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In the wake of the seizure of power by the National Socialist Party in 1933 came about one of the largest mass exoduses of intellectuals in history, as thousands of Jewish, socialist, and other oppositional academics fled Germany as refugees. With the annexation of the Sudetenland (1938) and later Bohemia and Moravia (1939) by Germany, more academics were uprooted from their homelands in the former Czechoslovakia [1]. One such individual was Dr. Rudolf Altschul (1901–1963), a German-speaking neurologist, anatomist, and later cardiologist. A brief account of Altschul's emigration and settlement to Canada provides an insightful case study for the greater migration wave, and its implications on the academic networks of the host countries of refugee neuroscientists since the 1930s. At the same time, the case of Dr. Altschul offers detailed insights into research in neuroanatomy, especially that of neuromuscular interactions, and the implications of atherosclerosis on the Central Nervous System (CNS). While Altschul has an extensive bibliography to his name before his exile, this article will focus on his career in Canada after 1939.

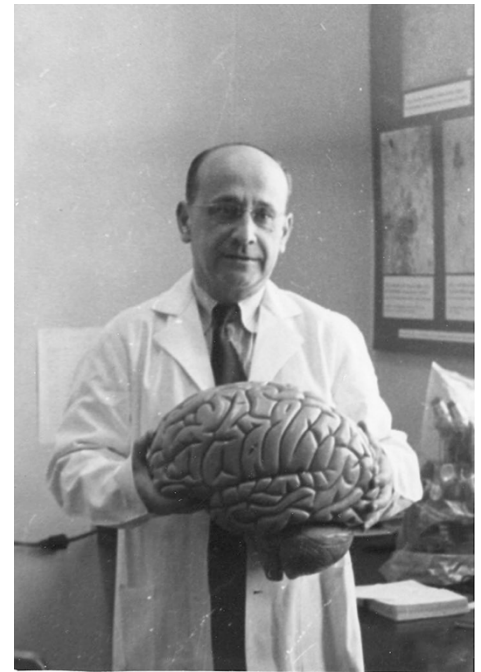
Rudolf Altschul was born in Prague on 24 February, 1901 [2]. After graduating from the German University of Prague in 1925, he worked in various medical institutions in France and Italy, including the Université de Paris and La Sapienza University of Rome [3]. He returned to Czechoslovakia in 1930 and joined the faculty of the German University of Prague until the city's annexation into Nazi Germany in March 1939. However, through this process, the infamous German "Law on the Re-Establishment of a Professional Civil Service" also came to apply for him, and he was barred from working in his professorial position at the university faculty [1]. To avoid further persecution—with recent memories of violent pogroms such as the infamous Kristallnacht of 9–10 November of the year before—, Altschul fled with his wife, Anna (née Fischer, b. 1903), first to Rome in Italy, then Paris in France [3]. In that time, he was offered a position in the Department of Anatomy by the University of Saskatchewan (U of S) in Canada, whose Faculty of Medicine was then headed by Dean W. Stewart Lindsay, from 1926 to 1952 [3]. The willingness of the young U of S in the western prairies to hire Jewish faculty is rather anomalous for a Canadian institution at the time, when academic hiring rates after the Great Depression were low and priority was given to Canadian-educated academics over refugees. It should also not be unnoticed that many—particularly eastern—universities in Canada boasted strict *numera clausa* for Jewish professors and students among their ranks. In addition, Altschul's admittance to Canada is somewhat of an outlier in terms of immigration policy. The Immigration Branch of the Department of Mines and Resources was headed by Frederick Charles Blair (1874–1959), who made outright anti-semitic pronouncements and developed firm restrictions against Jewish refugees seeking asylum in Canada [4].

However, with aid from the Jewish Immigrant Aid Society (JIAS) [3], the Altschul couple eventually settled in Saskatoon, Saskatchewan, in October 1939. Within their first years of settlement, Dr. Altschul was able to resume his work on neuroanatomy, primarily working on the neuromuscular junction, cardiovascular interactions in stroke, as well as processes of nerve degeneration. It should be emphasized that due to the sinking of their ocean liner SS *Athenia* by the German U-boat U30, Altschul—being a rescued survivor—lost all his research notes and belongings in the Atlantic; as a result, his career in Canada could be considered to truly be "from scratch" [5]. During the Second World War (1939–1945) and until circa 1948, much of his funding was provided through medical research projects for the Canadian Army and he

¹ Neuroscience Program, Hotchkiss Brain Institute, O'Brien Institute for Public Health, Cumming School of Medicine, University of Calgary, 3280 Hospital Drive N.W., Calgary, AB T2N 4Z6, Canada

² Departments of Community Health Sciences and History, Hotchkiss Brain Institute, O'Brien Institute for Public Health, Cumming School of Medicine, Faculty of Arts, University of Calgary, 3280 Hospital Drive N.W., Calgary, AB T2N 4Z6, Canada

could not relicense to pursue clinical work in medicine or neurology. His first publication from Saskatchewan was a detailed account on the growth of ventricular ependyma, distinguishing between “radial”, “circular”, and “longitudinal” growth patterns [6]. Reports to the Canadian government by Altschul indicate that through “Project Army Med 32” (regarding emergency care options and early rehabilitation) he had studied nerve and nuclear regeneration in skeletal muscle. Finding, from an applied research perspective on potentially delaying nerve degeneration after trauma, that minor denervation of skeletal muscle resulted in an intense proliferation of sub-sarcolemmal nuclei—which he termed as “nucleosis”—he proposed that this proliferation was amitotic, while the injection of colchicine (a mitosis and neutrophil inhibiting poison) failed to arrest the observed nucleosis [7]. It was also through this project that he came to visit Montreal in Quebec on multiple occasions. Between 1945 and 1947, he frequently met with the famed neurologists Wilder Penfield (1891–1976) and Herbert Jasper (1906–1999) to discuss his findings, while they suggested to broaden the approach into comparative neurochemical degeneration studies [2]. Correspondence between Altschul and his two eastern colleagues reveals an intensive exchange of ideas regarding tissue mechanics in neuropathology. Altschul would also request second opinions from them regarding brain tumours that he analyzed at his service at the U of S, which would last through most of the 1940s [2]. From this example, and by the high rate of published work at this time, it can be seen that Altschul’s career had found new productivity again, in part as a result of finding a new place within the professional network of biomedical scientists in postwar Canada.



Photograph of Rudolf Altschul (ca. 1955)—Half-length, facing forward, holding an anatomical model of a human brain. Courtesy of Images from the University of Saskatchewan Archives and Special Collections, Saskatoon, SK, Canada

However, it was not only established academics who he had worked closely with, as extensive letter correspondence existed between Altschul and fellow émigrés in America such as biochemist Erwin Schwenk (1887–1976) in Bloomfield, NJ, pathologist Hans Popper (1903–1988) at Northwestern University of Medicine in Chicago, IL, and the internist Siegfried J. Thannhauser (1885–1962) in Boston, MA, primarily from 1951 until his death in 1963. The correspondence regarded especially his new focus on atherosclerosis, to which he had shifted after more research funding on cardiovascular research became available through the Medical Research Council in Canada after WWII [2]. These instances demonstrate that émigrés such as Altschul had developed a new footing in North America, both by integrating into the academic network already existing, yet also through building new and fruitful connections with other academic refugees by the late 1950s (Fig. 1).

As Altschul’s work with the Army wound down by 1948, his research turned towards cardiology, particularly on cholesterol’s role in atherosclerosis—on which he had embarked by first analyzing stroke and cardiovascular brain pathologies—, a long-term endeavour he would pursue until his early death. In addition, Dr. Altschul was promoted from associate professor to head of the Department of Anatomy in 1955, at the same time collaborating with former Montreal neurosurgeon William Feindel (1919–2014), who had come to the U of S between 1955 and 1959 to build up its department of neurosurgery and further integrate brain research activities across campus, on multiple university committees such as the Committee of Scientific Affairs [8]. Altogether, Dr. Altschul would continue to make extensive contributions to the study of atherosclerosis, and near the end of his career, had begun effective pathophysiological research of plant estrogens and nicotinic acid on blood cholesterol levels as a means of preventing cardiovascular disease (including stroke), a promising endeavour that also earned attention in 1963 from local media and the US National Institutes of Health [9].

Altschul’s death during a mid-day’s rest from work on 4 November, 1963 was sudden, having left his research program in cholesterol regrettably incomplete. However, it would be effectively continued by his scientific protégé and succeeding head of the Department of Anatomy, Sergey Fedoroff (1925–2012), who later became a prominent researcher in the fields of animal tissue culture and the neurobiology of nervous regeneration processes [10]. Altschul’s settlement in Canada hence resulted in a diverse career spanning multiple fields, supported by a high level of integration

into the professional network of North American academia, both with native researchers and fellow émigrés as well. In addition, the relative tolerance of the U of S's administration towards Jewish refugee academics—in contrast to other Canadian institutions—provided a boost in scientific contributions and recognition for his medical faculty, as well as personal opportunities for Altschul to build a new career on an equal footing with his American peers. In summary, our case study of Dr. Altschul's adaptation to the neuroscientific community in Canada provides an instructive example of the challenges and the successes in the larger group of Germanspeaking émigrés [1], along with raising awareness for the external and social factors that fostered such fruitful research endeavours during the post-war period in North America.

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Compliance with ethical standards

Conflict of interest The corresponding author states that there is no conflict of interest.

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