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# Genetic geographies. A historical comparison of agrarian modernization and eugenic thought in Germany, the Soviet Union, and the United States

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## Abstract

The article deals with the role of genetics in the state-led agricultural modernization efforts that took place in different industrialized countries during the course of the 1920s and 1930s. A comparison between Germany, the Soviet Union and the United States shows substantial similarities in their attempts to increase the productivity of agriculture on different geographical scales. Following advances in scientific knowledge about the geography of cultivated plants, these countries sent out numerous expeditions to collect plant breeding material from all over the world. At the same time, states tightened their grip on farmers' and breeders' activities inside the country by establishing legal rules for the use of plant varieties and seed. But this was only one side of a larger "genetic modernization" project. In all three countries, concepts of agricultural modernization were substantially linked to social-darwinist thought which embraced programs of eugenics and "racial hygiene". These links are outlined for each of the cases, highlighting the widely differing intermingling of scientific concepts and terminologies with political ideologies. It is then discussed what role geography and in particular geopolitical thinking of the time were to play in the development of "genetic modernization", and more specifically, with regard to the nexus between agriculture and eugenics. While the discipline's involvement in both fields remained comparably marginal in practical terms, clearly there were conceptual contributions toward the development of the broader field. Going back to Ratzel's and Kjellén's work, it is argued that geography had an important role in the establishment of a political field in which ideas of managing human reproduction were fused with concepts of economic development and environmental determinism.

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## 1. Introduction

Thinking about genetic geographies and the role of the state today, we are most likely drawn to the development of the new biotechnologies, to the manifold initiatives to regulate the use of genetically modified food and organisms, and to the political conflicts about the utilization of biological diversity in national and international fora. In many respects, these highly contested issues seem to reset the parameters of classical politics in a Westphalian world, giving rise to a new set of "life politics" in which states have growing trouble in coping with transboundary bio-hazards, with identity-centered agendas of indigenous peoples and "consumer

eugenics" (Rose, 1998; Bryant, 2000; Flitner and Heins, 2002). In a Foucauldian perspective, it has been argued that we are heading towards a new "genetic governmentality" in which the "genetification" of social relations is increasingly achieved by technologies of the self (Lemke, 2000).

In the following article, I will try to shed light on a much earlier phase of genetics-related conflicts in the 20th century, which geographers have so far taken little note of.<sup>1</sup> I maintain that we are witnessing a first phase

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of “genetic modernization” in large parts of the industrialized world in the 1920s and 1930s. This modernization was a deeply geographical and political venture, amalgamating scientific and political concepts of difference across spaces and species. Similar to today’s dynamics, scientific progress was a strong factor in this venture. In contrast, however, it was largely the nation states that drove the development. “Genetification”, then, was basically a strategy of power, a disciplining by classical forms of state intervention.

During this time the states aimed primarily at increasing the productivity of agriculture by creating a new material base for plant breeding and by establishing rules for the use of seed. Yet the scientific and political conflicts arising from these policies can only be fully understood if we also look at the contemporaneous debates on eugenics and “race hygiene”. As the political scientist Rob Watts (1994, p. 319) wrote, “without hyperbole we can see the first half of the century as ‘the age of eugenics’”. Ideological links between agrarian and eugenic ideas and programs emerged not only in Nazi Germany—where they developed in the most horrifying manner—but also in a number of other countries, among them the leaders in the science of genetics, the United States and the Soviet Union. Concepts of a geographical distribution of differences that were (and still are) of interest for plant-breeding purposes merged with ideas about human heredity that were imbued with notions of racial hierarchy and genetic betterment. What the inventor of the term “geopolitics”, Rudolf Kjellén (1917, p. 95), once termed “physiopolitics”—the politics of the people’s body (*volkskörper*)—was conceptually linked to schemes for acquiring natural resources as an input into agrarian production.

To analyse these connections, the article will proceed in six steps. Following a brief introduction to the topic (2), the developments in Germany, the Soviet Union and the United States will be outlined in turn, considering a time span from the mid-1920s to the beginning of the Second World War (3–5). The analysis will focus on how the state got involved in agrigenetic modernization by sending out expeditions to acquire plant genetic material, by fostering plant-breeding research and by establishing rules for the use and re-use of agricultural seed. Furthermore, it is briefly described for each of the cases how the eugenics debate evolved during that period, and how it related to concepts of agrarian modernization. In the following section (6), I summarize and compare the developments in the three countries, highlighting the differences and common features of the case studies.

The last part (7) is devoted to the relationship of these developments to geopolitical thinking of the time and to the formulation of some open research questions with regard to this relationship for the German case.

## 2. Resources and regulations

The introduction of useful plants for all kinds of purposes has a long-standing history in many countries and places, most notably the “Columbian exchange” between Europe and the Americas with its major implications for the settlers as well as the indigenous populations (Crosby, 1972). In the US, presidents George Washington and Thomas Jefferson were among the early supporters of a systematic introduction of useful foreign plants, but it took until the end of the 19th century for an Office of Foreign Seed and Plant Introduction to be formally established (Juma, 1989, p. 64). In Russia, the Bureau of Applied Botany fulfilled similar functions from 1894 onwards, and many other European countries established comparable institutions at that time, mostly focussing on their colonial economies (Brockway, 1988).

In the first third of the 20th century, however, a fundamental change in the practices of plant collection and introduction occurred, a change that was largely driven by scientific achievements. Firstly, the re-discovery of Mendel’s rules made specific traits in organisms technically available to breeders, theoretically speaking at least. Secondly, the Russian botanist, plant geographer and leader of the Bureau of Applied Botany, Nicolai I. Vavilov (1887–1943), published his path-breaking work on the “centers of origin of cultivated plants” (1926) which could henceforth be used as a global roadmap to track down those geographical areas where plant hunters would most likely find interesting materials for breeding purposes. The usefulness of such a roadmap of diversity was readily apprehended by geneticists and plant breeders. From the late 1920s onwards, many countries intensified their support for expeditions aiming at the acquisition of what Vavilov at the time called “plant resources”.

During the same period, many states also intervened at the other end of the agricultural input chain. In different ways they began to regulate the use of seed by consumers, i.e. farmers, by implementing certification schemes, by regulating the marketing of seeds, and in some cases by creating incentives or establishing trade regulations (Kloppenborg, 1988; Flitner, 1995). Thus there emerged a new kind of biopolitical connection between states and seeds, in which a pivotal resource of agricultural production was reformulated in technical and political terms, a new material basis for plant breeding was created, and the distribution of the final products derived therefrom was regulated. In a regulationist perspective, Pistorius and van Wijk (1999) have characterized this phase as the beginnings of a “second agro-food order”, a second phase of industrialization in food and agriculture reaching well beyond the Green Revolution of the 1960s (see also Fowler, 1994).

This state-led reordering of the seed sphere coincided with a proliferation of eugenic ideas and programs.



Fig. 1. Poster of the London Eugenics Society, around 1930 (reproduced with the kind permission of the Galton Institute).

Similar to plant breeding efforts, these programs were now being strongly inspired by genetic concepts, unleashing fantasies of technical feasibility and suggesting scientific validity of the largely social-darwinist body of thought that had been thriving in Western minds for several decades. In many industrialized countries, discursive links developed between eugenic thought and agrarian modernization, however different in their dynamics and political effect (cf. Fig. 1). Some of these links, as we will see later, also had firm roots in geographical thought. In discussing their significance for each of the countries in the following sections, however, the rather complex disciplinary, professional and institutional developments in the eugenics debate can only be touched upon briefly. I will focus largely on their direct relation to concepts of agrarian modernization, returning later to question how these developments can be related to geopolitical thought.

### 3. Germany: Hardy plants and “varietal cleansing”

A number of plant collecting missions were carried out from the late 1920s onwards, mostly led by scientists of the Kaiser-Wilhelm-Institute for Breeding Research in Müncheberg near Berlin under its first director, Erwin Baur. Expeditions to Turkey (1926/28), Spain (1928) and South America (1930/31) provided basic collections of varieties of cereals and potatoes. After the Nazis came to power in 1933, these activities gained additional

support with the emphasis to remedy the so-called fat and protein gaps in German agriculture by introducing new plants, or promising new varieties of species that were already under cultivation. Geographers Carl Troll and Rudolf Schottenloher traveled to Ethiopia (1933/34, 1937/38), the German Research Society (DFG) financed a huge expedition to Afghanistan, India and Iran (“German Hindukush expedition”, 1935) and the SS supported Ernst Schäfer’s expedition to Tibet (1938/39) in search of hardy cereals. German plant geographers and plant breeders had closely followed the development of Vavilov’s “centers of origin of cultivated plants” and clearly used it as a master plan in identifying these regions for plant collecting (see Fig. 2). The several thousands of seed samples collected on these trips were seen as the core of a “world collection of cultivated plants”, and several factions of the well-supported agricultural research community were soon to compete for their control (Flitner, 1995, ch. 2).

While plant collecting and breeding were intensified and systematized, seed production and distribution in Germany came under harsh control. With the new seed law passed in 1934, a large operation of “varietal cleansing” (*Sortenbereinigung*) was begun, in which the breeders were pushed and, if need be, were forced to give up their “less valuable” varieties. This move was justified by referring to the need to protect farmers from “hereditary diseased seed” and facilitating their choices in an allegedly chaotic market. In fact it was part of a “rigorous state interventionism” (Corni and Gies, 1997, p. 145) in the food system that had already been established with a range of measures, including forced cartels and regulated cereal prices, destined to build a food economy ready for war.

This legal operation generated two results. First, the number of varieties available on the German market was drastically reduced. In wheat, for example, the use of 438 out of 454 varieties was forbidden. In sum, this “purification work” (Mitteilungen, 1937, p. 146) swept away over 90% of existing varieties from the market. At the same time, the 1934 seed legislation also regulated all kinds of seed trade, limiting it to breeders and certified multipliers and thereby creating the basis for a planned economy in that sector. In an indirect manner, this established a protection for original breeders very similar to the intellectual property protection as discussed in several European countries and the US in the late 1920s.

It is well known that agriculture generally played an important role in Nazi ideology, where the “blood and soil” rhetorics underpinned expansionist plans for German settlements in an enlarged Eastern *lebensraum*. In that context, plant breeders were busily looking for protein-rich fodder plants and a “sand wheat” that should grow under poorer conditions in the East. Ideas of selection, “counter-selection” and degeneration could be applied to plants, animals and humans alike. As Peter

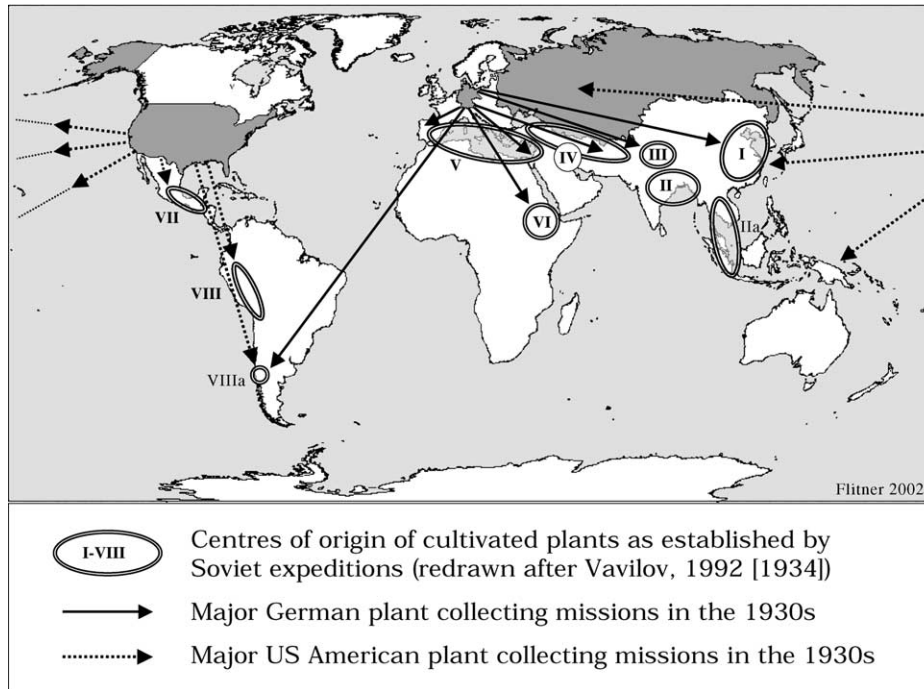


Fig. 2. Plant exploration on Vavilov's trail.

Weingart (1999, p. 172) suggested, an “anti-individualist, ‘gene-pool’ orientation” formed the common ground of eugenic thought and national socialism, creating a quasi-scientific legitimacy for Nazi political projects. The convergence of the “scientific objects”, plants and humans, even merged in the aims of several expeditions. During their travels to Tibet and the Hindukush mentioned above, some of the scientists would complement the search for hardy, “primordial” plants with a search for “remnants of Aryan peoples” in the region, measuring human skulls and determining eye colors alongside collecting seeds (Flitner, 1995, p. 78).

To be sure, the overwhelming part of eugenic thought and practice in Germany found its professional and disciplinary context in the medical and psychological communities (Proctor, 1988; Weingart et al., 1988; Kaufmann, 1998). This holds particularly true for its most horrifying parts, the roughly 400,000 forced sterilizations and the “euthanasia” program (Bock, 1986). But plant genetics and eugenics formed part of an all-encompassing biologicistic program in which both parts could only profit from mutual references, whatever their scientific accuracy. The enormous state-sponsored research efforts in agriculture during the 1930s were clearly profiting from the broader political ideology. In 1934 already, a Bavarian Cabinet Minister had ascertained that national socialism was nothing but “applied biology” (Proctor, 1988, p. 64). The geopolitical visions of the Nazis were intimately linked to biopolitical visions in a larger sense, to “demopolitics” and “ethnopolitics” in Kjellén’s words on the one hand, and to an

applied geography of cultivated plants and plant genetics on the other.

#### 4. Soviet union: “Genogeography” and “Genofund”

The Soviet Union was the world leader in plant collecting during the 1920s and 1930s. N.I. Vavilov and his aids traveled around the globe on more than 40 expeditions, with an additional 140 trips covering the vast territory of the Soviet Union. Large missions were carried out in Iran (1914), Afghanistan (1924), in North, Central and South America (1921, 1930, 1932/3), in China, Taiwan, Japan and Korea (1929) and around the Mediterranean Sea (1926/7) (Vavilov, 1997). It was on a collecting mission to Ukraine that Vavilov, fallen in disgrace, was arrested in August 1940 (Adams, 1978).

As the primary material result of these collecting activities, the Leningrad-based All-Union Institute for Plant Industry (VIR, according to its Russian initials) had amassed a collection of more than 250,000 samples of cultivated plants and their wild relatives at the end of the 1930s, among them 36,000 strains of wheat and 18,000 varieties of vegetables that were tested and developed further in a large net of agricultural experiment stations throughout the country. At that point in time this was by far the largest collection in any place in the world—and after the German attack on the Soviet Union, different factions of German agricultural research tried to get hold of it backed by SS and Wehrmacht troops (Deichmann, 1992; Flitner, 1995). Apart

from just collecting interesting materials, Soviet breeding research had pioneered work on several industrial plants that seemed relevant for German autarky plans, in particular rubber plants suited to the European climatic conditions such as *Kok sagis* (*Taraxacum bicornis*) that would later be bred at the Auschwitz concentration camp's plant breeding station in Rajsko (Zieba, 1966; Heim, 2001).

In the context of the forced collectivization of agriculture, seed was a crucial factor. Farmers unwilling to join the *kolkhozes* were often denied access to seeds, and seed reserves for the coming sowing periods were simply included in the often unrealistic quota of grain proliferation, sharpening the politically induced hunger crisis of the early 1930s (Davies, 1980, p. 238f; Fitzpatrick, 1994, pp. 69–76). Meanwhile, a strict planned economy was established to bring seed production in line with mechanization and large-scale monoculture cropping. Detailed sowing plans were developed that regulated the crops and even the varieties down to the smallest planning units, the *raions*, and single farms. Thousands of state seed farms were to provide “improved seed” to the farmers which they did with growing success throughout the 1930s. Vavilov, from 1929 to 1935 president of the Lenin Academy for the agricultural sciences (VASKhNIL), fully supported this state-directed modernization effort. To raise productivity, he urged in 1931 that the “systematic control by the State over the change of strains” had to replace the “spontaneous processes that were relied upon in the past” (Vavilov, 1992, p. 243). One single newly introduced variety of maize, he lauded, was now grown on 1.5 million hectares, and in a few years “all the seed material in the Soviet Union will be standardized” (*ibid.*).

Yet in the following years great pressure to deliver quick quantitative improvements combined with an intense ideological turmoil around the scientific foundations of genetics. Vavilov who was a key representative of classical “Mendelian” genetics ran into growing trouble proving the usefulness of his collections as a founding pillar of “soviet plant industry”. Infamous neo-Lamarckian leader Trofim Lysenko (1898–1976) had considerable success with his “vernalization” approach—a temperature method to change the germinating ability of plants which he believed to be useful also in “educating” plant varieties (Joravsky, 1970). While this development led to the marginalization of classical geneticists, it did not put the principles of a state-led seed sector into question.

In the given context it seems less important to reiterate the scientific “errors” of the Lysenko school than to have a closer look at what role the overlappings between plant, animal and human genetic research played in the quarrel about genetics. To situate the conflicts in agrarian research it is helpful to recapitulate briefly the complex developments of the eugenics debate in the

Soviet Union. During the 1920s, Soviet eugenics was a well developed field with its own journals, institutions and respected scholars. Yet the movement was highly heterogeneous with regard to professional background, research programs and political positions (Adams, 1990; Graham, 1987). Apart from the leading geneticists and zoologists Iuri Filipchenko and Nikolai Koltsov, there were a number of neo-Lamarckian protagonists and also “bolshevist eugenicists” like Aleksandr Serebrovsky (1892–1948), an influential classical geneticist who advocated far-reaching positive eugenics. In 1929, Serebrovsky proposed to organize selection in humans by “widespread induction of conception by means of artificial insemination using recommended sperm, and not at all necessarily from a ‘beloved spouse’” (quoted in Adams, 1979, p. 265). The “zootechnique” that the famous livestock breeder Ilia Ivanov had successfully developed for artificial insemination in animals was to be complemented by an “anthropotechnique” that should basically work along the same lines (Adams, 1979, p. 183f).

It was precisely in this context that Serebrovsky coined the two important terms “genofund” (gene fund) and “genogeography” (gene geography), drawing on concepts he developed in his research on domesticated animals, where he pursued very similar questions as Vavilov did with regard to plants. While the “genofund” was to denote what was later termed the gene pool, i.e. the sum of all genetic material of one species, “genogeography” meant the distribution of this material in space and the practices of tracking it down and describing it. Applying these concepts to the human species, Serebrovsky argued that the “genofund” of the Soviet people had to be seen as a “national wealth” on which the betterment of society heavily depended. Thus the idea of a common gene pool of a species unevenly distributed in space was precariously infused with eugenic connotations in the very creation of its terminology. Between 1927 and 1931, the term “genofund” was used by Serebrovsky and his co-workers as well as by Vavilov, and the term “genogeography” was eagerly taken up by leading Russian population geneticists (Adams, 1979, p. 259f).

But with the Soviet “cultural revolution” at the beginning of the 1930s, biologicistic and social technocratic concepts were sharply attacked by the Bolsheviks. Eugenic concepts in general were branded bourgeois if not fascist, and Serebrovsky's plans were termed “Menshevizing idealism”. The heterogeneous Soviet eugenics movement came to a complete standstill and its major proponents changed topics or lost their jobs, at least temporarily. Parts of the research work were taken up again later under the new title of “medical genetics”. But this work had to be devoid of the slightest links to racist Nazi biology and Serebrovsky's “bolshevist eugenics”. In the following years, classical genetics was pushed

back by the Lysenko group and with the fourth VASKhNIL Congress in 1936 the equation of genetics, eugenics and fascism was firmly established in public discourse (Adams, 1990). A Stalinist cleansing of the biological sciences saw hundreds of scientists killed or deported, among them Vavilov, the former winner of the Lenin prize and president of the USSR Geographical Society.

It is noteworthy that in the decisive debates over the validity and role of genetics in agriculture, the problematic connotation of the terms *genogeography* and *genofund* surfaced once again. In an attack on Vavilov's work in 1939, earlier statements he had made about the links between plant and human development figured prominently. In his response he carefully tried to step back from his older position that Europeans had a "more harmonious combination" of genes thanks to a loss of primitive dominant traits, just like cultivated plants had often lost their darker colour in the process of domestication (Vavilov, 1992, p. 142, 139, 419). It thus seems that the conflict about the role of agricultural genetics in the Stalinist modernization of agriculture can be more fully comprehended once we take the conflicts about human genetics and eugenics into account. Historians have hitherto portrayed the struggle between Lysenko and Vavilov about the right methods in agricultural research largely as a fight between Neo-Lamarckism and classical genetics, between "pseudoscience" and proper research methodologies, exacerbated by the ubiquitous power politics under Stalin's reign (Joravsky, 1970; Graham, 1987). The attacks on Serebrovsky and Vavilov however suggest that, on a deeper level, the political thrust of this conflict was created, at least partially, in the field of eugenics and "medical genetics". The practical geography of genetic distribution of Vavilov's expeditions had obvious terminological links with that field.

##### 5. United States: "of maize and men"

In the US, just like in the Soviet Union and Germany, plant collecting trips were high on the agenda in the 1920s and 1930s. More than 50 expeditions were sent out by the Department of Agriculture (USDA), with a growing number being truly mission-oriented collections aimed at but a few species or even specific characteristics of plants. Expeditions were sent to New Guinea to collect wild relatives of sugar cane (1928), to Russia to look for rust-resistant wheat strains (1929/30), to Mexico, Peru, Bolivia and Chile (1930–32) to search for fungus-resistant potato varieties, and to eastern Asia where two USDA researchers collected over 4000 soybean varieties that were to have a decisive impact on the US soybean industry (Ryerson, 1934; Kloppenburg, 1988).

In the mid 1930s, plant breeding was still largely a public activity, with three quarters of the wheat varieties coming from public research. As was stated in the USDA *Yearbook of Agriculture* of 1936 which was entirely devoted to breeding and genetics, plant breeding took so long and was so dependent on basic research that it "obviously becomes a function of governmental institutions capable of devoting the necessary money and time to the work and doing it with a sufficiently disinterested attitude" (quoted in Kloppenburg, 1988, p. 90).

The regulation of the seed industry was also under way in the late 1920s, but it was largely confined to (voluntary) seed certification under a number of state laws (Fowler, 1994, p. 82). With the *Plant Patent Act* of 1930, private breeders succeeded for the first time in establishing an intellectual property right for plants, but only for vegetatively propagated ones like many ornamentals and fruit trees, excluding tuber-propagating plants like potatoes. At this time, the Great Depression had already begun and seed sales had fallen to record lows, bringing private breeders into deep economic trouble.

An intense phase of state intervention came shortly thereafter with F.D. Roosevelt's *New Deal* policies starting in 1933 (Kirkendall, 1975; Perkins, 1969). The passing of the *Agricultural Adjustment Act* in May of the same year allowed for the regulation of prices through production reduction agreements for important agricultural bulk products like cotton, wheat, corn, tobacco, and milk. The aim of the subsidies was to stabilize prices for agricultural products in relation to industrial goods to contain the severe agricultural crisis that—in sharp contrast to the Soviet Union—was in the main a crisis of overproduction. With the *Bankhead-Jones Act* two years later, substantial funds were earmarked for agricultural research which led to a number of large projects in animal and plant breeding.

Theda Skocpol and Kenneth Finegold have underlined that the partial success of these measures heavily depended on a pre-existing, strong agricultural administration. The USDA and its affiliated institutions formed an "island of strength in an ocean of weakness" (Skocpol and Finegold, 1982, p. 271) and they had the political support of a number of influential farmers' organizations, in particular the *American Farm Bureau Federation*. Even though the latter was a rather conservative grouping (Howe, 1986), farmers organizations and other agricultural interest groups in the US altogether had an entirely different political background than in Germany where the *junkers* formed a reactionary stronghold (Puhle, 1986, p. 620f).

It was the Secretary of Agriculture, Henry A. Wallace (1888–1965), a former plant breeder and founder of the Hi-Bred Corn Company, who assured that private agribusiness would not be neglected (cf. Kloppenburg,

1988, p. 105). Maize breeding had its biggest successes in the 1930s, in particular with the development of the first economically successful hybrid varieties, in what Kloppenburg has described as the “Manhattan project” of agricultural research (ibid.). The *Bankhead-Jones Act* specifically furthered “research into basic laws” including genetic research, knowing how quickly this could lead to results relevant for practice.

Looking into the discursive context of these developments in agriculture, we again find plentiful references to eugenic thought current at the time (cf. Kevles, 1985; Paul, 1995). The *Journal of Heredity*, official organ of the American Genetics Association, is an exemplary source for this connection. It consists of a breath-taking and sometimes curious mix of papers on plant and animal breeding research on the one hand, and population issues, twin research and “race problems” on the other. Orator F. Cook, one of the most prolific writers of the journal, member of its editorial board and employee at the USDA’s *Bureau of Plant Industry*, wrote about plant geography in Peru, about economic problems of American farmers, about the dangers of race mixing and the necessity of a “rural eugenics” for the US, anxiously arguing that “the race must be immunized against urbanism” (Cook, 1935, p. 204; see also Cook, 1925, 1928). Jack H. Kempton, also with the USDA and a learned corn breeder, dealt with the origin of cultivated plants and with eugenic measures to improve the American human stock. Plant breeding in maize, he wrote, could serve as a good model for eugenics, the maize plant thus becoming “a sort of beneficent Frankenstein” (Kempton, 1926, p. 51). Meanwhile, the “human stocks” sections at state agricultural fairs featured “Fitter Families” contests throughout the country (Squiers, 2001, p. 10).

These discourses bear substantial similarities to those of German scientists, and some authors have underlined the close links between German and North American supporters of eugenics (Kühl, 1994; Weingart et al., 1988). It is important to note, however, that in the US academia there was also a current of harsh criticism of eugenics, in particular regarding theories of Nordic superiority. Anthropologists and social scientists clearly led this critique but there were also some well-respected geneticists joining in such as Thomas Morgan and Raymond Pearl (cf. Tucker, 1994; Weingart et al., 1988).

During the course of the 1930s, the eugenics movement in the US lost most of its momentum and was largely transformed into more moderate “reform eugenics”. State-led eugenic measures, and in particular forced sterilization measures that were common practice in states like California since the days of immigration restriction, lost popularity partly due to a growing opposition against the racist and antisemitic Nazi politics (Haller, 1963, p. 179–183; Hansen and King, 2001). While the general political mood turned against con-

cepts of Nordic supremacy and made it difficult for the eugenics movement to succeed with new programs, the number of forced sterilizations in the US kept growing until the second half of the 1930s (Weindling, 1999, p. 189). And it has been argued that the internment of Japanese Americans during the Second World War was also heavily influenced by a “eugenically informed geopolitical discourse” (Tyner, 1998, p. 252).

To sum up, we can conclude that the development of eugenics in the US was largely determined by political factors, like in the other countries. The general concept of genetic betterment was accepted by many leading scientists indiscriminately for plants, animals and humans. Like in the German case, cross-cutting concepts of agricultural modernization and eugenic improvement did develop, but the debate had much less political drive and slowed down during the 1930s. The eugenic movement had its main success with the debates on immigration restriction in the early 1920s. Agrarian modernization as it was formulated during the *New Deal* did not offer similar opportunities and, from the mid 1930s onward, the developments in Germany narrowed the space for forceful political alliances that could have pushed eugenic programs.

## 6. Three different genetic geographies: a brief summary

The social and political starting points of agrarian modernization in the three countries were just as diverse as their scientific-technical development. More importantly, deep political changes took place during the time in question in all three countries, making simple comparisons doubtful in political as well as in methodological terms. It looks as if we do not see just one singular German *sonderweg*, but rather three very distinct and complex ways how science-based concepts of agrarian modernization were implemented, how eugenic ideas and programs that bore surprising resemblance through the 1920s developed in different directions, and how these two lines related to each other in each of the cases.

In all three countries, genetically based plant breeding efforts were a central pillar of agrarian modernization. States became heavily involved in these activities, initiating and supporting the systematic acquisition of plants from all over the globe and investing in related research programs. In a complementary move, they started regulating the production and distribution of seeds, in the Soviet Union and Germany in a very prescriptive manner with rigid plans and prohibitions. In the United States, the regulations remained limited to a federal framework for voluntary certification and the property rights as embedded in the plant patent legislation. The interventions of the *Agricultural Adjustment Act* were largely confined to the prices of agricultural produce

and in any case they did not concern the varietal choices of single farmers.

In all three countries leading experts in plant breeding and genetics openly showed considerable sympathies for eugenic thought at least until around 1930. In Germany, and to a lesser extent also in the United States and the Soviet Union, this led to a discursive link between the improvement of agricultural organisms and the selection of superior humans, or groups of humans that were defined in racial or social terms. This link was stabilized by many international connections in the debate, especially between Germany and the United States (Kühl, 1994). The political convictions of the participating scientists seem to have played a subordinate role in this: communists like Serebrovsky and the American geneticist H. J. Muller had visions very similar to those of conservatives and reactionaries like O. F. Cook and E. Baur. And even Nazi technocrats could positively refer to the common notions of human selection and genetic betterment with regard to their plans for the Eastern *lebensraum* (cf. Schleiermacher, 1993).

Yet it was only in Germany and the Soviet Union that the theoretical and methodological nexus between human genetics and a genetically informed, applied geography of plants on the one hand, and eugenics as a political movement on the other hand, gained dramatic momentum. It could be maintained, admittedly simplifying, that the Bolsheviks cut back genetics, including their stronghold in plant genetic geography, for politically comprehensible reasons to finally crush it with all brutality in the larger context of Stalinist “cleansing”. The Nazis, on the other hand, generously supported all kinds of genetic research with criminal aims in mind. Such a polar perspective highlights at the same time the fact that the scientific validity of eugenic and human genetic programs is not an adequate yardstick with regard to the legitimacy of the connected political aims. Today’s struggles over human genetic diagnostics and germ line therapy are a topical case in point: now that most scientists agree on the theoretical foundations of genetic testing and the technical feasibility of selecting certain traits in so-called pre-embryos seems given, social consensus on the acceptable modalities and necessary conditions for the promotion or elimination of these traits seems farther away than some decades ago (Duster, 1990; Nelkin and Tancredi, 1994).

The “gene-pool orientation” that created an ideological affinity between national socialism and eugenics was also highly explosive in the Soviet context as illustrated in the politicization of terms like “genofund” and “genogeography” (Adams, 1979). In the United States, this orientation was much weaker for obvious political and ideological reasons from the first, and with the repugnance of Nazi racist and expansionist politics growing through the 1930s, eugenic visions lost political and public support. While the national agricultural

modernization efforts in the 1930s and 1940s prepared the ground for international programs that would later be termed the Green Revolution, major proponents of “rural eugenics” transformed into advocates of population policies for the global south (e.g. Cook, 1951), or of “therapeutic eugenics” in the form of marriage counselling (Ladd-Taylor, 2001).

## 7. Concluding remarks: anthropo-geography and anthropo-technique

In discussing the collapse of communism, Zygmunt Bauman (1992, p. 178) has sketched three dimensions of the specifically modern state, arguing that “it modeled its intentions and the prerogatives it claimed after the pattern of a gardener, a medical man, or an architect.” We might as well replace the architect by the geographer as the third type, and it is worthwhile quoting at more length how Bauman characterizes the three different dimensions:

It was a *gardening* state, in so far as it usurped the right to set apart the ‘useful’ and the ‘useless’ plants, to select a final model of harmony that made some plants useful and others useless, and to propagate such plants as are useful while exterminating the useless ones. It was a *therapeutically surgical* state, in so far as it set the standard of ‘normality’ and thus drew the borderline between the acceptable and the intolerable, between health and disease... It was a *space-managing* state, in so far as it was busy landscaping the wasteland (it was the landscaping intention that cast the operating territory as wasteland), subjecting all local features to one, unifying homogenizing principle of harmony (Bauman, 1992, p. 178f, italics added).

In their historical self-reflection, geographers have tended to fully concentrate on the third aspect mentioned, the space-managing and space-making aspects of modern statehood. And indeed, with regard to the first half of the 20th century we can understand all three of the types in an entirely unmetaphorical way. States did act like farmers and gardeners in the sense of the word, and they did define new diseases and perform sterilizations like medical men. And clearly, they shaped and homogenized the landscapes on an unprecedented scale in their modernizing efforts, in the midwestern US and the Ukrainian plains, sometimes linked to violent territorial expansion as in the German case.

Yet Bauman clearly aims beyond that immediate meaning, and we would oversimplify also the role of geography in the development of these dimensions of statehood if we restrict our understanding to the literal sense. While the links between state-led reordering of

landscapes and the geopolitical body of thought are obvious on a general level, geography's relationship to the other two of Bauman's dimensions is more complicated and has been little researched so far. Brechin's work on eugenics and the US conservation movement provides us with some details about the social setting in which a eugenic consensus could emerge, but he fails to explain conceptual or theoretical connections between the two areas (Brechin, 1996). More promising is the attempt of Tyner (1998, 1999) to search for the links between the surgical and the space-managing state. The exclusion of Philippine immigrants from the US as well as the incarceration of Japanese Americans during the Second World War, he maintains, can be understood as part of a larger "geopolitics of eugenics" at work in the first half of the century which was prepared by early geopolitical thinkers such as Friedrich Ratzel and Rudolf (Tyner, 1999, p. 58). I will try to build on this approach in the following remarks, focussing more on the German developments, however.

Ratzel certainly was the most influential thinker working on a conceptual connection of the different dimensions in the German scientific community. A trained natural scientist heavily influenced by Darwinist ideas, he had translated the struggle for existence into a never-ending fight for space, for *lebensraum* (living space)—a term coined by a German biologist several decades earlier. This implied what he himself called a "bio-geographical concept" of the state which was devised as a superindividual aggregate-organism governed by iron laws of competition and selection (cf. Heffernan, 2000, p. 45; Parker, 1998, p. 16). Despite conceptual and ideological confusions, this geographical vision heavily influenced the following generation of geographers and it prepared the ground for all kinds of biopolitical thinking with regard to the linkage of space and population. Apart from colonial expansionism and economic autarky plans to feed the hungry Leviathan, there was obviously the alternative option to control and manage the human parts it was composed of, in quantitative and qualitative terms.

Some authors have emphasized that Ratzel sharply attacked the early proponents of racist, proto-eugenic thought, Arthur de Gobineau and Houston Stewart Chamberlain, for their fanatic "one-sidedness" and their "denial of the influence of geographic conditions" (Ratzel, 1904, p. 75). Their brand of racial thinking included the notion of the immutability of races that "ran directly counter to environmentalism" of the Ratzelian kind, as Mark Bassin (1987, p. 118) rightly observed. At the same time, however, Ratzel fully accepted a racially based division of labour and even insisted on the "necessity of heavy race fightings" which he thought unavoidable due to the limited availability of space (Ratzel, 1904, p. 72; Schultz, 2000, p. 72). He also urged for developing a scientifically based "applied ethnogra-

phy" (Ratzel, 1906, p. 419) to limit the "danger of race mixing for the higher race". All in all, his ideas on race were certainly not in contradiction with the ideas of later eugenicists, many of whom saw concepts of "pure" and "stable" races as outdated if not undesirable. The main point here is that he brought the ideas of managing and manipulating human reproduction into the larger system of economic development and environmental determination in the first place. The positions *inside* this field varied widely even among hardcore eugenicists twenty-five years later, as illustrated above with the Soviet case.

The geographical imagination of empires that were dynamically defined by the space-population nexus was further elaborated by Rudolf Kjellén (1917). Radicalizing the Ratzelian vision, he conceived of the state as a "life-form" and in his political system, placed "ethnopolitics" at the same top level as "geopolitics", a fact largely neglected by historians of geography (Kost, 2000). The subfields of these ethnopolitics, "demopolitics" and "physiopolitics",<sup>2</sup> no doubt bear substantial similarities to later concepts that framed the thinking of eugenicists, as they include broader state-centered perspectives on epidemiology and "hereditary health" that became relevant in many countries in the 1920s and 1930s, most notably the *volkskörper* concept.

Thus the organic-state school of geopolitics provided a range of elements that could be readily fed into the broader eugenical argument giving rise to the "geopolitically informed eugenical discourse" Tyner has described. Still, it should be noted that geographers had a very minor role to play in the narrower eugenics debate of the 1930s. A first search suggests that the term eugenics is hardly ever used in major German (or US) geographical journals. One rather obvious reason for this may be found in the growing dominance of the medical professions as eugenics turned to practice, a dominance that was particularly marked in Germany, but also developing in other countries. Accordingly, the old Ratzelian anthropo-geographic framework may have lost influence when it came to the (bio-)nature of humans. It can be argued that the rather vague geographical visions were modernized and finally replaced in what could be called a first genetic turn. Thus genetic "anthropo-technique", to take up Serebrovsky's term once more, found its professional place outside anthropo-geography.

<sup>2</sup> Kjellén changed the names and ordering of the different fields in later editions of his work, e.g., the politics of the people's body (*volkskörper*) that was first termed "physiopolitics" became "plethopolitics", whereas the slightly altered first term ("physiopolitics") was now used to denote the physical area of the empire (Kjellén, 1917, 1924). For different outlines of the overall system, see Kost (1988, p. 46) and Holdar (1994).

German academic geographers' support for the *volk*-based ethnopolitics remained substantial despite this professional incursion, and geopolitical concepts were adapted to conform to the broader ideological shift from space to race (cf. Sandner, 1994, p. 11). The loss of competence in the field of "physiopolitics" was compensated by German geographers as the planning of the eastern *lebensraum* became their major task, and large parts of the discipline readily joined in devising economic and military schemes for that purpose (cf. Kost, 1988; Rössler, 1990). Plant-related "genogeography" meanwhile took a hybrid position: as plant geography it remained an integral part of applied physical geography, as applied genetic research it also drifted toward the biological sciences.

To sum up, the social and political outcomes of the first genetic turn of the 20th century were largely supported and partially facilitated by the main lines of geopolitical thinking. The organic-state school of geopolitics was particularly well suited both to inform eugenic discourse and to incorporate elements of eugenic thought into its broader biologicistic picture. The role of geographers in practical genetic modernization was limited though, as it seems. The dividing lines to the medical and biosciences deepened in the course of professional specialization. This is true for both agrigenetic modernization and eugenic programs. At a conceptual level, German geography included "blood" and "life forms"; practically it turned toward the "living space" and the soil component of "blood and soil" (cf. Schultz, 2000).

The conceptual convergences and cleavages between geopolitical thought and the field of eugenics in the first half of the 20th century await further explanation. Was there any difference in the reception of eugenics between the different geopolitical schools? For example, was the work of the "geostrategists" Alfred Mahan and Halford Mackinder less prone to eugenic racism than that of the organic-state proponents? In any case, geopolitical visions seem to have played a catalytic role in opening and stabilizing a discursive field in which the biopolitical ambitions of modern statehood were connectable to the equally power-ridden production of national spaces.

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