which in a pronounced degree are restricted to the Arctic sea areas. Indeed Dr. Jespersen states that "it is certainly a question whether among the oceanic copepods there are any distinct arctic forms at all".

The most frequent species were *Calanus finmarchicus*, *Calanus hyperboreus*, *Metridia longa* and young stages of the genus *Pareuchæta*. *Calanus finmarchicus* predominates in the hauls from the south of Davis Strait and the numbers are considerably reduced in Baffin Bay. In Smith Sound, much farther north, it is again abundant in the surface layers. *Calanus hyperboreus*, which likes cold water, is found only in small quantities south of Davis Strait, in the Strait itself in the upper layers being more abundant and in Baffin Bay present in small quantities. *Metridia longa* occurs in small quantities south of the Davis Strait and in the upper layers of the Strait itself, but occurs in fairly large numbers in Baffin Bay. *Pareuchæta* in its young stages is found in the water south of Davis Strait and only in small quantities in the Strait itself and in the more northern parts investigated.

Details of distribution and biology of all the species are given whenever possible with much interesting information, and many species are shown to have a more northerly distribution than was known before. A series of tables and curves is also provided. One new species was found, *Euchæta Wilsoni*, and this is represented by only one specimen.

All-Metal Radio Receiving Valves

IT will be recalled that about two years ago the 'Catkin' series of receiving valves was first produced in Great Britain (see NATURE, **131**, 735 ; 1933). In the construction of this valve, the amount of glasswork was reduced to a considerable extent, the upper portion of the envelope being formed of the cylindrical copper anode, which was sealed to the lower glass portion by a vacuum-tight joint. Now, an entirely new series of literally all-metal receiving valves is announced by the General Electric Co. of America, and brief details of these were given by the New York representative of the *Wireless World* in the issue of that journal of April 19. These new valves employ a cylindrical outer shell of steel or iron welded to a metal base which rigidly supports the electrode system. The lead-in wires from the electrodes are strung through beads of glass, which are then placed in eyelets of a new alloy known as Fernico, which lines the holes in the base of the valve. The assembly is then passed through a gas flame which fuses the glass beads so that they fill the eyelets. Fernico is an alloy of iron, nickel and cobalt which has the same coefficient of expansion as the beads of glass employed, so that the seal is accomplished without setting up strains in the fusing process. After the electrode system has been attached to the leads, the metal outer shell is placed over the structure and welded to the base. The valve is now exhausted through this metal tube, which is then clamped, welded and cut off at the appropriate time.

The use of an all-metal construction enables the valves to be made smaller in dimensions than existing glass valves, with corresponding reduction in lengths of leads and inter-electrode capacitances. The valves may therefore be of higher amplification factors without instability, and should retain their efficiency at shorter wave-lengths than existing types. Further, since the metal shell completely surrounds the valve and is maintained at earth potential, there will be no necessity for shielding the valve after it is placed in its socket in the receiver. At the present time, six types of all-metal valve have been put into production at the R.C.A. Manufacturing Co., which will make the valves for the General Electric Co. It is expected that new receivers designed round the metal valve will be produced by the autumn of this year.

Physical Methods in the Study of Earth Structure

THE increasing specialisation of science and its literature inspires an ever-growing demand for expositions of separate branches in terms suitable for workers in other fields. The effort to prepare such accounts is often beneficial to those who provide as well as to those who hear or read them ; but some stimulus for their provision is needful, and notable among the available effective stimuli are the endowed annual lectureships of such bodies as the Institution of Civil Engineers. This is well exemplified in the forty-first James Forrest Lecture, delivered to that Institution on May 7 by Prof. O. T. Jones, who took geophysics as his subject.

The choice by a geologist to lecture on geophysics might in past years have led to a passionate or scornful attack on the geological ignorance of geophysicists ; but even in this age of tolerance, Prof. Jones is notable among geologists for his sense of the importance of physical methods in studying the problems of the earth. He has, in fact, produced an admirably clear account of the subject, after modestly disclaiming any rôle save that of the exponent. So calm is the 'atmosphere' of his address that the geophysicist may even feel a craving for at least some more distinctively geological criticism or flavour. But in the closing part of the address Prof. Jones made a most interesting reference to a British problem that is of interest alike to geologists, geophysicists and engineers.

In many parts of the British Isles, Prof. Jones stated, there are known to be many deep rock channels that are so filled with various materials that their existence has not been suspected until engineering explorations for railways, roads, tunnels or sites for reservoirs have revealed them. Some of them are known to be post-glacial : others, being filled with glacial drift, must be pre-glacial. It is still uncertain whether these latter are due to normal river erosion, in which case their gradient must have been continuously downward to the sea-level of their period ; or whether they have been excavated by streams flowing below the ice, in which case they

may be deep narrow channels with a rising gradient at both ends. Several of these channels are known in East Anglia; one seems to commence a few miles south of Cambridge, and follows approximately the line of the L.N.E.R. to Bishop's Stortford at least as far as Newport. It deepens rapidly southward, and if it is a normal river channel it must somewhere enter the sea, possibly following the Lea valley into the Thames estuary. If so, it might cause grave difficulty to engineering projects (as other such channels have done elsewhere), like that for a Thames tunnel east of the Lea valley. The buried channel of the Thames higher up is well known, but if the Newport channel does indeed enter the Thames estuary, its depth below sea-level would far exceed that of the known channel. It would therefore be of great interest both to geologists and engineers if such channels could be detected with certainty by geophysical methods.

The lecture briefly describes such applied geophysical methods, after discussing the scope of geophysics and the history and present position of the main 'pure' problems of geophysics. It should be added that the term geophysics is used in the lecture in a restricted sense: and such a remark as "geophysicists in this country do not concern themselves very much with the electric and magnetic field of the earth, which are observed in detail in various observatories", and the mention of the Carnegie Institution's Geophysical Laboratory without reference to the same Institution's great Department of Terrestrial Magnetism, must be interpreted as betokening unfamiliarity born of lack of personal interest in these further fields of geophysics.

History of Bitumen

TO-DAY, when petroleum with its vast range of derivatives is regarded as indispensable to the welfare of man, it is wholesome to be reminded of the salient factors which gradually extended its usefulness during the course of some five thousand years. It is equally salutary to have delineated handicaps of lack of knowledge, apparatus and facilities, which nevertheless were minimised by the ingenuity of ancient peoples who employed bitumen for a variety of purposes still recognised to-day.

A booklet entitled "The Story of Bitumen" (presumably by R. J. Forbes of Amsterdam, who last year contributed a similar article to the periodical *Bitumen* entitled "Aus der ältesten Geschichte des Bitumens") recently issued by Shell-Mex, Ltd., gives a brief account of the exploitation of bitumen from earliest records of its existence to about A.D. 1800. Abundant deposits were known even to the most ancient civilisations inhabiting the region between the Nile valley and that of the Indus, but production was necessarily confined to surface operations by lack of knowledge of the technique of deep drilling and absence of geological information on deeper oil or rock-asphalt deposits. At the end of the period reviewed, in spite of vicissitudes which hindered rather than accelerated growth of the industry, particularly at the time of the later Roman Empire, the majority of deposits of which we now have knowledge were actually known. Then, however, the importance of petroleum was negligible compared with present-day values, for the internal combustion engine which was later to give such tremendous impetus to the industry and create such a widespread demand for petroleum products was not yet discovered.

Records of actual production in ancient times are naturally scanty. It is obvious, however, that methods were extremely crude, as it is authentically reported that bitumen was recovered from the Dead Sea by men in rafts who simply 'hacked off' as large a piece of the floating mass as they could conveniently carry away. Similarly, until the eleventh century, only the most primitive attempts towards distillation were made: and this fact virtually excluded the use of light combustible oils. Gradually, however, more elaborate and practical methods were evolved, until at the beginning of the nineteenth century it may safely be said that the foundations of modern distillation technique were laid. Even so, no appreciable growth of the industry took place until after 1860, when deep drilling came within the realms of possibility. It is surprising, therefore, that in spite of all these handicaps and difficulties to easy production, we find bitumen was used extensively in antiquity as a building and road material, as a waterproofing agent and in various guises as a weapon in times of warfare. In comparatively recent times it was universally used also for lighting and heating purposes and as an ingredient of paints.

The booklet, in addition to tracing the story of bitumen, gives a chronological list of outstanding dates in the history of bitumen and includes a bibliography on petroleum and bituminous materials which, together with the numerous excerpts from early works quoted in the text, should provide a useful background to a historical study of the petroleum industry.

University and Educational Intelligence

BELFAST.—Dr. H. Barcroft, lecturer in physiology at University College, London, has been appointed to the Dunville chair of physiology in succession to Prof. T. H. Milroy, who is retiring on October 1. Dr. D. C. Harrison, lecturer in biochemistry in the University of Sheffield, has been appointed to the J. C. White chair of biochemistry, in succession to the late Prof. J. H. Milroy.

Colonel S. H. Browne, formerly of the Indian Medical Service, has bequeathed to the University £10,000 to found medical research scholarships.

CAMBRIDGE.—The Royal College of Veterinary Surgeons has intimated to the Vice-Chancellor that candidates who submit evidence that they are graduates in the Natural Sciences Tripos and that in the course of their examination they have passed in physiology, pathology, biochemistry and anatomy, may be exempted from the second examination conditionally on their passing the prescribed examination in animal management before the third examination.

At St. John's College, F. J. S. Hollick has been elected into a fellowship.

OXFORD.—The Halley Lecture will be delivered on June 5, at 5 p.m. in the Lecture Theatre at the University Museum by Dr. J. S. Plaskett, director of the Dominion Astrophysical Observatory, Victoria, B.C., Canada, who will take as his subject: "Dimensions and structure of the Galaxy."

Mr. J. N. L. Baker has been appointed University reader in historical geography for seven years from October 1. Miss B. M. Blackwood has been