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## [On the State of Science in America]

*MS 363: June-July 1880*

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Gentlemen—In those fourth of July reunions of Americans on foreign soil it is usual to cast up our accounts and see how our nation prospers and what entire liberty with a boundless & teeming soil has done for us. It is usual enough to indulge in these occasions in self-glorification at our successes and it is equally useful to submit ourselves to a little self-humiliation at our shortcomings.

It falls to me this evening to report to you how Science has prospered in the United States since the Declaration of Independence,—and it is not an altogether agreeable report to make or to hear. I do not think that any observant sojourner in many lands can fail to perceive that the Americans are not merely an intelligent but a positively intellectual people, and yet some how or other modern science which has been the most glorious result of the past hundred years,—one of the most, perhaps the most glorious work of man—a great part of which has been performed in the century since the Declaration, in this great work of building up modern science America has had almost no part or lot at all.

Monsieur de Candolle who has devoted a thick volume to a careful impartial and masterly appreciation of the rank of the different nations in science places America not only after Switzerland, Belgium, & Holland,—after France, Germany, and England,—but even after Italy, and only a little in advance of Spain and Russia.

When the revolution broke out we had two eminent scientific men: Benjamin Franklin, and Benjamin Thompson afterward Count Rumford. The former as you know was one of the creators of the science of statical electricity. The other was the one undoubted father of the great mechanical theory of heat,—after that of gravitation the greatest discovery that has been made in physics. What a part the

theories of electricity and still more of heat have played in the science of the nineteenth century! And how little Americans have done for them since Franklin & Rumford.

Of the magnificent series of discoveries in electricity until within a year we could only claim one as our own. Notwithstanding that the electric telegraph was invented & so widely used in America, the laws of its action were all discovered elsewhere. So with heat. From the study of the steam engine, has sprung the modern science of heat. In America where so many engines were made one would have expected its theory to have been found out—but not so. Although Rumford left a liberal fund for the prosecution of such experiments not a particle of the glory of this great theory belongs to us.

Now, gentlemen, you may think that this is not the occasion to say so much ill of America; you may doubt its truth. It *is* true; so true that no man qualified by knowledge & absence of prejudice to give an opinion, can tell you otherwise. And for my part, gentlemen, my faith in & love for America is not of so Skin-deep a Kind that I am afraid to look her faults in the face. America!—that is you & I; and I have no admiration for the character that does not wish to look his own faults in the face.

I have not called attention to our backwardness in science merely to complain of it, but in order to seek the cause of it & to point out the cure for it,—a cure which is in the hands of the general public more than in those of the scientific men.

Why then has science made so little progress in America? One can certainly *not* attribute it to our popular institutions. For the most scientific nation of ancient times was Greece & that of modern times is Switzerland. It is common to say that it is because we are so young a people. That we have had to clear the fields & to commence society & that things have had to be done in the rough at first. That would be a very plausible excuse certainly. But in point of fact in spite of our having had to hew our forests and to mould the beginnings of civilization, we do *not* work in the rough, at all; it is one of our greatest triumphs that nowhere is machinery & all artisanship so perfect as in the United States. Now physical science is nothing but the theory of artisanship, machinery, and so forth; and it is surprizing that that does not advance where the mechanical execution is so perfect.

But I think I can tell you why it is, that science has not gone hand in hand with mechanism in our country. It is that the people have

made a distinction in their minds between *practical* & *theoretical* persons, the former experienced, not in the thing they undertake to do, but in business generally & densely ignorant about all science,—the latter a sort of pedants who never succeed in getting any thing really done, who do not even advance the science they profess.

This is the peculiarly American distinction between practical and theoretical men,—a distinction perfectly unknown in France, for example, because men do not really fall into those classes but on the contrary the highest men of theoretical science are the most practical of men,—their theory & practice perpetually helping one another. But in America the distinction is drawn because it exists. It exists because the scientific men are attached to Colleges and because the Colleges of our country are pedantical & pedagogical institutions where the prosecution of original scientific researches far from being required of a Professor or from raising his standing in the College is positively frowned upon as tending to interfere with his proper pedagogic activity. I know how it is in Harvard where I was brought up and where I well remember the inaugural address of the present president—a recognized enemy of science—setting forth those ideas most clearly. Columbia I also know of,—and I know that science, I mean real scientific research, is barely tolerated there,—or not tolerated where it can be got rid of. In New Haven, the Scientific school was run for years as a private enterprize of the professors and the college only took charge of it when it began to be pecuniarily profitable.

//If you ask why our colleges have been in this state, the answer is very simple. It is that they have been in the hands of the clergy who in all ages and in all countries have comprehended the nature of science,—with its single eye for truth—as little as they have the worldly code of honour.

/If you ask why our colleges have been in this state, the answer is very simple. It is that they have been in the hands partly of clergymen partly of other unscientific persons, to whom the spirit of science with its single eye for the truth, without partisanship, prepossession, or other passion than that of research, was perfectly foreign and unknown.//

The exception is said to prove the rule. And it will be found that the exceptions to the general low state of science in America are precisely the cases not covered by the explanation which I offer you of it. For instance, Astronomy is a science in which America has stood

high. To speak only of discoveries which are generally intelligible, over  $\frac{2}{5}$  of all the minor planets of our system discovered in the last twenty years and all the moons of Planets except one since Herschel's discoveries have been discovered in America. The true account of Saturn's rings, the most accurate description of the texture of the Sun's surface and the best drawings of celestial objects all come from America. Now the chief reason why we have been so successful in astronomy is that though the observatories are usually attached to colleges yet they are loosely attached. They are chiefly managed by the Astronomers who are not overburdened with teaching.

One university in our country, the Johns Hopkins university of Baltimore has been carried on upon principles directly contrary to those which have governed the other colleges. That is to say, it has here alone been recognized that the function of a university is the production of knowledge, and that teaching is only a necessary means to that end. In short, instructors and pupils here compose a company who are all occupied in studying together some under leading strings and some not. From this small institution, with half a dozen professors and a hundred and fifty students, I am unable to tell you how much valuable work has emanated in the 4 years of its existence in philology & biology. A great deal I am sure. With its work in mathematical & physical science I am better acquainted & I am proud to say—because it shows the real capability of America for such work—that in those 4 short years the members of this little university have published some 100 original researches, some of them of great value,—fairly equal to the sum of what all the other colleges in the land have done (except in Astronomy) in the last 20 years. One discovery alone by Mr. E. H. Hall of an entirely new effect of electricity, is distinctly the most fundamental addition to physical science which has anywhere been made in many years.

In whatever branches of science are touched by the works of the Scientific Institutions of our Government such as the Smithsonian Institution, the Coast Survey, the Geological Surveys, the National Observatory, the Signal Bureau, the Fish Commission, the Army Medical Museum, the Office of Weights & Measures etc. our science stands in the very first rank,—and we are teaching the world.

Nobody has ever thought that these institutions needed civil service reform, for politics has never meddled with them at all. When we shall create a great government university to be governed as

these institutions are, as one of these days we must, then shall American science for the first time at length begin to take the standing which we ought to expect it to take. One of the great parties has nominated for the presidency a man who by the exactitude of his studies,—though they are not of a physical nature—is entitled to the name of a man of science. The inauguration of a great national university, fit crown of the work of a great party of enlightenment, could not be more appropriately performed than under the auspices of President Garfield!