potassium, for instance, is thrown into a Bunsen burner, the chief line that one gets is a red one. Kirchhoff, in the early days of solar chemical investigation, pointed out that this red line is not to be found among the Fraunhofer lines. The flame also gives us a line in the blue. If we examine the spectrum of potassium by means of an induction-coil we find the blue line which we also see in the flame, but it is intensified in the spark. We also see some strong lines in the green and yellow, which are barely visible in the flame—which are in fact not generally recorded in the flame-spectrum of potassium, although they are really visible when considerable dispersion is employed. These lines in the yellow and green I say become prominent lines. Now, it so happens that some of these lines in the green do, it is believed, correspond with Fraunhofer lines, and we are, therefore, justified in assuming that they represent a something, whatever it may be, in the potassium, which can withstand the heat of the sun, while the red lines represent something which

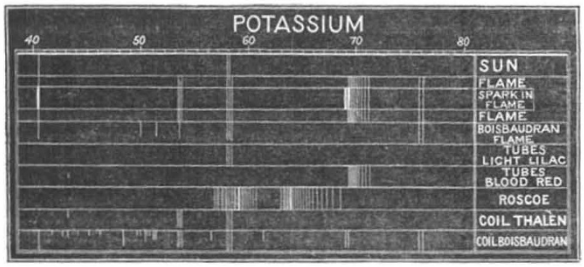

FIG. 49.—Spectra of potassium obtained under different conditions.

is broken up at the temperature of those regions of which we can determine the absorption. The interesting point of the experiment, therefore, is this: assuming for a moment that the red line does represent a complex something which cannot withstand the temperature of the sun, and that the yellow line represents a something finer which can withstand the temperature of the sun, what happens when we try to drive off the vapour of this potassium *at the lowest temperature* at which we can get it to volatilise at all, is that if the experiment is carefully performed it gives precisely those lines which are reversed in the solar spectrum alone, and of that line, which is the strongest line at the temperature of the Bunsen burner we see absolutely nothing at all. Referring to the spectrum which we get in the lilac and yellow-green part of the tube, two out of the three lines visible at all events are seen in the sun, whereas the other lines which we get in the flame and some of them which we get in the coil are not represented in that fine vapour which was produced at the lowest possible temperature.

The Bunsen burner produces some very exquisite colour-effects in the tube, and especially develops a beautiful blood-red colour which might be imagined to be the product of that molecule which gives the red line in the Bunsen burner; but that is not the fact. The line seen in the Bunsen burner is not visible as a rule in the vapour when heated in this way, the lines actually seen being more refrangible. Fig. 49 is a map of the spectrum of potassium under these various conditions. I give it simply as an indication that it is possible when other laboratory and chemical experiments are made with this view in mind that other analogies than those already obtained will be forthcoming.

The experiment then comes to this. If we assume the potassium to be a compound body and that its finer constituent molecules are those which resist the solar temperature, then it behaves exactly like a mixture of hydrocarbons is known to do, that is, the finer vapours come off in greatest quantity at the lowest temperature, and the more complex ones as the temperature is raised.

Conclusion

In concluding my lectures in this course on Solar Physics I would ask attention to the fact that the views which I have ventured to put forward, as being what I honestly believe to be the true outcome of the twenty years' work which has been applied to this subject, depend for their strength upon the convergence of very various lines of thought and work. No doubt the future progress of science will show that we, after all, are looking through a glass darkly, and that we are not yet face to face with the truth, and the whole truth. We must all of us be content to have our work criticised and expanded by future work, by researches carried on with greater skill, with more elaborate methods and higher views. But with all these reservations I do wish to draw attention to the fact that the convergence of many lines of work and many lines of thought suggest the ideas which I have put forward. Depend upon it, that we shall get a much higher and much richer truth out of further inquiries; and I quite acknowledge, although I have had a hand in the work myself, that the outcome of the work is so important that it ought to be considered honestly and carefully from every point of view. Still I consider that I am in honour bound to say, as the result of the work on solar physics, in that small branch of the inquiry into solar matters with which I am more personally connected, that my belief is that the late work has changed the views which were held say twenty years ago to this extent: whereas twenty years ago we imagined ourselves to be in full presence in the sun of chemical forms with which we are familiar here, I think in this present year we are bound to consider that that view may be modified to a certain extent, and that we are justified in holding the view that, not these chemical forms, with which we are acquainted here, but their germs really, are revealed to us in the hottest regions of the sun. J. NORMAN LOCKYER

NOTES FROM THE MALAY ARCHIPELAGO

A CORRESPONDENT in Java sends us the following:—

In 1879 I saw, at Tabu Breio, Padang Panjang, west coast of Sumatra, a child aged about one and a half years, with four legs. It was a female child with perfect organs, only the feet were clubbed and the legs bent. The added-on pair of legs were less perfect and their circulation evidently not in order, for they were not so sensitive to pain (pinches, &c.). They looked as if part of an embryo male child. The child was subject to fits; it could not walk, but crawled, using its female legs, the male (?) legs being dragged along. The spine was much dragged out of position.

During about six months of 1880 there was a child at Surabaya, Java, with two distinct heads joined to one neck. It is now with the Regent (a Javanese) of Surabaya, in spirits. Photographs of this are sold. The brains were quite independent of each other, for the one would sleep whilst the other was awake. I have not heard whether the one could articulate whilst the other slept.

Bornean Rhinoceros.—Mr. Bartlett writes to me: "We now know for certain that the Bornean is the same as the Sumatran. This comes of course from Hart Everett, and I do not doubt it for a moment." But I have strong grounds for believing that there are two kinds:—1. A Government official who recently spent a year in the deepest recesses of the island says the natives told him there were two kinds. 2. About eight years ago a small rhinoceros was killed at Bunut, about 150 miles above Sintang, on the Pontianak. This is certain, it had only one horn. I have recently spoken to an officer who spent a year and a half in the interior, and he says he always understood the animal had only one horn. Anyhow it is very rare indeed. No European I have met—and many have been a long way into Borneo—has seen it. That may be because they are phlegmatic Dutch, and not inquiring English. But the natives who killed the one at Bunut had never seen one before. At the first sight they fled in terror at such a beast. It might have been a young *R. Sum.*, as the horn was very small, and perhaps the trifling development of bud horn escaped notice.

A Dutch ship, the *Batavia*, has at length reached the point where the 141st degree cuts the west coast of New Guinea. This is considered a great feat; why, I can't precisely say. There has been a good deal of talk about sending explorers to the Dutch end of New Guinea, but directly money is asked for silence reigns. They had much better finish with Sumatra before going to New Guinea.

The cattle plague has been raging in the west end of Java, Bantam, the Preanger, and Batavia residences—during the west monsoon (now finishing) with redoubled vigour. It has now abated a little (after four years it may well do so, from want of victims) in these parts, but is extending eastward, its appearance in Krawang being the most alarming. The authorities have decided upon making a double fence right across Java at its narrowest part. This means a line from somewhere about Cheribon due south. In the interval—a considerable one—

between the two fences, no cattle will be allowed to pass or exist.

There is a bird (native name Jallak) which follows the buffaloes about and perches on their backs. Query, can this bird have anything to do with the spreading of the plague? If so I don't see what Government can do. They can't fence him out.

In all the parts where the cattle-plague has raged the most awful fevers have been the result amongst the native population. In Bantam alone 50,000 died in 1880. In the Preanger and Batavia the death-rate was also very high. There is no doubt whatever that this is due to the imperfect interment of the carcases. The Government says it is due to the wet season; but this is a lame excuse, for why is there no fever elsewhere? In the wet season it is, of course, worse, for the heavy rains cause more miasma.

SCIENTIFIC SERIALS

Journal of the Franklin Institute, July.—The direct manufacture of iron from ore, puddling, heating furnaces, and forge cinders, &c., by Mr. Du Puy. Discussion on steel rails.—Experiments with screw-propellers of different material and dimensions, applied to the steamer *Lookout*, with the hull coppered and not coppered, by Chief-Engineer Isherwood.—Percussion rock-drills, by Mr. Grimshaw.—Radio-dynamics, by Dr. Pliny Earle Chase.

Annalen der Physik und Chemie, No. 7.—On the forces acting on the interior of magnetically or dielectrically polarised bodies, by H. Helmholtz.—On the conductivities of metals for heat and electricity, by G. Kirchhoff and G. Hansemann.—On the same, by L. Lorenz.—The specific heat of liquid organic compounds and its relation to their molecular weight, by M. A. von Reis.—Contribution to the doctrine of induced magnetism, by E. Riecke.—On crystal analysis, by O. Lehmann.—On the contraction observed in formation of haloid salts in comparison with their heat of formation, by W. Müller-Erzbach.—Automatic mercury air-pump, by A. Schuller.—The theory of the law of saturation, by M. Planck.—The so-called self-exciting influence-machine, by P. Riess.—On K. Strecker's paper on the specific heat of chlorine, &c., by L. Boltzmann.

Bulletin de l'Académie Royale des Sciences de Belgique, No. 5.—On curves of the third order, by M. le Paige.—On the structure of the reproductive apparatus of Teleosteans (second paper), by Mr. MacLeod.—On a registering apparatus for signals of the mirror galvanometer, by M. Samuel.

Journal de Physique, July.—Experimental researches on the capacity of voltaic polarisation, by M. Blondlot.—Fundamental equations of induced magnetism, according to Maxwell, by M. Bouty.—Pumping machines and pneumatic apparatus, by M. de Romilly.—Researches on the specific heat of mixtures of heat and the three primary alcohols $C_2H_4O_2$, $C_4H_6O_2$ and $C_6H_8O_2$, by Dr. Zetterman.

Reale Istituto Lombardo di Scienze e Lettere. Rendiconti. Vol. xiv., fasc. x.-xi.—Contribution to the study of Amœba, by Dr. Grassi.—On an evaporimeter with constant level, by Prof. Fornioni.—Some researches on the distillation of cadaveric alkaloids, by S. Soldaini.

Memorie della Società degli Spettroscopisti Italiani, May.—Solar observations at Palermo Observatory during the first quarter of 1881, by Prof. Ricco.—On photographic photometry, by M. Janssen.—Scientific monument to P. Secchi in Reggio Emilia.—Spectroscopy applied to investigation of some colouring matters introduced into red wines, by S. Macagno.

Atti della R. Accademia dei Lincei, vol. v. fasc. 14.—Pharmacological researches on unstriped muscles, and particularly on the bladder, by P. Pellacani.—On some compounds of the furfuric series, by G. L. Ciamician and M. Dennstedt.—On some derivatives of pyrocol, by G. L. Ciamician and L. Danesi.—Action of nascent hydrogen on apoatropine, by L. Pesci.—On the saccharifying action of neutral salts, by F. Selmi.—Some theorems in geometry of *n* dimensions, by S. Veronese.

Rivista Scientifico-Industriale, No. 11, June 15.—Theory of siphons, by Prof. Rovelli.—New application of powdered graphite, by S. Mauri.—On Elban poltuce, by S. Corsi.—On radiant matter, by Prof. Mugna.

Archives des Sciences Physiques et Naturelles, No. 7, July 15.—Essay on the periodic variations of glaciers, by F. A. Forel.—Researches on the influence of heat on respiration, by W. Marcet.

SOCIETIES AND ACADEMIES

PARIS

Academy of Sciences, August 8.—M. Wurtz in the chair.—The following papers were read:—On the heat of formation of perchlorate of potass, by MM. Berthelot and Vieille.—Specific heats and heats of dilution of perchloric acid, by M. Berthelot.—Note on the communication to last meeting, by M. Boulley, on M. Toussaint's experiments on the infection produced by the juices of heated viands, by M. Chevreul.—Researches on the anhydrous chlorides of gallium, by M. Lecoq de Boisbaudran.—The standards of weights and measures of the Observatory, and the apparatus used in their construction, their origin, history, and present state, by M. C. Wolf.—On the Fuchsian functions, by M. H. Poincaré.—On the imitation, by means of hydrodynamics, of electrical and magnetic actions, by M. C. A. Bjerknes.—On the compressibility of carbonic acid and air under weak pressure and at a high temperature, by M. E. H. Amagat.—On the action of oxygen on mercury, by M. E. Amagat.—On the heating of waggons, carriages, &c., by means of the crystallised acetate of soda, by M. A. Ancelin.—Researches on the conditions of manufacture of magnets, by M. G. Trouvé.—Dissociation comparison of formulæ by experiment, by M. G. Lemoine.—Action of sulphuric acid on bromic amylene, by M. Chatin.—On a solution, of density 3·28, suitable for the immediate analysis of rocks, by M. D. Klein.—Tuberculous infection by the liquids of secretion and the serosity of vaccine pustules, by M. H. Toussaint.—Note on hydrophobia, by M. H. Duboué.

August 16.—M. Wurtz in the chair.—On cometary appearances, by M. J. Jamin.—Researches on the anhydrous chlorides of gallium, by M. Lecoq de Boisbaudran.—Singular effects of a gust of south-west wind, by M. G. A. Hirn.—Report of the place of Claude de Jouffroy in the discovery of steam-navigation, by M. de Lesseps.—The alcamines, by M. A. Ladenburg.—On the solubility of carbonate of magnesia in water charged with carbonic acid, by MM. Engel and Ville.—On the cobaltamines, by M. Porumbaru.—On the seat of gustation in dipterous insects: anatomical constitution and physiological value of the epipharynx and hypopharynx, by MM. Künckel and Gazagnaire.—On parasitism and tuberculosis, by M. H. Toussaint.—On the shooting stars of August, 1881, by M. Chapelas.

CONTENTS