but which have effected or contributed to the attainment of any medical or surgical purpose (specified or not as may be prescribed) of general utility or advantage which it is deemed desirable, in the national interest, to subserve."

Paragraph 29 of the Report of the Commission above referred to commences as follows:—"In a previous paragraph dealing primarily with patented inventions, it has been stated that, in the case of unpatented inventions also, the general principle has been adopted that rewards are not recommended in respect of inventions publicly proclaimed and thrown open to all the world to use." And after reference to the case of medical or surgical discoveries it is stated in this paragraph:—"Suggestions have recently been made elsewhere that a fund should be created for the pecuniary reward of investigators who have conferred great benefits on the public by such discoveries as those, for instance, which have resulted in the prevention of disease by inoculation and the like. But we have taken the view that all such matters as these lie entirely outside our province."

I may mention that in his letter appearing in the *Times* of July 13 last Sir Ronald Ross referred to a conjoint committee of the British Science Guild and the British Medical Association having written to the Prime Minister "suggesting that the powers of the Royal Commission on Awards to Inventors might be enlarged so as to include medical and sanitary discoveries and inventions." Replying in the *Times* of July 15 to this letter, Mr. Tindal-Robertson, the secretary of the Commission, in explanation of the general practice of the Commission, quoted the paragraph of the Report of the Commission which I have mentioned above.

In the case of unpatented inventions the Commission, it appears from reference to paragraph 27 of the Report, attached more importance to "priority of communication" than to "priority of discovery." And as showing that even these considerations may be outweighed by other counteracting considerations, the following statements are made in paragraph 28 of the Report:—

"It was found by the Commission that the credit of designing and producing the weapon of warfare known as the 'Tanks,' as actually used, was to be attributed to Sir William Tritton and Major Wilson, who, in fact, carried out their work in the latter part of the year 1915 and the early part of the year 1916; and it was recommended that a large award of 15,000*l.* should be made to them. On the other hand, it was found that Mr. L. E. de Mole, an Australian engineer, had made and reduced to practical shape, as far back as the year 1912, a brilliant invention which anticipated, and in some respects surpassed, that actually put into use in the year 1916; and that this invention was, in fact, communicated at the time to the proper Government Department, but was not then appreciated and was put aside and forgotten. The result in this case was expressed as follows:—"We regret that we are unable to recommend any award to him. But we are bound to adhere to the general rule in such cases that a claimant must show a causal connection between the making of his invention and the user of any similar invention by the Government." It need hardly be said that, had Mr. Mole's invention been brought either directly or indirectly to the notice of Major Wilson or Sir William Tritton, as was clearly not the case, a very different result would probably have been arrived at by the Commission."

From the foregoing remarks I think it will be apparent that the conditions affecting priority and validity of claims to discoveries in the case of un-

patented inventions for war purposes are unsuitable for adoption in the case of any future provision for awards, not only in regard to medical and surgical, but also scientific, discoveries the publication of which is desirable in the national interest.

Mr. Tindal-Robertson's letter, to which reference is made above, concluded with the following statement: "I need hardly say that this letter in no way touches the broader question raised by the first paragraph of Sir Ronald Ross's letter—namely, whether some new body should be constituted for the purpose of recognising and rewarding discoveries or services such as are there referred to."

I venture to say that, as a condition precedent to the constitution of such a body, it is necessary to define the principles upon which priority in discovery should be established and the validity of claims to discoveries should be determined. I have suggested such principles in my scheme, and they resemble in certain respects the principles upon which priority in the invention of patentable inventions is established and the validity of claims to such inventions is determined on application for patents or on proceedings to revoke patents.

In my Memorandum G (p. 18) I observed: "Another potent deterrent to research is the absence of any trustworthy means of establishing claims to discoveries, and the contentions that frequently arise as to the validity of such claims must tend to make research workers less disposed to attempt to solve problems of fundamental importance."

In exemplification of this I referred to letters appearing in the *Times* that succeeded and had relation to the insertion in the issue of the *Times* of May 22, 1918, of an article from a correspondent on the subject of trench-fever research, and reference was made in the correspondence to the Commissions on Malta fever, sleeping sickness, and trench fever.

I may mention that trench-fever research might have been promoted during the war by the allocation of grants (to be administered under conditions similar to those specified in my scheme) to unremunerative discoveries which advance the knowledge of the causation, prevention, or treatment of trench fever.

I may add that co-operative research, as well as the research of individuals working independently, can be promoted in accordance with the principles of my scheme. Priority in discovery could be established on similar conditions in both these kinds of research, and research by a co-operative body might be encouraged, without causing jealousy among the co-operative workers, by their agreeing to assign prospective grants to a nominee empowered to hold such grants for the purposes of the research.

WALTER B. PRIEST.

Gresford, Wrexham, November 28.

The Smoke-veil.

A curious instance of atmospheric pollution came to my notice on November 26 while walking from Hayfield into Edale over the central watershed of England in the Peak of Derbyshire. Below 1500 ft. on the western side there was hazy sunshine with a rime frost, but at this level we entered a thin cloud, with a temperature scarcely below freezing point, formed by a steady easterly wind blowing over the Peak plateau from the east. Friends in Edale informed us that these conditions had obtained since the morning of the previous day, and the hoar-frost thus formed was peculiar; the stream-lines of air-flow round stones were clearly mapped by curling lines of ice, while every blade of grass and stem of *Juncus* bore a deposit of ice-crystals which resembled the

blade of a knife, the knife-edge pointing up-wind and the parent leaf forming the back.

On the largest of the ice-knives, which approached an inch in width, a regular striped pattern was evident, even from a distance of two or three yards, and closer inspection showed the same stripes on every one. These stripes were three in number, pale grey near the leaf, and again grey towards the edge of the knife, with an intervening zone of clear or yellowish ice. The grey stripes were evidently due to the presence of smoke in the cloud-mist during the daytime on November 25 and 26, while the clear zone between had been formed from the cleaner night-wind.

At Edale Cross, 1750 ft. above sea-level, the undamaged knives pointed their edges due east magnetic or directly to the centre of Sheffield. The intervening distance is more than sixteen miles, of which the first fourteen miles traverse some of the wildest moorland in England. Though I became familiar with the fouling effect of our industrial towns even on this lonely hill-country during nearly two years' residence there, yet this particular example seemed strange enough to be recorded.

W. LAWRENCE BALLS.

The Orchard House, Bollington Cross,
near Macclesfield, December 1.

An Oyster Spat (1921) with Mature Male Sexual Products.

In the course of experiments carried out this year (1921) on the rate of growth of the slipper-limpet in the River Blackwater, Essex, I obtained a number of oyster spat on shells put in a floating raft and on clean scallop shells which were put in the water on June 9. These clean scallop shells were strung out on tarred rope at low water and kept suspended above the ground by tying the rope to stout branches of trees driven vertically into the ground. On November 16 the shells were taken out of the raft and from the shore and the new summer growth, including young oysters, examined and measured. Many of the young oyster spat measured about an inch in diameter (length anatomically) and an inch in depth (height anatomically). Some of these living spat were examined microscopically on the beds, and a few were taken back to the Plymouth Laboratory for careful examination in the living state.

In one of the spat examined at Plymouth a few ripe sperm-morulae were found, which disintegrated into active separate sperm while under observation under the microscope. In order to confirm this interesting observation microscopic sections were prepared, and some ripe sperm-morulae found actually in the gonadal tubes. It is therefore established that oyster spat may produce ripe sexual products in the year in which they are born. In the experiment described here the oyster which gave mature male products had a *maximum* age of twenty-three weeks; it was probably younger than this, but there is no means of determining how much younger it actually was. In a paper by the present writer ("Sea-temperature, Breeding, and Distribution of Marine Animals," Journ. Marine Biol. Assoc., vol. 12, No. 2, p. 352, 1920) it was predicted that "young specimens of the European oyster (*O. edulis*) will be found to be sexually mature in the summer in which they are spawned in those situations where high temperatures obtain for a few months." The exceptionally warm summer of 1921 resulted in an unusually long breeding period for oysters and in "high temperatures" prevailing over English oyster-beds for several months. In 1921, therefore, the

conditions over English oyster-beds compared with normal conditions in such oyster-breeding places as Arcachon, Taranto (Italy), and the spatting pools in Norway.

The observation here recorded is of considerable academic interest, and might become of practical interest when confirmed—as I have no doubt it can be—in a large number of specimens. Between September and November this year I have been able to examine only eight large 1921 spat, including those mentioned above. Most of them gave indications of developing sperm, but in such small quantity that microscopic sections are required of them all for confirmation. The young oyster containing ripe male sexual products was not ripe in the sense that all the gonadal tubes at the surface of the body were crammed with tailed sperm-morulae; and although there can be no doubt that the sperm from this young oyster were mature and were capable of effecting fertilisation under suitable conditions, it is not thought probable that ripe sperm are actually extruded by such small forms. There can be no doubt, however, that similar spat would be fully mature in the following summer, and would certainly breed at least as males. This experiment, which was made possible by a grant from the Royal Society, is being continued, and should yield—together with a large amount of spat now isolated from other localities—further useful material for investigating the sex of oysters at first maturity. The gonad of the young oysters examined in all cases indicated maleness, but the number examined is far too few to be of any value statistically. It is desirable to know the sex at first maturity of 1000 young oysters, and as young oysters have been more plentiful in most localities this year than for a good many years, it is probable that spat born this year can be identified with certainty now and isolated for examination next year. The sex of 1921 spat could be more easily determined in a large number of individuals next summer, and if results were recorded with accuracy from many different localities we should obtain a total of information which would help to clear up the doubtful question of the sex of the European oyster at its first maturity.

J. H. ORTON.

Marine Biological Laboratory, The Hoe,
Plymouth, December 5.

The Flight of Thistledown.

My attention has been directed to the letters in NATURE of October 20 and November 10 on the flight of thistledown. The explanation of the phenomenon observed seems to me to lie in the very slow air-currents which are sufficient to raise the pappose structures of many Compositae, especially when it is only the pappus which is raised, the fruit having fallen off.

Interested readers will find the hydrodynamics of fruit dispersal by wind discussed in some detail in my "Origin and Development of the Compositae" (Wheldon and Wesley, London, 1919), and more briefly in my "Text-book of Botany" (Churchill, London, 1921). Some of the results given may be of general interest, e.g. the minimum winds which will raise the following pappose fruits (with fruit attached) are: dandelion, 1 m.p.h., groundsel, $\frac{2}{3}$ m.p.h. The pappus alone would be lifted by a much slower wind, as is shown by the fact that a current of air moving at 0.59 m.p.h. is sufficient to blow the complete fruit of coltsfoot for a considerable distance horizontally.

JAMES SMALL.

Department of Botany, Queen's University,
Belfast, December 2.