the reaction $Si^{28}(n,\alpha)Mg^{25}$. The corresponding energy levels of the Mg^{25} nucleus were measured to be 0.57±.01, 0.95±.02, 1.60±.02, 1.94±.02, 2.72±.03, 3.37±.03, 3.88±.04, 4.24±.04 Mev. These results agree within one per cent of the literature values. Two proton groups from the $Si^{28}(n,p)Al^{28}$ reaction and two alpha groups from the $Si^{29}(n,\alpha)Mg^{26}$ reaction were also identified. The experiment appears to be ideally suited for an advanced undergraduate modern physics laboratory.

Some Considerations for a Simplified Orbiting General Relativity Experiment. RONALD D. PALAMARA, Purdue University.—The synthesis of a simplified orbiting experiment to test the validity of general relativity theory is examined. The original concept, suggested by L. I. Schiff, involved measurement of the relativistic precession of a torque free gyroscope which was located inside a satellite that was orbiting in a gravitational field. This paper considers a highly simplified system in which the satellite is itself the precise orbiting gyroscope. The primary problem areas are reduction of the non-relativistic precessions such that the 7 sec arc/yr relativity precession is a principal effect and measurement of the gyroscope precession. The effect of classical atmospheric, electromagnetic, gravitational, and micrometeorite impact drag torques upon the gyroscope precession is evaluated. By optimizing the orbit parameters and the unshielded gyroscope characteristics, the non-relativistic precessions can be minimized. The total precession is measured by rigidly attaching the proper resolving power lens and folded optics to the inside of the gyroscope. The apparent trace of a stellar reference as viewed by this system and recorded on a photographic plate placed behind the lens is exactly equal to the precession of the gyroscope.

An Hypothesis on the Operation of the Siphon. JAMES C. REBER (Work done as student at Indiana Central College; presently a graduate student and research assistant at Duke University).—Physics textbooks explain the operation of the siphon on the basis of air pressure. It is explained that there is an external pressure due to the atmosphere which forces the liquid up the tube. The difference in the pressure on the two columns is the driving force of the siphon. It is stated that a

siphon will not work if the column is higher than that which air pressure will support.

Dr. Konstantin Kolitschew of the physics department of Indiana Central College has proposed an hypothesis contradicting this theory. Dr. Kolitschew suggested that the siphon operates because of surface tension; the fluid continues to flow because of the cohesion between the molecules.

Experiments were designed to test this hypothesis. Capillary mercury siphons were operated in a bell jar at reduced pressure. Experiments were conducted in which the siphon continued to operate at as close to a perfect vacuum as possible with the available equipment (vacuum pump and diffusion pump with rated vacuum of 10^{-6} mm Hg.)

In the course of the experiment it was noted:

1. Vibrations tended to cause the siphon to fail, particularly at low pressure.
2. Siphons in which the upper end had a larger cross-sectional area operated at lower pressures than those in which the lower end had a larger cross-sectional area.

Equations for making an optimum siphon were developed from the general equation:

$$A_2h_2\rho g - A_1h_1\rho g = \frac{\text{(surface tension) (cross-sectional area)}}{\text{(distance over which force acts)}}$$

where A_2 is the cross-sectional area of the longer column and h_2 its height; A_1 is cross-sectional area of shorter column and h_1 its height; ρ is density of the fluid; and g the acceleration of gravity.

It was concluded that although atmospheric pressure is a factor in supporting the column, atmospheric pressure is not the *determining* factor in the possibility of the siphon's action.

Further experiments were suggested using water, water with lowered surface tension, oil, larger siphons, and siphons of varying cross-sectional area to verify the general equations developed.

I would like to give special thanks to Dr. Kolitschew for his encouragement and guidance throughout both the theoretical and experimental phases of this work.