

logarithms, natural sines and tangents, specific gravity and hydrometric tables, and tables of solubilities of a wide range of substances. As a rule, care has been shown in selecting the latest and best authorities, and the whole has been put together in a convenient form. The proofs have evidently been very well read, as the book is remarkably free from typographical errors. The editor deserves great praise for the thoroughness with which he has done his work, and the book, we trust, will find a place in the laboratory or on the desk of every chemical consultant.

The Purpose of Education: An Examination of the Education Problem in the Light of Recent Psychological Research. By St. George Lane Fox Pitt. New Edition. Pp. xxviii + 144. (Cambridge: At the University Press, 1916.) Price 2s. 6d. net.

Few people, it is to be feared, even among teachers, ever really face the question: "What ought education to aim at?" This book will at least stimulate to such inquiry, and it points the way in the right direction. The author, accepting the new conception of human personality which psychical research has brought about, considers that the proper purpose of education is the harmonising of psychic phases, the study of the laws governing them, finding their interpretation in the art of living and "giving them synthetic expression in the growth of character." To put the matter in definite form, the manufacture of noble souls is the right aim, and the right method is the inculcation of high ideals. The Sermon on the Mount is the acme of truth and beauty. It urges us to rely less on the seen, the concrete, the physically tangible, and more on the spiritual side of our natures, unmanifest to our senses, but very real and permanent, eternal while the other is temporal. Thus we gain true security and everlasting peace. The present state of Serbia, Poland, and Belgium shows what is the result when education in a neighbour-State becomes materialistic, aiming only at physical efficiency and power. The war has its lessons: we must learn them.

LETTERS TO THE EDITOR.

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Gravitation and Temperature.

As the outcome of a very delicate systematic series of experiments (*Phil. Trans.*, 1916) it is announced by Dr. P. E. Shaw that "when one large mass attracts a small one the gravitative force between them increases by about $1/500$ as temperature of the large mass rises from, say, 15° C. to 215° C."; that is, it increases by about 1.2×10^{-5} of itself per degree Centigrade. This seems to be a very startling result, at any rate if temperature is merely the expression of internal molecular motions, as, indeed, Dr. Shaw seems to admit.

By Newton's principle gravitation between masses

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must act reciprocally; the result, therefore, means that the astronomical mass of a body must increase with temperature by 1.2×10^{-5} of itself per degree Centigrade. The pendulum experiments of Bessel and recent determinations by Eötvös seem to establish proportionality between gravitational mass and mass of inertia, irrespective of temperature, well beyond these limits. Thus inertia also would have to increase with temperature; and when a freely moving mass is becoming warmer its velocity must be diminishing, for its momentum must be conserved. A comet like Halley's is heated upon approach to the sun; thus it should suffer retardation in the approaching, and acceleration in the receding, part of the orbit, enough probably to upset existing astronomical verifications. Indeed, as regards change of inertia, we can recall the principle applied by Prof. Joly to the question whether chemical change involves change of mass, viz., that every mass around us is moving through space with the velocity of the solar system, and a sudden rise of temperature in a body must therefore involve a violent kick if its inertia is thereby sensibly altered.

Electrodynamic theory does establish unequivocally an increase of inertia of a body arising from gain (δE) of thermal or electric energy; but this is only of amount $\delta E/c^2$, where c is the velocity of radiation, and so is minute beyond detection. The question whether there is also an equivalent increase in gravitational mass evades discussion until some link connecting gravitative and electric forces has been established.

J. L.

Cambridge, June 5.

A Plague of Caterpillars.

WITH reference to what has appeared in the public Press relative to the devastation caused by caterpillars to the oak trees at Ashted, you may be interested to know that some three or four years since a similar occurrence took place in the oak plantations in Richmond Park.

The denudation of the trees was so severe that in the spring of 1913 H.M. Office of Works consulted Mr. Maxwell Lefroy, the famous entomologist of the Royal College of Science, with the view of stamping out the pest. Eventually it was decided to spray the trees with chromate of lead at such a time that the young caterpillars, on hatching out, should have only poisoned food. The spraying operations were carried out by portable high-pressure pumping apparatus loaned by myself, self-supporting telescopic ladders being provided to reach the tree-tops some 40 ft. from the ground.

This was, I believe, the first occasion on which attempts were made to spray such large trees, and there is not much doubt that the oaks at Ashted could be treated in a similar manner.

It is, of course, now too late in the season to undertake preventive measures, but if spraying were undertaken early next May I have not much doubt that the pest could be eradicated.

J. COMPTON MERRYWEATHER.

4 Whitehall Court, S.W., June 7.

The Black-eared Wheatear: A New Bird for the Irish List.

ORNITHOLOGICAL readers of NATURE will no doubt be interested to learn that a black-eared wheatear (*Enanthe hispanica*) was obtained on Tuskar Rock, Co. Wexford, on May 16, by Mr. Glanville, principal lightkeeper. There are two races of this bird, an Eastern and a Western, each of which exhibits dimorphism of plumage, the