Migration of Scientists in the History of Science in Totalitarian Societies

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Introduction

Throughout this century totalitarian regimes were the most important sources of migration of scientists among industrially developed nations. Three major European countries experienced totalitarian regimes : the Soviet Union, Fascist Italy and Nazi Germany. All three lost scientists in response to a variety of policies adopted by these regimes. Reverse migration was very limited, mostly consisting of a few Soviet-bound Western scientists with a strong commitment to the Communist cause. They rarely lasted beyond the 1930s, either returning to their native lands or falling prey to the Great Terror.

One would expect any government, and a fortiori a government devoted to strengthening the State and to mobilizing the society, to oppose or prevent emigration. Scientists'strategic value had been amply demonstrated in the course of World War I. However, all three of the governments ended up causing emigration, willingly or not. While showing varying degrees of commitment to scientific growth, the leaders of the three countries all shared a strong belief in technological progress.

Soviet Exodus in Stages

The Soviet government was, perhaps, the most committed to science. Positivist sources of Marxism, the adulation of science as the ultimate means of human cognition, the very couching of their societal project in scientistic terms account for this unprecedented commitment.

This made the Communists begin to pay close attention to the welfare of science and to that of scientists from the very first months of the regime. Science was an exclusive domain of the Soviet State. In this sense science appeared to be no different from industry, foreign and internal trade, literature or ballet, all of which came to belong exclusively to the State. Science was, perhaps, distinct from most of these other spheres of human endeavour in that Russia's science had always been a state activity.

The Russian State literally imported Western science from Europe in the early XVIIIth century and has remained its exclusive patron ever since. The State considered science above all as a resource and a symbol. It would enhance Russia's military standing. Moreover, the cultivation of science made a persuasive claim on behalf of Russia that she belonged to " the civilized Europe ". Indeed, Russia's military might, its role in world affairs, its embrace of Christianity, and the presence of a Europeanized cultural stratum - which includes scientific elites - creates the impression that Russia is a modern society, imbued with Western mentality and a commitment to certain basic values. In reality, the bulk of Russia's population remained only partly

affected by occasional bouts of modernization since these would invariably befall Russia from the top, i.e. from its political and intellectual elites operating under varying degrees of government control. Gorbachev's perestroika was initiated and administered from the top, albeit infinitely more gently than Peter's modernization or Stalin's industrialization.

The fate of Russia's science can be compared to that of science in many a Third world country. In both, modern science was introduced in total disregard and, occasionally, in opposition to, autochtonous cultures and modes of cognition. Modern science was an exclusive, intolerant and arrogant culture. The intellectual dominion of the Scientific Method in society, not only in science, was a *sine qua non* condition of the transfer of science to non-Western cultures.

Science is an activity historically linked to Western capitalism and liberal values. The language of the original chapter of the Royal Society of London offers a good example of this link. It is not clear, however, how vital is this link for the development of science. Science suffered a peculiar fate in Russia's collective psyche. Its assimilation by society has been hotly debated ever since Peter the Great imported and imposed science on his domain. Attitudes to science often served a reliable litmus test to tell a " Slavophile ", proponent of a specifically Russian national course of development, from a " Westernizer ", an enthusiastic believer in the transfer of Western cultural, political and economic models.

Yet, it remains to be proven that scientific sophistication and political oppression are indeed incompatible. In 1933 Germany turned totalitarian all the while retaining its frighteningly high level of technological efficiency. In the USSR backwardness and inefficiency palliated rather than accounted for Stalin's terror. Alexander Hertzen, a nineteenth-century Russian dissident *litterateur*, feared that technological progress would bring about a " Genghis Khan with the telegraph ". Indeed, as the 20th century draws to a close it is increasingly difficult to believe in the ennobling qualities of science and technology. However, when totalitarian regimes made their appearance on the historical scene science was perceived as an incontestable sign of not only material, but also of spiritual progress.

It is in this context that the Soviet government faced a massive exodus of Russia's educated population in the course of the Civil War of 1918-1922. Scientists, whose fate was of concern to the new government, took part in the emigration. The atmosphere that characterized the first years after the Bolshevik takeover was thus characterized by a would-be emigre scientist. The years 1919-20 were a period of a growing - from week to week, from month to month - sentiment of moral mortal oppression, unbearable for a normal human, which is even hard to define except for the term " moral asphyxation ". The same author, medical researcher Manukhin, further explains reasons for the emigration :

"Everything is done with lies, in a misleading, hostile, angry way, in a completely, integrally illegal manner. Innumerable decrees fall upon the citizen, but there is no law, and its mere principle is absent. It is little wonder that Russians flee to the borders : to Finland, to the Ukraine, to Poland, to Belorussia. One wanted to live in whatever fashion : in poverty, in misery, as a vagabond, as a stranger but not under the obligation to live against one conscience".

Emigre scientists soon organize in academic associations in various countries. Cohesiveness of emigre scientists was particularly strong in the 1920s, before Stalin's consolidation of power would put an end to most hopes of return to Mother Russia. The first congress of academic associations of " Russian Abroad " is held in 1921. Berlin, formerly a major recognized centre of world science, also became a major centre of emigre Russian science in the 1920s. It is noteworthy that the first foreign scientific mission of the Soviet government was also attached to the Soviet Embassy in Berlin in 1922. Close political links between the two ostracized countries, Soviet Russia and Weimar Germany, facilitated such links. Prague and Belgrade were other important centres of scientific and scholarly activities for Russian emigres. Most considered their emigration temporary, which fostered cohesiveness and solidarity. A two-volume

bibliography of scientific publications by Russians abroad serves as a reminder of the magnitude of this phenomenon.

In the course of Soviet history thousands of Soviet scientists came to work in the West and never returned to the USSR. Several waves of emigration can be identified. The first one, in the years 1918-20, consisted of those who rejected the new Soviet regime and decided to leave Soviet Russia either to fight it from outside or just to wait till the regime would collapse. The first wave included scientists among the educated classes who found Communism unacceptable.

The second wave, in 1922-23, consisted exclusively of intellectuals and was caused by Lenin's decision to exile prominent scholars and scientists who had not overtly embraced the new regime. After the publication of an article " About the meaning of militant materialism ", Lenin instructed the Department of Justice to formulate a legal framework for substituting capital punishment with exile abroad, and for punishing unauthorized return to Russia with death. Arrests and interrogations ensued, with elite, most renowned scholars promptly exiled abroad, while less known, and understandably more numerous, intellectuals exiled to distant provinces of Russia. It is noteworthy that the intellectuals exiled abroad had to pay their own way, a precedent that may have inspired the architects of the " Final solution " in Nazi-dominated Europe to make Jews who were being deported purchase their own rail tickets for the final trip to Poland " for resettlement ". The second wave consisted of scholars and, to a lesser degree, of scientists and engineers. The ambivalence of the regime was well demonstrated in cases when a scientist slotted for exile would be found to be " the only specialist in his field ". High-level intervention on the part of leaders of industrial ministries might reverse or delay a deportation order in the cases of scientists or engineers.

Among the exiles was Pitirim Sorokin, future mentor of Robert Merton, sociologist of science, at Harvard. Sorokin said, prior to his exile, in a speech to students :

"The task of resurrecting Russia falls on your shoulders, it is a task infinitely hard and difficult... The first that you should take along is knowledge, pure science that is obligatory for everyone... But do not take surrogates of science, pseudoknowledge and confusions counterfeited so well to look like real science, be they " bourgeois " or " proletarian ", that a host of falsifiers are offering you in abundance".

Merton would formulate the famous four principles of scientific ethos, one of which stresses the universality of scientific pursuit. Thus, the second wave contributed to strengthening the scientific ethos which, though disdained by the Soviet regime, would remain a beacon for a good part of Soviet scientists throughout the years.

Trotsky, at that time a prominent leader of the new regime, justified the deportations as " preventive humanism ". While acknowledging that the exiles were " politically insignificant ", Trotsky branded them as " potential weapons in the hands of our possible enemies " who would be executed in the case of a war. " This is why we preferred to exile them now, in a quiet period, beforehand ". While Trotsky's arguments strike as rather far-fetched, he actually did act as prophet *malgré lui*. There is little doubt that most of the deportees would have indeed perished in the purges in the 1930s.

A few prominent scientists left the Soviet Union in the early 1930s. The Soviet government tried to convince them in 1936-37 to return to the Soviet Union - in vain. It was quite clear that a return to the Soviet Union meant certain lengthy imprisonment and often death.

Some of the emigres of the 1930s became prominent leaders of their respective fields in the new country. They joined earlier emigres some of whom, like I. I. Sikorsky or V. K. Zworykin, had attained fame as talented engineers and inventors, associated with helicopters and television, respectively. George Gamow became known for his work on atomic nuclei and the properties of elementary particles. Another Russian scientist, Vladimir Ipatieff, an eminent chemist who arrived in the United States at the age of 62, brought with him unique expertise in catalytic organic

chemistry which he successfully introduced into American petroleum industry. During his two decades in the United States Ipatieff authored scores of scientific papers and industrial patents, and trained dozens of specialists in catalytic petroleum chemistry. Several decades later, Soviet chemists concerned about the decline of the science of chemical catalysis in their country would seek Ipatieff's American disciples in the framework of Soviet-American scientific exchanges.

In the period of 1923-73 there were no waves of emigration of scientists even though prominent scientists escaped during a trip abroad. The third wave began in the early 1970s, and consisting primarily of Jews, it lasted intermittently until emigration was liberalized and dedramatized in the early 1990s. Some emigres had achieved prominence as *refuseniks*, i.e. applicants for emigration who were refused an exit visa and who had to endure years of persecution of various degrees. Given the relatively high proportion of scientists and engineers among Soviet Jews, this mass emigration resulted in resettlement of thousands of Soviet-trained specialists in Israel, the United States and a few other countries.

The third wave of emigration failed to include or produce scientists of such stature since it was a flow controlled by Soviet authorities mindful of their own strategic interest. The issue of emigration of scientists had been a taboo till very recently but it acquired a politically correct aura with the disappearance of Communism. A book and several articles were published in the late 1980s and early 1990s which, for the first time in Russian historiography of science, undertook an analysis of the phenomenon of Russian scientific emigration in his century.

In the last years of the Soviet Union, scientists of diverse ethnic provenance reacted to the shrinking science budgets and the novel freedom to travel and went to do research in many countries of the world. There was a wide-spread fear of a massive loss of scientific talent in Russia in the early 1990s. Throughout the history of Soviet science, the regime failed to use scientists in an efficient manner, with the exception of military projects. Emigration was therefore hardly an impediment to the country's scientific growth. In the 1930-70s the state came to rely on an abundant supply of young scientists. In the late 1980s, the country's science began to contract, and the outflow of personnel from science was directed primarily towards other pursuits within the Soviet Union, rather than to other countries. Some of the emigres adopted the so-called " pendulum pattern of migration ", splitting the year between Russia and a foreign country. Moreover, the collapse of the Soviet Union enabled scientists who had left on the third wave to reestablish contacts with their former colleagues and engage them in collaborative research projects. In this sense, the Soviet case of scientific emigration had a happier ending than emigration from Nazi Germany and Fascist Italy.

German Emigration: a Violent Rupture

The first government formed by the National Socialist Workers'Party of Germany lost little time to tackle its main ideological and racial enemies. Within a few months of the victorious election of 1933, most Jewish scientists were forced to resign their positions at the country's universities and research institutes. The following year, even First World War veterans were included in the purge. This prompted a massive emigration of German scientists, mostly Jewish but also those who had Jewish spouses. A few scientists who held strong anti-Nazi beliefs joined the growing wave of emigration. Several countries would benefit from this massive transfer of scientific talent : Britain, France, Holland, Palestine, Turkey, and, last but least, the United States. In some of these countries, such as Palestime (later Israel) and Turkey, German Jewish scientists built up local scientific infrastruture *ex nihilo* and had a lasting effect of the respective scientific institutions. As late as the 1980s, some would call the University of

Ankara or the Hebrew University in Jerusalem as " the last German universities in the world ". Indeed, universities in both Germanies had undergone profound changes under Western and Soviet influences while these " colonial " relics remained true to the tradition of the founders.

Holland, Germany and other Continental countries derived a passing benefit from the inflow of German emigre scientists. Most emigres look for more permanent abode in England and North America, and with the approaching of World War Two a second exodus began from the Continent. The impact of German emigre scientists on American and, to a lesser degree, British science has been amply documented. The most significant effect was no doubt the acceleration of the transfer of the world centre of science from Germany to the United States. This phenomenon had begun in the wake of World War One when German science came to be boycotted for several years by most Western scientists. The advent of National Socialism and the ensuing emigration of a large number of world-renowned scientists cast a *coup de grace* to the central position of German science. Since the 1940s the centre has been firmly implanted in the United States. It is undeniable that the emigration of scientists from Germany was a clear gain for the host countries. But how much of a loss was it for German science ?

Approximately 40 % of all university instructors inherited from the Weimar Republic were dismissed under the racial laws. Another estimate suggests that about half of all scientists and highly qualified technicians left the Reich by 1938. Early responses from apolitical scientists made it clear that the emigration had destroyed entire fields of inquiry and debilitated many more. However, in the euphoria of Hitler's first years in power these were deemed " legitimate " losses. Moreover, replacement of Jewish scientists opened up fast-track promotions for hundreds of scientists who thus came to appreciate the practical benefits of the new regimes's racial ideology. It was only with the beginning of the war that Hitler and his allies realized the gravity of the situation. But little was done to remedy the shortage of qualified manpower. In this respect, Hitler did not imitiate Stalin, who organized imprisoned scientists and engineers into sharagas, where intensive R & D work, particularly in the defense sector, was conducted in the 1930s and 40s. Moreover, while Stalin practically stopped all emigration in the course of his Great Terror, Hitler encouraged it through a combination of policies of exclusion and relatively liberal exit rules. Apparently, Hitler never shared Stalin's famous belief that " the cadre decide everything ".

Nuclear research is one field universally recognized as that of significant loss for Germany. Indeed, while opinions vary as to the real devotion of remaining German scientists to build the bomb, it is clear that the emigration deprived German science of its major potential in the field. The closely related field of theoretical physics, mathematics, various branches of industrial technology lost significant figures who not only did major professional work in exile but, more importantly, had occupied key innovation positions at such science-intensive and defense-related industries as Siemens, AEG and Krupp. The loss was acknowledged by experts on both sides of the divide in World War Two, Goering and Churchill.

After the end of the Nazi regime, relatively few German scientists returned home. Quite a few had reached positions of prominence in their adoptive countries where they had often worked for over a decade. Many harboured resentment against their " Aryan " colleagues who had stayed in Germany and continued their work. In the polarized atmosphere of the post-war years, those who stayed behind were often considered collaborators of the regime, and there was little inclination on the part of the emigres to risk their overseas careers in exchange for the dubious pleasure of joining in the re-building of German science. While some positions became vacant due to de-Nazification, emigres were seldom candidates to fill them. The rupture of German science became irreversible.

Italian Emigration: A Valiant Few

Italian Fascism up to 1938 was characterized by policies of rather inclusive societal mobilization. Jews took an active part, on a par with the rest of the population, in the institutions of Mussolini's Italy. By the time Mussolini assumed power, Italy was no longer an important centre of science. At the same time, there were pronounced differences among scientific disciplines, e.g. mathematics was better developed than physics. However, the Mussolini government stimulated important work in theoretical physics by opening new university chairs in Rome and Florence and providing state support for research.

This growth was brought to a halt by the " Manifesto in the Defense of the Race ", as was the official title of Italy's racial laws promulgated by Mussolini on July 14, 1938. Five physicists who had played crucial roles in the brief resurgence of physics in Italy emigrated. Three, Bruno Rossi, Emilio Segre and Giulio Racah, had lost their positions and civil rights. Enrico Fermi, married to a Jew, followed suit. Finally, Franco Rasetti " did not want to live in such an uncivilized country ". The feelings provoked by the Manifesto among scientists were best described by Primo Levi, a chemist who did not emigrate, was deported to Auschwitz, and became a world-renowned author after the war.

The pattern of motivations for emigration was quite similar to that observed in Germany and Soviet Russia. Dozens of younger scientists also emigrated, including Bruno Pontecorvo who, along side Fermi, would play an important role in the history of the atomic bomb, a project beyond the means of Italy whatever the political regime. Most of these emigres would restore professional links with their native scientific community but they would return for vacations or after retirement. The loss for Italy's physics was irreversible. Similar losses were sustained in mathematics.

Like in Germany a few years earlier, the emigration opened new avenues for professional advancement in the sciences. Some of the remaining scientists not only passively benefited from the effects of the Manifesto. They went as far as to have their Jewish colleagues excluded from international scientific institutions still domiciled in Germany. While German scientists could not, or would not, tell a Christian Italian from a Jewish one, their Italian colleagues obliged by written denunciation.

The return of Jewish academics, who had hidden in Italy or survived the German camps, to Italian universities was not made easy. Their old positions had already been occupied by their Christian colleagues. The vast majority of the latter were not active Fascists. They were, rather, fellow travelers, to use the term applied to the majority of German scientists in Nazi Germany. They had no reason to vacate their new positions which occasionally created tension. But, most importantly, Italy was poor, devastated by war and hardly attractive to scientists who had emigrated and continued their scientific careers in the incomparably more prosperous United States. While the period of their emigration was not as long as for their German or Soviet emigre colleagues, all three groups would be reluctant to return en masse to an impoverished, dejected periphery of science which they saw in their native lands.

Conclusions

The three cases of emigration of scientists have very different time spans. The Soviet emigration developed in three discrete stages : 1918-20, 1922-23, and 1970-91. It comprised thousands of scientists and was, by all counts, the most massive migration from any totalitarian

regime in this century. Germany's totalitarian experience is much shorter, and even within this shorter period, emigration of scientists occurred in the course of three or four years. Italy lost its scientists in much smaller numbers and during a much shorter period, practically within one year, summer 1938 to summer 1939.

Scientific comportment of the emigres also differed. Russians of the first and the second waves considered their exile a temporary punishment. They built up a cohesive international community which functioned for several decades, overlapping with the general scientific community, and thus preventing provincialization. Ethnically and religiously linked with Russia as the centre of their identity, these scientists preserved a distinctive collective identity which could no longer be found among the emigres of the 1970s and 80s.

Scientific emigres of the Brezhnev, or stagnation, period were mostly Jewish who saw their emigration as an act of redemption rather than punishment. They made no effort to preserve a distinctive collective identity. Rather, they tried to merge with the host scientific communities and make the best of it. They came to use international languages of publication rather than Russian since no Soviet journal would touch submissions from an emigre with a barge pole. Whatever the causes, in this sense, the behaviour of the third wave of Soviet emigres is comparable to that of the German and Italian emigres. The latter were also mostly Jewish, and they would have experienced similar problems had they chosen to publish in their native tongues, which also meant their native lands.

Several national sciences benefited from the outlflow of scientists from totalitarian countries. Unlike other cases of migrations of scientists, emigration from Nazi Germany, Fascist Italy and the Soviet Union brought to life strong movements of solidarity on the part of scientists in the host countries, primarily Britain, the United States and, in a different sense, Israel. Reception of the refugees was not always smooth. Tensions invariably developed in host institutions whose operations, processes of promotion and reward were disrupted by the inflow of foreign scientists. However, the sentiment of solidarity among scientists, often relying on sympathetic policies of the host governments, resulted in professional positions for the vast majority of the emigres. Turkey and Israel gained significantly in both qualitative and quantitative terms : their scientific communities were largely built up by German refugees and, several decades later, were strengthened by the inflow of Soviet scientists, mostly from the Soviet republics of Central Asia into Turkey, and from the whole of USSR into Israel. The United States and Britain gained mostly in qualitative terms as entire scientific fields were transplanted from Nazi-occupied Europe. The role of German emigres in the nuclear arms projects is an outstanding case of such impact. Soviet emigres of the 1970s reinforced several fields, such as mathematics, and greatly improved the quality of scientific training on various levels. Thus, emigration from totalitarian countries brought immediate and long-term benefits to the host countries.

The loss sustained by the scientific communities left behind varied widely. The massive outflow of scientific talent from post-revolutionary Russia was just another factor of disruption that Russia's science suffered in the wake of the revolutions. Their absence would not be felt until the first Five-year plan which ushered massive investment in science. However, in the intervening decade a new cadre of scientists were trained, and new centres of excellence, such as Kharkov in physics, were put on the map. It is also questionable whether the emigration beginning in the 1970s constituted a loss for Soviet science.

The fact that many young emigres developed splendid scientific careers in the host countries does not automatically mean that they would have developed them in their native lands. At the same time, senior scientists who had attained an international status and visibility were usually prevented from emigrating by Soviet authorities. Moreover, by the time this wave of emigration was under way investment in Soviet science had begun to peak. Soviet leaders had come to lose the traditional belief in science as the omnipotent saviour of Soviet economy. Thus, the gain to Israel and the United States from thousands of Soviet emigre scientists was not neces-

sarily commensurate with the loss sustained by the Soviet Union. Migrations of scientists rarely constitute a zero-sum game.

The losses to Germany and Italy appear more pronounced. The emigration deprived Germany of a broad status of senior and advanced scientists. While the Soviets controlled the outflow of scientific talent, neither Germany's Nazi leaders nor Italy's Fascist government would impede the exodus of scientists. Consequently, entire fields of science were left if not deserted, at least decapitated. Thus emigration contributed to the loss by Germany of its central position in world science, and deprived Italy of a few pockets of excellence that the Fascists had themselves tried to develop.