

Neurosciences

Constantin von Monakow (1853–1930): A pioneer in interdisciplinary brain research and a humanist

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Abstract

Constantin von Monakow (1853–1930), director of the Brain Anatomy Institute in Zurich, was a pioneer in the early history of interdisciplinary brain sciences. The elucidation of connectivity in sensory and motor pathways was richly illustrated in two landmark monographs: *Pathologie du cerveau* (1897) and *La localisation de l'encephale et la dégradation fonctionnelle par des lésions circonscrites du cortex cérébral* (1914). His special merit was to conceptualize his accumulating results. As to his term 'diaschisis': (1) neurological lesion are rarely restricted to a histologically defined neural structure; (2) any brain focus is interconnected with remote structures – thus, dependent structures are deafferented from the lesioned territory (= 'diaschisis') –; (3) dependent structures, however, gradually regain some autonomy, as reflected in partial behavioral recovery. His term 'chronogenic localization' was used for the brain's fundamental organization in time-dependent network constellations. Monakow attracted many researchers, particularly from Japan. He was an engaged member of the International Brain Commission until its dissolution during World War I. **To cite this article:** M. Wiesendanger, C. R. Biologies 329 (2006).

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Résumé

Constantin von Monakow (1853–1930) : un pionnier de la recherche interdisciplinaire du cerveau et un humaniste. Constantin von Monakow (1853–1930) fut directeur de l'Institut d'anatomie cérébrale de Zürich et, à cet égard, un pionnier des sciences interdisciplinaires du cerveau. La connectivité dans les voies sensorielles et motrices cérébrales fut élucidée et richement illustrée par l'auteur dans deux monographies qui ont marqué leur temps, *Gehirmpathologie*, en 1897, et *Die Lokalisation im Grosshirn und der Abbau der Funktion durch kortikale Herde* en 1914. Le mérite de Monakow fut d'avoir su conceptualiser les résultats qu'il accumulait. Par *diaschisis*, un des termes qu'il a souvent utilisés, il a voulu exprimer : (1) que les lésions neurologiques sont rarement limitées à une structure nerveuse histologiquement bien délimitée ; (2) que tout foyer cérébral est lié à des structures plus éloignées, qui pourront de la sorte être « désafférentées » de la zone lésée (*diaschisis*) ; (3) que ces structures regagneront progressivement une certaine autonomie, d'où une restauration comportementale, au moins partielle. Le terme de localisation chronogène fut créé pour établir une analogie entre cette organisation cérébrale et les constellations liées au temps. Monakow a attiré de nombreux chercheurs, en particulier japonais, vers son domaine. Il fut un membre très actif de la Commission internationale du cerveau, jusqu'à sa dissolution pendant la première guerre mondiale. **Pour citer cet article :** M. Wiesendanger, C. R. Biologies 329 (2006).

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1. A short overview of Constantin von Monakow's career (1853–1930)

At the age of 10, Constantin left Russia with his family. They first settled in Dresden, three years later in Zurich, where Constantin lived for most of his life. After his retirement, he wrote about his scientific life, *Vita mea*, which was edited and published 40 years after his death [1] (see also [2] and Fig. 1).

1.1. Early formative years

Already during his medical education at the University of Zurich, he established a personal contact with the professor of psychiatry at the Burghölzli Clinic, Eduard Hitzig (1838–1927), who, together with Gustav Theodor Fritsch (1838–1907), had discovered the ‘excitable cortex’ by means of low galvanic stimulations in a discrete area of the frontal cortex [3,4]. Monakow was determined to pursue a scientific career in the field of brain research. Hitzig, recognizing his talent, invited him to take over an assistant position for a limited period and granted him a small salary. This first contact with psychiatric patients was a decisive period, as he was confronted with the question of a link between behavioural and brain pathology; Monakow knew about Wilhelm Griesinger (1817–1868) who, as Professor of internal medicine in Zurich, pioneered the concept that *psychiatric diseases are brain diseases* [5]. As discussed later, Monakow was convinced of the biological foundation of psychiatry. At the end of Monakow's period at the Burghölzli, Hitzig sent him to Munich for a short visit of Bernhard von Gudden (1824–1886). Like Hitzig, Gudden had also been, for a short period, professor of psychiatry in Zurich, but he was also much interested in brain anatomy and pathology. The encounter of the student Monakow with Gudden lasted only two days, but had important consequences for Monakow's future research. Hitzig demonstrated to him how to make histological sections, including brain sections of deceased patients. The large microtome, developed by Gudden, became the gold standard in this early period of brain studies and was later intensively used by Monakow. He learned also about the mechanism of retrograde degeneration that played a crucial tool in establishing the neural connectivity of brain sys-

tems, such as the visual pathway from the retina to the cerebral cortex [6]. Monakow also took over the staining method from Gudden (carminium red) that he used all along his experimental career. These early contacts had certainly beneficial consequences for Monakow's scientific career. After having passed his final medical examination, Monakow was unable to obtain a paid assistantship and finally decided to engage as a ship doctor, travelling for one year from Hamburg to Brazil and Argentina.

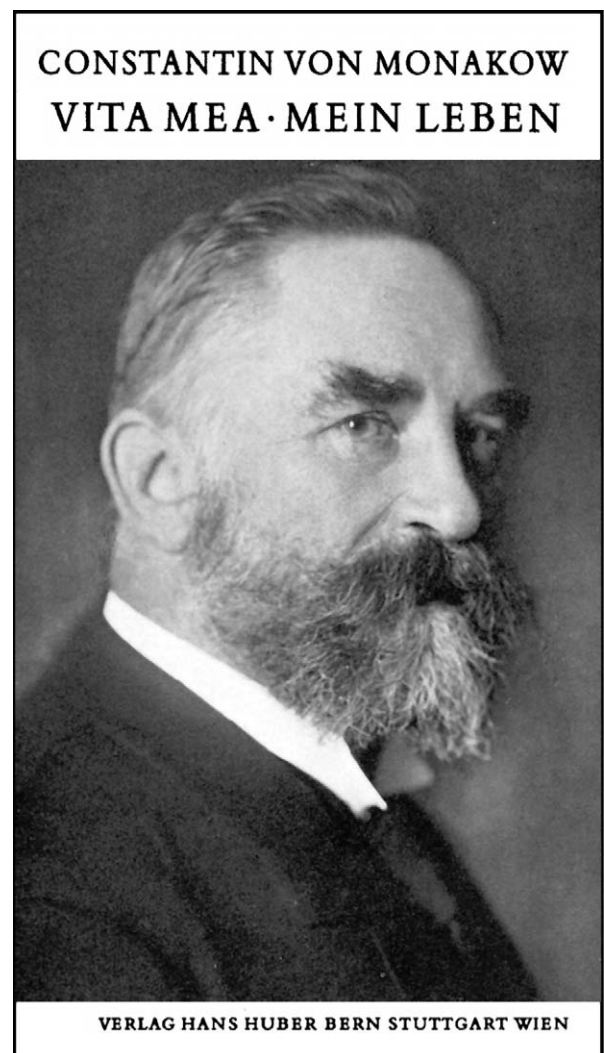


Fig. 1. Portrait of Constantin von Monakow (date not provided), published in [1].

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