OSKAR VOGT: THE FIRST MYELOARCHITECTONIC MAP OF THE HUMAN FRONTAL CORTEX

The aim of this paper is threefold: (a) to provide the translation in English of Oskar Vogt’s seminal 1910 paper describing the first myeloarchitectonic map of the human frontal cortex, introduced by a brief historical review of Cécile & Oskar Vogt’s contribution to neuroscience; (b) to provide an annotated bibliography of major works of cortical cytoarchitecture in the tradition of the Brodmann-Vogt architectonic school (Supplement 2); and (c) to provide an annotated bibliography of major works of the Russian architectonic school which was founded by Oskar Vogt (Supplement 3).

Abstract

1. Introduction

Cécile and Oskar Vogt were pioneers of modern neuroscience who opened new horizons and pointed to directions for future development and progress. Their biographies and accomplishments have been repeatedly described [1-5] and their names are probably familiar to any informed neuroscientist of today. However, only a few seem to be really familiar with their magnificent scientific opus – probably because none of their papers were ever published (or translated) in English. The purpose of this article is to start to fill this gap, by offering an English translation of the paper describing the first myeloarchitectonic map of the human frontal cortex, which Oskar Vogt published in 1910 (6). A brief biographical and historical introduction will serve to emphasize the importance of this seminal contribution to cortical architectonics.

Oskar Vogt (1870-1959) was born on April 6, 1870 in Husum (Schleswig-Holstein) and, following his graduation from the Husum gymnasium in 1888, he began his university studies at the Kiel University. In 1890, he transferred to the medical faculty of the University of Jena, where he was greatly influenced by evolutionary teachings of Ernst Haeckel as well as teachings of Otto Binswanger (the chief of the university psychiatric clinic) who firmly believed that mental disorders had an anatomical basis. Oskar Vogt graduated as a physician in 1893, and in 1894 obtained his doctorate in medicine from Jena University, to become employed for a year at Binswanger’s clinic. However, during the same year he moved to renown Burghölzi psychiatric hospital near Zürich, to study with Auguste Henri Forel (1848-1931). That collaboration turned into warm and life-long friendship. For example, Forel transferred to Vogt the editorship of the Journal of Hypnotism (Zeitschrift für Hypnotismus, which was founded by Forel and Freud), and in 1902 Vogt converted this journal into the Journal of Psychology and Neurology (Journal für Psychologie und Neurologie) which was to become not only the main vehicle for publication of research results of Vogt and his collaborators, but also one of the leading neuroscience journals in the first half of the 20th century.

After studying with Forel, Vogt went to the psychiatric and neurological clinic at the University of Leipzig, to study under Paul Flechsig (who introduced myelogenetic studies in neuroscience). However, the working relationship between Vogt and Flechsig quickly deteriorated, so that Vogt left Leipzig already in June 1895 (5).

In the Spruce Mountains (Fichtelbirge) region, there was an exclusive resort called Alexandersbad, and in the summer of 1896 Vogt accepted position there as a physician (Kurarzt). That was a very fortunate move, because there he quickly became a friend and personal physician of Friedrich Alfred Krupp and his wife Margarethe. As documented in detail by Klatzo [5], this intimate bond with Krupp family became instrumental in Vogt’s spectacular ascent to the peak of his career in brain research, as well as for saving and protecting the Vogt family at a later time from severe persecution by the Nazi regime. In addition, there was another Kurarzt at Alexandersbad – Korbinian Brodmann (1868-1918; for biography see ref. 7), who would soon become one of Vogt’s most valuable research collaborators.

Vogt departed from Alexanderbad at the beginning of 1897 and went to Paris, to continue his studies in the laboratory of Jules Déjérine. There, in the neighbouring laboratory (led by Pierre Marie) was working one of the first female medical students in Paris, Cécile Mugnier (1875-1962), who worked on her thesis concerning the myelination of cerebral hemispheres. They soon met, recognized their mutual scientific interest, fell deeply in love, and married in
March 1899. Throughout Oskar Vogt’s career, Cécile remained his best and closest research collaborator.

Oskar and Cécile Vogt moved to Berlin, started a private practice, and in 1898 (with generous assistance of Krupps) established an independent brain research laboratory which was boldly named as „Neurologische Zentralstation“ (Neurological Center). In September 1901, Korbinian Brodmann joined the team, and Max Bielschowsky followed in 1904. The group ambitiously and feverishly begun to realize their research program, which soon led to the birth of modern architectonics of the cerebral cortex. In addition, Oskar Vogt and Krupps spared no effort in trying to affiliate Vogt’s laboratory to the prestigious Friedrich-Wilhelm University of Berlin. The struggle was long and hard, but eventually successful. In 1902, Vogt’s Neurological Center became Neurobiological Laboratory (Neurobiologisches Laboratorium der Universität in Berlin), administratively attached to the Physiological Institute of the Berlin University – but still remained at Vogt’s apartment at Magdeburger Strasse [5].

In 1911, Germany decided to establish the Kaiser Wilhelm Society for Promotion of the Sciences (Kaiser Wilhelm Gesellschaft zur Förderung der Wissenschaften), and the idea of creating an independent K-W Brain Research Institute soon became one of the main topics on Kaiser Wilhelm Society’s agenda. Oskar Vogt was quick to seize the opportunity, and Krupps were once more ready to help. Thus, in March 1913, Oskar Vogt and Max Bielschowsky received the title of Professor (meaning that Vogt was officially eligible for nomination as the director of the K-W Institute). Krupps donated one million marks to the K-W Society (for the establishment of K-W Brain Research Institute) and heavily favored Vogt. On 21 March, 1914, Vogt was finally notified about the K-W Society’s decision to establish the Institute, with him as the director [5]. However, the outbreak of World War I postponed the construction of the new institute for a very long time – the new institute was finally constructed and opened in Berlin-Buch (the suburb of Berlin) in 1931, this time the most generous funding being supplied by the Rockefeller Foundation [5]. Unfortunately, the Vogts did not enjoy for long the use of their new facilities – under increasing pressure of Nazis, Vogt was forced to resign on April 1, 1937 (Hugo Spatz became the new director of the Institute). Once more, Krupps not only protected Vogts from Nazis, but helped them to move in Neustadt (Swarzwałd) and establish there a new, but smaller institute (Institut für Hirnforschung und allgemeine Biologie Neustadt/Schwarzwald). After the Oskar Vogt’s death in 1959, Adolf Hopf (for biography, see ref. 8) became the new director of the Neustadt Institute. Hopf successfully negotiated with the Heinrich Heine University of Düsseldorf, and in 1965 the Neustadt Institute became the Cécile and Oskar Vogt Brain Research Institute, GMBH, at the Düsseldorf University (C. und O. Vogt-Institut für Hirnforschung der Universität Düsseldorf in Neustadt). The transfer from Neustadt to the newly prepared facilities took place in 1971 [5]. After the retirement of Adolf Hopf, Professor Karl Zilles was appointed as the director, and the institute still thrives under his leadership.

Adolf Hopf also succeeded Oskar Vogt as the editor of the Journal für Psychologie und Neurologie, which in 1954 changed its name into the Journal für Hirnforschung, and in late 1990s changed again into the Journal of Brain Research.

2. A brief overview of major research publications of vogts

Cécile Vogt initially studied the cortical myelination in cats [9,10] and the myeloarchitectonics of the monkey thalamus [11]. As Oskar Vogt also began his research career by myelogenetic studies [12-15] this naturally led to their joint monographs on the myelination in the human infant brain [16,17]. Four major research topics were established during the first decade of their collaboration, and continued to Oskar Vogt’s death: (a) the correlation of cortical stimulation experiments in monkeys with cortical cytoarchitectonics [18-20]; (b) the study of the thalamus [11, 21]; the study of the extrapyramidal system and its pathology [22-27]; and (d) the concept of pathoclisis for explaining the selective vulnerability of certain areas within the cerebral cortex and related subcortical structures [28-32]. They also published a methodological chapter in a leading handbook of microscopic anatomy [33].

On the other hand, the development of cytoarchitectonics and myeloarchitectonics of the cerebral cortex was primarily the challenge facing Korbinian Brodmann, Oskar Vogt and their numerous students. Brodmann focused on cytoarchitectonics [see Supplement 2], while Oskar Vogt focused on myeloarchitectonics and on the general exposition and promotion of their new approach [34-36] which remained his major preoccupation throughout his long career [37-41]. In addition, Oskar Vogt was instrumental in establishing the Brain Research Institute in Moscow and from 1925 to 1930 served as its director [38]. Thus was established the important and productive Russian school of cortical architectonics (see Supplement 3).

However, all these management and promotional activities and responsibilities (in addition to numerous studies which Oskar Vogt conducted in a close collaboration with Cécile Vogt) significantly delayed the publication of his own myeloarchitectonic findings. Thus, between 1908 and 1910, Oskar Vogt briefly announced his myeloarchitectonic parcellation of the human cerebral cortex at several scientific meetings: on January 13, 1908 at the meeting of Berlin Society for Psychiatry and Neurology (Berliner Gesellschaft für Psychiatrie und Nervenkrankheiten), and in early 1910 at the Congress of French-speaking neurologists and psychiatrists (Congrès de neurólogistes et aliénistes de langue française) at Bruxelles. He also published a brief notice in French in Revue neurologique (Paris) in 1910. Finally, in 1910 he published the first myeloarchitectonic map of the human frontal cortex (translated here – see below) in his Journal für Psychologie und Neurologie [6]. A more detailed myeloarchitectonic description of the human parietal cortex followed in 1911 [42]. The most detailed exposition of his myeloarchitectonic mapping...