

lxxvii., p. 188), while the following additional observations have been made.

Distribution.—I found musical sand at intervals along the shore for more than ten miles north of Barmouth, at Whitesands Bay, Pembrokeshire, and at the North and South Sands, Tenby. This suggests that it is much more widely distributed along the shores of the British Isles than has hitherto been supposed.

Conditions affecting Pitch of Note.—I obtained the note by plunging a flattish pestle into an evaporating basin containing some of the sand, and there appears to be a definite relation between the curvature of the vessel and the pitch of the note produced. The following typical numbers were obtained with vessels of different material, which were approximately hemispherical in shape, the same pestle being used in each case:—

Vessels	A	B	C	D	E
Radius of curvature in cm....	5'4	5'1	4'7	4'4	4'2
Frequency of note (about) ...	1280	1440	1700	2180	2300
Inverse ratios of squares of radii	1'12	1'32	1'18	1'25	1'06
Ratios of frequencies	1'13	1'33	1'18	1'35	1'10
Vessels	A & B	A & C	B & C	C & E	D & E

When round-bottomed glass flasks are plunged into a milk-bowl containing sand, the pitch appears to depend on the curvature of the flask; e.g. flask

$$R = 3.5 \text{ cm gives note } n = 2050$$

$$R' = 4.2 \text{ cm gives note } n' = 1370$$

$$\frac{R^2}{R'^2} = 1.44 \quad \frac{n}{n'} = 1.49$$

Within certain limits, a change in the temperature, the quantity of sand moved, or the gas present between the sand particles, appears to have no appreciable effect upon the pitch.

E. R. THOMAS.

University College of Wales, Aberystwyth.

The Protective Value of the Sticky Hairs on Young Leaves and Shoots.

It is often difficult to imagine, and still more so to discover, the particular foes against which the hairs of young plants are a defence. In the course of the last two days I have noticed two instances in which the same foes have been successfully vanquished by a similar device on two widely different plants. The first instance was afforded by plants of *Salvia patens*, which had been removed from a cool frame to the shelter of a wall prior to being planted out in the borders; the second by the young leaves and shoots of several species of Rhododendron growing in my garden. The hairs of both these plants were abundantly laden with dead and dying hymenopterous gall-flies of several different species (? of the genus *Andricus*). I examined several individuals, and found them invariably to be females. They were caught by the legs, wings, or indeed almost any portion of the body. I failed to discover any insects other than the gall-flies captured by these hairs; and yet there were a few dipterous flies walking unconcernedly over the leaves, and in no way inconvenienced by the sticky hairs. The evidence would seem to point to these hairs being a special protection against gall-causing insects at a stage when the tender leaves and shoots would otherwise be very vulnerable by these tiny creatures.

OSWALD H. LATTER.

Charterhouse, Godalming, May 21.

The Teaching of Science in Secondary Schools.

THE report of the Board of Education on the above subject (see NATURE, May 4) contains many expressions of opinion with which I heartily agree. But I must beg respectfully to differ from the authors as regards the

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limitations they propose to put upon the use of everyday phenomena in science teaching. The report says:—"They should, of course, be introduced as illustrations, that is to say, when, and only when, they may happen to be wanted to give point to the teaching." This dogmatic statement ignores the fact that many well-known teachers strongly prefer the opposite mode of procedure. Upon their view a practical problem should be made the starting point, so that the development of the scientific method should follow instead of precede; e.g. from a study of the crane the class should discover the triangle of forces. The main argument for this procedure is that the boys actually want to know how a crane works, whereas interest in abstract principles does not, as a rule, outcrop until the age of sixteen or seventeen years. My own experience is distinctly in favour of the appeal to the utilitarian rather than to the scientific motive, except in the case of exceptional boys or of those above the age of seventeen.

G. F. DANIELL.

Oakleigh Park, N.

June Meteors.

THOUGH the long days and twilight nights prevent much attention being given to observations of shooting stars in June, still, important meteoric events are liable to occur in this month. The following are computed details of the four most important meteor showers that take place during the period June 9-30 in the present year:—

Epoch June 8, 17h. (G.M.T.), twenty-sixth order of magnitude. Principal maximum June 9, 9h.; secondary maximum June 9, 19h. 40m.

Epoch June 9, 6h., twenty-second order of magnitude. Principal maximum June 10, 9h. 35m.; secondary maximum June 10, 19h. 40m.

Epoch June 13, 12h. 20m., seventh order of magnitude. Principal maxima June 12, 5h., and June 12, 12h. 15m.; secondary maxima June 10, 23h. 10m., and June 12, 18h. 35m.

Epoch June 14, 4h., eighth order of magnitude. Principal maxima June 12, 23h. 20m., and June 13, 0h. 5m.

June 5.

JOHN R. HENRY.

Daylight and Darkness.

I AGREE with Mr. W. T. Lynn that the article in NATURE of May 11 (p. 349) leaves "little to be said with regard to the so-called Daylight Saving Bill"; but there is one remark in it to which exception may be taken. This is the statement (p. 350) that it is "easy" to alter one's watch when travelling into a zone where different time is kept, if by "easy" is meant "not inconvenient." All travellers must have found the inconvenience of the change of time, even when reduced to a minimum through the change being an exact hour. Some inconvenience is unavoidable in travelling, but it is, of course, absurd to cause this inconvenience unnecessarily as the "Daylight Saving Bill" proposes. The inconvenience is such that in a journey to India I found it best never to alter my watch at all, it being simplest to keep to Greenwich time, and mentally make the allowance for local time.

T. W. BACKHOUSE.

West Hendon House, Sunderland, June 1.

HEREDITY AND DESTITUTION.

DURING the past week a conference has been sitting to consider possible means for the prevention of destitution. A general inaugural meeting took place on May 30, at the Albert Hall, and sectional meetings were held on several days at Caxton Hall.

Mr. A. J. Balfour, who delivered the opening address at the general meeting, struck a note of which echoes were heard throughout the congress. He devoted much attention to the bearing of heredity on destitution, and to the influence of the present selective fall in the birth-rate on the average economic efficiency of the nation.

Although Mr. Balfour held that some supposed

deductions from the principle of natural selection among mankind were not supported by facts, those who believe that the importance of heredity and selection in racial qualities has been too much neglected cannot but be grateful to him for raising boldly a question which our statesmen and politicians are only too prone to ignore. Almost anything which directs public attention to the subject is to be welcome.

While according a generous recognition to the importance of racial studies, Mr. Balfour asked the selectionist to face the question why he could perceive no "segregation of efficiency in the past between those who are better off and those who are worse off." Mr. Balfour implied that, unless a satisfactory answer could be given, the theory of natural selection as applied to mankind should be regarded with hesitation if not with suspicion.

Not everyone will share Mr. Balfour's inability to perceive a higher level of ability among the upper half of the nation as compared with the lower. Distinct evidence of segregation of special types of ability might be adduced. But the question why the process has not gone farther, why the upper classes do not show preponderant ability more markedly than they do, is worthy of consideration.

The whole problem of selective action in mankind, and especially civilised mankind, is fraught with difficulty, and tentative considerations alone can at present be put forward. One could imagine a society in which ability possessed full selective value, and a cumulative segregation of mental qualities gave to the best part of the race at all events, a much higher average efficiency than we can now show. But that society would in some respects be unlike our own. It would be more ready to accord all advantages to ability without envy or hesitation; it would be much firmer in visiting weakness of mind or body with appropriate disabilities. It would secure in some way that able men and women should be encouraged to have a full complement of offspring, and should be placed in a position where a hunt for heiresses by themselves or their sons would not be necessary to support the position won by their own ability, for, as Galton pointed out, heiresses usually come of infertile stock, and too often extinguish the family which captures them.

These considerations may serve to give us the clue to Mr. Balfour's problem: Why are not our upper classes more markedly superior in ability to the lower?

First, ability, even ability which leads to achievement, does not necessarily secure a more able partner. A man rising rapidly too often either marries unwisely before he has risen, or, engaged in the struggle to advance, marries not at all, or too late, to leave many offspring. One or two children are not enough to give the hereditary ability a full chance of appearing. Thus the favourable variation is destroyed in the first generation.

Secondly, if he marries appropriately and rears a large family, that family has still many dangers to run. Unless the ability be of the type which wins great wealth, and unless the opportunity for winning that wealth occurs, a search for well-dowered partners will probably extinguish some lines of offspring. Or again, if wealth renders this search unnecessary, some of the children may fall a prey to the needy adventurer with undesirable mental qualities.

Thirdly, when a family becomes firmly established among the upper classes, the pressure of selection becomes less acute. Places are found for the sons, whether their abilities deserve them or not; some of

the daughters make good marriages, regardless of whether they possess their share of the family ability. Selection ceases to a great extent, and reversion to a lower level inevitably occurs.

These reasons apply to all the ages during which modern society has been developing. But, during the last forty years, the voluntary and deliberate restriction of the birth-rate among the more successful stocks of the nation has introduced a new cause which affects chiefly those among whom its results are most disastrous from the point of view of the nation and the race.

An able man and an able wife—a pair nearly sure to produce a high proportion of able offspring—too often regard the interests and duties, which their ability thrusts on them from all sides, as a reason or an excuse for restricting severely the number of their children, or for refusing the burden of parenthood altogether. For the last forty years the power of doing so has been changing slowly but surely the whole aspect of racial problems.

But, while we may give reasons to explain the comparative want of segregation of ability, it should be recognised that signs of partial segregation of ability are not totally wanting. At present, it is probable that selection is keenest and most effective in the professional class, and competent observers are to be found who believe that the average ability among the sons of professional men is higher than in any other class in the community.

During the eighteenth and early nineteenth centuries, there were frequent intermarriages between the leading political, administrative, and military families, and a statistical analysis of the entries in the "Dictionary of National Biography" gives us evidence of distinct accumulation of those special types of ability in the governing class during that period. The rarity of such accumulation in other cases may well be due largely to the want, in other sections of the nation, of distinct classes, corresponding to the different types of ability. If mates were naturally sought from within the limits of a definite class, access to which was more and more jealously guarded as its efficiency and ability increased, a similar and more marked segregation of ability might appear in other directions.

But Mr. Balfour saw another difficulty in the path of a selectionistic interpretation of social phenomena. As Dr. Archdall Reid has shown, disease is now one of the most effective selective agencies at work among mankind. By the early elimination of those specially susceptible to a given disease, the race is gradually becoming more and more immune to that special scourge. If we diminish the infection of the disease by improved sanitation and knowledge of hygiene, this process of immunisation will cease, and the race will revert to a more susceptible state. Hence, Mr. Balfour argued, no convinced selectionist should advocate improvement in our sanitary environment.

Doubtless, improvement in the environment has its dangers. It may keep alive to reproductive age many of weak physical or mental constitution, who would, for the sake of the race, be better out of the way. We shall guard against those particular dangers all the better for facing them with open eyes. But immunity from certain special and preventable diseases is not the highest quality of the ideal man. If we can guard against infection in other ways, it may well be that greater aggregate advance will be made when we can prevent the waste now incurred by nature in protecting the race against that particular disease. As our knowledge of inheritance, Mendelian or other, is increased, we may be able to point the

way to combining immunity from the disease with other valuable qualities. Meanwhile, it is unwise to lose the chance of preserving those other qualities, which may now be linked with susceptibility to the disease, for want of the sanitary precautions which advancing knowledge puts in our power. Thus the selectionist escapes from Mr. Balfour's dilemma, and may support with a clear conscience all efforts towards improvement in the environment, provided that it is fully realised that improvements in the environment alone will not necessarily improve the innate qualities of the race, any more than better cow-stalls will of themselves improve without limit our breeds of cattle, and, provided that all efforts are also made deliberately to encourage reproduction among the best stocks, and to discourage it among the worst.

But consideration of these general problems, interesting though they are, is not necessarily essential to the application of the principles of heredity to the treatment of destitution—the immediate object of the conference opened by Mr. Balfour's speech. Whether or no there is a general segregation of ability broadly between the upper and the lower classes in this country, it is undeniable that the ranks of the paupers contain a certain proportion of those who, mentally or physically, are hereditarily unsound. It is the fact that the differential birth-rate is telling in favour of the unsound as against the sound that is so sinister, even more so than its effect on the relative rates of reproduction of different social classes.

No one denies that many fall into reach of the Poor Law through no fault of their own. By seasonal unemployment, by movements of trade, by the pressure of temporary illness or economic misfortune, relief becomes necessary. To meet these cases, every attempt should be made to improve the organisation of the labour market, to obtain more effective education, to prevent blind-alley occupations for boys and girls. Such subjects met with their full share of consideration at the conference, and will always appeal with greater force to the philanthropist, who wishes to relieve immediate distress, and to the politician who wishes to capture votes by doing so.

But, as all those who administer the Poor Law with their eyes open know, these cases are but part of the problem. A large number of the occupants of our workhouses and prisons are congenitally defective in mind or body. Often, for the feeble-minded or unsound themselves, there is no hope of improvement, and, even in cases where, at great expense to the community, they can be taught a trade in special schools, as Mr. Balfour pointed out, their acquired characters will not be inherited, and their offspring will tend to reproduce their infirmities. The feeble-minded are specially prolific, and, in this time of a general fall in the birth-rate, are increasing relatively to the other sections of the community. Several years ago, a Royal Commission reported in favour of the compulsory and permanent care and detention of the mentally defective. That nothing has been done to carry out the recommendations of the Commission, in spite of the urgency of the case, is a standing disgrace to the Government and to the Parliament of this country. Were these unfortunates shielded from the degradation which follows their so-called freedom, and prevented from handing on their defects to future generations, this part of the problem of destitution would be solved, and a heavy burden of incompetence and pauperism removed once for all from the shoulders of the competent, who, there is now reason to fear, often restrict the number of their offspring to meet the increasing load of taxation required to support the inefficient members of the community.

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Several of the special papers read to the sections of the conference dealt with the problem of mental defect as a cause of pauperism. On May 30 Dr. F. W. Mott and Dr. A. F. Treadgold dealt with the insane and the feeble-minded in their hereditary aspects. Dr. Mott pointed out the significance of the fact that a considerable proportion of the inmates of the London County Asylums were related to other inmates, while Dr. Treadgold gave evidence that feebleness of mind was more prevalent in the rural districts. It should be noted that rural districts which have specially been depleted by immigration to the towns seem particularly affected in this way. The worst strains get left, and the inbreeding of defective stocks intensifies the evil. Dr. Treadgold said that the real cause of the existence of a certain class of parasitic pauper was germinal defect, and emphasised the folly of allowing such a class to propagate freely. On Wednesday Sir William Chance pointed out that, whatever the cost of segregation, it would be repaid in a generation many times over by the saving in workhouses and prisons. Other papers on mental defect in its bearing on pauperism and crime were read by Mr. T. Holmes, Dr. C. H. Melland, Miss Mary Dendy, and Dr. F. Needham, while Dr. C. W. Saleeby spoke on the eugenic summary and demand.

Whatever be the effect of the conference on legislation or administration, it is impossible to follow its proceedings without perceiving that the thinking world is at last waking up to the fact that biological knowledge has an intimate bearing on sociology. The last few years have seen a great change in this respect, and, though much more is yet to be done, the future is full of hope. W. C. D. W.

PLAGUE.

THE recent epidemic of plague in northern China with its 60,000 deaths, is remarkable in two respects. First it was the most extensive manifestation of pneumonic plague in this pandemic; and, secondly, it was characterised by a more or less sudden cessation. It affords a warning as to the capabilities of the disease, and as to one of its possible developments, and although the outbreak has come to an end for the time being without any great efforts in the direction of prevention, yet it has demonstrated that the plague of the present day is as powerful for mischief and as capricious in action as that of any period in the past centuries. Arising in or close to eastern Mongolia, where the ordinary annual epidemics of plague have for many years shown a tendency to a comparatively high percentage of the pneumonic type, this influenzal form, shorn of the bubonic variety which has hitherto accompanied it and has been its predominant partner, appears to have been conveyed as early as October, 1910, to some of the more recent settlements on the Manchurian portion of the Trans-Siberian Railway.

The increasing mortality in these settlements did not attract any particular attention until December, when, in consequence of panic following an appreciation of the situation, there ensued a great exodus of the Chinese, both by rail and by road, to their homes in the more southern provinces of Shinking, Chili, and Shantung. To the infection thus carried far and wide the rapid and extensive dissemination of the disease and the formation of new centres may be traced. But the virulence and great mortality which characterised the epidemic in some places and its comparative harmlessness in others are not so readily explained. The cause or causes of these variations have always been, and still remain, a per-