of the foot is purple, with a longitudinal orange stripe. The orange pigment is evidently the same as that of the other species, but the purple is different from the blue and does not dissolve out in formalin.

No doubt all these pigments represent "warning coloration."

T. D. A. COCKERELL.

East Las Vegas, N.M., U.S.A., November 10.

The Ash Constituents of Some Lakeland Leaves.

A FURTHER series of experiments bearing on the question indicated in this journal (vol. lxiii., No. 1634, p. 396) was undertaken during the summer and autumn of this year. It was deemed advisable to extend the research over a pretty wide range of subjects, so as to be able, if possible, to catch some kind of clue towards the correct elucidation of the causes operative in the case. The capital object in view was to ascertain the exact amount of inorganic constituents (especially silica and lime) which the leaves extract from the soil at different periods of their life, so as to determine whether this particular amount has any connection with the chemical composition, &c., of that particular soil. In all cases the entire leaf and petiole were used dried at 100° and then incinerated, the same vessel and the same source of heat being used for each separate incineration.

Leaves of	Date.	Percentage of crude ash.	Percentage of silica (SiO_2) and of lime (CaO) in the crude ash.	
			SiO_2	CaO
Beech	May 17	4·8		
,, ...	July 30	5	17	27·4
,, (brown)	Nov. 3	6·8	27·2	23·7
Oak	Aug. 17	5·8	12·2	29
,, (brown)	Nov. 3	6·8	14·5	37·5
Hazel	June 10	3·3		
,, ...	Aug. 4	5·7	6·2	26·8
,, (orange)	Oct. 27	6·3	15	28·6
Alder	July 29	4·9	1·8	31
,, (falling)	Nov. 1	5·7	1·7	33·6
Linden	May 30	5·5		
,, (yellow and brown)	Oct. 18	10·8	2·5	34·8
Ash	June 12	7·7		
,, ...	Aug. 2	6·7	1·5	37·7
,, (yellow)	Oct. 27	9·5	5·3	34·3
Elder	May 21	8·7		
,, (yellow)	Oct. 24	8·5	9·5	31·5
Scots pine (old leaves)	Aug. 19	2·5	9·4	15·9

On reviewing the foregoing table there would seem at first sight to be nothing remarkable therein; but a little collation and comparison serve to throw a more searching light upon the subject. All these trees and shrubs have sprung from a siliceous gravelly soil charged with basic constituents, but rather poor in lime (well under 12 per cent.). Nevertheless, the leaves of ash, alder and oak have managed to secure an amount of lime which may be regarded as nearly, if not quite, their full complement of that substance. The high proportion of lime in alder leaves may be referred to the very low proportion of silica; but this is hardly feasible in the case of the ash and oak. The ash-leaf, with a feeble proportion of silica, maintains a considerable quantity of potass and an amount of lime necessary to neutralise the organic acids which it produces in very notable degree. The oak-leaf, with far less potass in autumn, demands for the annulment of its organic acids (chiefly oxalic) a supply of lime apparently commensurate with its unique faculty for the production of starch. It will be specially observed that while, as indicated by the similar ratio of ash, the leaves of beech and oak have reached on November 3 a coequal measure of decay, that of the beech is evidently farther fallen. The leaves were selected for the experiment from beech trees flourishing right vigorously on the sandy shelving banks of the bays which indent the upper reach of Ullswater. The result was so remarkable that the experiment was repeated with every care and precaution, but the amount of silica remained as imperturbably high as before. The tree is a decisive alien in Lakeland and its seeds never ripen here, but in a sheltered situation on a sandy bottom it presents an aspect of unquestionable health and sturdy adaptation to the circumstances.

P. Q. KEEGAN.

Patterdale, Westmorland.

Note on a Point of Chemical Nomenclature.

THE use made by Mr. Goodwin and myself, in a recent communication to the Chemical Society, of the term *alphyl* is the occasion of an interesting letter from "A. T. de M.," published in NATURE (October 31, p. 648). The history of the term *alphyl* and its replacement by Prof. Vorländer's term *arryl*, or, better, *aryl*, the form in which it has been generally adopted, is correctly stated. In the interest of so important a matter as uniformity in chemical nomenclature I willingly agree with "A. T. de M.," and will adopt *aryl* instead of *alphyl* for monovalent aromatic hydrocarbon radicals (C_6H_5, $C_6H_4CH_3$, &c.).

But Prof. Vorländer goes further than this, and his view is advocated by "A. T. de M." He proposes to alter the well-understood meaning of the term *alkyl*, to retain the term *alphyl* with a new meaning and to introduce the combination *alpharyl*. These proposals seem to me not only confusing, but unnecessary. Let us retain *alkyl* in its old meaning, adopt *aryl* for monovalent aromatic hydrocarbon radicals and use *acyl* for all monovalent acid radicals. The terms *alkylene*, *arylene* and *acylene* might be adopted for the corresponding divalent radicals without introducing a new termination. For the radical benzyl and its homologues, if it be thought desirable, *ar-alkyl* could be employed.

ALFRED SENIER.

Queen's College, Galway, November 17.

Does Man use his Arms in Locomotion?

IN "Monkeys; Their Affinities and Distribution," by Dr. A. R. Wallace (reprinted in his "Studies; Scientific and Social," vol. i.), the author gives (p. 183) as one of the characters in which man *differs* from all the monkey tribe—"*the perfect freedom of the hands from all part in locomotion.*"

My object in writing is to point out the peculiar way in which the majority of people move their arms and hands when walking or running. One may safely say that everybody, adults and children, at one time or another exercise this movement. The natural way in which children run is to "paddle" with the arms and hands, though trained runners do not do so.

Now is it not possible that this muscular movement of the fore-limbs in opposite directions in the act of locomotion is a survival of the four-legged mode of progression of man's remote ancestors? The anthropoid apes, we know, get about by the aid of their arms and hands; while the baboons walk much in the same way as dogs do. The examples and illustrations could be enlarged upon indefinitely, and it is not for me to do so. I believe that this theory has been thought of before, but I am unable to find any trace of it in the books I have consulted. I should be very grateful if any of your readers would enlighten me on the subject.

BASIL W. MARTIN.

Elm House, Hampstead.

CELEBRATION OF THE JUBILEE OF M. BERTHELOT.

THE Berthelot jubilee, celebrating the fiftieth anniversary of the publication of Marcellin Berthelot's first scientific work, was held in the Great Hall of the Sorbonne, in the University of Paris, on Sunday, November 24. The President of the Republic, M. Loubet, was in the chair, surrounded by the Ministers of the Cabinet, the Ambassadors of the various countries in the French capital, and numerous delegates from foreign and from local scientific societies.

The hall, a large amphitheatre, capable of seating more than 3000 persons, was packed with those who delighted to do honour to M. Berthelot. Behind the daïs, in the

front of which the President was seated, is a large fresco representing Arts and Science; and round the amphitheatre there are niches containing busts of Robert de Sorbon, the founder of the Sorbonne, or University of Paris; of Richelieu, Pascal, Descartes, Lavoisier and Rollin—the *élite* of the Frenchmen who have exercised influence on French education and on arts and sciences. On the right of the President the band of the Garde Républicaine welcomed him with the Marseillaise, the audience all standing, and the proceedings began punctually at 10 a.m. They were opened by a discourse from the Ministre de l'Instruction publique, M. Leygues, who gave an impassioned address on the services which M. Berthelot had rendered to French education; he noted how the ubiquity of M. Berthelot's genius had led him to pay attention, not merely to scientific work, but also to extend his purview to the systems pursued in schools and to the primary and secondary education of French citizens. M. Darboux, sécretaire perpetuel of the Academy of Sciences, in a careful and well-delivered address, alluded specially to M. Berthelot's contributions to general science and to the recognition of his labours, testified by the international response to requests for subscriptions, and to the numerous societies and associations which had presented him with addresses. M. Darboux was succeeded by M. Fouqué, president of the Academy of Sciences, who echoed what M. Darboux had said and expressed the gratification of the Academy that one of its members, who had devoted his life to the pursuit of truth for its own sake, had, in receiving respect and recognition from the whole civilised world, conferred honour on the body of which he had so long been a member, and whose proceedings he had enriched by so many valuable contributions.

M. Moissan, now professor of chemistry at the Sorbonne, gave in his address an account in general terms of M. Berthelot's contributions to chemical science. As early as 1855 Berthelot's work on sugar, which led to the synthesis of formic acid and of alcohol, directed the attention of chemists, who had formerly regarded analysis as the chief aim and end of chemical work, to synthesis. Although the idea of a "vital force" had been attacked by Wöhler and Liebig, still Berthelot, by numerous brilliant syntheses, contributed more than anyone, during the decade 1855-65, to render the idea untenable. In this he was helped by his friends Pasteur and Claude Bernard, each of whom, at the later date, was laying the foundations of the work which rendered his name immortal. M. Moissan aptly remarked, in alluding to "vital force," "nous avons d'autant plus de théories que la chose est moins claire." Sketching rapidly Berthelot's work on acetylene, on explosives, on thermochemistry, on the absorption of nitrogen by plants, and his contributions to chemical history, he having translated and edited numerous Greek and Arabic writers on the subject, he concluded by the remark that, owing to the universality of his knowledge and attainments, M. Berthelot must be regarded as the last of the "encyclopædists." The address was concluded by the phrase, "Nous vous remercions pour nous avoir donné un peu plus de la verité."

M. Gaston Paris, one of the executive of the Collège de France, was the next speaker. He alluded to the long connection which had subsisted between M. Berthelot and the Collège de France. In 1851 he was recommended by Balard as deserving of the position of his "préparateur," or assistant. After eight years, however, he migrated to the École de Pharmacie, where, in 1865, he was made "Professeur titulé" of organic chemistry. Shortly after, however, he was recalled to his old home, the Collège de France, where he has remained ever since, in spite of numerous calls to accept more lucrative positions elsewhere.

After a few words from the president of the Academy of Medicine, Emil Fischer, the eminent professor of chemistry of Berlin, read an address in German from the Prussian Academy of Sciences, and at the same time presented one from the German Chemical Society; Dr. J. H. Gladstone followed, introducing first Prof. Ramsay, who, after a few prefatory remarks, read the address sent by the Royal Society, and next Prof. Emerson Reynolds, who presented an address from the Chemical Society, of which he is president; and lastly Dr. Gladstone handed in an address from the Royal Institution. Prof. Lieben, of Vienna, conveyed the congratulations of the Imperial Academy of Vienna; and Prof. Guareschi, those from the Academy of Turin. M. Troost, the former professor at the Sorbonne, read a list of academies and societies which had sent congratulatory addresses, so numerous that nearly a quarter of an hour was occupied by the mere recitation of the names; and concluded by reading a personal telegram from the King of the Belgians, conveying His Majesty's felicitations, and announcing that the Queen Regent of Spain had conferred on M. Berthelot the Grand Cordon of the Order of Charles III.

The following translation of M. Berthelot's speech in acknowledgment of the tribute to his genius and scientific work is from Monday's *Times*:—

I am deeply touched and really embarrassed by the homage which you are offering me to-day. These honours, I am aware, are not due merely to your affection for my person, I must attribute them also to my age, my long labours, and to certain services which I have been able to render to our Fatherland and to my fellow men. Your sympathy makes the lamp which is about to be extinguished in the everlasting night shine with a final brilliancy. The respect of humanity for old men is the expression of the solidarity uniting present generations with those that have preceded us and with those that are to follow. What we are, in fact, is only to a very slight degree attributable to our personal labour and individuality. We owe it almost entirely to our ancestors, ancestors by blood and our spiritual ancestors. If each of us adds something to the common domain in the field of science, of art, of morality, it is because a long series of generations have lived, worked, thought and suffered before us. It is the patient labours of our predecessors who created the science that you are honouring to-day. Each of us, whatever his individual initiative, must also attribute a considerable portion of his success to contemporary *savants* concurring with him in the great common task. In fact, no one—let us proclaim it loudly—no one has the right to lay exclusive claim to any of the brilliant discoveries of the past century. Science is essentially a collective work, prosecuted during the course of time by the efforts of a multitude of workers of all ages and every nation succeeding one another and associated by a tacit understanding for the search of pure truth, and for the application of this truth to the continuous transformation of the condition of all men.

Of yore *savants* were looked upon as a little group of amateurs and men of leisure maintained at the charge of the working classes, and executing a task of luxury and pure curiosity for the amusement and distraction of those favoured by fortune. This narrow and unjust view which paid so little heed to our devotion to the truth and our services, this prejudice, finally disappeared when the development of science showed that the laws of nature were applicable to the practice of industries, and had as a consequence the substitution for the old traditional and empirical receipts of the profitable rules of the theories based on observation and experience. To-day who would venture to regard science as a sterile amusement in presence of the general increase of national and private wealth which results therefrom? To confine ourselves to mentioning the most interesting perhaps of the services which science has rendered, it suffices to compare the servile and miserable condition of the popular classes in the past as revealed to us by historical documents with their condition at present, already so advanced in dignity and well-being without counting the just hopes of which they are pursuing the realisation. Is there a statesman who doubts the services, greater still, which are to be looked for as the result of this incessant progress? Science

is the benefactor of mankind. Thus it is that the tangible utility of scientific results has convinced the State that laboratory work should be encouraged and sustained, because it is economically a benefit to all, and for the public health. Science carries still further its legitimate pretensions. It claims to-day at once the material direction, the intellectual direction, and the moral direction of human society. Under its impulse modern civilisation marches with a more and more rapid stride.

Since the first half of the century that has just gone by, not to go further back, the world has strangely changed its face. Men of my generation have beheld coming on the scene by the side of and above that nature which had been known since antiquity, if not an antiphysis, a counter nature, as is sometimes said, yet a superior and in a way transcendent nature where the power of the individual is multiplied a hundredfold by the transformation, hitherto unknown or not understood, borrowed from light, magnetism and electricity. Nor is this all. Let us rise to a loftier and more fruitful range of ideas. From the deeper knowledge of the universe and the physical and moral constitution of man there results a fresh conception of human destiny governed by the fundamental ideas of human solidarity between all classes and all nations. In proportion as the ties uniting the peoples are multiplied and made tighter by the progress of science and the unity of doctrines and precepts which science deduces from the facts which it notes and which it imposes without violence, yet relentlessly, upon all convictions, these ideas have assumed a growing and more and more irresistible importance. They are tending to become the purely human bases of moral life and of the politics of the future. Hence the *rôle* of *savants* as individuals and as a social class has constantly grown in modern States.

But our duties towards other men grow at the same time, let us never forget that. Let us proclaim it in this enclosure, in this palace of French science. It is for no selfish satisfaction of our private vanity that to-day the world does homage to the *savants*. No! It is because it is aware that a *savant* really worthy of the name devotes a disinterested life to the great work of our epoch, I mean to the amelioration, too slow, alas, to our mind, of the lot of all, from the rich and fortunate to the humble, the poor, the suffering. This was what nine years ago in this very hall the State and the authorities affirmed by honouring Pasteur. This is what my friend Chaplain has sought to express on this fine medal which the President of the Republic is to offer me. I know not if I have completely fulfilled the noble ideal traced by the artist, but I have striven, at all events, to make it the object and the end, the governing aim of my existence.

The medal (or rather *plaque*) with suitable inscription was then presented to M. Berthelot by M. Loubet, the President of the Republic, and, according to continental fashion, the ceremony was concluded with a fraternal embrace.

Such is a brief account of the proceedings at this very interesting ceremony; and one is led to seek for analogies in our own country. The Kelvin jubilee at Glasgow and the Stokes jubilee at Cambridge may be cited as events of a similar character; but in France the ceremony appeared to be of greater national importance, owing to the presence of the Head of the State, the Ministers and the Ambassadors. In his reply M. Berthelot alluded humorously to the former position of science; it was regarded as a harmless pursuit, carried on by amateurs and men of leisure at the charge of the working classes, for the amusement and distraction of those favoured by fortune; it has now become one of the most potent influences for civilisation that the world has known, and will ever retain that position. Is it possible that in England the former view of science still retains some hold on the people, and that in France this aspect of science has long been outlived? Whether this be so or not it is certain that all Englishmen will join with the whole French nation in congratulating M. Berthelot on the completion of so many years of work, and will wish him health and a long life during which he may enrich the world by further investigations into the wide domain of Nature.

BERTHELOT, AND THE METALS OF ANTIQUITY.

THE metals of antiquity are among the many subjects which, from time to time, have been studied by M. Berthelot. It is principally by two different methods that he has investigated the matter: (1) the writings of ancient alchymists, (2) the analysis of metallic objects sent him by modern explorers. In 1885 Berthelot published a handsome volume, "Les Origines de l'Alchimie," in which he described his researches among the Greek papyri, and the still older documents of the Egyptian, Chaldean, Jewish, Gnostic and Chinese philosophers. In succeeding years he brought out several volumes under the title of "Collection des Anciens Alchimistes Grecs," under the auspices of the Minister of Public Instruction.

By far the most important for the present purpose is the collection of papyri at Leyden. The Papyrus X is more especially chemical. It dates from the end of the third century, but contains the lore of earlier times. It is described in fairly full detail in the *Annales de Chimie et de Physique*, 1886, vol. ix. Berthelot shows that the earlier alchemy was not founded upon purely chimerical fancies, but rests upon positive experiment, by which the adepts made imitations of gold and silver and precious stones, or taught how to increase their weight. In interpreting these ancient writings we are met with a great difficulty in fixing the meaning of the terms used for the metals and gems and the preparations made from them, the vagueness of the language being augmented by the idea that these substances were susceptible of transmutation into one another, and also by the Platonic doctrine of a primary matter from which everything may be derived. In this particular papyrus there are no less than 101 receipts for making gold, asèm (electrum), silver, &c., and the processes to be adopted. These are described by Berthelot as being genuine and definite, and not overlaid with fanciful notions; but the later philosophers and commentators were strangers to practical work and governed by mystic ideas: thus there was supposed to be a connection between the seven known metals and the seven planets, seven colours and seven transmutations. The later alchymists threw their energies into the search after the philosopher's stone which was to transmute baser metals into gold.

More important, perhaps, than his studies of the ancient manuscripts has been the prominent part which Berthelot has taken in examining chemically the metallic objects which have been unearthed by the great explorers of the present day. These researches are being carried on over the greater part of the countries bordering the Mediterranean and extending to the Persian Gulf. It is hardly necessary to say that they are enabling us to picture to ourselves these great nationalities of old in a way that was never before possible. The part that Berthelot has taken is not that of an explorer, but that of a scientific analyst; and it has been mainly confined to the metals employed in these ancient civilisations. He commenced by examining different Assyrian objects from ancient Chaldæa, some from the palace of Sargon at Khorsabad, others from the mounds of Tello excavated by M. de Sarzec, now in the museum of the Louvre. M. Place had found in the palace of Sargon a stone coffer containing votive tablets, covered with cuneiform inscriptions giving the date of foundation of the palace as B.C. 706. Of the four now in the museum of the Louvre, one is of gold, another of silver, a third of bronze and the fourth of the rare mineral crystallised carbonate of magnesia. Judging from the inscriptions two of the other tablets are believed to have been of lead and tin. The discoveries at Tello consisted of a vase of antimony, a metal which had subsequently been lost sight of for many centuries; a tablet of metallic copper, much corroded, but free from tin; and a little figure of pure copper, bearing the name