

## THE RELATION OF THE SCIENCES TO EACH OTHER.

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“Mr. Toastmaster, Ladies and Gentlemen:—I do not know just how it happened that I find myself on this program, after a delightful dinner and interesting speeches, to speak upon such a subject as “The Relation of the Sciences to each other,” but I think it is due nine-tenths to the persuasiveness of the genial Secretary of the Illinois Academy of Science and about one-tenth to the fact that I thought this would be a good subject to bring before an Academy interested in so many different subjects.

However, I can offer the same assurance offered by a certain cab driver, according to President Harris. A friend of his traveling in Porto Rico hired a carriage to take him to some point four miles out in the country, and after he had ridden a distance which seemed to him about six miles he called the driver and said ‘Is it much farther?’ ‘O, no, sir, its nearer,’ answered the driver. I can assure you that the end of the program is already nearer than it was before I began to speak.

I am not going to indulge in any history of the classification of the sciences ranging, perhaps, from Aristotle to Swift, but I am going to use what little time is at my disposal to call your attention to a system which has been helpful to me; one which we owe to a group of American gentlemen, and one which was put into practice and given a severe test at a city less than one hundred miles from where we are sitting this evening. The system was proposed by a committee of seven gentlemen and adopted in the International Congress of Arts and Science in St. Louis in 1904. My reason for calling attention to this system is the fact that it has been very helpful to me and the fact that I find it very little known even among scientific men.

The chief attraction of this classification to me is the fact that it recognizes that phenomena are not the only thing in the world worth studying. There are certain ambitions and purposes and strivings and tendencies and will-acts which are just as important and contribute largely to the most important work of the world; these as well as phenomena are legitimate subjects of study; and this leads to the first great rift in human knowledge. On one side *phenomena* and on the other side *purposes*.

Take for instance, a substance such as copper, stones or stars, plants, animals,—these are all investigated with respect to certain properties which are identical at all times. The atomic weight of copper is 63. If we found it to be different from 63 we would conclude that the substance was not copper or that it was impure copper. So we put in a certain group the sciences which investigate phenomena common to every specimen and not dependent upon the peculiarities of the individual. These sciences are called the physical sciences and include such as Chemistry, Biology, Astronomy. But there is another group of phenomena, peculiar to individuals—such, for instance, as what is going on in your mind or my mind at this instant. I am thinking how to say what I want to say most clearly and in the shortest possible time; and you are probably wondering at the slowness with which I am saying it. There is a set of phenomena peculiar to every individual. These phenomena are called mental. So then we have phenomena divided into two great classes—those peculiar to individuals and those which are over-individual.

If we pass now to, the will-acts of humanity we find the same distinction. There are certain will-acts, certain judgments upon which all humanity agree. For instance, that two and two make four is just as evident to the Hottentot as it is to you and me. Such judgments as these are wider than any group of individuals and are common to all sane human beings. We have sanitariums all over the country for people who do not agree that two and two make four. So the over-individual will-act are the general phenomena of the sciences of purpose, and are

grouped in one class—called the normative sciences. But what you determine upon, what you propose to carry out, what your ambitions are, what the ambitions of all the best thinkers of the world have been, these constitute what are called the historical sciences. In literature or political history, the same is true. Take such a thing as the story Homer tells. It may be hard to determine whether Homer was written by one individual or by a dozen; but in each line of Homer there is an execution of a certain purpose on the part of some individual; so in political history—take for instance the Franco-German War; we know it was the result of the individual will-acts of a certain group of men. So when Abraham Lincoln signed the Emancipation Proclamation, however we may speak of it, we know it was the individual determination of one particular man who actually brought that action to a focus, so to speak. All those sciences which deal with individual will-acts are grouped under the head historical.

So much for the pure sciences; but pure science is not the whole of science. There is the great field of the utilitarian sciences, of which we have already heard this evening, which are certainly a great deal more than merely applied science. Every one knows that an engineer does more than merely apply physics, mathematics and mechanics. He has opinions of his own and carries them out in his own methods. The same is true of education. I believe everybody who has seriously considered the problem will admit that the science of education is a great deal more than applied Psychology. How can we group these applied sciences? Professor Moore, the great authority on international law, and three or four other gentlemen decided upon the following classification:

All those sciences which deal with objects were called utilitarian sciences, including medicine, engineering, transportations and commerce; those sciences which deal with subjects other than one's self are grouped under the head of sciences of social regulation, including such problems as politics, administration, municipal government, colonial affairs; and there still remains one other group of applied sciences—those which

refer to the individual himself, including such subjects as education and religion. These are called the sciences of social culture.

So we have in addition to the four pure sciences, three utilitarian sciences; namely the sciences that deal with objects—sciences of social regulation dealing with other subjects—and, finally, the sciences of social culture dealing with the subject himself.

These seven sciences, as I say, were represented at the International Congress at St. Louis, and I want to take just the few seconds that remain to call your attention to the eight superb volumes of the report of that congress. The American gentlemen who were invited to participate in that Congress, together with the foreign guests, form what I believe is the most remarkable group of men ever gathered together at one time and one place in the history of the world.

You will find in the first volume of this report a description of this classification, largely due to Professor Munsterberg. You will find those volumes exceedingly well worth looking over, if you have not already done so; and if you will take the pains to read the first two or three hundred pages, you will realize that the republic of science and letters is a very large nation, not made up of many states closely touching one another; its departments are more like the claims of the western mining camps, overlapping one another, and are nothing like the water-tight compartments that sometimes seem to separate us when at work in the laboratory.

Allow me, in behalf of my fellow-members in the Academy of Science, and in my own behalf, to thank the gentlemen of the Chamber of Commerce for the delightful hospitality which have extended to us, and for allowing us to come together and talk matters over in this way."

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