the use of alcohol, the raising of the standard of parental fitness, and similar problems. In a detached appendix the dangers of venereal diseases are frankly pointed out. The author's general position is that much is to be attained by greater cleanliness, increased control of the hours and conditions of labour, and improved environment for children, but that there must also be some way of preventing the decisively unfit from becoming parents. The book is competent and wise, but some of the statements seem to us to require safeguarding. The citations as to child labour "in the greatest canning factory" in America are so terrible that we hope there is some mistake. The date should have been given. The book is dedicated to "Boys and Girls, the Guardians of the Next Generation," but we hope we are right in understanding that it is meant only for the teacher's use.

Principles of Physical Geography. By G. C. Fry. Pp. x+151. (London: W. B. Clive, 1915.) Price 1s. 6d.

THIS little book contains that part of the author's text-book of geography which deals with physical geography, with some additions on such subjects as map drawing, climate, and the crust of the earth, as well as a new chapter on man and his work. It contains no definite instructions for practical exercises to be worked by the pupil, but the descriptive treatment will prove suitable for students preparing for the examinations mentioned in the author's preface.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

The Thermionic Current.

If a carbon filament lamp is silvered inside, and a platinum wire through the side of the glass makes electric connection with the belt of silver, it is easy to experiment with the thermionic current, using a telephone receiver with one terminal to the platinum wire and the other to the water mains.

With an alternating current at 110 volts, a loud note is heard, depending on the frequency of alternation. With a direct current from a dynamo there is sufficient variation in the voltage to obtain a sound just audible at 100, loud at 110, very loud at 130, and it might be described as an uproar at 140 volts. It might be expected that the intensity would increase until the lamp burnt out. Nothing of the sort. At 142 volts the uproar is replaced by dead silence, which continues up to 165 volts, as high as the lamp would stand.

The explanation may be gathered from Langmuir's paper (*Physical Review*, December, 1913). The thermionic current does not increase with the temperature, according to Richardson's law, unless the vacuum is of a high order. With a moderate vacuum the volume charge between the filament and silver

causes the thermionic current to remain at a value nearly constant, as the temperature is raised above a certain value. The thermionic current begins by obeying Richardson's law ($i = a\sqrt{T}e^{-\frac{b}{T}}$), and then later approximates to a steady value.

Thus at low voltages variations of voltage cause variations of temperature and consequent fluctuations of thermionic current, heard through the telephone.

Above 140 volts, however, for the particular lamp in question, a change of voltage and of temperature produces no change of current, and hence no sound can be heard in the telephone.

It is possible that this method may prove very convenient for testing the electron emission from various substances in different gases, and it suggests a method of measuring a high vacuum. A. S. EVE.

McGill University, Montreal, March 31.

A Mistaken Butterfly.

WHILE waiting for a car at Pacific Grove, Monterey County, California, on February 12 (Lincoln's birthday) of the present year, I noticed that a man standing near me had the brightly-coloured "eye" of a peacock's feather in the band at the back of his hat. While looking at this I saw a butterfly floating above the man's head. It suddenly lighted on the "eye" and apparently began trying to extract food from it. I directed the man's attention to it; he removed his hat, and we watched the insect for several minutes as it tried to secure food from the feather. It then flew away, as if satisfied that it had made a mistake. I do not know the name of the butterfly, but it was one of many of a light brown colour that seem to be plentiful at Pacific Grove at that season. I was told that these butterflies at a certain time regularly alight in thousands upon a special pine tree (one of a great many) in the western edge of the town, and from this fact they have called it the "Butterfly Tree." I do not know whether these insects seek their food from flowers by the sense of smell or that of sight, but it was evident in the present case that this one was guided entirely by sight.

E. E. BARNARD.

Yerkes Observatory, Wisconsin, U.S.A.
March 29.

BRITISH SUPPLY OF DRUGS AND FINE CHEMICALS.

AT a British Association meeting about twenty years ago an eminent physicist received some rough handling from his chemical colleagues on account of the impurities which were manifestly present in the materials he had used in his experiments. He replied, in effect, that chemists should employ themselves in purifying chemicals for physicists to use. Nowadays chemicals such as he would have desired are made by the ton, chiefly by three firms in Germany. For ordinary chemical, and even physical, research such fine materials are turned out that it may be doubted in many cases if the work done with them is worthy of such refinement. Frequently the chemicals used are better than the chemist who works with them could have produced for himself. For work of the highest degree of refinement, such as the determination of atomic weights, the chemicals which can be purchased cannot be used with-

out much further purification, but even in these cases much time is saved by the previous elimination of the grosser forms of impurity. To those who were in their early days limited to chemicals produced in this country, the standard of purity attained by the German manufacturer came as a revelation, and the study of prices made it clear that the enormous advantage gained by the use of the German materials was obtained at no unreasonable cost. The standard set by the German makers has not even been aimed at by our own countrymen, and the words "pure," "puriss," and "absolutely pure, for examination purposes" on the labels, are ludicrously misused. Want of method, want of care, and the employment of workmen instead of chemists in the preparation are at the bottom of the failure.

With regard to drugs, it has been stated that some eight hundred different medicinal preparations have been patented within recent years by German chemists, and although this is probably an exaggeration, it is certain that a very large number of such substances have been prepared, and that many of them have been found of sufficient value from the physiological point of view to warrant their retention as commercial products.

In these days when the relationship between chemical constitution and physiological action is fairly well understood, it is clear that the discovery of an organic structure which has valuable physiological action will lead to the preparation of large numbers of others differing but slightly in composition, and that these will find their way into patent literature mainly in the hope of their being useful, and, incidentally, to retain the field for further investigation. Such was the case of salvarsan, and since the discovery of that substance by Ehrlich, the patent literature has teemed with specifications dealing with the preparation of organo-metallic derivatives of almost every conceivable description. The antipyretics, again, of which phenacetin and aspirin may be quoted as types, belong to definite groups of organic compounds, the other members of which possess more or less important properties, depending on a slight change of structure the nature of which is not definitely understood.

There is another class of drugs of which the Germans have made a special study, those which are obtained from vegetable sources. In looking through their descriptive catalogues (in English) which are largely circulated among medical men in this country, one is struck by their far-reaching enterprise in this direction. Their travellers have gone to the ends of the earth to investigate native diseases and the local remedies which are used for their treatment. So long ago as 1850, Schweinfurth, in his journeys in central Africa, compiled a list of such remedies and brought home specimens of plants from which they were made. In Germany a large trade is now done in the extracts from vegetable sources collected from the remotest corners of the globe, many of them British possessions. The medicines are sold in

elegant and even attractive form, and those whose memories go back to the pre-tabloid days may well envy the younger generation. It would not be just to underestimate the work done by certain firms in this country in the same direction, but in the number of the drugs and the enterprise shown in collecting new ones, we are, without doubt, behind our enemies.

In these matters of fine chemicals and drugs, both synthetic and natural, it is an arguable question whether the trade should be left as it is. On one hand it might be said that the work is admirably done by the German manufacturers in both branches; they have large and capable staffs and works excellently fitted for the purposes for which they were built; should not these particular manufactures be left in their hands? On the other hand, we have a sense of humiliation that we should be, in any conceivable juncture, dependent on those who are at present our enemies. Certain allied manufactures, *e.g.*, heavy chemicals, are still left largely in our hands, but if we yield in the smaller trades, is it not likely that they will succeed in wresting from us the larger source of profit? There can be no convention or agreement in these matters; each country will make what profit it can in the most convenient direction. "Capturing the Enemy's Trade" makes a good newspaper heading, but it is painful to read the many impracticable suggestions which have been made on the subject since the beginning of the war. Many people seem to have the idea that all that is wanted is that a works shall be built, or even a derelict factory be adapted, and then the thing is done. No thought is given to the years of patient research, the long training of the workers, and the period which must elapse before even the raw materials could be collected.

In the particular directions with which this article is concerned there is no doubt that the thing can be accomplished in time. In one laboratory of university rank the manufacture of three synthetic drugs in large quantities has been carried on since the opening of the war, and the resulting products have been handed over to the naval hospitals which were in urgent need of them. The preliminary investigation in this piece of work occupied a staff of seven experienced workers, under the direction of the professor, two whole months before the details of the processes could be mastered. The results not only gave to the naval service what was wanted at the moment, but they enabled the details of the processes to be handed over, through a committee of the Royal Society, to three manufacturers who will produce the drugs on a large scale. In a similar way the laboratory of another institution has succeeded in working out the process of making a natural drug from its plant sources. These instances illustrate the magnitude of the task which is before us, and the amount of highly specialised labour which must be employed on the problems. It is only courting failure if the conditions necessary are not realised before a start is made.

In the matter of highly purified chemicals another point must be noticed. The reputation of the German makers is high, and deservedly so, and it follows that it will be a long time before possible rivals, even if they produced materials of an equal degree of purity, could obtain the same degree of confidence in the minds of their customers. In order to give this confidence it has been suggested that the object might be most quickly attained by the establishment of a National Chemical Laboratory analogous in constitution and management to the National Physical Laboratory, in which the products of the manufacturers could be tested and the standard of purity guaranteed. The scheme would undoubtedly serve to hasten matters. The guarantee of the National Physical Laboratory is accepted as impartial and accurate throughout the world, and there is no reason why a chemical institution of the same kind should not command equal confidence. Into the question of cost there is perhaps no need to enter, but the fact must be faced that the average man would not expect to pay a much higher price than he has paid heretofore because the substances were made in England.

H. B. BAKER.

HOME FORESTRY AND THE WAR.

IN an article in *NATURE* of December 10, 1914, p. 393, it was shown how dependent we were upon foreign countries for our supplies of pitwood, without which coal-mining could not be carried on. About half the total amount of pitwood exported in normal times into the United Kingdom comes from Baltic ports; and as a result of the action of Germany in declaring pitwood contraband, the supplies from this source have practically ceased, what now arrives from Scandinavia being merely small cargoes from Gottenburg, Christiania, and other ports outside the Baltic. The important supply of pitwood from France, Spain, and Portugal still continues, though at enhanced prices; and in case of need, large quantities can be obtained from Nova Scotia, Newfoundland, etc. Nevertheless, it became necessary to ascertain the available amount of home-grown timber suitable for use in mining; and an inquiry into the subject was undertaken by the forestry branch of the Board of Agriculture, the report of which has been issued with great promptitude. From this it appears that the total area of woodlands in England, 1,884,000 acres, is capable of yielding 380,000 tons of pitwood annually by normal fellings; and that by anticipating the fellings of the next five years almost 3,400,000 tons of pitwood are available in England and Wales alone. Scotland by similar extraordinary fellings could supply about 2,500,000 tons; so that with the aid of a small quantity from Ireland, about 6,000,000 tons of pitwood could be felled, enough to keep the collieries going for eighteen months, as their average annual consumption of pitwood is approximately 4,500,000 tons.

In the *Quarterly Journal of Forestry*, January,

NO. 2372, VOL. 95]

1915, pp. 1-7, Sir W. Schlich, criticising the preceding report, asks what will be the position if the war should last for more than two years; and considers that in this case our coal mines would be obliged to shut down for want of pitwood. As labour in Canada is very expensive, he believes that supplies of mining timber from Nova Scotia, etc., may prove unavailable on account of the prohibitive cost. He urges upon the Government the necessity of taking early steps to increase the area under trees in these islands, and reiterates well-known arguments that, however sound, appear to have little effect upon our rulers. He sums up as follows:—

Forest schools have been set up for instruction in forestry; a forestry branch has been established in connection with the Board of Agriculture and another in Ireland; an officer has been appointed to convert the Dean and High Meadow Woods into a demonstration area. All this is in the right direction, but *very little has as yet been done to increase the area under forest*. Too much talking and too little action—that is the long and short of it. Let us hope that the new situation will lead without further loss of time to action. Of course, I should not advocate the taking of a single acre out of cultivation, because the production of food goes before everything else; but there are large stretches of land unfit for cultivation and yet quite fit to produce forest crops. Nor should I advocate the formation of large blocks of woodland, all in a ring fence as it were. No, what I look forward to are moderate sized areas scattered over the country. As long as the area is sufficiently large to justify placing a woodman in charge and also sufficient to be placed under systematic management, say a minimum of 500 acres, we shall have all that is required. In that case agricultural labourers and tenants of small areas will in time come forward and do the bulk of the forest work during the winter months, when agricultural work is practically at a standstill, thus improving their resources. Such a scheme will not be perfection all at once, but it will come by degrees. Only let the Government, with funds allotted by the Development Commissioners, start actual work, even on a small scale; it is sure to grow.

Another article in this journal deals also with the subject of pit-timber, and reviews the result of an independent inquiry by the English Forestry Association. Further articles treat of the preparation of yield tables, which are necessary in the estimation of the financial returns that are probable, when waste lands are afforested. Mr. Hiley writes a preliminary report on an investigation at Oxford into larch canker, and advocates a means of treatment which is scarcely advisable on account of the expense, not to mention the fact that the mode of infection on which the treatment is based is not yet clearly demonstrated to be the actual one.

In the *Transactions of the Royal Scottish Arboricultural Society*, xxix., part i. (January, 1915), the production of pitwood on wooded estates in Scotland is investigated by Mr. J. H. Milne Home, both as regards the present crisis and also with a view to a permanent increase in the supplies of mining timber in the future. Mr. Home considers that one-fourth of the normal