probably unaware of this, proposed that the name *michron* be given to the millionth of a second, while he suggested that the micrometre be termed the *microm*.

Similarly, many years ago Sir Benjamin Brodie attempted to induce the chemists to rationalise their nomenclature by re-naming CO carbon*ous* oxide, and taking the name carbonic oxide for CO_2.

Had either of these proposals even partially materialised, it would undoubtedly have led to great confusion.

While to some extent I agree with Dr. Guillaume's remarks regarding the English use of "specific," I do not think he strengthens his general case by referring to "puissance massique," which, to my mind, conveys only the haziest sort of meaning.

I might point out that, according to a view I have heard frequently expressed, the general introduction of the metric system into England has been hindered by prejudice against what is considered the unnecessary number of names of units appearing in the usual books dealing with the subject. It may be desirable to have these for rare use, but it is surely inadvisable to mention them in the school books as if they were current. Thus, for example, among measures of length, one is accustomed to think in metres, centimetres, or millimetres, and of greater lengths in kilometres. The decimetre is rarely used except in connection with the litre, and the decametre, hectometre, and myriametre practically never.

In conclusion, I think I represent the views of readers of NATURE when I say that many of them will be glad to buy the French Physical Society's useful volume, if it is only to be able to get rid from their library table of one or other of the editions of its well-known predecessor, written in the language of the Huns, which at the present moment they are unable to tolerate.

J. A. HARKER.

Teddington, May 25.

University Appointments in War Time.

I VENTURE to direct attention to the advertisement for a professor of organic chemistry in the University of Liverpool. It appears to me, and I believe many share my opinion, that this is a very inopportune moment for filling a university chair when eligible men are away on active service. It may seem unfitting to criticise the internal policy of another university, but it is a matter which closely affects many who have no connection with the University of Liverpool. Professors of chemistry and others are being solicited for testimonials by candidates, and in many cases such requests cannot be granted except by doing a grave and irreparable injustice to more highly qualified men who have responded to the country's call for volunteers in the present national crisis. I trust that the University of Liverpool will in this matter follow the same course as has been pursued by the University of Birmingham in the case of the vacant chair of physics, and postpone the appointment of a professor until after the termination of the war.

PERCY F. FRANKLAND,
(Dean of the Faculty of Science).

The University, Birmingham, June 12.

Volunteers for Scientific Work.

CIVILIANS of all grades are being enrolled as volunteer workers in our ammunition factories. Are there no Government chemical factories where persons of a certain amount of scientific training could render voluntary aid towards the production of chemical munitions of war? There must be many who, like myself, are beyond the fighting age, whose skilled labour might be of use at the present juncture.

EDWARD HERON-ALLEN.

Large Acres, Selsey Bill, Sussex, June 12.

SCIENTIFIC METHODS IN INDUSTRY.[1]

THE publication of this volume is opportune, for it presents data which will tend to focus attention still further upon the present unsatisfactory recognition of science by the Government and manufacturing interests of this country.

A state of war has disclosed this in detail; and demonstrated that a nation which is ill-prepared against industrial expansion in the modern sense, finds itself in an inferior position in times of war. For reasons which are still somewhat obscure, the British manufacturer has shown in the past a distinct preference towards those industries which develop best on lines of empiricism. Many have held that this is a defect; the present position has proved this to the hilt. Our manufacturers have surrounded themselves with an atmosphere which demands their whole attention in directing their ventures as they exist, manufacturing articles which depend upon a market already existing and the low selling price which always goes with such conditions. If empiricism were the only law of manufacture (as it was some fifty years ago) they would by their application outdistance all competitors.

It has been to Germany's credit that she realised the great driving force behind this system as it has been practised in the northern part of these islands, and that to turn the shield concentration in other directions was demanded, where some new factor could be introduced and the methods of empiricism were useless. British methods were not so much improved upon as superseded; scientific supervision and investigation were the beginning and end of this development; industries were built up which could not even have been started under the old *régime*; industrially useful products were in the scientific sense in many cases created, and then introduced into commerce. The older method of improving existing manufacture by empirical methods gave place to a new system. Thus the British manufacturer found himself face to face with the German industrialist, who had already convinced the German banks that he was working for a new era, where profits would be large and developments world-wide. To-day we have to consider a position where many of these new industries (by chance, or design) have been of the first importance in the time of war. The manufacture of large quantities of ammonium nitrate and nitric acid from synthetic ammonia (or the nitrogen of the air), has made Germany free from outside supplies of nitrates, and thus to some extent counteracted

[1] "First Principles of Production.—A Study of the First Principles of Production and the Relation of Science to Industry." By J. Taylor Peddie. Pp. 231. (London: Longmans, Green, and Co., 1915.) Price 5s. net.

our command of the sea. Extensive coke-oven plants, while tending to commercial efficiency in times of peace, have given her a supply of raw material for high explosives in times of war. Her extensive liquid chlorine plant has also been turned to notorious use.

The lesson of all this is that a nation lags behind in scientific development at a cost of a possible loss of supremacy in times of war. A state of unreadiness in this direction is co-extensive with its influence and life. Industry developed on empirical lines has a certain advantage in times of peace, for it has at its command markets of great strength and deals with large outputs, but it is one-sided. It actually leads into a backwater where adventure is suppressed in favour of mere attention to detail; the walls of the factory or works being the natural bounds of the manufacturer's interests; his energies confined within a few yards of buildings. In other words he is working in the proverbial rut. Industrially he is entirely domesticated.

It would be impossible to deny that in certain directions this system has its advantages; or that many industries are undoubtedly sound under such conditions. Also that certain phases of Empire have partly directed industry into the lines we have followed, where a large output of universal application is essential. The distressing limitations of such a system have only come to be universally recognised under the stress of war.

Now the British manufacturer is called upon suddenly to turn industrialist, and to co-operate with the scientific investigator to consider our industry as a whole. The danger of such a rapid change will be seen in the persistence of command which is essential to empiricism, as seen in the attempt to control rather than co-operate. This will only represent a transition stage, serving a purpose in the course of a radical alteration in procedure.

It is for the scientific worker to see that this intermediate stage is made as short as possible; that recognition of the work of the investigator shall be complete in all directions. This can best be achieved by taking an active interest in industrial affairs. To be merely academic will not suffice, for this offers no encouragement to the manufacturer to hold out the hand of friendship. When obliged by the circumstance of the moment to seek scientific advice he has turned to those who have technical experience rather than a studied condition of brain energy directed in the display of pure science. That a severely academic attitude has reacted against the application of science to industry is certain. The effective antidote against such a condition is a greater interest in application, as apart from theory. This can be most easily achieved by a linking up with some specific industry, which method has led many a German chemist to widen his horizon and plan of research. The effect of such a change in this country would be magical. It would react progressively both on science and industry.

The scientific worker must never forget that the business man has achieved great things for this country in the past. This is our hope for the future when he will work in partnership with the experimentalist. Such a change in attitude is an essential preliminary to a working arrangement between the interests involved. The business man will then realise that a new factor has come into his affairs. While scientific endeavour is almost entirely confined within the college walls, and recorded in the journals of learned societies, this will remain unrecognised. What is required is an active partnership between the trained investigator and those who specialise in the means of actual manufacture. The manufacturer must be convinced that certain modern industries are so bound up with experimental science that they are inseparable; that they cannot be run on the lines which were so successful in the case of the older industries.

It may even be that a thorough awakening of science is more necessary than that the business man should afford recognition. So far as chemistry is concerned, the division of those actively engaged in this science (as roughly represented by the different societies) has not altogether made for progress as a whole. Science must speak with a collective authority and with no uncertain voice. It must demonstrate by the conduct of its own affairs that it is capable of leading; that its advent into the industrial (and political) world will bring order and not chaos. At this late stage of development, the English business man will only respond to a party which exhibits by action the essential qualifications of its watchword.

Thus the passing of a certain sense of exclusiveness on the part of those who follow research is a preliminary step towards recognition by the commercial world. An advance on parallel lines is not business. Against this system we have the close association of the German method which has resulted in a solid network of endeavour.

Just so long as our advance is confined to empiricism, so long will the work of the chemist be chiefly directed towards the mere testing of material, instead of the legitimate work of developing new processes and manufacturing new materials. The war has cleared the air, and clearly points to a new path which we shall do well to follow, the common one of partnership between science and industry.

The treatment in this volume of such matters as the influence of tariffs and political economy on the industries of a country will enable the general reader to grasp certain essential factors as they are recognised to-day by the contending schools. Chapters on finance and industry, and science and industry, are equally valuable as an introduction to these complicated and involved relationships, which are so little understood in certain quarters where they should really be mastered in detail. Not the least satisfactory feature of this volume is the reprinting, with notes

by Prof. R. A. Gregory, of Sir Norman Lockyer's address on the Influence of Brain Power on History, and articles on the Steel Industry by Dr. W. Lorrimer, and on the Chemical Industries by Prof. Percy Frankland.

W. P. DREAPER.

HAMPSHIRE FIELD ARCHÆOLOGY.[1]

SOME years ago Dr. Williams-Freeman undertook to make a list of "Defensive Earthworks of Hampshire" for the Hants Field Club, and when this was done, evidently with inexhaustible patience and enthusiasm, some discerning persons urged him to publish his plans and descriptions.

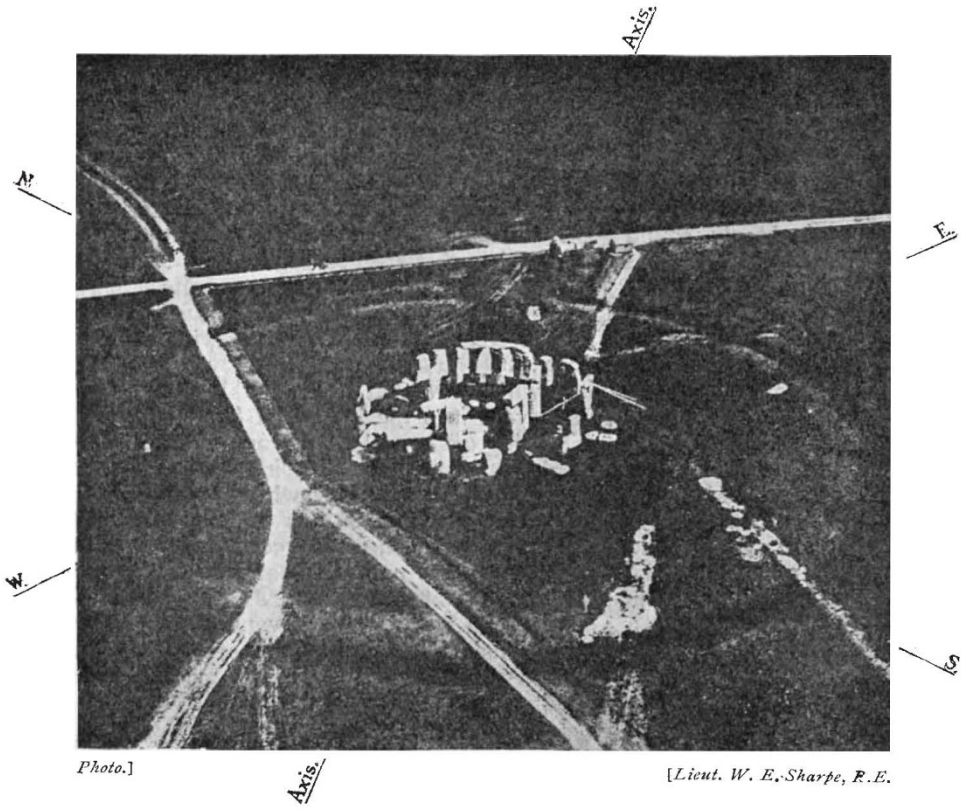

Photo.] [*Lieut. W. E. Sharpe, R.E.*

FIG. 1.—Stonehenge from a war balloon. From "An Introduction to Field Archæology as Illustrated by Hampshire."

The resulting book is divided into three sections, a division which adds considerably to its value and has made it far more generally useful, interesting and readable.

The first section deals with the general subject of field archæology, including earthworks, ethnology, roads, the influence of the natural features of the country on the nature of the earthworks likely to be found therein, etc. The author rightly insists on Field Archæology being the *Scientia Scientarum,* that all sciences are its handmaidens, and he enumerates several. But surely in the data and results accumulated, more especially since the beginning of this century, there is *prima facie* evidence for the inclusion of astronomy as a *sine qua non* in the equipment of the Field Archæologist.

The second part of the volume deals with particular earthworks visited in the form of a day's itinerary in each chapter. Distance, direction, state of roads, possible methods of locomotion, charming descriptions of the country and places of rest and entertainment are all given, yet never obscure the primary function of the book, the description of the earthworks. The author examines quite judicially many interesting, arguable points but never becomes dogmatic; there are also many practical hints which the amateur archæologist will find invaluable. For example, the finding of a Roman coin does not *prove* that the Romans *built* the earthwork, each of which may have been successively occupied by different peoples over a long period. The close investigation of all finds is absolutely necessary from all points of view, if faulty conclusions are to be avoided. *A propos* of this Dr. Williams-Freeman relates a story concerning "Black Bar" or "Black Barrow," an oval sandhill near Linwood. Certain excavators found charcoal and Roman pottery, but as regards the latter an "old inhabitant of the district says that in his youth he used to put bits of pottery into the hill in order to get the employment of digging them out"!

The fifth day's journey, according to schedule, takes us from Hampshire, because, being near to Stonehenge, it would be an "unpardonable archæological sin" not to visit our most famous and grandest megalithic monument. The author carefully describes the monument and, as is his custom, judicially sifts the archæological evidence concerning its origin and date. He points out that the date astronomically determined by Sir Norman Lockyer and Mr. Penrose has been independently confirmed by two other, totally different, lines of evidence and must be accepted. But the Friar's Heel was not the index mark for

[1] "An Introduction to Field Archæology as Illustrated by Hampshire." By Dr. J. P. Williams-Freeman. Pp. xxii+462. (London: Macmillan and Co., Ltd., 1915.) Price 15s. net.