in the mind of the student and that of the teacher 'the idea of the oneness of knowledge' and to emphasize that 'scholarly work is service to civilization'.

Sir Richard Gregory, Bt., F.R.S.

THE tidings that Sir Richard Gregory, editor of *Nature*, has been elected a fellow of the Royal Society will have given wide-spread satisfaction among those who enjoyed the privilege of meeting him and Lady Gregory during their visit to this country in January and February of the current year.

Among the statutes of the Royal Society is one, seldom brought into operation, enabling election of a personage who, in the opinion of the Council, has rendered conspicuous service to the cause of science, or whose election is deemed to bring signal benefit to the Society. It has been customary to elect successive Prime Ministers under this statute, but we do not recall its application to other persons of eminence. Thus a special interest attaches to the election of Sir Richard Gregory, whose service to the cause of science is indeed conspicuous. During an association with *Nature* extending over forty years, and particularly under his long continued editorship, the publication has become unique. Its wealth of information in all branches of science, the courageous and broad-minded survey of such current affairs as relate to the progress of science, the cultivated and informative reviews of books, and the diverse correspondence columns, are features now so familiar to the scientific world that we can appreciate them at their true value only by considering for a moment the blank in our lives that would ensue were *Nature* to vanish.

On behalf of our readers we offer Sir Richard Gregory the warmest congratulations of *Current Science*. Since his return to England Sir Richard has been gravely ill, but the mail announcing his new distinction announces also his convalescence, and the hope that his health may be soon restored to its original vigour will be universal.

Joseph Priestley, 1733-1804.

THE bicentenary of Priestley's birth on 13th March, 1733, received special recognition by the Chemical Society at its meeting on 6th April, 1933, when addresses on his life and work were delivered by Professor A. N. Meldrum, Sir Philip Hartog and Sir Harold Hartley. These emphasized his remarkable personality, his nobility of character and the novel contribution to chemical practice arising from his facility in handling gases.

The life of Priestley merits attentive study by all students of science, old and young. He was a genuine philosopher inasmuch as he loved wisdom in all the branches then accessible, and his command of languages was extraordinary. His piety and rectitude were so pronounced and so commingled with curiosity regarding natural phenomena that they invited the persecution of an intolerant age; and it is one of life's ironies that he narrowly escaped destruction on account of his revolutionary sympathies when Lavoisier was beheaded for his counter-revolutionary proclivities. Probably the only years of peace he knew were the concluding decade of his life, spent with his family in Pennsylvania.

Scientific experiments were for him a hobby early adopted and faithfully pursued. His admission that he was "not a practical chemist" in part explains his outstanding success, because, as we are reminded by Dr. Meldrum, he declared that "if I had been accustomed to the usual chemical processes, I should not so easily have thought of any other; and without new modes of operation I should hardly have discovered anything new". His work on gases began in 1767, but he was nearly forty before the experiments with air, and the exact date of his discovering oxygen remains obscure: in fact, the careful survey of correspondence submitted by Sir Philip Hartog to *Nature* (1st July, 1933, p. 25) indicates "before the month of November, 1771" as being probable, the experiments of 1st August, 1774, in Wiltshire and of 1st March 1775, in London, being confirmatory and extensory.

In referring to his outstanding discovery Priestley has modestly recorded a reflection often recurring in the minds and writings of those interested in the relation of cause to effect when he says "it provides a striking illustration of a remark I have more than once made in my philosophical writings and which can hardly be too often repeated, namely, that more is owing to what we call chance than to any proper de ign or preconceived theory in this business". That reflection remains legitimate, but must be accepted only in conjunction with Pasteur's dictum that "in the field of observation chance favours only those who are prepared". M. O. F.

Locomotion of Fishes.

By Dr. Sunder Lal Hora, D.Sc., F.R.S.E., F.L.S., F.Z.S., F.A.S.B.,
Zoological Survey of India, Indian Museum, Calcutta.

THE muscular movements of fishes have been studied from a very early time, and the researches of Borelli,[1] Pettigrew,[2] Maurey[3] and Breder[4] deserve special mention in this connection. In spite of the wealth of literature available on the subject (see Breder for bibliography) the exact significance of these movements has only been realized during the current year as a result of the careful work of Dr. J. Gray[5] in the Laboratory of Experimental Zoology, Cambridge. It was believed that the fins of fishes are the main organs of locomotion, and that the fish impels itself forwards by the tail and the caudal fin. These conclusions seem to have been based on erroneous impressions, for the eye observes only the movements of the tail relative to the head instead of observing its motion in relation to the background of the fish. Dr. Gray has, however, recorded photographically the movements of a number of fish against a scaled background, and these records have enabled him to analyse the nature of the part played by different organs in the locomotion of fishes.

Superficially the motions of various types of fish appear to vary considerably from one kind to another. For example, the most conspicuous features of a moving eel are the waves of curvature which pass along the length of the body from head to tail. In the fast-moving mackerel the visible movements appear to be due to transverse strokes executed by the posterior end of the body across the axis of motion. Dr. Gray was able to demonstrate that the waves of muscular contraction occur in almost all fishes, but that these vary greatly in speed of propagation, amplitude and frequency. As in eel, the forward progression of fishes is mainly due to the waves of muscular contraction. It has been experimentally demonstrated by Breder in the case of *Scardineus erythrophthalmus* that it makes no appreciable difference in the "cruising" speed of the fish whether it moves with the caudal fin intact or with the caudal fin carefully amputated. These observations have been confirmed by Gray by the removal of the caudal fins of the rudd, the perch, and the whiting.

In a fish moving forwards the waves of muscular contraction start from the anteriormost region of the body, and it is found that the speed of propagation of the waves is too low to be controlled by the rate of conduction of a simple nervous impulse. The forward propulsion of the fish is due to the fact that its leading surface faces obliquely backwards relative to the head of the fish and that it moves at an angle to its own direction of motion. It is thus seen that so long as the leading surface is moving at an angle to its own path of motion, there will be a pressure exerted at right angles to the surface, and so long as the leading surface is directed obliquely backwards relative to the head of the fish, the pressure will be directed obliquely forwards. "The magnitude of the forward thrust depends, among other things, on (*a*) the angle which the surface of the fish makes with its own path of motion, and (*b*) on the angle between the surface of the fish and the axis of forward movement of the whole fish, (*c*) on the velocity of transverse movements of the body." Dr. Gray has shown that the underlying mechanism of propulsion of a typical fish is similar to that of a typical screw propeller. In this movement it is seen that each point on the body of the fish travels in a horizontal figure of 8 relative to a transverse axis which is moving forwards at the same average velocity as the whole fish.