



Contributions to our modern understanding of cranial nerves and brain: Friedrich Arnold (1803–1890)

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His life

The German anatomist Friedrich Arnold (Fig. 1) was born in Edenkoben in 1803 [1]. Friedrich Arnold studied medicine at the University of Heidelberg between 1821 and 1825, with elder brother Johann Wilhelm Arnold, who was 2 years older than himself [2, 3]. Arnold had received anatomy training from Friedrich Tiedemann and Vincenz Fohmann. On September 7, 1825, he became a medical doctor in Heidelberg [4]. In 1825, he was the first person to describe the otic ganglion in his doctoral thesis. In this respect, he earned a great reputation in the world of anatomy and had a position in the anatomy department of the university where he graduated [3]. A few years later, he was appointed as an associate professor here [4].

In 1826, Arnold and his brother visited the institutions of natural sciences and medicine in Paris and in the autumn that year was invited to Heidelberg as professor at the institution of anatomy that town. In 1834, he became an extraordinary professor here [2].

In 1835, he was invited to Zurich as a professor and director of anatomy institute. He worked in Zurich for 5 years [2]. Then, he worked at the University of Freiburg and University of Tübingen. After 17 years, he returned to Heidelberg in 1852 as a professor of anatomy and physiology [4].

He retired in Heidelberg, where his career began in 1873. Despite retirement, his desire for knowing was not over. His son, Julius Arnold, professor of pathology, continued to work

with his groom, Carl Gegenbaur, who became his successor. Arnold died in Heidelberg on July 5, 1890, when he was 87 years old [3].

His books

Arnold's work concentrated on the anatomy of the nervous system [2]. In these studies, he has examined the head and neck region, the brain, the cranial nerves especially the vagus nerve in great detail [1, 5, 6]. Arnold described the fiber systems, containing bundles later to be named with his name [5]. Arnold was one of the most common contributors to standard terminology in the Classical Era of neuroanatomy [7].



Fig. 1 Friedrich Arnold, which can be found at [https://en.wikipedia.org/wiki/File:Friedrich_Arnold_\(Anatom\)_\(cropped\).jpg](https://en.wikipedia.org/wiki/File:Friedrich_Arnold_(Anatom)_(cropped).jpg). Accessed 22 July 2018

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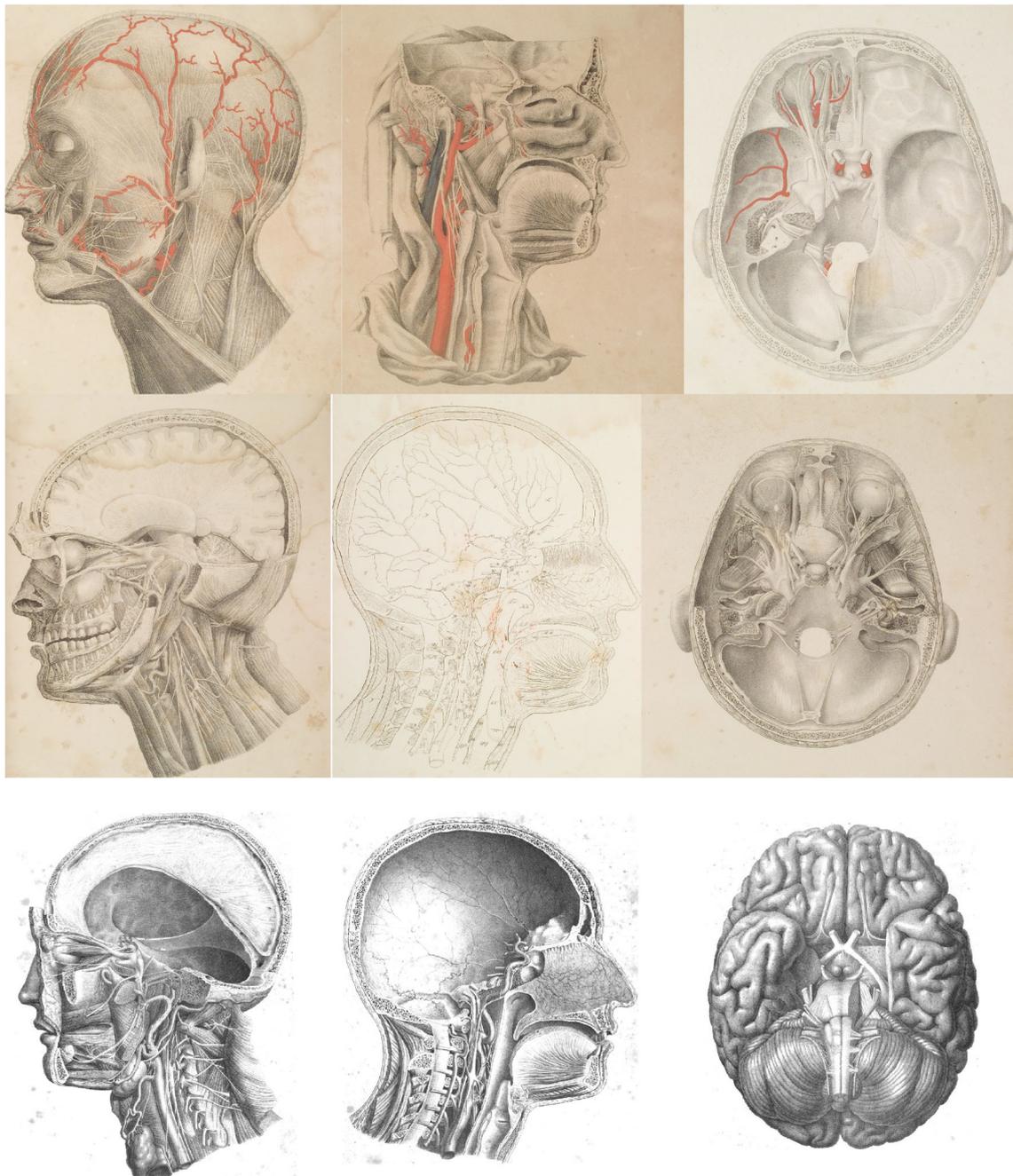


Fig. 2 Some illustrations in *Icones nervorum capitis*

However, Arnold's work is not only related to neuroanatomy, but also to a variety of other issues.

Some of his books

Icones nervorum capitis, published in 1834, is one of the most important books in the anatomic literature of the nineteenth century [6]. In this book, the cranial nerves were examined and the excellent drawings were present on the head and neck region (Fig. 2).

Arnold suggested classification in three categories according to the functional properties of the fibers in the cranial nerves. Sensory nerves, mixed nerves (combined motor and sensory nerves), and simple nerves (motor nerves). Also, he stated that some cranial nerves have also been associated with each other, with the nerves in the neck region, or with the upper division of the sympathetic nerve.

Über den Ohrknoten. Eine anatomisch-physiologische Abhandlung published in 1828, in the drawings in this book, the connections between the nerves around the temporal bone

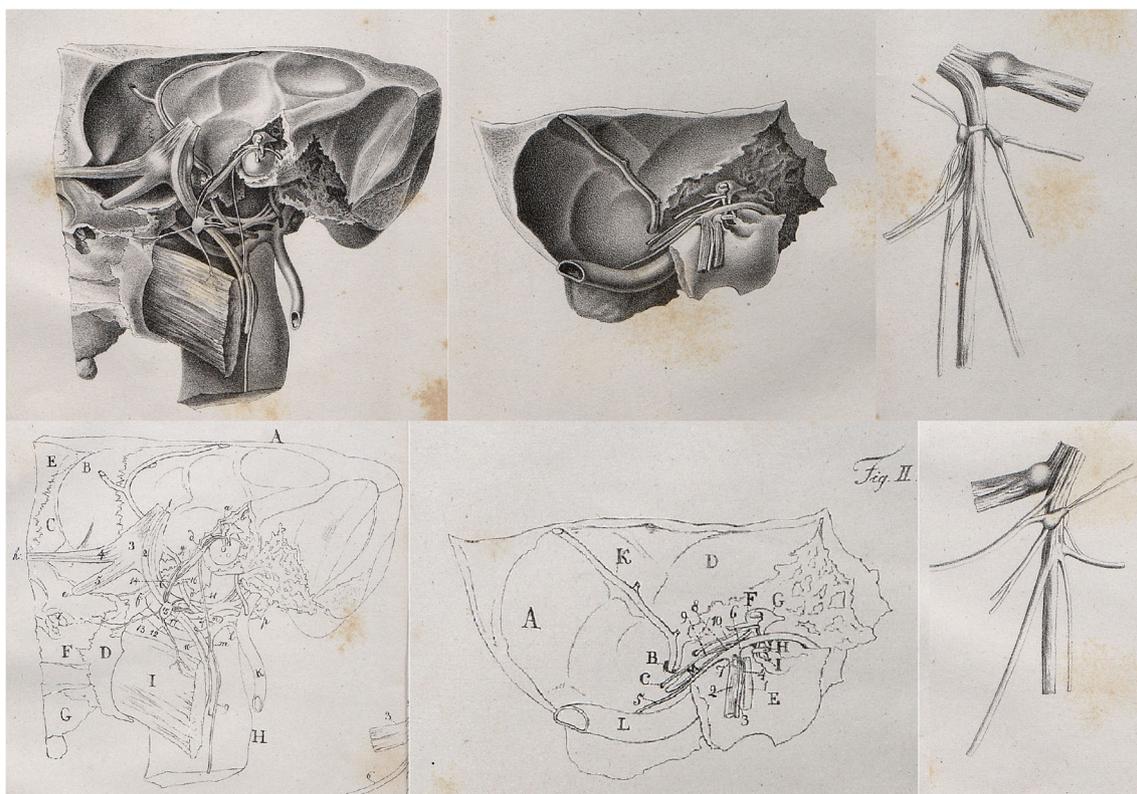


Fig. 3 and cover Some illustrations in *Über den Ohrknoten Eine anatomisch-physiologische Abhandlung*

and the internal ear and these nerves were shown clearly (Fig. 3 and cover).

Some of Arnold's other books

Published in 1832 *Anatomische und physiologische Untersuchungen über das Auge des Menschen*

Published in 1860 *Friderici Arnoldi Icones Nervorum Capitis*

Published in 1858 *Die Physiologische Anstalt der Universität Heidelberg*

Published in 1854 *Zur Physiologie der Galle Denkschrift zur fünfzigjährigen Jubel-Feier*

Published in 1838 *Untersuchungen im Gebiete der Anatomie und Physiologie. Bemerkungen über den Bau des Hirns und Rückenmarks*

Published in 1838, 1839, 1840, and 1842 as 4 volume *Tabulae anatomicae*

Published in 1851 *Handbuch der Anatomie des Menschen*

Related eponyms

Arnold's name is used as an eponym in many neuroanatomical structures.

Arnold's canal: The passage in the petrous part of the temporal bone for the superficial petrosal nerve

Arnold's ganglion: Otic ganglion

Arnold's nerve: Auricular branch of the vagus nerve (the other eponym is *Alderman's nerve*)

Arnold's nerve: Tympanic nerve of the glossopharyngeal nerve (the other eponyms are *Jacobson's nerve* and *Nerve of Andersch*)

Arnold's nerve: Greater occipital nerve

Arnold's nerve cough: Reflex cough, caused by irritation of auricular branch of the vagus nerve

Arnold's bundle: Frontopontine fibers

Fibrae arcuateae of Arnold: Arcuate fibers

Trigone of Arnold: Vagal trigone

Conclusions

Friedrich Arnold should be remembered as contributing to our current understanding of neuroanatomy, especially cranial nerves and brain.

Compliance with ethical standards

Conflict of interest None

References

1. Arnold F (1803–1890). <http://www.ub.uni-heidelberg.de/helios/digi/anatomie/arnold.html>. Accessed 22.07.2018
2. Arnold F <http://www.whonamedit.com/doctor.cfm/281.html>. Accessed 22.07.2018
3. Lekakis G (2003) Philipp Friedrich Arnold, Ludvig Levin Jacobson and their contribution to head and neck anatomy. *J Laryngol Otol* 117:28–31
4. Arnold F https://en.wikipedia.org/wiki/Friedrich_Arnold. Accessed 22.07.2018
5. Schmahmann JD, Pandya DN (2007) Cerebral white matter—historical evolution of facts and notions concerning the organization of the fiber pathways of the brain. *J Hist Neurosci* 16:237–267. <https://doi.org/10.1080/09647040500495896>
6. Hildebrand R (1988) The cranial nerves as living morphotic entities—Friedrich Arnold's icones nervorum capitis, Heidelberg 1834. *Acta Neurochir* 92:5–14
7. Swanson LW (2015) *Neuroanatomical terminology: a lexicon of classical origins and historical foundations*. Oxford University Press, New York