always be looked upon as of secondary importance, we are convinced that greater progress will be made if chemistry is regarded and studied from the high point of view so forcibly pointed out by Dr. Fittig in his interesting address. F. J.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.*]

Chemical Research in England

IN confirmation of your remark in the last number of NATURE that, in regard to scientific discovery, we in this country "are conspicuous for our prominent position in the rear," will you permit me to state the result of an inquiry which I lately made into the comparative activity of this and other countries in the prosecution of chemical research?

In the year 1866 there were published 1,273 papers on new discoveries, by 805 chemists, 1·58 paper being thus the average produce of each investigator. Of these, Germany contributed 445 authors and 777 papers, or 1·75 paper to each author; France, 170 authors, and 245 papers, or 1·44 paper to each author; whilst the United Kingdom furnished only 97 authors, and 127 papers, or 1·31 paper to each author; all other countries yielding 93 authors and 124 papers, or 1·33 paper to each author. Thus, not only are we far behind in the aggregate of activity in discovery, but our individual productiveness is also markedly below that of Germany and France. From a purely national point of view, our case is even worse than it appears to be from a comparison of these figures, since a considerable proportion of the papers contributed by the United Kingdom were the work of chemists born and educated in Germany.

It will be seen that the above comparison covers chemistry only; but there is every reason to believe that in other sciences, the progress of which depends, like that of chemistry, upon experimental investigation, our position is still worse. It is highly remarkable that a country which, perhaps more than any other, owes its greatness to the discoveries of experimental science, should be distinguished for its neglect of experimental research. But the causes of this anomaly are sufficiently obvious; they are:

1st. The want of suitable buildings and apparatus for the prosecution of such investigations.

2nd. The non-recognition of experimental research by any of our universities.

With regard to the first of these causes, the prosecution of experimental discovery in this country is rendered extremely difficult, if not impossible, to those who do not possess ample private fortunes; and even to such as have this advantage, it is by no means easy. A laboratory of research is not a convenient or agreeable adjunct to a dwelling-house, and it is generally prohibited by the terms of the lease or covenant; indeed it is agreed on all hands that most of the operations which are required for the prosecution of inquiries in chemistry, physics, and physiology, ought only to be carried on in buildings specially devoted to the purpose. But where are such buildings to be found? Our chemical laboratories are only adapted for beginners, there is not in any one of them a separate department constructed and fitted for original research. Still less is this the case in physical and physiological laboratories; indeed until Sir William Thomson instituted one in Glasgow some three or four years ago, there was not in the United Kingdom a physical laboratory even for beginners. In Germany, on the other hand, the noble State laboratories of Berlin, Leipzig, Bonn, Heidelberg, Königsberg, and Stuttgart, are provided with special departments where the experimental investigator finds ample convenience and the necessary but costly instruments of precision provided for his use, the payment of a moderate fee only being required to secure all these advantages.

With regard to the second case, the highest degrees, and even honours in experimental science, are given in all our universities without any proof being required that the candidate possesses the capacity to conduct an original experimental investigation, or that he is competent to extend the boundaries of his science. On the other hand, in all the Prussian Universities, and in the best German Universities generally, no candidate is even admitted to examination for his degree unless he first submits to the senate a dissertation on some original experimental investigation conducted by himself. This investigation must also have a sufficient importance; for, as a matter of fact, more candidates are rejected on the ground of insufficiency of dissertation than through failure to pass the subsequent examinations. The entire ignoring of research in the granting of degrees in this country not only effectually prevents the training of students in experimental investigation, and the actual execution of researches by students; but it has also a direct tendency to divert the attention of professors and teachers from original research—they are not called upon to devise, as is the case in Germany, suitable subjects for research to be pursued by their students; and thus, not only is their attention withdrawn from this all-important field of experimental science, but, as their students have to be trained for subjects which are foreign to research, they feel that to devote any considerable portion of their own time to it would be to that extent to neglect their class duties.

E. FRANKLAND

Dublin Observatory

IN an account of the Observatory of Trinity College, Dublin, given in NATURE of March 16, 1871, there is a slight mistake in the date of the erection of the Transit Instrument, which is there assigned to 1808. It was erected many years before; for in the second volume of the Transactions of the Royal Irish Academy, Dr. Usher describes observations made with it in 1785.

I should not have thought the correction of this error necessary but for the fact that this transit marked the epoch of a most important improvement in astronomical instruments. It was the first in which the illumination of wires was effected through the axis by an internal reflector. This invention is described by Usher in the volume already referred to.

1808 was the date of the circle's erection; it having been ordered in 1783. This delay was in one respect fortunate. Ramsden, having quarrelled with Usher, resolved that the latter should never have the circle. On Usher's death Ramsden set to work to complete it, but found, to his dismay, that the extremities of its radial arms had become "rotten," having been acted on by the sulphurous atmosphere of London.

As originally constructed, it was ten feet diameter. He removed the rims (which, I believe, had been also acted on), cut away about six inches from each of the arms, and found the remainder sound. But as he was doubtful about its permanence, he let it lie several years longer, and found his apprehensions verified. He cut off six inches more from each arm and awaited the result, notwithstanding the urgent expostulations of Brinkley; and it was not until a short period before his death that he was satisfied that no farther change was probable. He then completed it at its reduced diameter of eight feet. But it was not divided till after his death (by Berge, his successor).

It is not easy to explain why this destruction was confined to the ends of the arms. To judge from the analogy of the Palermo Circle, the diameter of these arms at the outer extremity was very small; and if they were of cast brass, the molecular condition of the metal there, in consequence of the more rapid cooling, may have been different from that of the more massive portions.

A still more remarkable instance of this destructive action occurred to a circle described by Mr. Bond in the Philosophical Transactions, 1806, and known as the Westbury Circle. This was ultimately established at the old Observatory of the Glasgow University, and in an atmosphere still more sulphurous than that of London. When this University was broken up, and its instruments sold, this circle was purchased by the late Sir James