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SOME REMARKS ON NATIONAL HISTORY OF SCIENCE

The teaching of national history of science, beside lectures on the general history of science seems to become a necessity. On the one hand, students (as well as the general reader) should have a systematic idea of scientific development of their own country, on the other, science is increasingly considered as an important factor of historical development, attracting the attention of political, social and economic historians. But, while the ways and patterns of lecturing and writing on general history of science are established, at least to a certain degree, the "model" of a national history of science practically does not exist. Thus, it may be interesting to present some general ideas on this subject, drawn from the experiences connected with the work on an outline of the history of science in Poland.[1]

The following problems will be discussed below: (I) value judgements and criteria of choice; (II) the diffusion of science; (III) autonomy and creative powers; (IV) continuity versus discontinuity and the teaching of national history of science.

I

The question of value judgements on which the choice of material is based — appears in a different light, when applied to national circumstances.

In general history of science, two criteria seem most important: achievement (discovery) and continuity versus discontinuity. Putting things in a very simple way — successive steps in scientific develop-

[1] This outline is being prepared collectively at the Institute of the History of Science and Technique of the Polish Academy of Sciences. The author is working on the first part of the book concerned with the Middle Ages; he is a historian of the social sciences. The present paper is only aimed at presenting an outline of some chosen general problems, which may be controversial. All examples will be taken from the history of Polish science.

ment form the chronological background of the discourse, while continuity within separate schools of thought is opposed to discontinuity or even contradictions between them. Thus, the subject of general history of science: development of scientific thought, is set within the framework of the time-factor. Now, within a national history of science, two more factors have to be introduced, namely: the geographical and the ethnic one. National history takes into account a "limited" sector of the "overall" reality represented by general history of science.

Two notions should be defined here, namely: what is understood by "general history" and by "geographic and ethnic limitations". The first definition is rather simple: traditionally general history concerns our western culture in the broad sense of the word, and it is only recently that other cultures of our globe, such as China, are being reluctantly introduced into the picture (thus, strictly speaking, general history is also in a sense only a partial one). The second definition is much more complicated, depending on conditions of historical development of various national cultures. Here it is enough to say, that geographical boundaries changed in the past according to political events, and the ethnic criterion can not always be applied with success, since its meaning was also subject to change in various historical periods. Copernicus and Marie Curie Skłodowska may be taken as typical examples. Furthermore — living in a world of fading nationalisms, we are perhaps too often inclined to apply to the past our present criteria (or better criteria from very recent days).

Let us now come back to the problems of value and choice. As said before, the essential value judgement in general history of science concerns the importance, originality, preeminence or level of a certain author, school or system of thought. Thus, simplifying matters, "first and second rate" authors or schools appear in textbooks of history of science, while the, let us say "third and fourth rate" ones are left aside. All this, of course, is subject to constant re-evaluation, since research furnishes new basic facts and methodology changes and improves. Here, however, it is essential to state, that this particular set of criteria can not be applied (even *mutatis mutandis*) to national history, since the latter is definitely much more than a simple geographical or ethnical paragraph of general history.

What are then the national criteria, or rather, what should they be? Science as a system of theorems and hypotheses can not be *ex definitione* national. It may be national only accidentally, *obiter dictu,* if *e.g.* a certain set of theorems is identified with the nationality of their authors. (Only in such a sense the term "Polish school of logic" may be used). On the other hand, most of the institutional aspects of science are national, in other words the social framework in which

science develops is very often national. The subject matter of human sciences may also be national, as it is the case for historiography or for history of litterature. The same is true, perhaps to a lesser extent, for social sciences, in which a national subject matter may often have international meaning, as in the case of Machiavelli's *Il principe,* or Thomas and Znaniecki's: *The Polish Peasant in Europe and America.* Thus to the extent in which institutional, factual and theoretical elements merge, science has national and international aspects, not speaking of the obvious geographical and ethnical criteria.

This leads to the crucial point concerning national history of science, namely that it is concerned with the interrelation between scientific theories, scientific activities and scientific development as well as with cultural, social, economic and political history of the country. This interrelation may, or may not be stressed; it may concern various (or even deliberately chosen) aspects of science and of social life; it may contain more or less of the purely theoretical element, but in any case — it will always remain the feature of national, as opposed to the general history of science.

Assuming the former, the system of values will also be different. The basic, cognitive values will of course remain to the extent in which they may be applied to the country in question. But other values as well will have a very strong, if not predominant, impact on research. Let us start with some examples taken from Polish history: Fof the Middle Ages (13th — 14th c.) such world known figures as Vitello, Martinus Polonus or Mathaeus de Cracovia seem to be less important for the development of Polish culture, than the multitude of obscure Polish scholars at the Italian universities, at Montpellier, Paris or Oxford, who were forming the developing body of the first intellectual class of the country. In the same way it could be said, that thousands of manuscripts at the libraries of Cracow and Wrocław give more hope to get a better understanding of the intellectual life of the country in the 15th c. than the writings of Paulus Vladimiri on *De bellis iustis,* or even the *Polish History* by Jan Długosz. In the same sense, from the Polish point of view, research on the Copernican revolution should not only concentrate on the great astronomer's work, but also on his predecessors and followers within the country. Sometimes the national point of view turns out to be *par excellence* an international one, as in the case of the Polish Friars, who seem to be predecessors (after their expulsion in 1660) of the Enlightenment period. Even some definitely "negative" aspects deserve much more consideration (as in the case of Jesuit schools in Poland in the 17th c.) since only they can explain some basic cultural phenomena.

Summarizing, it seems that value judgements in national history of science should be based on the following criteria:

1. Sociology of science — the forming of intellectual social groups and centers, their evolution and changes.

2. History of scientific institutions, their development, raise and decline, radiation *etc.*

3. Mutual influence between domestic and foreign centers.

4. The interrelations between the factors (1—3) and the cultural social, economic and political development of the country.

The importance of "pure" scientific values can not of course be disregarded or diminished. Those values, however, should be blended with the criteria presented above. And it is only this blend that can lead to adequate proportions and balanced judgements in writing a national history of science. Such a balance will perhaps be still better understood in the light of the following considerations on scientific diffusion.

II

The problem of diffusion of scientific ideas seems to be of basic importance for the understanding of structures in national history of science. "Diffusion" should be understood as the spreading of scientific ideas in time and space. Thus it may be vizualized as a "three-dimensional" approach to the history of science: the timeless and spaceless "contents" of science being determined by two further dimensions — those of time and space.

Time may be treated as expressing the "lag" between the origins of certain ideas or schools, and their appearance in a given country. It determines also their duration, their assiduity and the period of their influence. On the other hand, space may be treated as a kind of scientific "geography"; the analogy between such an approach and modern regional economics [2] is most striking here. One would almost be inclined to use the economic terms of "macro" and "micro" distribution of science, the former pertaining to the great international trends in science, the latter to the scientific structure on the national (or regional) scale. To use only one example: the transition from the Middle Ages to the Renaissance can not be properly explained without introducing the factors of time and space. The theses of Jacob Burckhardt [3] about the contradictions between those periods, traditionally accepted in general history of science, are practically unapplicable to national history, in which empirical material demonstrates a tremendous diversification of the problem. The humanistic and scholastic attitudes (however they would be defined) "coexist" together for cen-

[2] See *e.g.* W. Isard (and others): *Methods of Regional Analysis.* The Technology Press of the M. I. T. and J. Wiley & Sons, 1960.

[3] J. Burckhardt: *Die Kultur der Renaissance in Italien.* Basel 1860.

turies; for instance in the 15th c. humanistic commentators of Aristotle such as Donato Acciaiuoli [4], draw from the tradition of medieval authors (Walter Burleigh, Thomas Aquinas *etc.),* though they express themselves in beautiful Latin. On the other hand, some commentaries, which are scholastic in form (as the ones of the Cracow masters of the early 15th c.) contain basic ideas attributed generally to the Renaissance thought.

It is only detailed, historical investigation that can disentangle the problem, and a profound study of texts is the only means of showing ways of their diffusion in time and space. Only such a detailed "map" explains the processes and regularities taking place within a given country. If we do not have such a "map" for the country in question, we are condemned to use *a priori* criteria drawn from general history of science, which usually lead to false conclusions. Thus the following, basic "kinds" of diffusion should be distinguished:

1. International diffusion, *i.e.* basic trends of thought coming from one country (or group of countries) to another.

2. Internal structure within the country, showing the "geography of science" at a given time-period.

3. Social "radiation" of science.

All three aspects are in many senses interrelated. First of all, international diffusion, as said before, should not be treated schematically — since it is only the sources that may give an adequate key to the ways in which it influenced science in a given country.

Internal structure of diffusion within the country expresses the local geography of science. It is perhaps less important from the general point of view, but very meaningful for scientific stratification, presenting the links of science with its social background, and its impact on the life of the country. This last feature is strictly connected with the "radiation" of science, that is to say, with the influence of scientific activities, and especially of the activities of those graduates, who did not choose a scientific career, engaging in teaching, public service, etc. Their work was an additional link between science and social life, demonstrating also, at the basic level of the community, the interactions of scence and religion, philosophy, literature and art.

III

If diffusion, however, is treated in the traditional meaning of simple influence, it may well lead to a kind of mechanical approach to scientific development, assuming tacitly, that except for the great masters, no autonomous, creative work existed. In this light, scientific

[4] Donati Acciaiuoli *In Aristotelis libros octo Politicorum Commentarii.* Venetiis 1566.

schools are presented as groups of more or less strict followers of their founders, the rows of successors appear parallel to each other, their controversies and fights are based on mechanical contraposition of their logical theses, the "new" fights with the "old" and the whole picture becomes a pitiful simplification of actual life.

This method is most disastrous for national history of science, especially in smaller countries. Simplifying matters, there is little or nothing happening in such a country — since most of the schools and trends of thought are of foreign origin, deserving simply to be treated as ready imported blueprints.

The original sin of such a philosophy of science consists in an erroneous idea of intellectual activity; strictly speaking — in a mechanical treatment of scientific thought. The historian of science should have deep belief in the creative powers of the human mind, in its freedom of choice and autonomy. Each author or school in the development of science, even the least important one, should be given the credit of independent thought. This is the only way of saving human values in the history of science.

To be well understood, let us determine closer the scope of such independence. It is obvious, that everyone is not a genius, and that great discoveries and new basic ideas are the lot of a chosen few. Their followers however, were also intelligent, thinking and living creatures, directed in their intellectual work by their own motivations, they had the freedom of choice within existing conditions, and above all they had definite aims and definite ideas concerning the sense of their intellectual work. If history of science is approached in this way, every intellectual activity in the past becomes interesting and important. This seems to be the only possible approach to national history of science, enabling to preserve the necessary scale of values, as discussed in the first paragraph.

But let us get down to the ground. If such a philosophy of the human mind, together with the value system and the criteria of choice presented in the first paragraph are applied to the various layers of "diffusion" discussed previously, we seem to be obtaining the correct picture of national history of science. When the three layers of diffusion: the international, the internal and the radiation one, are treated as autonomic intellectual activity of free human beings, then every detail appears in new, brighter light. We begin to understand the intellectual history of our country, the motivations and not only the contents of intellectual activities, the purposefulness of this or that intellectual choice, the cultural, social or economic sense of radiation, in a word, the historic meaning of science.

Perhaps the best example from the Polish history would concern the Enlightenment period. For the country in question it was simul-

taneously a period of political disintegration (owing to the partitions) and cultural as well as intellectual renewal. Thus, the Polish scientific activities of the period can not be judged exclusively by intellectual standards, but they should be strictly connected with much broader motivation. Such men as Stanisław Konarski, king Stanisław Leszczyński, Hugo Kołłątaj or Stanisław Staszic were all engaged in the fight for the renewal of their country, treating science as one of the basic tools leading to this aim. Thus, they should not exclusively be judged by intellectual standars, since it is only the understanding of very complex political, social and cultural motivations that explains the autonomy of their choice and the real aims of their work.

IV

The last question concerns continuity versus discontinuity of national history of science. Assuming, that science, in its great lines of development is essentially the result of international cooperation, national development of science will always in this sense be more or less fragmentary and disrupted. This discontinuity may seem much more acute, if the system of values criticized above in paragraph one is applied, that is, if only the logical structure of science is taken into consideration. If however, the mechanism of diffusion and the assumptions of autonomy (paragraphs II and III) form the basic structure of research, then there is a much greater chance of seeing a continous line of development, despite its logical disruptions. Of course, the picture will be different for big and small countries, for those which during long historical periods were at the head of scientific achievement, and those which could not always keep up the pace. For the latter, even in such a light, there is a very definite, constant problem of continuity versus discontinuity, to the extent in which foreign influences interrupted tradition being built up locally. It seems, that those traditions were basically related to the institutional framework, while the logical structure of science was subject to much faster modifications. It is obvious, however, that detailed judgement must be based on empirical material.

There is, however, a second aspect to the problem, namely, what was the actual consciousness of national scientific traditions in separate historical periods. Judging from our present state of knowledge of Polish history, such a tradition was disrupted many times, and the appearance of new, international trends of thought often virtually erazed the memory of passed Polish achievements. To a certain extent, however, this may be a somewhat superficial point of view, since recent research brings up more and more traces of such traditions. But, such disruption was not only a feature of the past. Owing to our present

educational system, the knowledge of those traditions seems also to be deficient nowadays. That is why, the teaching of national, versus general history of science should also be taken into account.

To what an extent, therefore, national history of science should be taught, and what should be its relation to the teaching of general history of science? To a certain degree analogy can be drawn from the teaching of political history and that of the history of literature and philosophy. While political history of one's own country as well as the history of national literature comes first in the teaching order, before general political and literary history, the inverse seems to be true for the history of philosophy, since it is only the "general" history of philosophy that can give the student an understanding of the development of the essential problems of the human mind. The same seems to be true for general history of science. On the other hand, the importance of national history of science for general education and for the education of future historians of science seems to be evident, since scientific development is an essential factor of national culture, and it is only the specific features of national history of science that can explain the particular ways in which science developed in a given country.

That is why national history of science should be treated as a separate subject for the general student, otherwise it will always be in a sense diluted in various chapters of general history, or worse still, in the history of literature. The same, to a still greater extent concerns the education of historians of science. Since many of them work on problems concerning their own country, their "standard" education should also comprise this subject, otherwise they risk to have important gaps in this field, and more important still, their approach to national history may be seriously biased by the general one in the many senses determined above. Especially, certain assumptions taken *a priori* from the very beginning from general history of science may lead them to basic errors in interpretation. That is why, courses of national history of science should be seriously considered within the programs of respective university departments, and a good textbook of this subject seems to be a really useful and important tool for future research.