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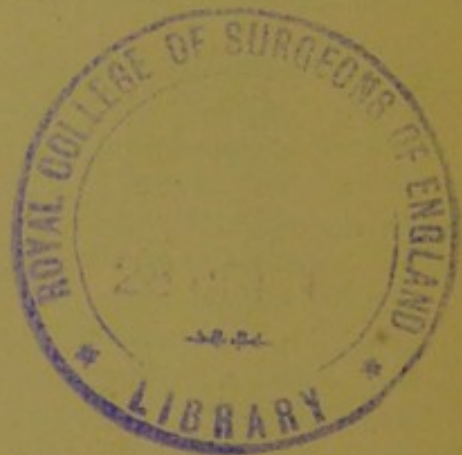
PRESENT POSITION OF SCIENCE

IN RELATION TO THE

BRITISH GOVERNMENT.

BY G. GORE, F.R.S.

READ BEFORE THE SOCIAL SCIENCE ASSOCIATION,
PLYMOUTH, 1872.



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ON THE PRESENT POSITION OF SCIENCE

IN RELATION TO

THE BRITISH GOVERNMENT.

It is a matter of great importance to this nation, and of special importance to the scientific men of this country, to clearly realise the position which science at present occupies in relation to our Government. That position will probably be further brought to light by the evidence which is now being given by our leading scientific men before the "Royal Commission for the Advancement of Science."

For many years science has been of immense practical value to us ; it has, by means of its discoveries, originated all our telegraphs, railways, steamships, gas lighting, photography, electro-plating, artillery, and nearly all our great manufactures. It has led to the expenditure of hundreds of millions of pounds upon these and other matters, and at the present time this nation largely exists upon the applied results of scientific discovery. There was a period when we did not possess such evidence of the great value of science ; but that time has passed away, and our governing men have had abundant proof of the national importance of scientific discovery, and of the essential dependence of the welfare of this country upon scientific research. It is upon these grounds, therefore, that our Governments are expected to consider their duty with regard to science.

Scientific discovery and research (as distinguished from invention) is *national* work, and it is a duty of the State to provide and pay for it, because the results of it are of immense value, and indispensable to the nation ; also, because nearly the whole benefit of it goes to the nation, and scarcely any to the discoverer ; and because there exists no other means by which scientific investigators can be paid for their labours.

It is barely credible that, whilst the non-productive classes of the community are justly protected in the enjoyment of titles and material wealth which they have not earned, the greatest scientific workers and benefactors of the nation receive actually no payment for their labours, and the nation in general, and the non-productive classes in particular, reap the pecuniary benefit. The chief benefits of science go to the enrichment of the great manufacturers and capitalists, and finally and

permanently to the great landowners, by increasing the value of land. It does not add to the dignity of one class of persons that they should be living largely upon the unpaid labours of another class ; and it tends to produce evil feelings between them.

It may be objected that scientific men ought either to sell their discoveries or protect them by means of patents. Neither of these courses are possible. Scientific discoveries, although of such great value, are not saleable things ; because they have not been converted by the process of invention into practical shapes, and because they cannot be protected by patent. They cannot be protected, because they are so universal in their applications. A single discovery often originates more than one hundred inventions, as may be readily seen by the number of patents taken out for the application of a single discovered substance, such as gutta-percha or india-rubber. No man could have secured to himself the discovery of the chemical action of light, because of the great number of persons who would have applied it to useful purposes, and used the applications ; to claim such a discovery would be a considerable approach towards monopolising the benefit of light itself.

It is only when a discovery has been adapted to some particular use in some special way, by means of invention, that its discoverer can protect a part of it by patent, and reap any pecuniary benefit ; and to protect it completely would require it to be applied to all the practical uses of which it is capable, which could only be effected by means of many inventions. Further : the faculties of invention and discovery are rarely united in one man, and it requires a higher quality of mental power to make a discovery, than to apply that discovery to useful purposes by means of invention.

Scientific discoveries, being of universal utility, like the light, the land, the air we breathe, belong by their very nature to all the nation. From the moment that a discovery is published it gets copied into all the scientific publications ; it immediately becomes used by teachers for the purposes of instruction, and by inventors generally as a basis for patentable inventions ; and in these ways it becomes at once national property, and no law can prevent it.

It may also be objected that scientific men should not make discoveries if there is no payment for such labour. Many men are impelled by a natural desire to do good, irrespective of payment, whilst others are equally selfish, and live upon the labours of their fellow-creatures ; and if such men did not make discoveries we should be without most of the luxuries, comforts, and conveniencies of life. Every man who benefits his fellow-men, or labours for the good of the nation, is entitled to means of existence, and the only just course is to provide for his support.

It may further be objected that scientific men should keep their discoveries secret ; but that would be worse than useless, because discoveries cost great skill and labour, and when published are of great value to mankind.

The general aspect in which science is viewed by many persons in this country is that of a refined intellectual pursuit, which may be encouraged and honoured for the purpose of maintaining the tone of society, but which must on all occasions be considered as secondary to the more *apparently* practical requirements of national life, and be sacrificed to them; but this is a superficial idea, and has its origin in the low state of scientific knowledge. Science is eminently practical; scientific discovery lies at the very basis of national progress, and is the origin of many of the practical advantages of civilised life. The idea of men being able to honour demonstrable truth is simply an ignorant conceit. Science cannot be honoured by anyone, and the question is, not whether the State shall encourage science as a refined intellectual occupation, but whether our governments will consider the welfare of the nation in its relation to science.

One of the first duties of a Government is to protect its subjects in the enjoyment of their property; but as no law can reserve to discoverers the fruits of their industry, and as scientific discovery is national work, it is clearly a duty of the State to pay for it. It is as certainly its duty to provide and pay for original research as for its military and naval establishments; because the development of the industry and warlike appliances of a nation is quite as important as the maintenance of its means of defence and aggression. The power which has brought into existence new industries is certainly as valuable to this nation as the means of preserving to us the possession of them afterwards; and we must not forget that our great cannon, explosive missiles, and armour-plated ships, would not have existed but for the discoveries of scientific men.

Since the last Paris Exhibition an opinion has gradually spread that, in consequence of our neglect of science, foreign nations are supplanting England in her manufactures; but whether this opinion is or is not correct, there can be no doubt that national superiority can only be maintained by being first in the race, and that as a matter of prudence we should not neglect any precaution which is necessary to the welfare of the nation.

The very foundations of science in this country are rapidly being destroyed by the neglect of science by our Governments, and by those who have derived the greatest amount of benefit from it. Original discovery is the basis of all scientific progress. Great discoverers are rare, and the loss of a few of them is a national calamity. The majority of our most able investigators have ceased to make researches because the State does not pay for such labour. Several, also, of our most eminent discoverers have died, and others have not arisen to take their places. The discoveries in chemistry by British chemists, published in the journal of the Chemical Society, have diminished almost to zero; whilst those of foreign chemists have so increased that the journal referred to is almost filled with them. But few first-class investigators are making original researches in this country,

and we are rapidly becoming dependent for our progress in scientific arts and manufactures upon knowledge supplied to us by foreign nations.

In all directions, wherever we examine the state of knowledge of science amongst the governing men of this country, we find it very defective, and attended by results seriously injurious to the welfare of the nation. Gentlemen who are comparatively ignorant of science are appointed by our Governments to decide scientific questions. Only recently (May 21st, 1872), a memorial of the British Association, signed by the eminent president, Sir William Thomson, was sent to the Lords of the Treasury, applying for a sum of £150. to continue a series of observations on the tides upon which the Association had already expended £600. from its own resources, and which was essential to a more complete knowledge of the tides, and consequently to the greater safety of our navy. The reply to this application was most civil; but, putting upon it the most charitable construction, it exhibited a degree of ignorance of the national value of science most painful to contemplate. The reply stated "that their Lordships have given their anxious attention to the memorial, and that they are fully sensible of the interesting nature of such investigations; but that they feel that if they acceded to this request, it would be impossible to refuse to contribute towards the numerous other objects which men of eminence may desire to treat scientifically. Their Lordships must, therefore, though with regret, decline to make a promise of assistance towards the present object out of public funds."

Here was a subject of great importance to the national welfare, and which it was the duty of the State and not that of the British Association wholly to pay for, treated as if it was only an investigation of an "interesting nature," "which men of eminence may desire to treat scientifically."

Their Lordships were apparently not aware that ignorance of the course and height of tides often leads to shipwrecks, and that their refusal of £150. might lead to the loss of some valuable ship; they seemed to have forgotten that the loss of the ill-fated "Captain" was due to neglect of science. Such a want of knowledge in any private appointment would be a sufficient reason to remove from his post the responsible person. It is difficult to believe that the Government of a maritime country should be so ignorant of science as to decline to make even a promise of assistance out of the public funds of the small sum of £150. for such an important purpose, whilst it expends immense sums of money upon ships. Their Lordships were manifestly unable to appreciate the importance of the application, or to perceive the duty of the State to pay for such labours; and instead of acting upon the opinion of disinterested men, of the highest eminence in the subject, declined to accede to the request.

Gentlemen who are but little acquainted with science are also appointed by our Government to direct eminent scientific men in scientific matters, and the results, as might be expected, are most unsatis-

factory. A recent melancholy instance of this kind, which has degraded our Government in the opinion of other nations, and of all well-instructed persons, is fresh in the memory of the public. Mr. Ayrton, the Chief Commissioner of Works, was placed in authority over the eminent botanist, Dr. Hooker, at Kew Gardens, and presumed to interfere with the management of the hothouses under Dr. Hooker's care. There is scarcely a scientific man in this country who has not frequently suffered from similar ignorant misdirection, but the circumstances have not happened to become public. If governing men possessing the requisite knowledge of science for such posts cannot be obtained, it is clear that those appointed should not be entrusted with the power, nor burthened with the responsibility of directing subjects they do not understand, and the course indicated in such a case is a division of labour, making the scientific officers much more independent than they hitherto have been.

The origin of all these evils lies largely in the defective state of scientific instruction at our old Universities and great public schools. Our governing men, having been chiefly educated at those institutions, have been but little instructed in science. In addition to this, science has advanced so greatly during the last few years that it has become an immense department of national life, requiring a special education to understand, and has left our old institutions behind.

The heads of colleges and the head masters of nearly all our Grammar schools, having also acquired their learning at our old Universities, have been but little or not at all educated in science, and in consequence of this, scientific instruction is in a low state throughout nearly the whole scholastic system of the country. Further, the "Endowed Schools Commission," now pursuing its labours, recommends "that all lecturers and teachers" in the various Government schools of this country "shall be appointed and dismissed by the head masters," and that "the said head masters shall have under their control the choice of books, and the method of teaching" in those schools. A result of these provisions will be that the system of appointing gentlemen comparatively ignorant of science to direct teachers of science will be continued, and scientific instruction will continue to be degraded in the grammar schools of this country. These very proposals prove that the gentlemen who made them had not been well instructed in science.

It is manifest that the only foundation of a reliable judgment in scientific affairs is a good knowledge of science, and this can only be obtained by long-continued study and experience. It is also clear that the practice in this country of appointing gentlemen comparatively ignorant of science to legislate for it, and to direct scientific men in Government offices and public schools, is one of the most effectual that could be devised for retarding the progress of the nation in all those matters which depend upon science. If scientific men are to be legislated for and directed, justice requires that it should be by men possessed of adequate scientific knowledge.

To partly remedy this unsatisfactory state of things, we require a State Minister of Science, possessed of scientific knowledge and good administrative ability ; a Scientific Council, to advise the Government in all important matters relating to science ; and State laboratories for pure scientific research.

The funds for providing State laboratories already exist ; the sum of nearly £600,000 has accumulated in the form of fees received by Government for the granting of patents for inventions ; and as the discoveries made by scientific men form the materials by means of which those inventions were made, the money thus accumulated may be justly claimed by scientific discoverers as a source from which their labours should be remunerated by the State.

As long as scientific men continue at their own expense to do scientific work which ought to be paid for by the State, so long will the governing and richer classes of this country, impelled by the selfishness which pervades them in common with nearly all mankind, and unenlightened by knowledge of science, neglect the duty of paying for original research, and reap the chief benefits of such labours.

The time has arrived when this great national evil should be made known, and put an end to ; and our men of science should present a memorial to our Government, claiming as a matter of justice, necessary for the nation's welfare, that the accumulated fees from patents should be applied to the establishment of a Scientific Department of the State, the erection of State laboratories, and the payment of discoverers for the national work of research.

Should our Governments continue to neglect these just claims, and disregard the evidence collected by the "Royal Commission for the Advancement of Science," the decline of original scientific research, which has already commenced, will continue. The probable results of this will be, inventions will become scarce ; new trades will not be developed ; improvements in agriculture, arts, manufactures, means of defence, and other important matters, will decline ; the value of houses and land will diminish ; and our commerce will pass into the hands of other nations.