Research Items.

THE DATE OF STONEHENGE.—In the September issue of *Man* Rear-Admiral Boyle T. Somerville discusses a previous article in that journal by Mr. Stone on the date assigned by Sir Norman Lockyer, through astronomical means, for the building of Stonehenge. He points out in detail the limitations which surround the dating of prehistoric monuments by means of bearings of sunrise or sunset. There are also at Stonehenge two circles, one apparently considerably more ancient than the other. Neither of these stands on the arc of a true circle, and consequently it is not possible to discover the accurate centre, nor any given diameter of either of them. The remains of the earthwork vallum do not lie on parallel lines, nor does either wall appear to be straight. A difference of date of 1000 years is effected by the movement of the observer of only one foot to left or to right of what may originally have been the true point of observation within the circle. The result is that the attempt to date either of the circles at Stonehenge by the azimuth of the midsummer sunrise is useless, as the present condition of ruin of the monument is too great to lay out from the ground-plan of either circle an orientation line of sufficient accuracy. If the orientation towards Silbury Hill can be considered a probability, as it was by Sir Norman Lockyer, the limits of date given by him, namely 200 years on either side of 1680 B.C., are justified for whichever circle to which it related.

ARAB ART IN AMERICA.—The University Museum, Philadelphia, is in the fortunate position of being able to spend largely on additions to its collections. In the March issue of its *Museum Journal*, Mr. G. B. Gordon describes some examples of Arab art which have recently been acquired. Two mosaic fountains of fifteenth-century work are charming, and are appropriately placed in a room decorated with a wonderful wooden door with carved ivory inlay from fourteenth-century Cairo. The ornamentation of this door is singularly beautiful, the style combining small pieces dove-tailed together, the result of the scarcity of large blocks of suitable wood in Egypt. There are also some examples of Rhodian, Damascus, and Samarkand tiles, which are finely reproduced in colour to illustrate the article. Mr. Gordon gives some useful notes on the development of Arab art, especially in connexion with the taboo of human and animal forms prescribed in Islam. At Fostat, near Cairo, a rubbish heap in the town, abandoned in the thirteenth century for the present capital, has yielded some curious fragments of early Arab pottery, of which examples are also reproduced in colour.

ORIGIN OF ANIMAL PIGMENTS.—That animals in general are, directly or indirectly, dependent upon green plants for their supplies of energy is one of the most widely recognised generalisations of biological science. The importance of chlorophyll in the animal economy, however, seems to be by no means limited to the problem of food-supply. It is extremely doubtful whether chlorophyll is ever actually formed by the animal body itself, but it is very extensively taken in with vegetable food, and then apparently forms the basis from which a large number of animal pigments are built up, including the widely distributed respiratory pigment, hæmoglobin. Such, at any rate, is the finding of Mr. John F. Fulton, Jr., who contributes an interesting paper on "Animal Chlorophyll: its Relation to Hæmoglobin and to other Animal Pigments" to the current number of the *Quarterly Journal of Microscopical Science* (vol. 66, Pt. II.). It would appear from these results that a vast number of animals are dependent upon green plants for their ability to carry on the function of respiration as well as that of nutrition.

SOURCES OF VITAMIN A.—In the *Biochemical Journal* (vol. xvi., No. 4) a paper appears under the names of H. L. Jameson, J. C. Drummond, and K. H. Coward, giving an account of the work in which Dr. Jameson was engaged at the time of his death. Previous work by the other two authors had shown that vitamin A is produced in green plants by the action of light. Animals are apparently unable to make it for themselves, and since the liver of fishes is one of the best sources of this vitamin, it was of interest to follow the course of its transfer to this place. In the present paper it is shown that a pure culture of the diatom Nitzschia produces the vitamin under the action of light. Various molluscs were also found to contain it in considerable amounts. In a further paper in the same number of the journal, Prof. Drummond, Dr. Zilva, and Miss Coward show that the small organisms of animal nature making up the plankton on which small fish feed contain vitamin A in abundance, no doubt derived from the diatoms on which the plankton feed. Thus the cycle in marine life is complete. Whether this vitamin is identical with that preventing the onset of rickets is made somewhat doubtful by a paper in the *Journal of Biological Chemistry*, vol. 53, p. 293, by McCollum, Simmonds, Becker, and Shipley, in which it is shown that the vitamin A of cod-liver oil can be destroyed without depriving the oil of the substance which causes utilisation of calcium and its deposition in the bones. It may be that it is this "vitamin" that is produced in the human infant under the action of light.

ANOMALOUS STORM TRACKS.—A communication is made on this subject to the *U.S. Monthly Weather Review* for March by Mr. E. H. Bowie of the U.S. Weather Bureau. The author criticises the explanation of the paths of cyclones given in the text-books, and remarks that it would simplify the work of forecasters if cyclones behaved in an orderly manner. The paths are shown of five exceptionally erratic cyclones, and especial care has been taken to ensure the accuracy of the charted positions of the storm centres. The erratic paths given traverse the eastern United States; one storm was of West Indian origin. Each of the tracks formed one or more loops, and in forming the loop the turning in all cases was counter-clockwise. Some notes on the erratic paths of the storms are added by Prof. A. J. Henry, chiefly with the object of stimulating discussion. He notes that the temporary blocking in the path of the cyclone takes place in the neighbourhood of water surface, and in each case of temporary blocking, except in that of the West Indian storm, pressure rose over the Canadian Maritime Provinces.

CLIMATE AND PHOTOGRAPHY.—An article by Mr. H. G. Cornthwaite on this subject appears in the *U.S. Monthly Weather Review* for March. The wide variations in the strength of daylight with the time of day, season of the year, conditions of the sky, and with latitude and altitude, as well as the effects of temperature and humidity on photographic and chemical processes, are recognised and discussed. The actinic light is naturally brightest when the sun

is at or near the zenith, and it dims rapidly with increased obliquity of its rays. The seasonal variation due to this cause is said to be too often overlooked or underestimated by amateur photographers, the strength of the light being about twice as great in summer as in late autumn or winter. It is mentioned that during heavy rainfall the light is photographically stronger than in densely cloudy weather without rain, due to the light reflected from the falling raindrops. Tropical daylight is asserted to be about twice as strong photographically as summer daylight in latitude 40°, and about four times as bright as winter daylight at this latitude. The light is much brighter along the sea coast than inland. Chemical activity in developing and fixing processes is greatly increased with high temperatures, and correspondingly retarded with low temperatures. Photographic films and prints may be subjected either to high temperatures or high humidity without excessive deterioration, but not to both in combination. Both prints and films are said to deteriorate rapidly in the moist tropics, but those developed and fixed under tropical conditions have a greater permanence in the tropics than those developed and printed in the temperate zone and subsequently taken to the tropics.

ELECTRICAL RESISTIVITY OF STEELS UNDER STRESS.—The recent researches of Bridgman have shown that under hydrostatic pressure the resistivity of steels decreases, while the earlier work of Tomlinson on stretched steel wires showed that under tension less than the elastic limit the resistivity increased. According to the May issue of the Science Reports of Sendai University, Mr. Sin-iti Fukuta has, under the direction of Prof. Honda, carried the observation of the effect of tension on resistivity beyond the elastic limit, and has succeeded in showing that up to stresses of the order of 5000 kilograms per sq. cm., steels with various carbon contents increase in resistivity $1{\cdot}14 \times 10^{-6}$ per cent. per kilogram per sq. cm. of tensile stress, the proportionality continuing past the shoulder of the stress-strain curve. In all cases about 90 per cent. of the observed change of resistance of the specimen was due to its elongation and cross contraction.

GLASS RESEARCH.—Volume iv. of "Experimental Researches and Reports" has recently been published by the Glass Technology Department of the University of Sheffield. It comprises a series of reports by Dr. W. E. S. Turner and his staff, principally on the influence of aluminium on sodium and sodium calcium trisilicate glasses. Aluminium is shown in the first paper, No. VII., to facilitate manipulation in lamp-working and to assist in preventing devitrification. The second paper on the effect of aluminium on the annealing temperature is less convincing, as it neglects questions of time and rates of cooling. Pelouze's conclusion that as aluminium is substituted for sodium the density increases, is reversed in paper IX.; density and refraction both appear to diminish. Careful stirring has evidently been necessary to detect the small variations recorded. In determining the thermal expansion effect of silica and sodium oxide in sodium silicate glasses, a silica factor value very different from that of Schott has been obtained. In the next paper, No. XV., the effect of aluminium on thermal expansion is considered, but further research is evidently required. Two of the most practical papers deal with the relative advantages and disadvantages of limestone, burnt lime, and slaked lime in common glass batches containing soda ash and salt cake. The shrinkage, porosity, and other properties of British fireclays are discussed in paper XXIII. Comparison is made with one foreign clay only, the German Grossalmerode. In view of the present conditions it might have been well to include several of the French clays which compare favourably with Grossalmerode. Following two papers on lime-magnesia glasses, a general report on glass and one on the refractory materials, both by Dr. Turner, are reprinted. The glass industry is to be congratulated upon its close association with the University of Sheffield and the Society of Glass Technology.

PHOTOGRAPHIC SENSITOMETRY AND TESTING.—The Washington Government Printing Office has issued No. 439 of the Scientific Papers of the Bureau of Standards on the "Sensitometry of Photographic Emulsions and a Survey of the Characteristics of Plates and Films of American Manufacture," by Raymond Davis and F. M. Walters, jun. For several years the Bureau of Standards has made measurements of the characteristics of photographic light-sensitive materials, aiming at uniformity in the standardisation of methods, so that the results by various workers may be directly comparable. The present paper gives details of the principles involved in photographic sensitometry and testing generally as introduced by Hurter and Driffield and published over and over again during the last thirty years. Perhaps it is desirable to restate them to render the paper more complete. The methods of the Bureau are more original. Their light source is a 6 to 8 volt Mazda C automobile headlight with a special blue glass filter, giving 2·73 candle-power and the colour of average yearly noon sunlight at the latitude of Washington. The principal other deviation from H. and D. methods is that the Bureau of Standards defines the speed of a plate as 10 divided by the inertia, instead of 34 divided by the inertia as adopted by Hurter and Driffield to fit in with their actinometer. For colour sensitometry a replica grating is used with a slit 2 inches long, and the exposure is graduated by a disc with suitably curved apertures that is rotated close in front of the slit. The methods of making other tests are fully described. Appended are 86 charts, each dealing with a single plate and giving three characteristic curves representing the result of development for 3, 6, and 12 minutes respectively, a contrast development curve, a fog contrast curve, the fog being exclusive of the glass and gelatine, a spectrogram showing colour sensitiveness, exposure factors for several colour filters, speed, extent of the straight part of the characteristic curve, and the resolving power estimated by a standardised method. Only sensitive materials made in the United States, and practically all of these, are discussed.

SEPARATION OF ISOTOPES OF LEAD.—In the Scientific Proceedings of the Royal Dublin Society for August (vol. xvii. N.S. No. 6), Drs. T. Dillon and R. Clarke and Mr. V. M. Hinchy describe some preliminary experiments on the separation of the isotopes of lead by a chemical method. The process is based on the reaction between lead chloride and an organo-magnesium compound:

$$2PbCl_2 + 4MgRX = PbR_4 + 2MgCl_2 + 2MgX_2 + Pb.$$

Hoffmann and Wolf in 1907 had already found that when lead chloride containing radium-D reacted with magnesium phenyl bromide, most of the radio-activity was found in the metallic lead separated by the above reaction, and this was confirmed. With the two portions of lead separated, the atomic weights 207·1 and 207·3 or 207·4 were found, and it is considered that the different isotopes of lead are not identical in their chemical properties in the reaction chosen. Further experiments are in progress.