

drought and the ravages of these pests, which stripped the scanty bushes of every green leaf till they were nothing more than bundles of bare sticks, the surrounding country presented an appearance of desolation that defies description.

Under such circumstances of heat, sand and effluvia, it is not surprising that the health of the party suffered eventually from ophthalmia and gastro-intestinal complaints, and, indeed, it was chiefly this which led to the breaking up of the camp at the end of November for the time being.

It would be an unworthy omission if I were not finally to acknowledge the cheerfulness and skill with which Mr. Zietz performed his duties under somewhat arduous and depressing circumstances; indeed, whatever satisfactory results may have been achieved by this expedition they are most chiefly due to his indefatigable zeal in the interests of palæontology and of his museum. To the Messrs. Ragless our best thanks are due for their kindness and hospitality to members of the party at various times, and for many necessary articles supplied, sometimes, I fear, at their own inconvenience. Our great obligation to the Government of South Australia for the loan of camels, granted through the mediation of Mr. Goyder, the Surveyor General, I have already acknowledged.

For the preceding notes I can only claim that they comprise but a rough and imperfect epitome of the physical features of the fossiliferous area, and of the conduct of the Museum party's operations up to the present time. As has been already stated, until the whole of the specimens have been unpacked, cleaned, mended, examined and compared, no accurate summary of the palæontological results can be given. It must further be remembered, that the South Australian Museum has recently shared in a general retrenchment imposed upon all Government institutions by the financial exigencies of the day, and that at this very time when the limited museum staff is called upon to deal with, for it, an unprecedented mass of material, it is also called upon to remove and re-arrange, with expedition, the whole of its collection in a new and more commodious building. I mention these facts as a plea for some indulgence for the delay that must inevitably take place, even with such collaboration as we may hope to secure, before the full scientific results can be made known.

Recognising the extreme promise of this discovery at Lake Callabonna, no hesitation was felt by the Museum Committee in subordinating all other work for a time to its vigorous prosecution. But for reasons, to which I have just alluded, excavations could only have been continued for a very limited time, had it not been for the very timely, generous, and unconditional assistance afforded by Sir Thomas Elder, G.C.M.G., a gentleman who stands conspicuous amongst Australian colonists for the liberal support he has so frequently and so munificently displayed in the interests of education and exploration in South Australia. This latest benefaction has enabled much to be done under undoubted difficulties, but much yet remains to be done, and it is hoped that, at a more favourable season, the work now for a time suspended may be resumed, to yield results still more favourable than those hitherto achieved. In the meantime the area comprising the lake has been reserved by the Government for the purposes of further exploration to be carried on under the authority and direction of the South Australian Museum.

KAFIRISTAN.

THE concluding meeting of the Royal Geographical Society for the present session was held on June 25, when a paper on Kafiristan was read by Surgeon-Major G. S. Robertson. Kafiristan is the least known part of Asia, and Dr. Robertson is the first European who has succeeded in penetrating its remote valleys, and making the acquaintance of the primitive tribes who dwell there.

Kafiristan is a geographical expression used to designate the country of those non-Mahomedan tribes who inhabit that space left blank in our maps, which is bounded on the east by Chitral and the Kunar valley, on the south-east by the Kunar valley, on the west by Afghanistan, and on the north by the Hindu Kush and by Badakhshan. Politically speaking, the whole region is bounded on the east by Chitral and the debatable land of the Kunar valley, and on all other sides by Afghan territory. All the rivers of Kafiristan drain into the Kabul river. The parts of this country explored during a year's stay included the Bashgul valley and many of its subsidiary valleys, from the head

of which a passage was made to the Minjan valley of Badakhshan. The Kunar valley was also visited, and the valley known as Viron by the Mahomedans, and Presun by the Kafirs, was finally reached and found to be the most sacred part of this well-secluded country and the most interesting. Tribal jealousy made progress very difficult, but Dr. Robertson's journey and sojourn did not cost a single life, a very remarkable fact in a country where homicide is not regarded as criminal. All the passes leading into Kafiristan from Badakhshan are more than 15,000 feet in elevation, and internal communication between valley and valley is completely cut off in winter, when the various tribes live in absolute seclusion, each in its own district. The tracks which take the place of roads are narrow and difficult, running along the river valleys in many parts; they can only be traversed by experienced men; dogs cannot pass some of the difficult points without assistance.

The origin of the people is unknown. Classifying the tribes according to speech, there are, first, the Siah-Posh; secondly, the Wai, including probably the Ashkun; thirdly, the Presun. The Presun are certainly unlike all other Kafirs; they are possibly an aboriginal race. Dr. Robertson could never learn to repeat nor could remember one single word of their language; indeed, at their religious functions the sounds uttered by the officiating priests seemed more like a soft musical mewling than anything else.

Their customs are very peculiar and extremely primitive. One of the most curious is that a chief on his appointment, or anyone who excels in athletic exercise, does not receive tribute or reward, but is expected to feast all his neighbours as a thanksgiving for his exceptional distinction. The physique of the people was splendid, perfect muscular development being the rule, and fat men were quite unknown amongst them. They are great dancers, and have many ceremonial dances of much complexity. Funeral ceremonials are elaborate, and last a long time; but marriage is performed with the minimum of ceremony, the only essential being the payment of purchase-money to the bride's parents. The people were boastful, and at first it was impossible to get them to speak the truth on any subject; but they are brave to the last degree, and have maintained their independence for centuries against all comers.

A short paper was read at the same meeting by Mr. F. G. Jackson, describing the equipment of the Jackson-Harmsworth polar expedition and its proposed route.

SCIENTIFIC EDUCATION AND RESEARCH.¹

ENGLISH boys and girls at the present day are the victims of excessive lesson learning, and are also falling a prey, in increasing numbers year by year, to the examination-demon, which threatens to become by far the most ruthless monster the world has ever known either in fact or in fable. Ask any teacher who has to do with students fresh from school his opinion of them: he will say that in the great majority of cases they have little if any power of helping themselves, little desire to learn about things, little if any observing power, little desire to reason on what they see or are called on to witness; that they are destitute of the sense of accuracy, and satisfied with any performance however slovenly; that, in short, they are neither inquisitive nor acquisitive, and as they too often are idle as well, the opportunities offered to them are blindly sacrificed. A considerable proportion undoubtedly are by nature mentally very feeble; but the larger number are by no means without ability, and are, in fact, victims of an acquired disease. We must find a remedy for this state of things, or perish in the face of the terrific competition now setting in. Boys and girls at school must be taught from the very earliest moment to *do* and to *appreciate*. It is of no use our teaching them merely *about* things, however interesting—no facts must be taught *without their use* being taught simultaneously; and, as far as possible, they must be led to discover the facts for themselves. Instead of our placing condensed summaries in their hands, we must lead them to use works of reference and acquire the habit of finding out; they must always be at work applying their knowledge and solving problems. It is a libel on the human race to say, as many do, that children cannot think and reason, and that they can only be taught facts; early childhood is the time at which these faculties are most apparent, and it is probably through failure to

¹ Extracted from the Presidential address delivered by Dr. H. E. Armstrong, F.R.S., at the Chemical Society, on March 22.

exercise them then that they suffer atrophy. The so-called science introduced into a few schools in answer to the persistent demands of its advocates has been in most cases a shallow fraud, of no value whatever educationally. Boys see oxygen made and things burnt in it, which gives them much pleasure; but, after all, this is but the old lesson learning in an interesting shape, and has no superior *educational* effect. I would here repeat what I have recently urged elsewhere, that in the future *all subjects* must be taught *scientifically* at school, in order to inculcate those habits of mind which are termed scientific habits; the teaching of *scientific method*—not the mere shibboleths of some branch of natural science—must be insisted on. No doubt some branch of chemistry, with a due modicum of physics, &c., is the subject by means of which we may best instil the scientific habits associated with experimental studies, but it must be the true chemistry of the discoverer, not the cookery-book-receipt pseudo-form which has so long usurped its place. Whatever be taught, let me repeat that mere repetition work and lesson learning *must* give place to a system of allowing children to *do* things themselves. Should we succeed in infusing the research spirit into our teaching generally, then there will be hope that, in the course of a generation or so, we shall cease to be the Philistines we are at the present time; the education given in our schools will be worthy of being named a "*liberal education*," which it never will be so long as we worship the old world classical fetish, and allow our schools to be controlled by those who reverence this alone, having never been instructed in a wider faith.

As regards our college courses, I see no reason to modify the views expressed in my address to the chemical section of the British Association at Aberdeen in 1885; on the contrary, the experience I have since gained as a teacher and examiner has served only to strengthen them and to convince me of the paramount necessity of a very radical change in our system of instruction, and I rejoice at the increasing evidence of a state of unrest both at home and abroad. The "thorough" course of qualitative analysis which it has long been customary to impose at a very early period of the student's career must, I venture to think, be relegated to near its close; this course certainly has not the effect of producing competent analysts, and but too often reduces those who toil through it to the dead level of machines; in hundreds of cases I have seen students, as it were, hang up their intelligence on the clothes-peg outside and enter the examination room masked with a set of analytical tables, through which alone they allow themselves to be actuated, and to which they render the blindest obedience. Qualitative analysis actually requires the fullest exercise of the mental faculties as well as considerable manipulative skill. By introducing this branch of study at too early a period we force our students to act as machines, inasmuch as they do not, and cannot, know enough to work intelligently; we are but trying to make them run before they have learnt to walk. Even when the interactions on which qualitative analysis is based are fully studied, and the equations relating thereto are conscientiously written out, the result is not much better, owing to the slight importance of so many of the interactions apart from their technical application in analysis, and especially on account of our ignorance of the precise nature of many of the interchanges of which we avail ourselves: the persistent misrepresentation of facts which such a course encourages is, in my opinion, one of its worst features.

I believe that in the near future our students will first be set to solve problems, each in its way a little research, and involving much simple quantitative work; they will thus be taught chemical method, or, in other words, *the art of discovery*. They will then be taken through a course of quantitative exercises with the object of making them acquainted, by direct contact with the facts, with the fundamental principles of our science, which are but too rarely appreciated at the present day. After this, they will seek to acquire proficiency in quantitative analysis and in the art of making preparations; and subsequently they will give sufficient attention to the study of physical properties to enable them to appreciate the physico-chemical methods of inquiry which are now of such importance. The study of qualitative analysis in detail will be left to the last, as being an eminently technical subject. Meanwhile, by attendance at lectures, by reading carefully chosen works of a kind altogether different from the soul-destroying text-books we now possess, and especially by the study of classical models in chemical literature, they will have acquired what is commonly spoken of as theo-

retical knowledge, but too often regarded by us as of secondary importance, and which it is so difficult to make Englishmen realise means a proper understanding of the subject. Students so trained—imbued from the outset, even from early school days, with the research spirit—will at all times be observant and critical, nay, even logical; dogmatic teaching will cease to have any charm for them: they will actually take deep interest in their studies—a result devoutly to be hoped for, as nothing is more galling to the teacher at the present day than the crass indifference of the average student and his refusal to give attention to anything unless it will pay in an examination. At the close of such a course, the student will be thoroughly prepared to undertake original investigation, distinctly with the object of exhibiting his individuality and originality, and not, as at present, with the object of acquiring for the first time an insight into the methods of the investigator; he will thus be spared the unpleasant discovery which the advanced student now too often makes that his early training has unfitted him, rather than prepared him, for the task of original inquiry.

But to attain to this happy state it will be necessary that school education be "rationalised" and improved, as I have already indicated; that the material placed at our disposal be of far higher average quality than heretofore; and that the period of study be lengthened.

As it offers but few prizes and unfortunately has no sinecures—which, however objectionable from an abstract point of view, are actually of the greatest service to many causes—chemistry has hitherto failed to attract much ability. Very many commence its study because they have an idea that chemists are always making interesting experiments of the firework order such as the conventional lecturer shows to a popular audience, and when the drudgery of actual practice is discovered by the young worker to be something very different from the rosy picture which such displays had excited in his mind, it often turns out that a mistake has been made in the choice of a career; such mistakes will occur less frequently when our schools are so conducted that we shall be able to find out what our boys and girls are fit for. Too often those who take up the study of chemistry are destitute of the mental ability required to comprehend so difficult and wide a subject, even if possessed of considerable manipulative skill; very many of these never can rise to the dignity of chemists, and it is clear that in the future some distinction must be made between cultured chemists and those who are but mere skilled workmen in some special branch of the subject; even "analyst" is too broad a term, in many cases; "tester" might, perhaps, be coined for the purpose. When we teachers are in a position to advise a parent that his son has not the making of a chemist in him, but that he would do well as a food tester, manure tester, or iron tester, for example—and the advice is understood and appreciated—we shall be relieved of much anxiety. We have to bear in mind Huxley's remark—that the future of the country depends, in industries as in everything else, on getting our capacities to the top and, if possible, sending our incapacities to the bottom. Infinite mischief has been done in this country by the intrusion into our industries of large numbers of men dubbed chemists, who have no right whatever to the name—from no fault of their own, but owing to their imperfect training, and more especially the ignorance of employers. Experience has shown only too fully that no one has derived any real advantage from this state of affairs. We may hope for better things in the future, especially if our colleges generally are led to impose an entrance examination. I am satisfied, from the experience that we have had at the City and Guilds of London Central Technical College, that it is of utmost importance that those who are to study chemistry should at least have acquired a sound elementary knowledge of mathematics; that those who prove to be satisfactory students of chemistry are almost invariably those who are fairly proficient in mathematics, and *vice versa*. "It is almost impossible to become a chemist in less than three or four years of constant application." (Author's preface to Lavoisier's "Elements of Chemistry," English translation by Kerr, 5th ed. 1802.) Such being the opinion nigh on a century ago, what must our view now be? And yet there is a strange illusion abroad that a *three years' course* suffices to make a lad who has had no previous training whatever in scientific method a "full blown" chemist, worthy of considerable hire! It is often heart-rending to the teacher to see lads of great promise forced out into the world, largely by this prejudice, just at the most critical period of their

career, when they are on the very verge of acquiring real understanding of their subject, and of developing originality, as well as the power of working independently: abandoning their studies in this way, they too often degenerate into mere machines, capable of doing what they are told, but rarely more. And the manufacturer, who is too short-sighted to discriminate, then complains that he gets very little help from his "chemist," and seeks for a superior article abroad.

If we consider what a chemist, to be worthy of the name, must know in these days, it is clear that public opinion as to the duration and nature of his studies needs much emendation. He must be both artificer and artist. By constant practice and persevering application, he must acquire the manual dexterity, manipulative skill and neatness required of the analyst, while, at the same time, he must gradually become imbued with that high sense of accuracy, without which his labours will ever be untrustworthy; he must also acquire manipulative skill of an entirely different order by preparing a variety of typical substances, so that he may understand how to set to work when he subsequently engages in original labours involving the preparation both of materials already known and of new ones; and he must be practised in the more important methods of determining physical constants. While thus engaged in the laboratory, he must also be studying hard, constantly reading and occasionally attending lectures. To be a chemist it is necessary, moreover, to know much besides the practice and theory of chemistry proper; no slight amount of mathematical knowledge is also requisite for the proper understanding of the fundamental problems of our science, and no mere acquaintance with the first principles of physics, especially electricity, suffices; some acquaintance with biological science is indispensable, if we are to understand the manifold applications of our science in agriculture and in medicine, or are to assist in unfolding the nature of physiological processes generally; without some knowledge of mechanical drawing it is impossible to deal with machinery or to understand the language in which machinery is described; and it is necessary to read French and German fluently, the latter especially, in order merely to follow with intelligence what is being done by chemists. All this cannot be compressed into three years, and be it remembered I have said no word as to the necessity of every student who aspires to rank as a chemist undertaking some research work in order that he may acquire independence and the ability to solve problems and to progress.

So long as it is commonly supposed that it is but necessary to learn how to "analyse" in order to become a chemist, there will be but little progress; but when it is realised that chemistry is an exceedingly difficult subject to master, requiring a high order of intellect and breadth of mind, combined with extreme patience and perseverance and much mechanical dexterity, other views will prevail, and we may hope that we shall then count as of us very many who will rank high as artists and designers, and statesmen even—instead of being for the most part mere bricklayers, carpenters and joiners, capable only of working to order.

I have great hope that in the near future there will be many inducements held out to capable students to prolong their period of study to a satisfactory extent. At present, scholarships are mostly given to lads on their leaving school and commencing their technical training; the method by which such lads are selected is, in too many cases, an unsatisfactory one, the award being made on the result of an examination for which the candidates have been carefully prepared and crammed beforehand: the result too often affords but a proof of the power of lesson learning, and but little evidence of real ability. Serious injury is done at the Universities, owing to the stilted and artificial character of many of the college examinations, mere lads being required to answer questions of a highly technical character, far beyond the standard of school knowledge of the subject; those who are successful are more often than not overtrained—purely artificial products, whose mental digestion has been impaired, if not altogether ruined, by skilful tutors up to the tricks of the examiners. Such a system is partly responsible, also, for the growing practice of keeping lads at school—and even establishing "technical" sides for their special benefit—far beyond the age at which school should be quitted; such lads usually acquire bad habits during the last year or two of their school career, growing lazy; they are more often than not very poor material when they come to college; and in cases in which they are successfully pushed through public

examinations, such as those of the London University, not having enjoyed the advantages of college life and instruction, they are too frequently but provided with a varnish of knowledge. However, it will probably be thought necessary to offer such entrance scholarships in order to attract ability, and they will be regarded with favour by schools as they obviously afford a means of advertising—in fact, they are used as such; it is, therefore, all the more important that the conditions under which they are awarded should be such as to favour rational methods of teaching and which as nearly as may be correspond with the natural conditions of school life; especially should we guard against encouraging the tendency which undoubtedly exists in schools to lavish attention on those of great promise at the expense of those of average ability. Genius will ever take advantage of opportunities, while necessarily it will benefit from careful training; but it may be overtrained and dulled, or made priggish by undue specialisation at too early an age. Yet to make changes is difficult, as there are so many rivals interested; and although the evils of our system are recognised, no one is willing to take the first step, fearing that this may entail individual sacrifice.

It has long been my opinion that scholarships would be of most use if given to those who have gone through a systematic course of training—lasting say about three years—and who are on the verge of learning to become capable independent workers; an additional two years spent in acquiring the power of undertaking investigations will render such students highly competent. But most parents can ill afford the necessary outlay, and it is astonishing how little at this stage lads themselves realise how extraordinarily important it is for them to continue their studies; that, in fact, they are worth very little to anybody. A limited number of such scholarships are available in some of our provincial colleges, and those given by the 1851 Exhibition Commissioners are also of this kind. In London, however, there has long been a strange deficiency in this respect, but I rejoice to say that this is on the eve of being remedied by the enlightened action of the Salters Company, by whom not only has a scholarship of £150 per annum been offered to my Institute for the encouragement of higher research in chemistry, but also one of £100 tenable in the research laboratory of the Pharmaceutical Society, as well as one of like amount to aid in the investigation of the more medical aspects of pharmacology, tenable in the school attached to St. Thomas's Hospital. The influence of the example thus set will, I trust, be widely felt—may our sore needs be met ere it is too late!

In my address at Aberdeen I dwelt much on the necessity of creating an *atmosphere of research in our colleges*, and to-day I am but repeating much that I said then; I regret to say that meanwhile no great progress has been made, although indications are not wanting that the foundation is being laid on which, if conditions become more favourable, we shall be able to build extensively. I venture to think that the time is come when we must appeal to our senior students to help us: hitherto the majority of these have gone to Germany to complete their education, Liebig's magnetic influence being in no wise exhausted—for it was he who gave direction to the stream which ever since has steadily flowed in one direction, and deep beyond description is the debt we owe to his memory in consequence. Time was when it was necessary to take passage on this stream, but this is no longer the case, or need not be if advanced students will but collect around us in sufficient numbers to enable us likewise to form schools of original workers—for we, like the ancient Egyptians, cannot make bricks without straw, and to be condemned always to teach the rudiments, more often than not to unwilling ears, takes the very life and soul out of those among us who by nature have any higher aspirations. There are undoubtedly advantages to be gained from a residence abroad—no one can recognise this more fully than I do; but I believe the case to be one of such gravity that some sacrifice must be made, and that if national interests are not to be put aside as of altogether secondary importance, individual preferences must, for a time at least, be subordinated to higher considerations. It is not accounted necessary in Germany to study abroad, and severance from apron strings is effected when desirable by visiting a university away from home. Why should not English students in like manner pass from college to college in this country, and thus help us to help them?

But we want help also from another quarter—or rather, let me say, that there is another section, and that a very large one, of the community *must help us* far more than they have hitherto

done to help them; I mean our manufacturers generally. Let me remind you that the Chemical Society was established for the general advancement of chemical science as intimately connected with the prosperity of the manufactures of the United Kingdom: these very words form part of our charter. Yet to how small an extent is it recognised that chemistry is of service—that many of our manufactures, in the words of our charter, mainly depend upon the application of chemical principles and discoveries for their beneficial development? It is of no use to manufacture goods if you cannot sell them, and that is too often our position. Every teacher of any standing in Germany can count on placing his students so soon as he is in a position to state that they are fully capable and worth a trial; but here there is no such relationship established between the schools and the works; no proper opportunity is given to young men to prove their fitness for an industrial career. It is not even recognised that the discipline afforded by the study of our subject is an admirable preparation for an industrial career. Take the brewing industry, which in this country has availed itself far more than any other of our services—the brewer is called on to conduct operations involving chemical changes of a most complex and delicate character, subject to variation if the slightest departure be made from a very limited range of conditions, and this too with a material subject to constant fluctuation in composition and character, requiring the most vigilant and appreciative watching. Every brewer ought consequently to have received a chemical training; yet those who enter this industry are, with very rare exceptions, pitch-forked into it as raw lads from school, without any preliminary training whatsoever, having received their position through the influence of a friend and from no merit of their own. The same might be said of the dyeing industry, of that of gas manufacture, and of many others. Some of you may have seen the list of subscriptions to the proposed Schorlemmer laboratory at the Owens College, Manchester, and may have marked with sorrow, as I have done, how few and small are the contributions from those connected with the local industries, and how large and numerous relatively are those from friends and admirers of the deceased chemist and from members of the college staff. Contrast with this the great number of subscriptions towards the erection of the Hofmann-Haus in Berlin. Although the comparison is not quite a fair one, perhaps, yet it illustrates my meaning, the reception accorded to the Manchester scheme being sufficiently indicative of the absence of appreciation of the real value of chemical science to industry in one of our chief industrial strongholds. . . .

The proposed Teaching University in London and the Commission on Secondary Education may help in an extraordinary degree to improve our position. But it is to be feared that our subject will not attain to its proper condition unless some action be taken which will consolidate the teaching—which will lead to the centralisation of students of chemistry proper, so they may enjoy the inestimable advantage of intercourse, and have at their disposal a complete staff of competent teachers, each one of whom thoroughly represents some special branch of the subject; so long as students are distributed about the town in half-dozens and each chief teacher is called on to cut himself up into any number of small pieces, so as to deal with the subject of chemistry as a whole, true higher teaching is impossible.

Much to be feared, also, is the tendency to over-estimate the value of examinations, and the great work of the future will be so to improve these that they shall have no prejudicial influence on the student's work and in no way check the development of original methods of teaching; we must fix our attention mainly on the influences to which the student is to be subjected during his career; the competent teacher will ever study his students while they are at work, and do the best for them, provided he be not rendered powerless by the trammels of an examination system which heeds "results" only and not individuals.

Finally, let me say that, while sympathising most fully with those who advocate a complete course of study, I feel that it is very easy to demand too much—very easy to make it impossible for students to do justice to their work by imposing too many subjects. Our chief desire must always be that students shall acquire a knowledge of scientific method and the power of working independently. Certain subjects must be insisted on—for example, mathematics and drawing: if a knowledge of these be not acquired early it will never be acquired; but apart from these and a competent knowledge of the main

subject, we probably may, as a rule, be satisfied with comparatively little. Those who have once learnt to work and acquired a knowledge of scientific method will of their own accord, in proportion to their intelligence, apply themselves also to the study of other subjects—as many among us have done; those who are not sufficiently intelligent to do this are not, as a rule, improved by being forced to pay attention to unpalatable studies; on the contrary, they are, more often than not, thereby hindered from acquiring a competent knowledge of some one subject which does appeal to them, and are spoilt for life in consequence.

SCIENTIFIC SERIALS.

Bulletin de l'Academie Royale de Belgique, No. 4.—On the hydrates of the alkyl-amines, by Louis Henry. It has been known for some time that ammoniacal bases form compounds with water, a typical example being $2\text{CH}_2 \cdot 2\text{NH}_2 \cdot \text{H}_2\text{O}$, ethylenic diamine. Their properties have not yet been fully investigated. The author distinguishes between hydrates whose bases are soluble, and such whose bases are insoluble in water. He deals with methyl, ethyl, propyl, butyl, and amyl compounds, with the aromatic series, and with nitrites and amides. Their density increases with the percentage of water contained in them, even if the molecular weight diminishes. Their power of combining with water increases with their solubility and their richness in hydrogen, whether this be contained in the nitrogen radicle or the hydrocarbon.—On the creation of an International Bureau of Bibliography, by M. Mourlon. M. F. Vander Haeghen had proposed to the literature class of the Academy to initiate a movement for the compilation of a universal catalogue of public libraries. This proposal coincides with that for the establishment of a comprehensive and international catalogue of scientific papers, brought forward by the Royal Society. M. Mourlon proposed the deputation of three delegates to confer with the other two classes of the Academy with a view towards co-operation with the Royal Society.—On the aurora borealis observed at Louvain on March 30, 1894, by F. Terby. The author points out the recurrence of the monthly period previously observed in the appearances of February 28 and March 30.—Vascular hyphae of the mycelium of the *Autobasidiomycetes*, by Ch. van Bambeke. The mycelium in question always contains vascular hyphae, varying in number, distribution, dimensions, and form according to the species of mycelium. They are larger than ordinary hyphae, and are usually cylindrical, with occasional fusiform or claviform extensions. They consist of a thin, extensible, and elastic envelope containing a substance which is usually homogeneous and highly refracting, but sometimes granular. They may be considered as a conducting apparatus playing an important part in the distribution of nutritive materials.

Symons's Monthly Meteorological Magazine, June.—The May frost of 1894. M. Symons publishes minimum temperatures in the shade, obtained from forty-six counties in England and Wales, in which the thermometer fell below the freezing point between the 20th and 22nd May. In six counties minima of 25° or lower were recorded, while on the grass, readings of 18° in Nottingham, and 19° in Stafford were registered. The readings were not excessively low for May, which has always a cold period about the middle or latter part, for during a frost in May 1891 these low temperatures were exceeded by about 1° . Letters from correspondents show that the wide-spread disaster to vegetation was caused not so much by the lowness of the air temperature, as by the radiation, which was facilitated by the clearness of the sky, while owing to the mildness and dampness of the weather previously the vegetation was more forward and fuller of sap than usual, which froze and burst the cells by expansion. The frost was, as usual, most severe in the lowlands, near streams, and except in the north-east, where the temperature just touched 32° , none was recorded on the English sea-coast.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 31.—"Propagation of Magnetisation of Iron as affected by the Electric Currents in the Iron." By J. Hopkinson and E. Wilson.

Consider a solid, cylindrical electromagnet, it is well known that, in reversing the magnetising current, the induction does