ties. Notable progress has been made in the Department of Embryology in the analysis of the control of sex differentiation in the embryo by the action of sex-gland hormones; and a long-term study of the blood flow through the placenta, first in monkeys bred for the purpose, and afterwards on human placentas, points to physiological factors—that is to say, differences in blood pressure between the maternal arterial and venous blood and the blood within the placenta—as the chief directive agency of the maternal placental circulation, assisted by anatomical features of placental structure. Experiments on pregnant rhesus monkeys suggest that sugar metabolism in the primate placenta is not like that in sheep, at least with respect to glucose and fructose. The Department of Archæology continued its researches dealing with the preconquest history of Yucatan.

RELATIONSHIP OF SCIENCE AND RELIGION

IN his Rede Lecture for 1954 on "Science and Religion: a Changing Relationship", which has now been published*, Prof. C. A. Coulson, pointing out that Nature (by which he means the totality of our environment) and man are central both to science and religion, maintains that the division of our experiences into those labelled scientific and those labelled religious is wholly unsatisfactory and false to the true character both of science and religion. Science claims to give an account of all our environment, and he believes that the limits of science are only those which are presented by the words: if a question about Nature can be posed in scientific terms, then ultimately it will be susceptible of a scientific answer. In remarking that every scientific law is a new imaginative conception, Prof. Coulson suggests that, like the artist, the poet and the saint, the scientist is making sense out of that part of his experience which appears most amenable to his own selective understanding; he is looking for a pattern within them which will satisfy him as reasonable and consistent. Science is one kind of pattern, art is another.

Our loss of immediacy in our relation to Nature has, Prof. Coulson thinks, increased rather than diminished the contrast between conventional science and religion. Among the scientists of to-day there are respect and excitement, sometimes astonishment, but all too seldom reverence; and if we could recognize that man's total response to Nature must include not merely the making of a pattern that may be called true but also the recognition that God is mediated to him both in the experience and in the pattern, science would be recognized as one of the languages in which God is revealed, and the work of scientists would be seen as part of God's work. The sense of immediacy, which has largely been lost in modern scientific study, would be rediscovered. Our approach to the study of man is also changing, and here Prof. Coulson thinks science can help religion by forcing us to see and understand the sacramental value of Nature and the wholeness and unity of things. Science is also a powerful and insistent reminder of the worth of reason at a time when men's faith in the virtues of reason is wavering. A faith in rationality is central to the Christian tradition at its finest. Science is also affecting our view of the role of men within the whole pattern of Nature. Men and Nature are inextricably mixed, and Prof. Coulson believes that science has something to say about the very structure of human fulfilment, for which Christians have greater reasons for being grateful than they sometimes admit. There is a liberating quality about scientific thinking to-day, and yet a humility, which seems to him to augur well for a future complementary relation between science and religion.

In its methods of working, in its dependence upon the assumption of a spiritual wholeness about life, in its insistence upon the richness and variety of experience, and the inter-relatedness of all things within the role of a person, continued Prof. Coulson, the changing pattern of science has come back to something more like harmony with the Christian faith. In that new harmony there are new notes which would never have been sounded but for the patience, the integrity and the creative imagination of men of science. Lastly, all scientific beliefs are experimental in character, and the concepts of science acquire their validity only in experience. This is also true of the Christian faith, and it is one more debt which religion owes to science.

* Science and Religion: a Changing Relationship. (Rede Lecture for 1954.) Pp. 36. By Prof. C. A. Coulson. (Cambridge: At the University Press, 1955.) 2*s.* 6*d.* net.

BURSTS OF RADIO EMISSION

R. D. DAVIES has published a paper entitled "An Analysis of Bursts of Solar Radio Emission and their Association with Solar and Terrestrial Phenomena" (*Mon. Not. Roy. Astro. Soc.*, **114**, 1; 1954), which presents a detailed analysis of bursts of radio emission recorded at the Radiophysics Laboratory, Sydney, during January 1950–June 1951. This analysis includes a detailed study of the correlation of bursts with flares, sunspots, ionospheric fade-outs and magnetic crochets. While attempts to draw physical conclusions from the analysis have not been made in most cases, nevertheless certain results of immediate interest are briefly discussed. The radio data were obtained mostly from records at 200, 600, 1,200, 3,000 and 9,400 Mc./s., and in the latter part of the analysis these were extended to 62 and 98 Mc./s. All these came from the records taken at the Radiophysics Laboratory, Sydney, except the first, which came from records from the Commonwealth Observatory, Mt. Stromlo.

The analysis—in two parts—includes a number of histograms, and shows that many of the properties of bursts change with frequency (a burst is defined as "any clear-cut solar radio emission rising above the daily level"). A characteristic of bursts is their 'jaggedness', that is, short-duration rises and falls in intensity, and the degree of jaggedness decreases with increasing frequency. Tables, figures and histograms show that there are many interesting relations between the number of bursts and their frequencies, and also between bursts and sunspots, flares, fade-outs and crochets. As the frequency of bursts rises from 600 to 9,400 Mc./s., their average number per hour diminishes from 0·10 to 0·04, and the average interval between the bursts increases from 10 to 26 hr. A number of figures shows the distribution of the lifetime of the bursts at the different frequencies, the distribution of their decay times, the distribution of their intensities, etc.

The second part of the analysis deals with the relation between radio data and sunspot data, and to do this an estimate was made of the average number of bursts per hour for each month; Fig. 7 gives a comparison of the three-month running means (number of bursts per hour) with the monthly average sunspot areas and numbers for the period referred to earlier. From this figure the following conclusions are drawn: (1) time plots of the burst index are similar at different frequencies; (2) there is a good correlation between the burst index and the sunspot area and number. Additional important results are the coincidences between flares and excess radio noise; at least 99 per cent of all flares are accompanied by excess radio emission in some part of the frequency-range, but it is admitted that this high correlation may be due to chance coincidences. So many other matters are dealt with that it is impossible to consider them all here. One further point, however, may be mentioned, namely, magnetic storms and world-wide crochets, briefly referred to in the appendix. On four occasions, listed in Table 6, the sudden commencement of a magnetic storm was preceded by a burst but not a flare, the time delay between burst and commencement of the magnetic storm varying between 20h. 58m. and 29h. 13m.; Table 7 lists eleven world-wide crochets, not accompanied by a reported flare, associated with bursts, between February and November 1950. These phenomena, it is stated, appear to be genuine and may be supposed to have a flare-like origin, judging from their association with bursts.

EARTHQUAKES DURING OCTOBER 1954—JANUARY 1955

DURING the last three months of 1954 there were in the world twenty-four earthquakes having instrumental magnitude 6 or greater. The greatest two had magnitude 7 and occurred on October 21 in the South Indian Ocean, and on December 16 near Fallon, Nevada. The latter caused moderate property damage. The earthquake of deepest focus during the period had a focal depth of 650 km. and occurred on November 25 in the Fiji Islands region. There were two minor British earthquakes. On the afternoon of October 23 South Elmsall (Yorkshire) was affected by a severe tremor which shook furniture and crockery. The shock was also felt at Hemsworth and Pontefract. On November 15 at 6.25 a.m. Winster, in Derbyshire, was shaken by an earth tremor felt with Modified Mercalli intensity 4, which rattled crockery, pictures and furniture. The shock was also felt at Birchover and Elton. Both these earthquakes were accompanied by low rumbling sounds. Previous tremors at Winster occurred in February 1952, and before that in 1903–4.

In other parts of Europe, earth tremors were reported to have occurred in October near Trieste, near Innsbruck and in Spain. On November 16 an earth tremor occurred forty miles south of Rome, and on November 23 at Grisi, near Palermo, in Sicily. The following month nearly all the houses on Salina Island (about fifty miles from Messina) were damaged in an earthquake swarm which began on December 23. Possibly associated with this, there was a lava flow accompanied by steam from the crater of Stromboli, while from Etna there issued a column of smoke mixed with ash. Shocks and volcanic activity ceased by January 3. On December 23 an earthquake occurred in western Peloponnesus, injuring nineteen people and causing the collapse of several houses.

Elsewhere, on December 4 an earthquake with instrumental magnitude 6¼ and depth of focus 60 km. occurred near Trinidad. One person was killed, several injured, and there was extensive property damage, including damage to Government House and both the Anglican and Roman Catholic Cathedrals. On December 21 an earthquake of instrumental magnitude 6½ occurred in Humboldt County, California, injuring several persons and causing extensive property damage.

During January of this year there were reports of eight earthquakes with magnitude 6 or greater. The greatest occurred on January 13 in the Fox Islands (Aleutian Islands). It was felt at Unalaska and had logarithmic magnitude 6·9. The shock with the greatest depth of focus occurred on January 22 in the Fiji Islands, its depth of focus being 650 km. The only shock reported as having caused property damage occurred on January 25 on the Tennessee–Arkansas–Missouri borders. The damage was of a minor character.

FORMATION AND CHARACTERISTICS OF LATERITE

THE dark-red, hard, barren, slag-like, acre-wide sheets of laterite commonly seen in the tropics have led many to conclude that this is the final wretched residue of soil-forming processes and represents the death of the soil. The origin of these impressive formations has long been disputed. Weathering has apparently been associated with removal of silica and bases; but that seems to be the case also with two other materials: Buchanan's laterite, a soft, vesicular, red earth which hardens on exposure and has long been used as building stones; and the deep, very friable, porous, dark-red, well-drained soils of forested slopes. Each of these materials consists largely of sesquioxides, and it has seemed remarkable that they differ so strikingly in their physical properties.

Dr. J. D'Hoore, director of the Service Pédologique Interafrican and a distinguished member of the staff of the Institut National pour l'Étude Agronomique du Congo Belge, has thrown a welcome light on this problem by distinguishing 'absolute' and 'relative' accumulation of sesquioxides in soil*. He remarks that the concentration of a salt solution can be increased by adding salt (an absolute accumulation) or by removing solvent (a relative accumulation). Similarly, a low-lying area can receive an inflow of ferruginous solution, an absolute accumulation, and a high-lying area can suffer loss of silica and bases and thereby exhibit a relative accumulation of sesquioxides.

In the case of the low-lying area attention is given to the physical and chemical nature of the substrate (for example, mixed colluvial material) that receives the absolute accumulation of sesquioxides, and in the case of the upland area attention is given to the

* Publications de l'Institut National pour l'Étude Agronomique du Congo Belge. Série Scientifique No. 62: l'Accumulation des sesquioxides libres dans les sols tropicaux. Par Dr. J. D'Hoore. Pp. 132. (Brussels: Institut National pour l'Étude Agronomique du Congo Belge, 1954.) 80 Belg. francs.