

lying portions of the ill-fated cities and the Calabrian villages once stood. It is a warning to those who may be in any way responsible for rebuilding them.

A. IRVING.

Bishop's Stortford, January 21.

The Isothermal Layer of the Atmosphere.

MR. DINES makes a happy choice of terms when he writes of the isothermal column (NATURE, January 21, p. 341). Each of the unrejected traces is interpreted to show a more or less isothermal column, and it is by mentally piecing together these columns into a sort of honeycomb that the miscalled isothermal layer is brought into existence. It must not be forgotten that this hypothetical layer has a very uneven floor, and that each cell in the honeycomb has its own particular temperature. This is a complex structure. I certainly think it more feasible to ascribe the sudden and sustained minimum in the temperature curve, which is the gist of this discussion, to some idiosyncrasy or limit to which all the instruments, foreign as well as native, are subject night and day, and on the down as well as the up journey. In your issue of January 21 I referred to the falling density of the air current, upon which current the whole experiment depends. If the trace shows a uniform temperature during the upper 9 kilometres of an ascent, there is no escape from the conclusion that the temperature of the air has steadily fallen to compensate for its tenuity, and if we assume an adequate compression of the hydrogen before the rubber gives way, there is a further compensation required for loss of speed.

I shall now endeavour to answer Mr. Dines's points by the help of the old-fashioned laws of heat.

"The isothermal column of air shows just as plainly in ascents made after sunset as in those made in the day."

Yes. Radiation is stronger by day, but radiation and convection balance at some point, and the balance, if maintained, means a regular fall of temperature upwards.

"At night the thermograph must receive some heat by radiation from the earth, and lose some by radiation into space, but both amounts must be infinitesimal in comparison with that which would be given to it by the sun."

Being quite close to the hot planet, and being far below the temperature due to such proximity, the balloon, &c., will receive more radiation than they emit. The radiation from the planet, subtending nearly a hemisphere, will be far from infinitesimal compared with that of the sun.

"That solar radiation in the ordinary conditions is not important is proved by the fact that if the balloon bursts, and therefore does not float, it is not possible to say from the trace alone if the ascent was by night or by day."

If solar radiation cannot be detected on the traces it must be because they differ so much *inter se*. Surely if aëration is so good for the thermograph it must be equally good for the balloon, and a perfect torrent of warmed air must waft on to the instrument during the ascent.

"There have been cases in which the balloon did not burst, and the temperature at the top reached the freezing point of water."

This shows an approach to what I call the natural temperature of a body between the sun and a warm planet. Of course, the balloon, instrument, &c., would have been much hotter out of contact with the cold air which was basking in the sunshine at a temperature of about 100° F. below freezing. This recalls the question with which I finished my last letter.

"I still believe that radiation at night to and from the bright metal of the thermograph is so trifling that the rate of ascent is of no consequence."

The whole apparatus is admirably contrived—let us try faithfully to decipher the trace it gives us. The thermograph is scores of degrees below its natural temperature. This argues an intake of heat by absorption of rays, which heat is taken by the air current. The current must be colder or more rapid at the 20-kilometre level to give the traces that are now under discussion.

"There is also the fact that the up-trace, where the motion is comparatively slow, is identical with the down-trace where the motion is rapid."

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Mr. Dines has dispensed with a timepiece in many cases. Can he speak positively as to the vertical speeds? If it is quite clear that the down-speed is greater I can only suggest that with a parachute the motion is partly lateral, *i.e.* a gliding motion *through the air*, which would tend to interfere with the draught, as would also the parachute acting as a cover to the screen. Perhaps also the parachute subtends a larger angle than the balloon did.

Summarising the matter, I contend that "isothermal layer" is a misleading misnomer.

The basaltic structure of the upper air which is inferred from the traces is intrinsically improbable.

To get the temperature of the air from the trace a curve must be drawn on its low-temperature side and diverging upwards.

The result will be a non-isothermal curve.

The amount of this correction for all currents can be determined on the instrument in the laboratory.

R. F. HUGHES.

The Size of the Leather Turtle.

As trustworthy weights and measurements of large turtles are not often available, the following measurements and weight of a leather-back turtle, *Sphargis*, are submitted in the hope of eliciting further data regarding this or other species. The total length of the animal, measured along the curve from the nose to tail, was 6 feet 10 inches; the carapace along the curve, 5 feet 2 inches; the circumference at the widest part of the carapace, 7 feet 2 inches; from tip to tip of front flippers, over the shoulders, 8 feet 9 inches. Weight, a little more than 840 lb., for, when on the scales, the tips of the large front flippers rested on the ground. This is one of the largest turtles of this species that has come under my observation. Another specimen that I was able to weigh turned the scales at 740 lb.

F. A. LUCAS.

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Moral Superiority among Birds.

IN NATURE of January 7 Mr. F. C. Constable describes an observation of the moral superiority of the blue-tit over the robin. This is by no means exceptional. I constantly observe the same thing from my dining-room window, where I have a string stretched across with pieces of cocoa-nut and pork-fat attached to it for the tits to feed upon. In the cold weather the robins come too, but they are never allowed to feed in company with the blue-tits; they are attacked at once if they venture to hold their ground. The long-tailed tits and the cole-tits are much less aggressive, and will even give way to the robins.

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23 Torrs Park, Ilfracombe, February 1.

WOMEN AND THE FELLOWSHIP OF THE CHEMICAL SOCIETY.

IN our issue of July 9, 1908 (vol. lxxviii., p. 226), we directed attention to the fact that an influentially signed memorial had been presented to the council of the Chemical Society stating that, in the opinion of the memorialists, 312 in number, including ten past presidents, twelve vice-presidents, and twenty-nine members of council, among whom were thirty-three Fellows of the Royal Society, and the heads of the chemical departments of nearly all the most important universities and colleges in the kingdom, the time had come when duly qualified women should be admitted to the fellowship of the society, and praying that the council would take the necessary steps to permit of their election.

The council, having taken the memorial into consideration, determined to consult the whole body of the society, and instructed a committee to prepare a statement of reasons for and against the proposal, to be submitted, together with the memorial itself, to

each fellow, with a view to elicit a definite statement of his opinion as to the expediency of acquiescing in the prayer of the memorial.

We had occasion at the time to animadvert on the manner in which certain members of the council, and in particular the executive officers of the society, allowed their declared hostility to the admission of women to the fellowship to get the better of their judgment and sense of fair play, and we commented on the significance of the protest on the part of a large majority of the past presidents, which was sent to every fellow of the society—a protest which lost nothing of its force by the studied moderation of its expression of indignation.

The result of this referendum was that, by a large majority—1094 for and 642 against—the fellows expressed their opinion that the desire of the memorialists should be acceded to, and that duly qualified women should be admitted to the full rights and privileges of fellowship.

After having put the society to the expense and trouble of a referendum on an issue which was definitely stated with all the reasons for and against which could be urged, it might have been assumed that the council, as a representative body and in its fiduciary capacity, would have given heed to the expression of opinion which it had deliberately invited. Certain members of the council were, however, determined that nothing of the kind should be done. No matter what the size of the majority in favour of the admission of women might be, a contumacious and recalcitrant element in the minority—a cabal of London chemists, in fact, in no proper sense representative of the general feeling of the society—set themselves to thwart the wishes of the majority of the fellows. The whole business of the referendum was thereupon deliberately reduced to a fiasco. It was expedient, however, to temporise. The size and character of the majority was too significant and weighty for it to be treated with too great an appearance of contempt, and accordingly it was decided to offer such women as the council should think fit the privilege of attending the society's meetings, of consulting the society's library, and of purchasing the society's publications at cost price, but to deny them the fellowship.

This, of course, was not carrying out the mandate which the council had received. It was, indeed, in flagrant and contumacious opposition to it. It was necessary, therefore, to make some show of justification for such a course, and the result was one of the most remarkable productions in the way of excuse, evasion, partial statement and special pleading which a perverted and not over-scrupulous ingenuity could put together. This *apologia* is published in No. 349 of the society's Proceedings, and will serve to make that issue historical. By way of preamble it recites, with a chastened sobriety, the results of the voting, and then proceeds to state what was perfectly well known to the council before they instituted the referendum, and should have been stated to the fellows on that occasion by those who raised objections to the admission of women, that, having regard to the state of the law affecting women at the time of the granting of the Charter, there might be legal difficulties in its interpretation, and that these difficulties—if they really existed—might not be overcome unless practically the whole of the society was unanimous in praying for a supplementary or amended Charter. It does not state, however, what is the fact, that, whatever may be the difficulty as regards married women, counsel advised that, in the event of the society deciding to admit women, it should make the necessary alteration in its bye-laws. This advice clearly shows that, in the opinion of

counsel, the society might certainly admit unmarried women to the fellowship without serious risk to its action being legally challenged, if it were minded to do so, at the trifling cost of amending its bye-laws.

The fact is, there is not a single word in the Charter which either explicitly or implicitly excludes women. It has been held, indeed, by legal authority that by the very wording of the Charter it was clearly contemplated that women might possibly become fellows. Nor is there anything in the nature, functions, or objects of the society as defined by its founders which would preclude the admission of women. These facts were brought to the knowledge of the council on the authority of an eminent lawyer, whose written opinion was laid before them. But no hint of a possible conflict of legal opinion is given in the *apologia* which was put forward on behalf of the council, and only that particular one is referred to, and only so much of it is quoted as serves the purpose of him who drafted the argument. The net result of this conflict of legal opinion on the mind of the council was that it was a case of *tot homines, tot sententiæ*.

It is obvious that the whole of the *apologia* put forward on behalf of the council is simply a disingenuous plea of *non possumus*.

Every fair-minded person is now convinced that if the society is determined to admit duly qualified women to its fellowship it can do so without troubling itself about its Charter, and with no risk of an injunction against it so long as such women fulfil the objects of the society and are prepared to comply with its laws. In fact, what it has already done in regard to the election of Madame Curie as an honorary member it can do in regard to any British-born woman as an ordinary fellow.

But now comes the Nemesis. The council having professed their great anxiety concerning the legal difficulties they have conjured up, and which, like so many lions in the path, they say confront them, proceed to disregard the Charter and propose to act in a wholly irregular and unconstitutional way. They enact a resolution, indistinguishable, as has been said, in form and substance from a bye-law, and create a special class called "Subscribers," in no sense differing from that of the associates mentioned in the Charter, except that it is restricted to women, who are not admitted by the ballot of the fellows as are the associates. The difficulty of the council is obvious. Although the women so admitted are, in effect, associates, to call them so would be to give away the whole case. Hence the institution of the new grade. This makes confusion worse confounded. Whilst professing to have regard to the Charter, the council deliberately ignores or sets aside its provisions. No such resolution can take effect until it is sanctioned as a bye-law by a general meeting.

The fact is the council, under the direction of unwise advisers, have bungled in this business from start to finish. The only prudent step they have taken was to elicit the general feeling of the fellows. Having obtained it, they should have acted loyally and in good faith, and have sought to give effect to it. As it is, they have been led by devious and crooked ways from the straight path, with the customary result. The position now is as irregular as it is inequitable, and as illogical as it is unjust. Their plain duty is to retrace their steps and end an unseemly episode by doing what common sense, reason and justice demand.

In the meantime, the women concerned have, with a wiser instinct than that which has actuated the council, declined to accept the invitation to take up a position which, in view of its irregularity, would

have made themselves and the council ridiculous, and would have prejudiced their case as regards the fellowship.

This issue—namely, the position of women chemists in regard to a society which professes to have no other aims than the promotion of chemistry—is one which is bound to be settled in favour of the women. Men have no prerogatives as regards the study and cultivation of natural knowledge. It is open to women, as human beings, to follow its pursuit if they are so minded, and they have the same moral rights as men to benefit by membership of an organisation which has been created to further its interests. We admit women to our colleges and universities; they work in our chemical laboratories; they engage themselves in the business of original chemical inquiry; we publish their scientific communications in our journals; and we confer upon them our degrees in science. Why, then, should the Chemical Society of London be singular in refusing to admit them as fellows? That it is singular is shown by the fact that even a purely professional society—the Institute of Chemistry—admits them. The Society of Chemical Industry places no obstacle in their way, and they are admitted to Continental and American chemical societies.

The small group of London chemists who have set themselves to oppose the wishes of the main body of the society have thereby raised an issue which is even broader than that which they have sought to evade. It is whether, in an essentially democratic institution like that of the Chemical Society, the will of the majority is to prevail, or whether it is to be thwarted by the machinations of a self-constituted oligarchy which abuses its trust and makes use of its opportunities to gratify its personal prejudices. Perhaps the general body of the fellows will have something to say on this matter at the forthcoming general meeting of the society.

PERIODICITY IN THE SUN AND THE RED VARIABLE STARS.¹

THE mechanisms of the periodicities of the sun and stars are matters still of great obscurity. The cyclic change of the sun's spotted area has long been known, indeed can be traced in the early Chinese observations. In probable association with this are periodicities of facular and floccular areas, and of prominence activity. Coronal forms have been shown to change in type from point to point of this solar cycle, while recent observations of the so-called "solar constant" have shown its intrinsic variability. This last also is likely to be periodic. Such intimate first-hand knowledge is impossible in the case of the stars. Their integrated light changes alone can be examined. For variable stars about or below the solar level, according to its classifications of Secchi, Lockyer, or Pickering, some idea of the details of their variation may be obtained by analogy with the sun. In dealing with the red variable stars this method has been followed in the publication under review. This is an "Essai d'une Explication du Mécanisme de la Périodicité dans le Soleil et les Étoiles rouges variables," by A. Brester, Jz, Docteur ès Sciences, published by the Academy of Science, Amsterdam, 1908. The first accounts of the theory have been already reviewed in NATURE (vol. xxxix., p. 492, and vol. xlvii., pp. 433, 434). Its main features remain unchanged. The present statement gives it in the light of more recent knowledge, amends it in detail, and extends its appli-

¹ "Essai d'une Explication du Mécanisme de la Périodicité dans le Soleil et les Étoiles rouges variables." By A. Brester, Jz. Eerste Sectie. Deel ix., No. 6. Pp. 137. (Amsterdam: J. Muller, 1908.)

cation, more especially, to the case of red variable stars.

A short preliminary re-statement of the theory is perhaps desirable. In the case of the sun there is postulated a hot fluid globe made up of concentric layers of different substances arranged, more or less, according to their densities, and having angular velocities increasing with the depth in the sun. For the stability of such a stratification a relatively tranquil sun is demanded; such disturbances as are admitted are considered as being of the order of feebleness of terrestrial winds.

Radiation from the outermost solar layers provokes condensation, retarded by exothermic chemical action, which, falling as a torrential rain, forms the photospheric clouds. If the loss of heat above exceeds the gain of heat below the clouds increase in thickness and gradually reach lower and lower levels. In their descent they leave behind the finer condensed material, which serves to explain the loss of solar light at the limbs and the "yellow veil." The extreme brilliance of the photospheric clouds is likened to that of an incandescent mantle, the brightness of which seems to be associated with some subtle chemical activity. The breaks in the photosphere through which the re-vaporised clouds ascend constitute the spots, the vapours of which, though at least equal in temperature to the photospheric clouds, have smaller emissive powers. An upthrusting of faculæ would usually precede a spot, which seems to correspond to the latest observations, while the facular lag and equatorial acceleration of spots would follow from the assumed distribution of angular velocity.

The periodicity of the thickening and sinking of this photospheric cloud and its re-conversion into uprising vapour, which again condenses at a high level, grows in thickness and slowly reaches lower levels once more, is obviously too indefinite for mathematical treatment, so that the eleven-year cycle and the minor periodicities are still only facts of observation. An intensification of this clouding up of radiation and an increased periodic spottiness represent the extension of the theory to the red variable stars.

The tranquility and absence of eruptive phenomena, which the author regards as essential to his theory, are fearlessly imposed. Since the delicately poised strata must not be disturbed, the directly observed velocities, both on the photosphere, as spot and floccular changes, and at the limb, as prominence activities, are discredited as movements of matter. A transference of luminescence serves to explain them. The displacements of some solar lines indicate, on the principle of Döppler, velocities in the line of sight which the author holds as "impossible and absurd." Since line displacements are now known to be produced by other agencies, as well as by line-of-sight velocities, Döppler's principle is held to be untrustworthy. The invariability of the general Fraunhoferic spectrum is adduced as evidence of this photospheric calm, while the outermost different angular velocities of some of the solar layers, as indicated in the recent work of Prof. Hale, show, according to the author, that the "supposed solar eruptions cannot exist."

The above is a very brief sketch of the theory which in the essay is treated in great detail. A wealth of pertinent quotations and references is brought to its support, the collection of which must indeed have been a labour of love.

The parts which exothermic and endothermic chemical actions play in the theory are interesting. Dissociation, a distinctive solar theory of Sir Norman Lockyer, is used in this connection, though the relative temperature and the direction of motion in the umbrae of spots are the opposite of those given in