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REFLECTIONS ON THE DECLINE OF SCIENCE IN ENGLAND,
AND ON SOME OF ITS CAUSES.

by

CHARLES BABBAGE

DEDICATION.

HAD I INTENDED TO DEDICATE THIS VOLUME, I SHOULD HAVE INSCRIBED IT TO A NOBLEMAN WHOSE EXERTIONS IN PROMOTING EVERY OBJECT THAT CAN ADVANCE SCIENCE REFLECT LUSTRE UPON HIS RANK. BUT THE KINDNESS OF HIS NATURE MIGHT HAVE BEEN PAINED AT HAVING HIS NAME CONNECTED WITH STRICTURES, PERHAPS TOO SEVERELY JUST. I SHALL, THEREFORE, ABSTAIN FROM MENTIONING THE NAME OF ONE WHO WILL FEEL THAT HE HAS COMMANDED MY ESTEEM AND RESPECT.

C. BABBAGE.

DORSET STREET,
MANCHESTER SQUARE,
29th April, 1830.

PREFACE.

Of the causes which have induced me to print this volume I have little to say; my own opinion is, that it will ultimately do some service to science, and without that belief I would not have undertaken so thankless a task. That it is too true not to make enemies, is an opinion in which I concur with several of my friends, although I should hope that what I have written will not give just reason for the permanence of such feelings. On one point I shall speak decidedly, it is not connected in any degree with the calculating machine on which I have been engaged; the

causes which have led to it have been long operating, and would have produced this result whether I had ever speculated on that subject, and whatever might have been the fate of my speculations.

If any one shall endeavour to account for the opinions stated in these pages by ascribing them to any imagined circumstance peculiar to myself, I think he will be mistaken. That science has long been neglected and declining in England, is not an opinion originating with me, but is shared by many, and has been expressed by higher authority than mine. I shall offer a few notices on this subject, which, from their scattered position, are unlikely to have met the reader's attention, and which, when combined with the facts I have detailed in subsequent pages, will be admitted to deserve considerable attention. The following extract from the article Chemistry, in the Encyclopaedia Metropolitana, is from the pen of a gentleman equally qualified by his extensive reading, and from his acquaintance with foreign nations, to form an opinion entitled to respect. Differing from him widely as to the cause, I may be permitted to cite him as high authority for the fact.

"In concluding this most circumscribed outline of the History of Chemistry, we may perhaps be allowed to express a faint shade of regret, which, nevertheless, has frequently passed over our minds within the space of the last five or six years. Admiring, as we most sincerely do, the electro-magnetic discoveries of Professor Oersted and his followers, we still, as chemists, fear that our science has suffered some degree of neglect in consequence of them. At least, we remark that, during this period, good chemical analyses and researches have been rare in England; and yet, it must be confessed, there is an ample field for chemical discovery. How scanty is our knowledge of the suspected fluorine! Are we sure that we understand the nature of nitrogen? And yet these are amongst our elements. Much has been done by Wollaston, Berzelius, Guy-Lussac, Thenard, Thomson, Prout, and others, with regard to the doctrine of definite proportions; but there yet remains the Atomic Theory. Is it a representation of the laws of nature, or is it not?"---CHEMISTRY, ENCYC. METROP. p.596.

When the present volume was considerably advanced, the public were informed that the late Sir Humphry Davy had commenced a work, having the same title as the present, and that his sentiments were expressed in the language of feeling and of eloquence. It is to be hoped that it may be allowed by his

friends to convey his opinions to posterity, and that the writings of the philosopher may enable his contemporaries to forget some of the deeds of the President of the Royal Society.

Whatever may be the fate of that highly interesting document, we may infer his opinions upon this subject from a sentiment expressed in his last work:--

"--But we may in vain search the aristocracy now for philosophers."----"There are very few persons who pursue science with true dignity; it is followed more as connected with objects of profit than those of fame."--SIR H. DAVY'S CONSOLATIONS IN TRAVEL.

The last authority which I shall adduce is more valuable, from the varied acquirements of its author, and from the greater detail into which he enters. "We have drawn largely, both in the present Essay, and in our article on LIGHT, from the ANNALES DE CHEMIE, and we take this ONLY opportunity distinctly to acknowledge our obligations to that most admirably conducted work. Unlike the crude and undigested scientific matter which suffices, (we are ashamed to say it) for the monthly and quarterly amusement of our own countrymen, whatever is admitted into ITS pages, has at least been taken pains with, and, with few exceptions, has sterling merit. Indeed, among the original communications which abound in it, there are few which would misbecome the first academical collections; and if any thing could diminish our regret at the long suppression of those noble memoirs, which are destined to adorn future volumes of that of the Institute, it would be the masterly abstracts of them which from time to time appear in the ANNALES, either from the hands of the authors, or from the reports rendered by the committees appointed to examine them; which latter, indeed, are universally models of their kind, and have contributed, perhaps more than any thing, to the high scientific tone of the French SAVANS. What author, indeed, but will write his best, when he knows that his work, if it have merit, will immediately be reported on by a committee, who will enter into all its meaning; understand it, however profound: and, not content with MERELY understanding it, pursue the trains of thought to which it leads; place its discoveries and principles in new and unexpected lights; and bring the whole of their knowledge of collateral subjects to bear upon it. Nor ought we to omit our acknowledgement to the very valuable Journals of Poggendorff and Schweigger. Less exclusively national than their Gallic compeer, they present a picture of the actual progress of physical science throughout

Europe. Indeed, we have been often astonished to see with what celerity every thing, even moderately valuable in the scientific publications of this country, finds its way into their pages. This ought to encourage our men of science. They have a larger audience, and a wider sympathy than they are perhaps aware of; and however disheartening the general diffusion of smatterings of a number of subjects, and the almost equally general indifference to profound knowledge in any, among their own countrymen, may be, they may rest assured that not a fact they may discover, nor a good experiment they may make, but is instantly repeated, verified, and commented upon, in Germany, and, we may add too, in Italy. We wish the obligation were mutual. Here, whole branches of continental discovery are unstudied, and indeed almost unknown, even by name. It is in vain to conceal the melancholy truth. We are fast dropping behind. In mathematics we have long since drawn the rein, and given over a hopeless race. In chemistry the case is not much better. Who can tell us any thing of the Sulfo-salts? Who will explain to us the laws of Isomorphism? Nay, who among us has even verified Thenard's experiments on the oxygenated acids,--Oersted's and Berzelius's on the radicals of the earths,--Balard's and Serrulas's on the combinations of Bromine,--and a hundred other splendid trains of research in that fascinating science? Nor need we stop here. There are, indeed, few sciences which would not furnish matter for similar remark. The causes are at once obvious and deep-seated; but this is not the place to discuss them."-- MR. HERSCHEL'S TREATISE ON SOUND, printed in the ENCYCLOPAEDIA METROPOLITANA.

With such authorities, I need not apprehend much doubt as to the fact of the decline of science in England: how far I may have pointed out some of its causes, must be left to others to decide.

Many attacks have lately been made on the conduct of various scientific bodies, and of their officers, and severe criticism has been lavished upon some of their productions. Newspapers, Magazines, Reviews, and Pamphlets, have all been put in requisition for the purpose. Odium has been cast upon some of these for being anonymous. If a fact is to be established by testimony, anonymous assertion is of no value; if it can be proved, by evidence to which the public have access, it is of no consequence (for the cause of truth) who produces it. A matter of opinion derives weight from the name which is attached to it; but a chain of reasoning is equally conclusive, whoever may be its author.

Perhaps it would be better for science, that all criticism should be avowed. It would certainly have the effect of rendering it more matured, and less severe; but, on the other hand, it would have the evil of frequently repressing it altogether, because there exists amongst the lower ranks of science, a "GENUS IRRITABILE," who are disposed to argue that every criticism is personal. It is clearly the interest of all who fear inquiries, to push this principle as far as possible, whilst those whose sole object is truth, can have no apprehensions from the severest scrutiny. There are few circumstances which so strongly distinguish the philosopher, as the calmness with which he can reply to criticisms he may think undeservedly severe. I have been led into these reflections, from the circumstance of its having been stated publicly, that I was the author of several of those anonymous writings, which were considered amongst the most severe; and the assertion was the more likely to be credited, from the fact of my having spoken a few words connected with one of those subjects at the last anniversary of the Royal Society. [I merely observed that the agreement made with the British Museum for exchanging the Arundel MSS. for their duplicates, (which had just been stated by the President,) was UNWISE; --because it was not to be expected that many duplicates should be found in a library like that of the Museum, weak in the physical and mathematical sciences: that it was IMPROVIDENT and UNBUSINESSLIKE;--because it neither fixed the TIME when the difference was to be paid, in case their duplicates should be insufficient; nor did it appear that there were any FUNDS out of which the money could be procured: and I added, that it would be more advantageous to sell the MSS., and purchase the books we wanted with the produce.] I had hoped in that diminutive world, the world of science, my character had been sufficiently known to have escaped being the subject of such a mistake; and, in taking this opportunity of correcting it, I will add that, in the present volume, I have thought it more candid to mention distinctly those whose line of conduct I have disapproved, or whose works I have criticised, than to leave to the reader inferences which he might make far more extensive than I have intended. I hope, therefore, that where I have depicted species, no person will be so unkind to others and unjust to me, as to suppose I have described individuals.

With respect to the cry against personality, which has been lately set up to prevent all inquiry into matters of scientific misgovernment, a few words will suffice.

I feel as strongly as any one, not merely the impropriety, but

the injustice of introducing private character into such discussions. There is, however, a maxim too well established to need any comment of mine. The public character of every public servant is legitimate subject of discussion, and his fitness or unfitness for office may be fairly canvassed by any person. Those whose too sensitive feelings shrink from such an ordeal, have no right to accept the emoluments of office, for they know that it is the condition to which all must submit who are paid from the public purse.

The same principle is equally applicable to Companies, to Societies, and to Academies. Those from whose pocket the salary is drawn, and by whose appointment the officer was made, have always a right to discuss the merits of their officers, and their modes of exercising the duties they are paid to perform.

This principle is equally applicable to the conduct of a Secretary of State, or to that of a constable; to that of a Secretary of the Royal Society, or of an adviser to the Admiralty.

With respect to honorary officers, the case is in some measure different. But the President of a society, although not recompensed by any pecuniary remuneration, enjoys a station, when the body over which he presides possesses a high character, to which many will aspire, who will esteem themselves amply repaid for the time they devote to the office, by the consequence attached to it in public estimation. He, therefore, is answerable to the Society for his conduct in their chair.

There are several societies in which the secretaries, and other officers, have very laborious duties, and where they are unaided by a train of clerks, and yet no pecuniary remuneration is given to them. Science is much indebted to such men, by whose quiet and unostentatious labours the routine of its institutions is carried on. It would be unwise, as well as ungrateful, to judge severely of the inadvertencies, or even of the negligence of such persons: nothing but weighty causes should justify such a course.

Whilst, however, I contend for the principle of discussion and inquiry in its widest sense, because I consider it equally the safeguard of our scientific as of our political institutions, I shall use it, I hope, temperately; and having no personal feelings myself, but living in terms of intercourse with almost all, and of intimacy with several of those from whom I most widely differ, I shall not attempt to heap together all the

causes of complaint; but, by selecting a few in different departments, endeavour to convince them that some alteration is essentially necessary for the promotion of that very object which we both by such different roads pursue.

I have found it necessary, in the course of this volume, to speak of the departed; for the misgovernment of the Royal Society has not been wholly the result of even the present race. It is said, and I think with justice, in the life of Young, inserted amongst Dr. Johnson's, that the famous maxim, "DE MORTUIS NIL NISI BONUM," "appears to savour more of female weakness than of manly reason." The foibles and the follies of those who are gone, may, without injury to society, repose in oblivion. But, whoever would claim the admiration of mankind for their good actions, must prove his impartiality by fearlessly condemning their evil deeds. Adopt the maxim, and praise to the dead becomes worthless, from its universality; and history, a greater fable than it has been hitherto deemed.

Perhaps I ought to apologize for the large space I have devoted to the Royal Society. Certainly its present state gives it no claim to that attention; and I do it partly from respect for its former services, and partly from the hope that, if such an Institution can be of use to science in the present day, the attention of its members may be excited to take steps for its restoration. Perhaps I may be blamed for having published extracts from the minutes of its proceedings without the permission of its Council. To have asked permission of the present Council would have been useless. I might, however, have given the substance of what I have extracted without the words, and no one could then have reproached me with any infringement of our rules: but there were two objections to that course. In the first place, it is impossible, even for the most candid, in all cases, to convey precisely the same sentiment in different language; and I thought it therefore more fair towards those from whom I differed, as well as to the public, to give the precise words. Again: had it been possible to make so accurate a paraphrase, I should yet have preferred the risk of incurring the reproach of the Royal Society for the offence, to escaping their censure by an evasion. What I have done rests on my own head; and I shrink not from the responsibility attaching to it.

If those, whose mismanagement of that Society I condemn, should accuse me of hostility to the Royal Society; my answer is, that the party which governs it is not the Royal Society; and that I will only admit the justice of the accusation, when the whole

body, becoming acquainted with the system I have exposed, shall, by ratifying it with their approbation, appropriate it to themselves: an event of which I need scarcely add I have not the slightest anticipation.

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REFLECTIONS ON THE DECLINE OF SCIENCE IN ENGLAND, AND ON SOME OF ITS CAUSES.

INTRODUCTORY REMARKS.

It cannot have escaped the attention of those, whose acquirements enable them to judge, and who have had opportunities of examining the state of science in other countries, that in England, particularly with respect to the more difficult and abstract sciences, we are much below other nations, not merely of equal rank, but below several even of inferior power. That a country, eminently distinguished for its mechanical and manufacturing ingenuity, should be indifferent to the progress of inquiries which form the highest departments of that knowledge on whose more elementary truths its wealth and rank depend, is a fact which is well deserving the attention of those who shall inquire into the causes that influence the progress of nations.

To trace the gradual decline of mathematical, and with it of the highest departments of physical science, from the days of Newton to the present, must be left to the historian. It is not within the province of one who, having mixed sufficiently with scientific society in England to see and regret the weakness of some of its greatest ornaments, and to see through and deplore the conduct of its pretended friends, offers these remarks, with the hope that they may excite discussion,--with the conviction that discussion is the firmest ally of truth,--and with the confidence that nothing but the full expression of public opinion can remove the evils that chill the enthusiasm, and cramp the energies of the science of England.

The causes which have produced, and some of the effects which have resulted from, the present state of science in England, are so mixed, that it is difficult to distinguish accurately between them. I shall, therefore, in this volume, not attempt any minute

discrimination, but rather present the result of my reflections on the concomitant circumstances which have attended the decay, and at the conclusion of it, shall examine some of the suggestions which have been offered for the advancement of British science.

CHAPTER I.

ON THE RECIPROCAL INFLUENCE OF SCIENCE AND EDUCATION.

That the state of knowledge in any country will exert a directive influence on the general system of instruction adopted in it, is a principle too obvious to require investigation. And it is equally certain that the tastes and pursuits of our manhood will bear on them the traces of the earlier impressions of our education. It is therefore not unreasonable to suppose that some portion of the neglect of science in England, may be attributed to the system of education we pursue. A young man passes from our public schools to the universities, ignorant almost of the elements of every branch of useful knowledge; and at these latter establishments, formed originally for instructing those who are intended for the clerical profession, classical and mathematical pursuits are nearly the sole objects proposed to the student's ambition.

Much has been done at one of our universities during the last fifteen years, to improve the system of study; and I am confident that there is no one connected with that body, who will not do me the justice to believe that, whatever suggestions I may venture to offer, are prompted by the warmest feelings for the honour and the increasing prosperity of its institutions. The ties which connect me with Cambridge are indeed of no ordinary kind.

Taking it then for granted that our system of academical education ought to be adapted to nearly the whole of the aristocracy of the country, I am inclined to believe that whilst the modifications I should propose would not be great innovations on the spirit of our institutions, they would contribute materially to that important object.

It will be readily admitted, that a degree conferred by an university, ought to be a pledge to the public that he who holds it possesses a certain quantity of knowledge. The progress of society has rendered knowledge far more various in its kinds than

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