# physical sciences

GENERAL RELATIVITY

## Six-sided satellite for gravity test

Drs. Duane H. Cooper and Howard W. Knoebel of the University of Illinois believe they have found a low-cost method, using a gyroscopic satellite, to distinguish between the predictions of Einstein's general relativity and other relativity theories.

The satellite would be observed by existing equipment, which would simultaneously photograph both the stellar background and the flashing reflection of sunlight from six flat surfaces. These optical flats would be symmetrically positioned around a spinning dielectric sphere 60 centimeters in diameter. From the photographs, spin-axis orientations could be determined, they report in the November PHYSICS TODAY.

At an orbital distance of 1,000 kilometers, the satellite would be above atmospheric and most magnetic disturbances. Drs. Cooper and Knoebel have recently simulated their experiment on a computer to determine that remaining disturbances can be eliminated by data reduction.

They find they could measure the effects of gravitational forces due to relativity on precession of the satellite's gyroscopes to better than one percent after it had been in orbit for at least one year. This is sufficient to discriminate the eight percent discrepancy between the predictions of Einstein's general relativity and the Brans-Dicke theory (SN: 6/1, p. 532).

PARTICLE PHYSICS

## No particles faster than light

Two Princeton scientists looking for particles that travel faster than light in a vacuum have failed to detect any. Such theoretical particles, compatible with Einstein's theory, have been named tachyons (SN: 9/9/67, p. 242).

If the assumption is made that tachyons interact with ordinary particles and fields, they could be detected by the Cerenkov radiation they emit in a vacuum. Drs. Torsten Alväger, now at Indiana State University, and Michael N. Kreisler looked for such particles with a photomultiplier in a high vacuum between two plates.

Results appear in the November PHYSICS TODAY.

COSMOLOGY

## Background radiation high

Far infrared measurements from a rocket more than 100 miles above the earth indicate that the background radiation pervading the universe (SN: 6/15, p. 575) has a much higher temperature than previously observed.

The residual radiation from the proposed original big bang in which the universe was created has been measured at several wavelengths during the past three years. So far these have supported the big bang theory, which calls for residual radiation to be that of a blackbody giving off radiation at a temperature of 2.7 degrees K. That is the temperature to which it would have cooled since the original primeval fireball some ten billion years ago.

Now three scientists at the Naval Research Laboratory and Cornell-Sydney University Astronomy Center have found the infrared radiation of the night sky is 100 times stronger than expected from a blackbody at 2.7 degrees. The intensity of the radiation they measured is calculated to correspond to a background temperature of about eight degrees.

Because only one measurement was made, and the work is a pioneering effort in rocket measurements at the infrared wavelengths, the result cannot be said to contradict the big bang theory. Dr. Kandiah Shivanandan of the Naval Research Laboratory and Drs. James R. Houck and Martin O. Harwit of the Cornell Center urge further observations to clarify the problem in the November 11 PHYSICAL REVIEW LETTERS.

OPTICS

## Identifying live cells

Much of the work of microbiologists is concerned with the positive identification of various microorganisms, often very difficult. The usual culturing techniques and biochemical assays are time consuming and relatively expensive compared with the automated testing methods of many physical sciences.

A new approach to identification of living microorganisms based entirely on fundamental concepts of mathematical physics has been developed by Dr. Philip J. Wyatt, now with Science Spectrum in Santa Barbara, Calif. His theoretical concepts, developed while he was with EG&G, Inc. in Cambridge, Mass., relate to the virtually unique manner in which distinct microorganisms scatter light.

Dr. Wyatt reports in the October APPLIED OPTICS that such microorganisms as *Bacillus subtilis, B. anthracis, Staphylococcus epidermidis* and *Escherichia coli* and the spores of *Bacillus cereus* could be identified by variations in their light scattering properties resulting from structural differences.

SPECTROSCOPY

## New charge image detector studied

In recent years interest has increased in improving the efficiency of detecting faint optical images. This is so especially in the development of various forms of electron-optical image amplifiers. These are more sensitive than photographic emulsions, but because of their shape they have lower information handling capacity.

Three scientists at the University of London are now testing a technique that combines the use of photoemissive or photo-conducting layers to give high detecting efficiency with the advantages of photography.

A charged image previously produced on the surface of a dielectric layer is read out by closely scanning it with a rapidly vibrating conducting probe. Alternating currents of equal magnitude are induced both in the probe and a conducting material backing the layer. These currents are directly proportional to the charge density of the dielectric layer being scanned.

Dr. Robert L. F. Boyd and co-workers report the work in the Nov. 9 NATURE.