hydrostatic pressures and near-zero temperatures on the deep ocean floor, some of the basalts erupted there fail to release any of the rare gas components which may be present. For example, in some of the deep sea basalts previously investigated by Fisher excess $^4He/^{40}Ar$ ratios were as high as 15, the maximum value to be expected from U, Th and K decay in a closed system with terrestrial abundances. Thus not only did the original magmas possess a rare gas component, the component remained in the rock after eruption. If this happens with ^4He it is a fair assumption that any ^3He in the deep Earth regions sampled by these magmas will also remain.

The fact that the ^3He concentration in these basalts was less than 10^{-10} ccSTP g^{-1} proves that if the Earth originally had a gas rich or average chondritic abundance it thoroughly degassed a long time ago. And because ^3He only lives in the atmosphere for about 10^6 years, primordial ^3He from these chondritic abundances could not possibly still be there. The same could also be true for ordinary chondritic abundances but definite confirmation of this would require apparatus with a ^3He concentration resolution of at least 10^{-11} ccSTP g^{-1}, unfortunately an order of magnitude higher than that available to Fisher. To rule out the Clarke hypothesis completely it would, of course, be necessary to prove that the ^3He concentration in the deep Earth is less than $4{\cdot}4 \times 10^{-13}$ ccSTP g^{-1}. Nevertheless, Fisher's results begin to make ^3He leakage through the ocean floor less likely.

INTERSTELLAR MOLECULES

More Light on Interstellar H_2

from our Cosmology Correspondent

THE terse report by G. E. Carruthers that a rocket-mounted ultraviolet detector has observed interstellar molecular hydrogen in the far ultraviolet spectrum of ξ Persei (*IAU Circ.* No. 2250) will probably arouse more interest than the news that D. Buhl and L. E. Snyder have detected an emission line of HCN at 3·4 mm (*IAU Circ.* No. 2251). Since the recent discovery of formaldehyde emission lines (Snyder *et al.*, *Phys. Rev. Lett.*, **22**, 679; 1969), there is bound to be little surprise that a new organic molecule has been discovered in interstellar space by its radio emission, particularly when the new molecule is HCN. It has been detected in the sources W49, W51, W3, Ori A. DR 21, and in the ammonia cloud previously found in Sgr A. The radial velocity for the Ori A line is the same as that of the CO line in this source, and in the other sources the HCN line has the same radial velocity as the formaldehyde lines.

At first sight the report from Carruthers is more interesting because the ultraviolet spectrum suggests that the column density of molecular hydrogen in the direction of ξ Persei is about 5×10^{19} cm^{-2}, comparable with that of atomic hydrogen along the same path. Although no other information is given in this first report, it is tempting to speculate that the result may be typical of the overall galactic hydrogen distribution, implying that there is as much molecular hydrogen between the stars as there is atomic hydrogen, which would make this discovery almost as important as the original discovery of 21 cm radiation from interstellar atomic hydrogen.

RELATIVITY

Einstein Rules the Waves

A NEW test of the general theory of relativity has been achieved by two groups of radio astronomers in California who have measured independently the deflexion suffered by a beam of radio waves as it passes within the vicinity of the Sun. The radio signals from the source 3C279 were measured as the source was obscured from view by the Sun in October last year, and in both cases the angle of deflexion coincided with that expected from Einstein's theory of gravitation to well within experimental error. The accuracy compares favourably with that for similar experiments on the bending of light, which date back as far as 1919.

A second contribution to the deflexion comes from the refraction of the beam in the coronal electron plasma, and this effect must, of course, be subtracted out. The measurements in both experiments were effected by recording the interference between signals picked at two antennae separated by a large distance. The signals from 3C279 were compared with those from the neighbouring quasar 3C273 which kept well away from the direct line with the Sun and whose beam would therefore have been unaffected by the gravitational field of the Sun.

G. A. Seielstad, R. A. Sramek and K. W. Weiler (*Phys. Rev. Lett.*, **24**, 1373; 1970) took recordings at 9,602 MHz on two dishes separated by 3,500 feet (1,075 m). They found that the angular deflexion due to gravity at the limb of the Sun is $1{\cdot}77 \pm 0{\cdot}20''$, or about the angle subtended by a fingernail at a distance of one kilometre. D. O. Muhleman, R. D. Ekers and E. B. Fomalont (*Phys. Rev. Lett.*, **24**, 1377; 1970) selected a frequency of 2,388 MHz with antennae separated by 13·4 miles, and obtained a gravitational deflexion of $1{\cdot}82 \pm 0{\cdot}20''$. Both values are in good agreement with the prediction of 1·75" from Einstein's theory of gravitation, and it seems very unlikely that there is any significant error in the estimation of the small angle of refraction in the electron plasma.

The advantages in using radio waves rather than light are immediately apparent in these experiments. For one thing, it is possible to make measurements much nearer the limb of the Sun with radio signals, and the observations may be maintained for a considerably longer period of time. The gravitational deflexion is roughly proportional to the inverse of the distance of the beam from the Sun. A further advantage is that the alignment of the Sun with the radio source occurs once in each year and Muhleman *et al.* point out that with a modest increase in observation time—16 h were taken in their experiment—and a better distribution of observation over the period of occultation it should be possible to increase the accuracy by a factor of three.

Both groups mention that while it is heartening to find a new way of checking the general theory of relativity the measurements do not completely rule out other alternative theories. The theory proposed by Dicke to explain his determination of the quadrupole moment of the Sun lies on the fringe of the likely error. But the similarity of two measurements at different frequencies must count as strong backing for the theory of Einstein.