insoluble in water. These substances, even in quite dilute solutions, have their long paraffin chain ions aggregated into 'ionic micelles', and Hartley suggests that the solvent power is due to the interior of these micelles closely resembling liquid paraffin, and having similar solvent properties; so that when such a substance as azobenzene, or cetyl alcohol, is caused to dissolve in a soap solution, it is not distributed evenly over the whole solution, but is all to be found in the interior of the ionic micelles. A discussion of the changes in vapour pressure, as the ionic micelles increase in size through taking up other organic substances, leads to the conclusion that they can increase only to a certain size before becoming unstable; hence the solvent power of a soap solution for organic substances insoluble in water is definite and limited, and there is an unstable region of sizes between the largest micelles which can exist, containing dissolved organic material, and the droplets of an emulsion stabilized by a monolayer of the soap-like material: these emulsions simulate stability, though they are not strictly stable in a thermodynamic sense. Whether such solvent action has any practical bearing on the problem of detergent action is not certain; but it is a most interesting and novel theory of solvent action in unusual circumstances. E. K. Rideal directed attention to the possibility that the molecules of detergent substances may penetrate and displace films of other substances adhering to a solid surface; that such penetration often occurs in monolayers at an air-water surface has been shown by J. H. Schulman and A. H. Hughes. An extension of v. Búzagh's work on the adhesion of solid particles to solid faces was also described, with particular reference to detergent solutions.

Space scarcely permits of an adequate notice of the important points in the chemical constitution of detergent and wetting agents, but papers by H. K. Dean, and by E. T. Williams, C. B. Brown and H. B. Oakley gave a general account of them. As a rule, the successful detergents have a long hydrocarbon chain attached to an ionizable, strongly acidic, end group; compounds of similar constitution but basic, yielding paraffin chain cations, may be good detergents but suffer from the practical difficulty that, being mutually precipitated by soaps, they cannot be utilized in conjunction with soaps. One case was mentioned, however, of a new detergent in which there is no ionized end group, but instead a polymerized glycerol derivative, partially esterified with fatty acids.

That wetting and detergent agents operate by forming surface films on the surface both of the solid and of the grease or other dirt to be removed is clear. Part of the discussion turned on the orientation of the molecules in these films. Though the proof is not complete, it appears probable that when the wetting of a greasy surface, that is, one externally composed mainly of paraffin groups, is assisted by a wetting agent, the hydrocarbon part of the molecule of the wetting agent lies flat on the surface; the observed increase in hydrophilic character can probably be accounted for by the presence of only one water-attracting group in the space on the surface occupied by a molecule of the wetting agent lying flat. Such observations as are available on the amount of adsorption of detergents by paraffin wax surfaces show it to be much less than that required to cover the surface with a monolayer oriented perpendicular to the surface, but of the right order for a complete layer of molecules lying flat. In cases where a soluble agent is required to diminish the ease of wetting of a solid surface, as with the collectors used in flotation, the molecules may be oriented perpendicular to the surface, but with the hydrophilic groups towards the solid; this is not yet, however, certain, as a considerable diminution of wetting could probably be attained even with the molecules lying flat. A rather interesting case of the deposition of a layer difficult to wet on glass was mentioned; substances such as cetyl trimethyl ammonium salts, with a long paraffin chain cation, cause (in dilute solution) clean glass to become greasy in appearance, probably through their hydrophilic ends being attracted to the glass, which thus acquires a paraffin-like exterior.

The papers presented will be published in a separate volume, shortly; and they constitute a valuable focusing of ideas on many very important, and not yet fully understood, industrial questions.

N. K. A.

Maiden Castle, Dorchester

A REPORT by Dr. Mortimer R. E. Wheeler on the results of three years' work on the hill-top site of Maiden Castle, Dorchester, on behalf of the Society of Antiquaries and the Dorset Archæological Society, was presented at a meeting of the former Society on February 25.

As originally planned, the excavation was intended to occupy three seasons. The third and last of these in the autumn of 1936 was prolonged until December 24. As, however, the site has proved of even more intense interest than was anticipated, providing evidence of signal importance in its bearing on the development of civilization in the south and south-west of Great Britain, it has been decided to extend the investigation for another season to enable supplementary excavations to be carried out next year.

Maiden Castle has always been impressive by its size alone; and its vast dimensions have borne witness to a capacity for economic and political organization, which it seemed difficult to credit to a population so primitive as the early inhabitants of Britain. Dr. Wheeler's excavations have shown that not only was the construction of a far more complex and imposing character than surface indication showed, but also that it embodies a complete picture of all known phases of urban life in Britain before the days of the building of Roman towns in the latter part of the first century; while the presumedly primitive character of early British culture is shown to be anything but in accord with the facts now revealed.

Dr. Wheeler distinguishes at least four major phases in the occupation of Maiden Castle. The first, belonging to the early neolithic, was a settlement at the eastern end of the mound which had long been covered over, and became known only by this excavation. It had been enclosed by at least three rings of entrenchment excavated in the chalk by deer-horn picks. A large section of this was uncovered in the excavations of the last season. From the contents it was evident that the settlers had been farmers, pasturing sheep and long-horned cattle, as well as practising agriculture. Their pottery showed that here in Wessex was a meeting place of the two strains of the neolithic in Britain, the western deriving from Brittany and the eastern from the Baltic. After a brief occupation by beaker folk from the Rhine, there followed a period extending over fifteen hundred years in which the site was abandoned.

Resettlement began in the eighth or seventh centuries; and by the fifth century B.C. settlers landing from north-east France had begun to raise the downland population to crowding point, necessitating organized defence behind the ramparts and entrenchments of the first Maiden Castle, concerning which recent excavation has revealed so much that is new in the elaborate limestone faced walls, the impressive double entrance, and the great ditch, 50 ft. wide and 25 ft. deep. Then comes the great enclosed city, covering forty-five acres, with a population of upward of four thousand—a city, however, primarily of farmers and industrially self-supporting, with few imports. Finally, in the first century B.C., there was the last and most ambitious enlargement, a monument of civic dignity, when spreading ramparts and ditches and high stone walls were added, with a provision of twenty thousand sling stones at the gates to ward off attack—walls which were to be laid low and finally abandoned save for a brief period, when Roman Dorchester was built.

Science News a Century Ago

Lyell and his Views on Geology

ON March 7, 1837, Lyell wrote a long letter to Whewell regarding the criticism with which some of his views had met. "As we had some conversation the other day," he said, "touching the extent to which I carried my doctrine of 'Uniformity' in the 'Principles of Geology' I wish to refer you to the first edition of that work . . . in order to show you that certain passages were somewhat unfairly seized upon by the critic, and not duly considered with and interpreted by others and by the context generally of the first volume. . . .

"It was impossible, I think, for anyone to read my work, and not to perceive that my notion of uniformity in the existing causes of change always implied that they must for ever produce an endless variety of effects, both in the animate and inanimate world. . . .

"In the review in the *British Critic* . . . you stated three formidable theses which I had undertaken to defend, in order to hear out my theoretical views. . . . I am sure that none of the propositions can now seem to you extravagant and visionary. . . . I allude to, first the adequacy of known causes as parts of one continuous progression to produce mechanical effects resembling in kind and magnitude those which we have to account for; secondly, to changes of climate; thirdly, the changes from one set of animal and vegetable species to another. . . .

"I was taught by Buckland the catastrophical or paroxysmal theory, but before I wrote my first volume, I had come round, after considerable observation and reading, to the belief that a bias towards the opposite system was more philosophical."

Geology of Suffolk

AT a meeting of the Geological Society held on March 8, 1837, the Rev. W. B. Clarke concluded the reading of his paper on Suffolk. The substratum of the whole of Suffolk, Norfolk and Essex, he said, is chalk overlaid with clay, sand and crag. While the crag still lay beneath the sea a violent catastrophe broke up many of the secondary strata from the chalk to the lias inclusive, and the debris thus caused, together with numerous masses of ancient rocks, was spread by a rush of water, over the surface of the tertiary formations and the chalk, in some places to a depth of 400 feet, constituting the beds of drift, clay, etc., which occupy so great an area in Suffolk. Afterwards a series of shocks elevated the whole district until the crag attained the height of nearly 100 feet above sea-level.

Shillibeer's Voltaic Battery

WRITING from the Grammar School, Oundle, on March 9, 1837, to William Sturgeon, the Rev. John Shillibeer gave a "Description of a new arrangement of the Voltaic Battery and Pole Director". "In the course of the last winter," he said, "when I was preparing a few lectures on experimental philosophy for the amusement of my scholars, I was struck with the complicated arrangement of the voltaic battery, and the difficulty which frequently occurred from the number of connexions, to get all the wires into so perfect a contact as to ensure success to the experiment." To get over the difficulty he experienced, Mr. Shillibeer had devised a battery consisting of a copper trough divided into five compartments by copper partitions, the trough being filled with a solution of copper sulphate. Into the compartments dipped five plates of zinc the tops of which were soldered to a copper bar which was fixed to a wooden cover to the trough. In a groove in the wooden cover were two sliding terminals by which contact could be made with the copper or the zinc. By means of these terminals the direction of the current in a wire could be easily reversed. In concluding his description, Mr. Shillibeer said, "I cannot but feel gratified at the success which has hitherto attended the career of my little instrument; and very glad shall I be if it may lead to other and more important improvements in aid of a science which, let us hope, may be ultimately applied to purposes of solid benefit to all mankind." (*Sturgeon's Annals*, 1, 224.)

Airy's Observations at Cambridge Observatory

ON March 10, 1837, Airy communicated to the Royal Astronomical Society the "Results of the Observations of the Sun, Moon and Planets, made at Cambridge Observatory in the Years 1833, 1834 and 1835". During those three years, he said, the sun, moon and planets were observed on the meridian at Cambridge Observatory with the transit and mural circle, with as much regularity as the limited personal establishment of the institution permitted. The instruments with which the observations were made were not, he thought, surpassed by any in the world. The immediate results of observation were systematically compared with the places given by tables, and the apparent error of the tabular place in right ascension and north polar distance was given in the *Cambridge Observations*. The series of apparent errors thus found was, he believed, one of the most complete that had been formed from observations over the same period.