Research Items.

A ROMAN FORTIFIED HOUSE NEAR CARDIFF.—In the Journal of Roman Studies (vol. xi. Part i), Mr. R. E. M. Wheeler gives an elaborate account of a fortified Roman villa, about two miles west of the west bank of the river Ely, at the point where that river, though still tidal, first becomes fordable. He concludes that about A.D. 300 this work fell into line with the general defensive and offensive activities of the period. At a time when Romano-British towns seem to have built or strengthened their walls as the Welsh tribesmen did, it is not unnatural that a private householder should have followed the same example on a smaller scale. It is indeed rather matter for remark that other examples of domestic fortification in the late Roman period have been so rarely observed or recorded. The closest analogy is perhaps the partially excavated house and baths within the Castle Dykes near Ripon.

AN OLD-WORLD CUBIT IN AMERICA.—In *Ancient Egypt*, Part iv. 1922, Prof. W. M. Flinders Petrie directs attention to excavations made by the School of American Research at Santa Fé, New Mexico, where the measurements of buildings indicate a unit of 20·7 inches. This figure accords exactly to the well-known Egyptian cubit: 20·62 in the best early examples, 20·65 in later cubit rods, 20·76 on the Roman Nilometers. Babylonia had a rather longer type, 20·88 in. for the cubit of Gudea's plotting scales, and this was also the standard of Asia Minor, 20·6 to 20·9, with a mean of all of 20·63 in. "How could this reach New Mexico? It was evidently Asiatic. We have evidence from weights of an Asiatic diffusion of a Babylonian original over India, China, and Etruria. If the cubit similarly passed to China, it might thence reach North America. It has been already pointed out how the cross at Palenque (Southern Mexico) was in its detail of ornament derived from Italian crosses of about the eighth century, probably carried to China by the Nestorian mission. By the same route the Asiatic cubit may have passed over to the New World at some earlier period."

MARRIAGE CUSTOMS IN MEDIEVAL INDIA.—In a paper published in the last issue of the Bulletin of the School of Oriental Studies, Sir G. Grierson directs attention to an epic still recited in Northern India describing the war between the Rajputs of Bundelkhand and Delhi. When a Raja had a marriageable daughter he used to send a challenge to neighbouring Rajas, who attacked him, and the contest for the bride was accompanied by serious loss of life on both sides. No exact parallel to this custom has been traced, and it looks as if the bard had exaggerated the details of the mock fight which occurs on the occasion of a wedding. The view that this is a survival of marriage by capture is now generally abandoned, and anthropologists are disposed to believe that the mock fight is a symbol of a contest between the powers of good and evil. The final victory of the good spirits is carefully arranged beforehand, and thus the fertility and happiness of the union is assured.

SUBMARINE WEATHERING OF ROCK-MATERIAL.—K. Humnel of Gieszen (*Geologische Rundschau*, vol. 13, p. 40, 1922) gives the name "halmyrolysis" to the processes of decay and reconstruction, akin to weathering, that go on in rock-material on the floor of seas and oceans. He gives special attention to the origin of glauconite, and attributes its absence from freshwater deposits to the facts that the salts in sea-water are essential to the reactions that build it up, and that certain marine bacteria also play a part. The organic matter, the humic acid, and the energy of oxidation on sea-floors are not sufficiently different from those in lakes to account, as others have suggested, for the absence of glauconite from fresh waters. We may hope that the author will expand his views (p. 102) on phosphatisation on the sea-floor, which he regards as beginning with the absorption of phosphorus by gels consisting of calcium carbonate. The colloidal character of the material for which A. F. Rogers has recently revived the name of "collophane" (see NATURE, vol. 110, p. 292), might thus be an inheritance from previous colloidal calcium carbonate; but this would not account for the widely spread "halmyrolysis" of marine oozes and limestones without loss of the intimate structures of their shelly constituents, which were deposited as crystalline material.

TERTIARY BRACHIOPODA OF JAPAN.—Ichirô Hayasaka, whose papers on the Palæozoic Brachiopoda of Eastern Asia and the Permian Brachiopoda of Japan we have already had occasion to refer to (NATURE, July 29, p. 161, and December 2, p. 749, 1922), has now dealt with the Tertiary Brachiopoda of Japan (Science Reports, Tôhoku Imp. Univ., Sendai, Second Series (Geology), vol. ii., No. 2). While the waters of the Japanese Islands are notoriously rich in these forms, no fewer than thirty-seven species of "lamp-shells" being recorded therefrom, only thirteen species and five varieties figure in the present monograph, one species and four varieties being believed to be new. Of the eighteen forms, seven are only known fossil, seven are found living in Japanese waters, while the remainder now inhabit distant regions. The occurrence in Japan of *Terebratulina septentrionalis* in the fossil state, indeed, seems to be the first recorded instance, and that, since it is to-day an Atlantic form, is the more remarkable. In an appendix one other species and another variety are recorded as coming from the Pleistocene. These last are apparently additional to the three previously recorded from beds of that age near Tôkyô in 1906.

THE INNER STRUCTURE OF ALLOYS.—The thirteenth annual May lecture of the Institute of Metals was delivered on Wednesday, May 2, by Dr. W. Rosenhain. Referring to the great accumulation of facts in regard to the properties and microstructure of alloys which have been forthcoming in recent years, Dr. Rosenhain considers that it is most desirable that there should be found a key to this maze of knowledge in the form of a general theory that will link together the mass of facts into a homogeneous whole. Such a theory is put forward, based upon the intimate knowledge of crystal structure acquired by X-rays analysis. The crystal structures found in pure metals are modified in the case of alloys, particularly in those called solid solutions, where a second kind of atom enters into the structure of the crystal and produces in it certain minute changes. Especially important is the connexion between the minute distortion of crystal structure which occurs in alloys and the behaviour of alloys on melting and freezing, while such phenomena as plasticity, diffusion, and others fall easily into line with the same type of explanation. This new theory of alloy structure is said to afford a ready explanation of the electrical properties of metals and alloys and the changes of those properties when the metal is heated or cooled, and cover the phenomena of super-

conductivity found in many metals when cooled nearly to the absolute zero of temperature.

WEATHER RESEARCH ON THE KERMADEC ISLANDS.—The *New Zealand Journal of Science and Technology*, vol. v. No. 5, contains an article by Mr. D. C. Bates, director of the Dominion Meteorological Office, Wellington, on the above. The chief feature of the article is an effort to stimulate the acquiring of Sunday Island, the largest of the Kermadec Group, for a meteorological station, which it is maintained would improve the weather forecasting for New Zealand. It is shown that cyclonic disturbances commonly influence the weather at Sunday Island a couple of days or so before being felt in New Zealand or the adjacent waters. The island was first discovered in 1788 and was partially frequented by settlers in 1837, but calamities which have occurred suggest the question whether it is worth while occupying apart from weather reporting. The island is apparently of volcanic origin, and earthquakes occur about once a month. It is mountainous, with few flat surfaces; water is not easily procurable, and it is out of the track of vessels. The rainfall is said to be by no means deficient. Meteorological observations taken for nine months in 1908 show a total rainfall of 66·26 in. during the period; the heaviest monthly fall was 11·30 in. during April, the least, 3·91 in. during September. The highest temperature in the shade was 85° F. in February, the lowest 46° F. in August. Easterly winds predominate from February to May and westerly winds from June to October. No observations are available for November, December, and January.

THE DELAY OF VISUAL PERCEPTION.—The issue of the *Optician and Scientific Instrument Maker* for April 20 contains an article by Mr. F. G. Smith which summarises the recent work of Prof. Pülfrich on the effect of brightness on the time which elapses between the formation of an image on the retina and its perception by the observer. If an object moving across the line of vision from left to right is viewed with the right eye direct and with the left through a smoked glass to diminish the brightness of the image formed on the left retina, there is a delay in perception in the case of each eye, but the delay for the left eye exceeds that for the right, and the body appears to the left of and behind the actual position it occupies. If the object is moving from right to left it appears for the same reason to the right and in front of the actual position. If it moves alternately to right and left it appears to describe a circular motion about its mean position. The experiment is easily done with a fixed and a moving pencil, and it is rather remarkable that the phenomenon has not been observed previously.

BRITISH SURVEYING INSTRUMENTS.—Several recent improvements in the design and construction of British-made surveying instruments are detailed and illustrated in a paper by W. H. Connell in the Proceedings of the South Wales Institute of Engineers, vol. xxxix. No. 1, March 15, 1923, which has been reprinted in pamphlet form by Messrs. Cooke, Troughton and Simms, Ltd., Buckingham Works, York. Modern manufacturing methods involving the extensive use of jigs render possible the attainment of great accuracy and uniform production of the parts of instruments. The use of new and improved alloys has diminished the wear of moving parts, and thus instruments retain their adjustments for longer periods. Changes in design have led to the elimination of many adjustments, only one being necessary or provided in many modern levels, namely, that for securing parallelism between the line of sight and the tangent to the curve of the bubble tube. By the adoption of the internal focussing telescope collimation errors are almost entirely eliminated, and the use of accurately fitting removable cells permits of the graticules being cleaned or exchanged without disturbing the collimation adjustment. Changes have been introduced also with the view of saving time and labour in taking readings. For, example, the bubble, compass, and staff can all be read from the eye-end of the telescope without change of position on the part of the surveyor, and the focussing screw is easily accessible no matter what position the telescope may be in.

LITHIUM CARBIDE AND HYDRIDE.—In the *Comptes rendus* of the Paris Academy of Sciences for April 9 MM. A. Guntz and Benoit give an account of some properties of a mixture of lithium carbide and lithium hydride. This homogeneous mixture can be obtained either by heating metallic lithium in ethylene or by dissolving lithium carbide in fused lithium hydride. Submitted to electrolysis this fused mixture gives an abundant deposit of amorphous carbon. This may arise from a true electrolysis of the carbide or by a secondary reaction between hydrogen from the electrolysis of the hydride and the lithium carbide. From the results of their experiments the authors are inclined to regard the first view as the correct one, the lithium carbide being ionised into its elements in the hydride solution. The minimum electromotive force required to produce the carbon deposit is about 0·05 volt.

VULCANISATION OF RUBBER.—Mr. V. V. Byzov, in the Journal of the Russian Physical and Chemical Society, 1921, vol. 53, gives an account of work he has carried out on the vulcanisation of rubber. The researches indicate that the processes of hot and of cold vulcanisation are essentially the same, and are of extreme complexity. Vulcanised rubber consists of four components, which may exist in varying proportions in different samples of rubber. The first component is crystalline sulphur, which can be extracted from the rubber by boiling acetone. In a specimen of rubber containing 2·86 per cent of sulphur, 1·57 per cent was of this type. Most of the remaining sulphur is adsorbed in the rubber, and is in the amorphous plastic condition, this form of sulphur being insoluble in acetone. While plastic sulphur, under ordinary conditions, soon crystallises, in the fine state of division in which it occurs in rubber, conditions are perfect for supercooling, as each globule of sulphur is enclosed in a protective coat of colloidal material. To this plastic sulphur is ascribed the superior elasticity of vulcanised rubber. The rubber itself undergoes isomeric change to an insoluble form, from which a hydrochloride more stable than that obtained from ordinary rubber may be prepared, and the ozonide of which gives, on hydrolysis, not lævulinic aldehyde, as does that of natural rubber, but diacetyl propane. Whether this difference is due to a different degree of polymerisation of the isoprene molecules, or whether a transposition of the double linkages has occurred, it is not possible definitely to state. The fourth constituent of vulcanised rubber is a polymorph of isoprene disulphide $[C_{10}H_{16}S_2]_n$, but this is not as a rule present to any great extent. Thus vulcanisation of rubber is not a reversible process, and the problem of the recovery of pure rubber from an already vulcanised material, important in the waste rubber utilisation industry, appears to be an impossible one, as no means are known whereby the insoluble isomeride of rubber can be converted into the natural form.