Science development on both sides of the Iron curtain

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*The Iron curtain's division of Europe into two different worlds was also reflected in the development of the natural sciences. To achieve political domination in the period of the Cold War, investing in natural sciences was crucial because they were key for a country to become more prominent. This paper takes a look at how did Western and Eastern world differ in science development, how was science affected by the politics and restriction of knowledge circulation, what are some of the great discoveries made during that time and, in the end, how can those years of armless battle can still be identified in the scientific statuses of the European countries today.*

INTRODUCTION

 After the Second World War, the world is in a completely new situation. Countries are recovering from the Great War and each of them is trying to achieve stability in a different way. While old alliances are breaking and new ones are forming, no one actually knows what are true afterthoughts behind those new relationships, what will the relations between countries be and how will it affect the world's image. Europe was mostly affected by these dynamic changes in international relations because it has always been a place where different cultures, mentalities, social systems and, in the end, political ideologies collided. As a consequence of two great world wars (but also and many international conflicts before the 1914.) a new form of conflict is coming to rise. Among many definitions of Cold War, I would like to cite only a few:

„ ...state of intensive political, economical and technological competition that is still under the lower limit of military conflict between the states“ (Evan Laurd)

„ ...endeavour of two superpowers to find a new system of relations in Europe and define their new relations“ (A.W. de Porte)

„ ...state of relations between states or state systems in which there is always present politics of mutual hostility without application of military means “ (Paul Seabury)

The key thing to be aware of is that the tension between countries (primarily USA and USSR) was so great that it didn't allow them to solve any kind of problems.

DIFFERENCES IN POLITICAL STRATEGIES

 Both countries of Eastern and Western Bloc were in a really bad economical and political situation when the Second World War ended. Political strategies of countries from both sides of the Iron curtain caused countries to differ greatly because they were built on opposite foundations.

 Western Bloc was consisted of USA and countries of the Western Europe. USA was the only country of the Western Bloc that had the ability to help countries of the Western Bloc in achieving a stable economy. USA also wanted to repress socialistic influence of the countries of the Eastern Bloc (primarily USSR) in Europe and to firm their own influence. Their efforts resulted in the creation of the Marshall plan which was a plan for suppression of communism in Europe. It was created with both political and economical goals and it affected the division of Europe.

 Eastern Bloc was consisted of the USSR and the countries of the Eastern Europe where communist (or communist oriented) parties were leading. Communists concentrated on preventing any possible conflict that could shake the „stability“ of USSR. Also they were constantly trying to firm their influence in communist-oriented countries and were helping actions of communist parties in countries of the in Eastern Bloc, but also and those out of the Eastern Bloc. Of course, they were achieving their power and domination by total repression of any ideas that weren't in accordance with their, communist, ideas.

ROLE OF SCIENCE

 The role of science in this armless battle was crucial because investing in (primarily) natural sciences was a way for a country to become preeminent. That is why countries of both blocs (but mostly USA and USSR, because they were most powerful) hired the best scientists to work at the projects that were of the country's interest. Development and progress of science was a priority for both of them and they invested in it and stimulated it's growth. That resulted in something that we today call „big science“ which is a term for all the changes that happened in the history of science and scientific research during the period of Cold War. In this period great discoveries were made in the fields of physics, astronomy and biology. It is important to understand that during that time science consisted of large scale projects funded by national governments and international agencies. This meant that only projects and investigations that were of country's interest were funded and they were meant to make a country seem stronger, fearless and more dominant. However, because of it, freedom in science didn't exist in the way it does today and scientists were supposed to investigate what they were told to, otherwise they wouldn't be funded. This may sound very repressing, but the truth is both USA and USSR had this kind of policy.

 Most of the investments were intended for the projects that were important for the competition between USA and USSR in development of nuclear weapons and the space race. Those projects demanded a lot of investigations in fields of chemistry, physics and astronomy. But also, they demanded good and obedient scientists whose mindset was in accordance with the state's policy. That is why not everyone was able to be a scientist. It didn't really matter how good scientist someone is if he didn't want to work for his country's interest. Also, since a lot of projects were kept secret, only a few scientists new what is the goal of their investigations – most of them would just come to their laboratory and do their job regularly, not even knowing what was the purpose of their work.

 During the time of Cold War science actually suffered because free investigations weren't possible in a great extent and therefore some of the great, intelligent minds weren't allowed to work at the scientific investigations they would, possibly, master. Cold War scientists ceasednto be independent researchers, but became members of highly hierarchical organizations. In those organizations, only few confidential collaborators were allowed to know the whole idea of those large projects. Since those projects were very expensive only governments and big international agencies were able to afford them.

SCIENCE ON THE WEST

 First of all, we have to remember that USA was in a better financial situation after the War and they had good plans on how to recover their economy. Therefore they could invest in scientific researches with far less risk than USSR could. USA had two main goals – keeping their country safe and achieving better and easier life. Dr. Vannevar Bush said: „A nation which depends upon others for its new basic scientific knowledge will be slow in its industrial progress and weak in its competitive position in world trade, regardless of its mechanical skill“ Obviously, USA lived by that because, although their main goal was achieving technological, industrial and military domination, they had a different approach than USSR. They knew that investing in basic research at the universities was important because that was a way to educate new young scientists and help them improve themselves and their scientific disciplines by new ideas, researches and, eventually, discoveries. International exchanges between scientists from USA and, mostly, Western European scientists, continued during the Cold War as well as conferences, symposia, meetings and scientific cooperation. This may lead us to the conclusion that scientific researchers in USA had freedom and independence of politics. Unfortunately, this is not the case. For example, let's look at the case of a famous physicist, Robert Oppenheimer who worked on the Manhattan project. He is often called „father of the atomic bomb“. After the detonation of the first atomic bomb, when he realised how destructive his invention is, he said: „Now I am become Death, the destroyer of the worlds“ He refused to work at further projects of this kind and became a professor at the University of Berkeley. He was under strict surveillance because he was accused of having friendship with communists and, as a result, was forbidden to access state documents and was ejected from his position of political influence.

SCIENCE ON THE EAST

 In the East, situation was quite different. People lived in fear of everyone, even their own neighbours and family. Communist party supervised everything and freedom was scarce in every aspect. That made life of scientists hard also because they were constantly watched over and controlled. However, being a scientist at that time in the USSR was pretty good because they were leading figures of every organization supported by the communist party and became members of the highest state elite. It is interesting how even some members of ministries tried to transverse into scientific fields, not because of their skills and intellectual abilities, but because they found it suitable. Of course, they wouldn't do it if being a scientist at that time in USSR wasn't an amiable job. Scientists would get all kinds of benefits – housing, food, goods, salary bonuses (which were impressive benefits when we recall that almost half of the country lays in ruins and the population is starving). In fact, those attempts of state bureaucrats to migrate into science mostly happened because of a sharp increase in salaries.

 Soviet science was completely dependent on state funding and that led to development of very close relationship between scientists and the party. However, this close relationship was mostly built on personal contacts between leading scientists and party-state leaders. Scientists sought advantages for themselves and for their projects and they had to compete with each other for the government funding. That also meant that scientific development became very sensitive to the inner-party struggles, misunderstandings and intrigues. Scientific disciplines differed greatly in their importance for the party (and the country), number of institutions, number of representatives within the Soviet academies, strength of their international contacts... These differences are reason why some of the disciplines were much stronger at that time, and still are today.

THE NOBEL PRIZE PARADOX

 Nobel prize is given to the scientists for „outstanding contributions for mankind“ in physics, chemistry, medicine, literature, peace and economy. Obviously, a scientist will be awarded with the Nobel prize only if he truly deserves it. However, if we only look at the Nobel prize laureates for physics in the period 1945-1989, we come to a very interesting fact. Out of 44 awards, 36 were given to the scientists of the West (primarily USA). Furthermore, out of these 36 awards, 18 were accomplished by the scientists who immigrated to USA. This shows us two very important things. First, freedom scientists had in the USA and countries of the Western Europe resulted in great discoveries. Second, because of the immigration from the Eastern Europe, West was richer for a lot intelligent minds.

SCIENCE OVER THE WALL

 Conflict between East and West was very intense, of course, on the thinnest boundary between the two blocs – the Berlin wall and the Iron Curtain itself. It doesn't surprise that scientists immigrated from the East to USA and countries of the Western Europe. There are numerous stories on how living behind the Wall was „personally stressful and professionally frustrating“[[1]](#footnote-2) because scientists that weren't working for the state had outdated equipment and lacked basic research supplies. Also, if a East German scientist wanted to get his paper published in a West German scientific journal, it would require that he had some connections with West German scientists. However, that kind of connections were rarely possible. Letters from East German scientists to American or West European scientist had to be mediated through the Bureau of International Relationships and often they weren't sent. Also, young students were tracked by Stasi. If they were very good at some scientific discipline and the Stasi recognized that they would give them two options – either to work for the party or not to work as a scientist at all. These are only few examples on how science was repressed and, not only science and research, but lives were repressed and not lived fully and freely.

IMPORTANT DISCOVERIES

 Since the role of science was so important during the Cold War, all those investments didn't pass without great discoveries. In fact, some of the greatest discoveries ever were made in this period. In the beginning, let's look at the discovery made by Enrico Fermi in 1942. He demonstrated first nuclear chain reaction. Although this discovery didn't happen in the Cold war, it directed the development of science to nuclear weapon development. That is one of the main reasons why physics was (and still is!) leading scientific discipline. Another great discovery was made in 1947. by William Shockley's team which invented transistor, a device that amplifies and switches electronic signals. Their discovery was important for the development of electronics and computing science. In 1953. follows a great discovery in molecular biology by James Watson and Francis Crick (of which neither one was a biologist!) – discovery of the molecular structure of DNA. It was very important because they revealed what was the molecular basis of life. Ten years later, plate tectonics were discovered by Frederick John Vine and  Drummond Hoyle Matthews and it explained why are earthquakes and volcano eruptions happening and enabled geophysicists to predict where could they happen. Only a year later, in 1964. Murray Gell-Mann and George Zweig independently proposed a theory of quantum model which says that subatomic particles (protons and neutrons) are consisted of quarks. Few years later, their theory was accepted when those particles were found (thanks to new accelerators and laboratory equipment). Very interesting discovery in astronomy was made by Jocelyn Bell Burnell and Antony Hewish who discovered pulsars in 1967. Pulsars (short for pulsating radio star) are stars that emit electromagnetic radiation that can be observed only when the beam of emission is pointing towards the Earth. This property enables astronomers to use them as space (or even time) measurement. In 1975. Cesar Milstain discovered monoclonal antibodies which was very significant for medicine. Monoclonal antibodies are molecules that are specific for only specific virus or bacteria and it enabled scientists to target them more effectively when they attack human organism. Finally, in 1983. two separate groups led by Luc Montagnier and Robert Gallo isolated HIV and recognized it as the cause of AIDS. Scientists are today still struggling to find a way how to cure this disease completely.

EFFECT ON TODAY'S SCIENCE

 It is logical that those years of „armless battle“ had big influence on the scientific statuses of countries today. Since USA and Western Countries invested in a lot of various scientific disciplines it is inevitable that they developed their science more than USSR and Eastern countries. Best indicator of a scientific status of a country is number of published scientific papers and their citation (if a scientific paper is valuable it will be useful to other scientists and, as a result, be cited). If we compare USA and Russia we can see that USA had 11 times more publications in 2013. than Russia. However, difference is citation is much smaller, USA has only 2 times more cited publications than Russia. In Europe, countries of the Western Europe follow the USA trend and countries of the Eastern Europe follow the Russian trend in number of publications. It is obviously because of all the connections that scientists of the Western Europe managed to create during this period of Cold War and after it, they could just continue of collaborating and improving their science. However, countries of the Eastern Europe are still recovering from the communist regime and that is also felt in science because creating connections with other countries (primarily countries of the West) is still hard. Mostly developed scientific disciplines in USA today are those more oriented towards human benefit – medicine, biochemistry, pharmacy, social sciences. However, in USSR, physics, astronomy, material sciences, mathematics and engineering are still leading in number of investigations and publications.

CONCLUSION

 In the end, I think this overview gave many answers, but also opened a lot of new questions. We can conclude that the period of Cold war brought great changes in everyday life, but in the science also. Science developed from small investigations by independent scientists into large-scale projects of country's priority. Some of the greatest and most significant discoveries were made in this period – from discovering disease causes to revealing the secrets of the universe, from discovering subatomic particles to revealing secrets of Earth's structure. All those great investments in science resulted with a great technological progress and a higher health standard. However, it taught us a lot about secrets that this world keeps unrevealed, secrets that only science can reveal. Differences between western and eastern science are still felt today in the scientific statuses of the countries. The great question now is how will science develop in the future and what will be its role in forming the world's image.

LITERATURE

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