fairly well preserved dermal skull-roof, lacking the snout; it provides a perfect transition between the Crossopterygian and Ichthyostegid patterns of dermal bones.

The bones are exposed mostly from the visceral aspect, and have the arrangement shown in Fig. 1. The bones in front of the orbit are probably flattened out rather more than in life. Between the orbits the skull-roof was markedly concave from side to side, with a sharply depressed median groove. The specimen is clearly a new form and may be named *Elpistostege watsoni*[5], gen. et sp. nov. (from 'ελπιστός, hoped-for; στέγη, a roof. The trivial name is a token of my indebtedness to Prof. D. M. S. Watson). A more detailed description, with an account of other material (some of which may perhaps be referred to this form) will be published elsewhere in a general work on the Scaumenac Bay Devonian fish-fauna by Graham-Smith and myself.

In Fig. 2 the skulls of *Diplopterax* (a primitive Crossopterygian from the Middle Old Red Sandstone, restored by me), of *Elpistostege* (from the lowest Upper Devonian[5]), of *Ichthyostegopsis* (from the *Remigolepis*-series high up in the Old Red Sandstone facies in East Greenland, modified after Säve-Söderbergh), and of *Actinodon* (from the Lower Permian, modified from Lydekker) are compared. There is an unmistakable homology between elements as follows:

Usual Crossopterygian names		Tetrapod names
Parietal	=	Post-parietal
Supratemporal	=	Tabular
Intertemporal	=	Supratemporal }
Dermosphenotic	=	Intertemporal }
Frontal	=	Parietal
Nasals (posterior)	=	Frontal
Supraorbital	=	Post-frontal
Posterior antorbital	=	Pre-frontal

In most Stegocephalia, as in *Ichthyostega* and *Elpistostege*, the separate intertemporal of such forms as *Trimerorachis* and many Loxommids and Anthracosaurs is apparently usually fused with the supratemporal, though in some cases it may possibly be reduced. The Crossopterygian extrascapulars have apparently been lost in Tetrapods.

It seems clear that the differences between the bone-patterns in the forms figured are, with the exceptions noted above, rather a matter of changes of proportions of the skull than of reshuffled elements or differential fusions such as Säve-Söderbergh suggested. The present study completely confirms my previous revisions of homologies, which were the results of different lines of investigation.

The following points may be noted. (1) The pineal foramen is absolutely homologous in position in all the forms discussed. (2) The single median post-parietal of Ichthyostegids can be paralleled occasionally in Crossopterygii; I have a skull of *Eusthenopteron* showing this feature. It represents a pair of bones in related animals. Analogous cases from other groups could be quoted. (3) The cheek in *Elpistostege* was not united to the table of the skull by suture. (4) It now seems possible that the transverse division of the Crossopterygian cranium is no bar to regarding that group as ancestral to the Tetrapods. The division is a retention of the separate trabecular and parachordal chondrifications of the embryos, perhaps because of some special mechanical necessities of the extremely wide gape in Crossopterygians. (5) Although the Ichthyostegids may not be directly on the line of evolution to the known Stegocephalia, they provide a very good morphological ancestry in many ways. (6) The Stegocephalia quickly lose the primitive appearance of Ichthyostegids, being even more shortened posteriorly, and having the orbits with their surrounding bones moved forwards, so that the primitive pattern tends to be distorted. (7) It now seems likely that the evolution of the Tetrapods from fish-ancestors may have taken place very rapidly in the early Upper Devonian; the state of the paired limbs of *Eusthenopteron* and *Sauripterus*, and the structure of the vertebral column of some Crossopterygian fishes of this period offer a good ancestral type.

These matters will be more fully discussed elsewhere. I wish to acknowledge grants from the Royal Society of London, and the Geological Society, and a Senior Research Award from the Department of Scientific and Industrial Research, which were in force during the visit to Canada. I am also much indebted to my companion in the field, Mr. W. Graham-Smith.

[1] Säve-Söderbergh, G., *Medd. om Grønland*, **94**, nr. 7 (1932).
[2] Säve-Söderbergh, G., *Medd. om Grønland*, **98**, nr. 3 (1935).
[3] Westoll, T. S., *Geol. Mag.*, **73**, 164 (1936).
[4] Westoll, T. S., *Geol. Mag.*, **74**, 517 (1937).
[5] Westoll, T. S., *Geol. Mag.*, **74**, 520 et seq. (1937).

The Science Masters' Association

ANNUAL MEETING

THE thirty-eighth annual meeting of the Science Masters' Association, held on January 4–7 in London, was attended by more than six hundred members. There were as usual exhibitions by leading publishers and manufacturers of scientific apparatus and the customary exhibition of apparatus devised and made by members themselves.

The meeting opened with the presidential address by Sir Cyril Ashford. Sir Cyril was one of the founders of the Association and was its first secretary, and, rather naturally, contrasted the state of science teaching as he knew it in the early days of the Association and as he found it to-day. The whole address was of a delightfully domestic nature, and at the conclusion Sir Cyril was thanked by two of his fellow pioneers in the forming of the Association—Mr. Archer Vassall and Dr. T. J. Baker.

A new feature of the meeting was the holding for the first time of a lecture on "Science and Citizenship". Since the last London meeting, the Association has accepted the trusteeship of certain funds the purpose of which is to endow a lecture on the subject named. The Association was fortunate to obtain Sir Richard Gregory as the first lecturer under the scheme, and a crowded attendance listened to an extremely interesting and informative lecture.

Sir Richard began by referring to the loss sustained by the Association in the deaths of Lord Rutherford

and Prof. H. E. Armstrong, whom he described as closely similar in their devotion to science, but markedly different in their personal characteristics and in the scope and manner of their work. Lord Rutherford was a supreme example of a modern scientific investigator, fertile in conception, ingenious in experiment, with brilliant insight into the relation between causes and consequences of phenomena in a sublime field of physical inquiry. Prof. Armstrong, on the other hand, though his original work belongs mainly to the field of organic chemistry, had extensive interests in much wider fields such as geography, geology, natural history and agriculture. He took a great and active interest in educational matters, though he was critical—and sometimes caustic—in his comments on science teaching and science teachers.

The comparison of these two great men of science led Sir Richard to his main theme, which was that the scientific worker must not subordinate his citizenship to his science. If he does, society may itself take measures to prevent the perversion of science to destructive purposes. Our national leaders and administrators need wide knowledge and keen foresight to enable them to make the most effective use of the scientific forces which are shaping the conditions of modern life. Science can render the fullest service to the community by harnessing the relations between the scientific workers and the general citizen so that a nobler type of citizenship becomes possible, adequate to defend us against the dangers to which civilization is exposed.

Education may be defined as the deliberate adjustment of a growing human organism to its environment, and therefore preparation for citizenship must involve instruction in the principles of human biology: a course of general biology should open and close with man in the centre of the picture. In schools and universities there is still a tendency to teach science only as a specialized study and not as an essential part of a general education. As science is responsible for the industrial developments and economic changes which have caused violent disturbances in our social structure and provided the means by which civilization may commit suicide, it has a right and a duty to occupy a position of authority in the government or control of the powers it has created. Men of science are citizens as well as scientific workers, and they are beginning to realize their special responsibilities for securing that the fruits of scientific knowledge are used for human welfare. It would be a betrayal of the scientific movement if scientific workers failed to play an active part in solving the social problems which their contributions to natural knowledge have created. They must promote the extension of the application of scientific method to the consideration of social, economic and political questions, so that accurate knowledge may be obtained upon which sound conclusions may be based and progressive policies established.

Other lectures at the meeting were varied in type. Prof. P. M. S. Blackett talked on cosmic rays; Mr. W. D. Seymour on the heating, lighting and ventilation of schools; Dr. Sherwood Taylor on the origins of chemistry; Prof. Allan Ferguson on capillarity; Mr. J. Z. Young on "Brain Waves" (dealing with the regular rhythmical changes of electrical potential recorded for numerous parts of the brain); Mr. A. Rodger talked on vocational guidance and Dr. C. C. Paterson on the appraisement of lighting.

Two discussions were also held. The first dealt with the problem of laboratory assistants in schools. The Committee of the Association is in the course of preparing a memorandum on this matter, and the opinions expressed at the meeting will be incorporated therein and will be published. The second discussion dealt with the relations between school and university science teaching. Discussions of this type almost invariably lead to the difficulties of university scholarship examinations, and this was no exception.

At the business meeting, Prof. James Gray of Cambridge was elected as president for next year. In succession to Mr. F. R. Snell (Eastbourne College), Mr. W. Ashhurst (Stretford Grammar School), Mr. L. G. Smith (Trowbridge Grammar School) and Dr. W. G. Davies (Royal Grammar School, Newcastle), who retired from the Committee, the meeting elected Mr. J. W. Cottingham (Barnsley), Mr. R. E. Williams (Oxford), Mr. G. Fowles (Latymer Upper School) and Mr. R. P. Ayres (Leys School). Mr. S. V. Brown (Liverpool Institute) was re-elected general secretary, Mr. B. M. Neville (William Ellis School), honorary treasurer and Mr. W. Ashhurst (Stretford) as annual meeting secretary. S. V. B.

The Mathematical Association

Annual Meeting

At the annual meeting of the Mathematical Association, which was held at the Institute of Education, London, W.C.1, on January 4 and 5, Prof. E. H. Neville, in taking the chair, explained that he occupied that position in consequence of the sudden death of the president, Prof. L. N. G. Filon, which took place on December 29. After the members had stood in tribute to the late president, the business meeting took place, at which Mr. W. Hope-Jones was elected president for the following year. The existing officers were all re-elected and Miss M. A. Hooke and Mr. F. J. Swan were elected to the Council in succession to Miss G. K. Stanley and Mr. C. T. Daltry, who retired under the regulations. A presidential address, prepared by Prof. Filon previously to his illness, was read by Prof. G. B. Jeffery. The address, which was entitled "Mass and Weight in Newtonian Mechanics", and contained an analysis of the fundamental ideas of dynamics, will be printed in full in a forthcoming issue of the *Mathematical Gazette*.

Prof. D. R. Hartree then spoke on "The Mechanical Integration of Differential Equations". Prof. Hartree referred first to the need for mechanical contrivances for carrying out extended calculations in pure and applied science. So far as purely arithmetical calculations are concerned, this need has been largely met, but the use of machinery for dealing with problems relating to rates of change is not yet widespread. He explained, illustrating by lantern slides, the mathematical and mechanical principles of the differential analyser, a type of machine invented by