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(Warsaw)

THE DEVELOPMENT OF SCIENCE IN POLAND IN THE 19TH AND 20TH CENTURIES

1

Science is the common achievement of many nations and many civilizations. This co-operation between them has been assuming throughout the ages various dimensions, but always — and especially in recent times — it has been an essential factor of science's development. Poland — in common with other nations — has been participating in this development and has not only been availing herself of its results but also — sometimes — opened new prospects for it. In natural sciences this was done by Nikolaus Copernicus and his heliocentric theory, and in the field of social sciences by the Polish 16th century theory of a peaceful coexistence of Christians and pagans, the theory of a just and tolerant State. Stanisław of Skarbimierz and Paweł Włodkowic, Fricius Modrevius and Polish Arians, as well as Polish writers of the Enlightenment, all of them contributed to the formulation of that great humanistic conception of living together and observing the law of nations.

In this conception man was given the place of pride: "A white man or a black slave — wrote H. Kołłątaj — should he suffer under the unjust laws or in fetters, he is man and is in no way different from us". This vision of the just order on earth completed the Copernican conception of *harmonia mundi* in which the sun, called "The world's lantern", governed over "the family of planets" while shedding its light equally on everything.

But let us move now from the distant past, though always remaining very close to us, Poles, and concentrate on the 19th and 20th centuries, that is to say on the period in which Polish State was lost and then recovered; the period during which the development of Polish nation was proceeding in spite of foreign suppression. This is an extremely important age for science, and in this country, too, science acquired during that time its modern shape.

But, while discussing this period, we are not going to describe in detail the Polish contribution to the development of science in general. A detailed list of these contributions is important, yet it could be drawn up only by a large group of specialists from all branches of science. And only they would be able to fill in the gaps which still appear in this list, drawn up already on several occasions.

I have chosen here another way. Science can be presented not only as a collection of results achieved in research, but also as a process in which the acquisition of knowledge is determined by social forces, individual aspirations, by the values and aims which science is expected to support. So let us try to look at the sources, from which the development of science sprang up in this country in the 19th and 20th centuries, and to describe their characteristics.

2

In considering these sources we must point first of all to the richest of them and which has remained the most important one also today — service to the nation. It is obvious that in every country science serves society, but there are few countries in which this service is as strong and of special character as it is in Poland. While in many countries science progresses mostly according to its proper, immanent tendencies, and only its results are made use of in society, in Poland service to the nation was a major challenge for science which used to determine the motivation for scientific work and research programmes. This was due not only to the fact that under foreign rule scientific pursuits were an essential way of preserving national independence. It resulted also from the age-long, and historically justified concept of the nation as a whole being more durable and important than the particular generations living currently on the native soil. According to science, too, was to serve not only people at a given time, but also nation as a whole in its ups and downs, in its struggle for independence and the realization of its development plans.

There is a symbolic meaning in the fact that in 1800, that is a few years after the fall of the Republic of Poland, there was founded in Warsaw, incorporated at that time into Prussia and doomed to political decline, The Society of the Friends of Science. It had acted for thirty years — until its liquidation by the Tsarist authorities — as a kind of Academy of Sciences, a free association of scholars and people interested in science, which both inspired and planned studies of special significance to society.

The first chairman of the Society, Albertrandi, stated in addressing his colleagues: “You will be deprived of any councils and public rallies, of political gatherings and legislature, of civil endeavours and legal preoccupations... Similarly, acts of bravery, of courage, bloody fights and knightly exertions — all of them will be beyond you... But the liveliness of your hearts will remain and will nourish your scholarly pursuits. These are notably the unfading flowers that can be thrown on the noble tomb of our country”.

Stanisław Staszic, who had for many years directed the activities of the Society, described its purpose like this: “The main task before our Society is to improve the language of our fatherland... our next preoccupation is to keep alive the memory of great deeds in our history and of the famous men in our past. Finally, we shall be trying hard to acquaint our countrymen with all the riches that the soil of the Polish land produce within itself and outside”.

In accordance with these plans researches were both inspired and supported. They contributed to the development of those branches of science and humanities that were essential both for the country and national awareness. Among them were historical sciences, Polish and Slavonic studies, and also natural sciences, especially geology and geography. All these branches developed in subsequent decades with increased intensity especially in Cracow which became the main centre of historical studies and of physiographical researches.

Then in the positivistic period new social requirements determined the development of science in this country. Also new tendencies made themselves seen in this evolution. The development of science, of chemistry and physics in particular, was further increased, as was also that of social sciences connected with social movements, especially those among peasants and workers. Both the solidaristic and revolutionary tendencies sought in science a weapon with which to fight the feudal and bourgeois structure of society.

Science got a new stimulus after Poland regained independence in 1918. The reconstruction of statehood in a country ruined by war and underdeveloped called for systematic endeavours and these could be made more effective by science. So major scientific institutions, especially those belonging to the Polish Academy of Sciences and Humanities and to the Warsaw Scientific Society, higher schools, universities, polytechnics and agricultural academies, all of them became research centres in a variety of fields. Science was then indeed serving Poland.

It resumed that service, on an incomparably bigger scale, after the second world war. People's Poland needed science then as it does now to the extent unprecedented in our history. The industrialization of the country, the necessity to modernize agriculture have become a real challenge to natural and technical sciences. The shaping of a socialist society calls for an intensified development of social sciences and humanities, of those fields which can form a modern national awareness. That is why when the 2nd Congress of Polish Science was held in 1973 its main motto was: "Science in the service of the nation".

Thus during the whole 19th century, and in the 20th, that call to serve the country determined main tendencies in the development of science in this country. The words of Staszic in which he described the character and purpose of science, quoted on numerous occasions during those two centuries, have still remained valid in our day. "Any knowledge — he said — until it is not put to the use for nations is simply an empty invention, a futile exercise of mind or a play for the lazy. And men of science do not fulfil their calling properly unless governments draw on their knowledge in the country's administration, seek their advice and assistance, unless their know-how is applied to factories and handicraft, facilitates their work, unless it guides and ensures progress".

It is obvious that the necessity to "serve the nation" did not determine all the tendencies in the development of science in Poland in the 19th

and 20th centuries. It was developing in accordance with its inherent logic. And people did always acknowledge in this country the relative independence of science of circumstances and utilitarian tasks. They appreciated everything that had to do with new problems, with questions being asked and with doubts surrounding the results already achieved. It was understood that science was — in the last resort — a seeking of truth no matter what benefits might be drawn from it. Even in the utilitarian period of Enlightenment it was considered — as Jan Śniadecki expressed it — that inventions are valuable not because they make our rule over nature easier, but because “by improving man’s powers and faculties they uncover before us the physical order of the world”.

This approach to science was increasingly stressed in the 19th century as far as political circumstances made it possible. And it was so first of all in Cracow. The Scientific Society, founded in 1872, became in time the Academy of Learning, a major institution which sponsored and organized researches. The Academy, always, trying to meet home requirements, especially in the fields of natural and medical sciences — catered also for the development of all disciplines.

Similarly the Warsaw Scientific Society, founded in 1907: in the intention of its organizers it was supposed to sponsor and develop the so called „pure science”. Jan Tur wrote in this connection: “Exclusively scientific researches, original ones, making a genuine contribution to Western science — this is our sole purpose”.

Many years later, while analysing the realization of this purpose, said Franciszek Pułaski, the scientific secretary of the Society: “It was necessary to set up workshops in which young minds could be exercised and strengthened and, while working on their native soil, would preserve their separate characteristics. Because each nation has its own inborn talents which may lead it, in their own way, to the heights of human thought. And that is why each enlightened nation leaves its imprint on science which then becomes its own science, the finest acquisition of culture. Like verses of a national poet are sung in the native tongue, so also the nation’s genius can express itself best only in native science”.

So in the Polish science under foreign rule two of its aspects were closely linked together: being useful and being disinterested, and the service to the nation combined with a pursuit of truth created a whole that was rich and varied indeed.

Once Poland regained independence this combination became even more pronounced. While the Polish State was being rebuilt after 1918, science was called on numerous occasions to help, and at the same time conditions for its independent development were also ensured. In the early years of that period, Polish men of science used to come together and formulate the main requirements for researches in particular fields, while also indicating “what Poland was losing by not cultivating science sufficiently”.

This duality repeated itself after 1945. People’s Poland called upon science to co-operate in the major tasks of the country’s development; and at the same time science was also secured conditions for its “disinterested” pursuits,

according to its own needs. Two big Congresses of Polish Science — in 1957 and 1973 — bore evidence of it.

At the first of them Jan Dembowski, subsequently Chairman of the Polish Academy of Sciences, said: "There are no sciences completely detached from life and one cannot be sure that some theoretical problem will never find its practical application".

It was an important vindication of theoretical sciences which had already for decades been developing. Though they did not serve the country directly, they did so indirectly as they concentrated on a search of truth and on the cultivation of intellectual values which went beyond pragmatic or instrumental considerations.

It had always been a matter of ambition — especially in independent Poland — to pursue such researches. An example of it may be mathematics in this country which, while connected with practise, went beyond these boundaries and won international recognition owing precisely to the boldness of its thought and to being true to itself. Let us recall here the words of Zygmunt Janiszewski, said in 1919, when the Polish school of mathematics was just emerging.

"We are far away — wrote Janiszewski — from the major centres in which mathematics is produced, we have come late and are lagging behind. Now, if we do not wish to trail behind others we must use radical means. We ourselves must create such a centre in this country. We shall acquire a worthy position in the world of science when we come to it with our own initiative".

With a similar initiative would come to the world of science also the representatives of other disciplines in this country.

Service to the nation and the immanent progression of scientific research were the objective factors governing developments in science. But it was men of science who in the last resort determined these developments. They were they who were especially sensitive to national needs and sought to solve scientific problems. They were they, obeying their passion for research, who gave all their time to science, sometimes even literally offered their lives to it while overcoming obstacles and unfavourable circumstances. It was they who were shaping science.

What sort of men were they — authors of its dynamic development. This question can be answered only when we bear in mind in what circumstances Polish nation was obliged to live in the 19th century, the period of foreign rule. Asking it would probably not be relevant if it were addressed to free nations, but not to the Poles. In this country science was not supported by the state, indeed it was mostly cultivated against the will of the authorities. Scientists did not have here at their disposal public establishments for work, there were no Polish higher schools, no Polish research institutes. Quite often it was prisons that were their universities, and frequently too they tried to do scientific work abroad where they had emigrated or in outlying places where they had been banished. H. Kołłątaj wrote to T. Kościuszko from an Austrian prison: "I am living here as if I had to die tomorrow; but I am thinking as if I had an age before myself to live". Those were the words which characterized the fate of many Polish scientists during

the period of foreign rule, including their experiences later under the Nazi occupation.

A separate page in the biography of Polish men of science was Siberia — the land of political banishment, since it became the object of very significant and devoted investigations, done by them, both in the field of natural and social sciences. Such names as Benedykt Dybowski, Aleksander Czekanowski, Józef Szczepan Kowalewski, Ignacy Pietraszewski, Bronisław Piłsudski and many others made up the history of Polish deportees who there too remained faithful to science. Some of them paid with their lives for their efforts. So in the region of the East-Siberian Sea, at the confluence of the rivers Indigirka and Kolima, Jan Czernski was dying in a boat and dictated, in these last moments of his life, instructions for the expedition he led and which was to be led, after his death, by his wife.

Even when the circumstances were not so tragic, even when the men of science could live in this country, scientific work did not ensure them their living. They were obliged to earn it by working as clerks or teachers and do their research work when they were not occupied, that is at night. These sacrifices were not done in vain. Polish science did make considerable progress.

There were at that time numerous extraordinary examples of people whose scientific work replaced that done by whole institutes. The first dictionary of Polish language was the work of a single man — Samuel Linde; Oskar Kolberg wandered all around Poland collecting into tens of volumes what then became the basis of Polish ethnography; and the Estreicher family did similarly in the field of bibliography.

These experiences led to the concept of a man of science whose personal devotion to research was of the utmost importance. That kind of commitment made it possible to overcome the most unfavourable conditions. Occasionally it called for many sacrifices, and sometimes — simply for heroism. It always expressed the personality of the man of science — the real man. In answering the question about a particular scientist it was these aspects of him that were mostly stressed.

The distinguished philosopher and logician, Jan Łukasiewicz wrote in his dissertation *On science*: “He who wants to be creative in the field of science should work on himself in three directions: let him develop his senses so as to see facts and observe [...] let him develop his feelings because it is against the background of rich emotional life that a new and fruitful thought is most likely to appear; let him develop his mind because from his creative ideas he must draw conclusions and compare them with facts. The man of science should be an all-round man”.

It was in a similar spirit that the unusual confession of Maria Skłodowska-Curie was made: “I am one of those — she wrote — who think that science is a thing of great beauty. A scientist is not in his laboratory only a technician, he is also a child to whom the sight of natural phenomena is like a fairy-tale”.

These conceptions of the man of science are, when compared to those in other countries, our peculiar and durable position which did not change once Poland had regained independence and the state began to secure

material and organizational basis to science. The traditional model of the scientist as a *man of vocation* was now completed by the modern model of a *scientific worker* acting professionally in the framework of an institution. In this respect our solutions are not specific; together with the whole world of science we experience the contradiction and co-operation which exists between scientific creation and scientific work, between the vision of great scientists and the collective endeavours of scientific groups, between intuition and documentation, between the risk of exploration and planned organization.

5

The activity of Polish scientists, corresponding to the needs and expectations of society, has always been held by the later in high regard. And this atmosphere of respect and sympathy resulting in the help readily extended to men of science is a very characteristic and noteworthy component of Polish scientific life, stimulating its development.

After the fall of Polish State its scientific institutions were liquidated. With the exception of Cracow, which in some periods enjoyed a little more freedom, they were not restored in any other town. So science became the concern of society. To its initiatives and generosity it owed a great deal indeed in this country. Let us recall only the major facts: the Józef Maksymilian Ossoliński foundation of 1817 in Lwów — existing now in Wrocław; Edward Raczyński's foundation in Poznań, that of Tytus Działyński at Kórnik; big libraries founded by the families of Zamoyski, Krasieński, Przeździecki in Warsaw. Apart from these foundations, established by rich aristocratic families, there were also emerging institutions organized and maintained by wider circles of Society and financed by contributions or bequests. Among such institutions were the Mianowski Foundation of 1881 and the Museum of Industry and Agriculture of 1875 which as also equipped with laboratories. In one of them Maria Skłodowska-Curie had worked for a time.

Society's care for science used to express itself not only in an organized help for research but also in an interest in the results of these studies. In trying to spread science and scientific culture there was from the very start a tendency — especially in the scientific societies — to combine the researches with the postulate of "public enlightenment" by making knowledge generally accessible.

This spreading of scientific knowledge was not restricted to information on the results of researches as attempts were also made to involve wider circles of society in scientific investigations. There were no sharp distinctions between specialists and laymen; on the contrary: scientific activity was considered to be "open", that is to say accessible at various levels to people variously equipped for it.

This led to numerous publishing and organizational activities in which scientists co-operated with laymen interested in a given field. A special name was coined for this category of people: they were called lovers of friends of science.

In such circumstances and such atmosphere science was regarded — sometimes — as the major factor in the education of man. A term was coined — probably without its counterpart in any other language — service to science. The latter was to be a calling and happiness of men who sacrificed their lives to scientific research. But, at the same time — and this was perhaps the most important — it was to be accessible to wider circles of society as well. Many branches of science base themselves on the collection of materials; this is the case of the sciences of Earth, of historical sciences, of ethnography and linguistics, sociology and pedagogics, as well as of sciences concerned with living Nature. Those taking part in this service to science were young people as well as older ones, once they showed interest in and readiness to co-operate with scientific workers.

In some circumstances the service to science could lead to the more lasting commitment; those pursuing it could eventually devote their lives entirely to it. How very significant, and how extreme, was the view of the distinguished polar explorer, A. B. Dobrowolski who presented that vision of a society engaged in the service to science in the following words: “What is the greatest and most important thing is not man, individual, nation or mankind... neither is it “life” nor “work”, neither “history”, nor soul, nor inner improvement... but Science and Art. We are working for Science and Art — they should provide us with our greatest pride and most profound humility, with the sense of our existence — they should become the basis of a new conscience. What have been termite hills should now change dramatically into a society of a completely new type, into workshops of Science and Art.”

6

Finally, in concluding these considerations, we must draw the attention to the fact that the development of science in Poland in the 19th and 20th centuries has always gone together with a critical and keen reflection on science. Its progress was not planned — although there were also big collective undertakings — and yet science was an object of considerations guided by a feeling of responsibility of the men of science for their work.

The questions what is science and what is the role in the world of those cultivating it were of particular interest in Poland. They were repeatedly asked during the period of Enlightenment. At that time Marcin Świątkowski was the author of the first in Poland, and perhaps also in Europe, treatise on science which foreshadowed the branch which we call today the science of sciences. *Prodromus Polonus Seu Tractatus de dignitate et utilitate scientiarum* — Berolini et Vratislaviae 1765. The problem of learning and of those cultivating it used to be taken up also by Staszic and Kołłątaj, Jan and Jędrzej Śniadecki. It would emerge in the activities of the Warsaw Society of the Friends of Science. Many times the philosophers and scientists of the positivistic period would return to these questions. Also in the prewar period they were thoroughly discussed at the Science Circle, acting at the Mianowski Foundation. The thick volumes of the “Nauka Polska” (Polish Science) are filled with numerous articles on this subject which was later

called by Stanisław Ossowski the "science of sciences". The articles in question have still remained a topical and significant component of the contemporary science of sciences, a branch to the development of which Poland has been contributing since the first postwar years.

A reflection on science becomes increasingly necessary in People's Poland where the planning of science has been in progress. This purposeful interference into the development of science is not only important but also difficult. It is essential in it to select priority problems and organize research into an integrated process.

Surely Poland has something to say on those matters. Especially as regards the integration of sciences. This problem has long been topical with us as it has to do with the country's social and ideological transformations. Let us recall in this connection the thoughts of the distinguished economist, Oskar Lange.

"In the socialist society — he wrote — science and technology are subordinated to the humanistic aims of transforming social relationships and social awareness, and at the same time they provide the material-technical basis indispensable for the achievement of those humanistic aims. It is also an outdated method to combine mathematical education with the scientific one, and philosophical education with solely the arts. These days when mathematics and technology inspire new philosophical problems, when technology has far-reaching social consequences, when the intellectual categories of cybernetics are growingly applied to technology and to guiding social processes — the unity of science becomes glaringly obvious".

Considerations on the nature of learning were in Poland not only of philosophical significance. They also would become the starting point for a moral reflection on the responsibility of men of science. This reflection guided tendencies in the development of science by directing them towards social humanistic values.

Polish men of science, while serving wholeheartedly the nation and truth, were bound to society with numerous links and were thereby qualified to speak about their duty to mankind and the nation. They were always faithful to the words of Fricius Modrevius that all matters which may upset a just co-existence in society should be judged before "the tribunal of reason". They also remembered the words of Hugo Kołłątaj that "human mind has achieved two major things: it has come to know despotism and has now set about humiliating it too". Neither did they forget Stanisław Staszic's thought that "learning leads to the understanding of the real nature of relationships between the system of violence and superstition."

Fryderyk Skarbek, a distinguished economist in the early 19th century, wrote about science: "It is not afraid of attacks from the obscurants' hordes, nor of the machinations of ignorants, nor of the iron hands of despots. Stronger than any power subjecting nations and abolishing empires, it is steadily growing in importance and authority and is doing it amid struggles and human passions, amid disturbances and the falls of states and nations."

It was along these lines that the alliance of science with the elements of progress, with revolutionary movements of masses, at the turn of the

century, reflected this tendency, and did so especially in the works of L. Krzywicki, E. Abramowski, and St. Brzozowski making considerable contribution to our knowledge of society and culture and especially to the development of the Marxian thought.

Also representatives of the exact sciences participated in these tendencies. The distinguished physicist, Marian Smoluchowski, stated: "The exact sciences, acknowledging only the laws of nature and man's own reason, have always been an antidote against a blind believe in authority, against the slavish servility of mind."

After the Second World War the awareness of the scientists' moral responsibility manifested itself with increased strength. While it was stimulated throughout the world by the tragedy of Hiroshima and the danger of atomic annihilation, Polish scientists had already before experienced the consequences of the Nazi programme of the world's destruction. When, in accordance with this programme, attempts were made to liquidate entire nations and when human values were being trampled upon, Polish science worked clandestinely for the future of the nation and inspired the hope for the world's regeneration.

It is understandable therefore that it was precisely Polish scientists who at their 2nd Congress addressed an Appeal to the community of scientists the world over to direct learning in a responsible and thoughtful way and use it in the fight for peace and justice.

"It is the dictate of both reason and heart — it was said in the Appeal — that the scientists of all countries should initiate a sincere and fruitful dialogue on the role and tasks of science in the contemporary world... We, Polish scientists, continuing the progressive traditions of our science, remembering the historical vicissitudes and experiences of the Polish nation, aware of the achievements won in the formation of a socialist society, feel morally entitled to address today from Warsaw, the capital city of Poland which was the first to heroically oppose fascism and its threat to the world and which sustained particularly cruel sacrifices in this struggle, an Appeal to the scientists the world over: [...] let us develop between the states of various social systems an international scientific co-operation while recognizing the sovereignty and rights of every nation to peaceful development and respecting its creative achievements, cultural authenticity, tradition and individual characteristics;

[...] let us influence the public opinion and the decisions of governments so as to make researches satisfy material needs of every man and that they may enhance spiritual values and the beauty of human life..."