Journal of Clinical Neuroscience 33 (2016) 69–72

Contents lists available at ScienceDirect

Journal of Clinical Neuroscience

journal homepage: www.elsevier.com/locate/jocn

History

The enduring legacy of pioneering neuroscientist Dr. Jerzy Edwin Rose

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ARTICLE INFO

Article history:
Received 19 February 2016
Accepted 28 February 2016

Keywords:
Brain mapping
Electrophysiology
History
Jerzy Rose
Neuroanatomy
University of Wisconsin

ABSTRACT

The human nervous system maintains dominion over everything experienced in life, consolidating a constant barrage of stimuli and chemical fluctuation into memory, sense, emotion, and even character. Despite decades of productive investigation, comprehension of the nervous system's function and structure remain shrouded in mystery. Historically, the burden of elucidating these mysteries has fallen to neuroscientists bold enough to seek answers to this most nebulous vista. The legacy of one such neuroscientist, Jerzy Edwin Rose, endures today as a pillar of neuroscientific discovery. In the nascence of his career, Rose explored volumetric comparisons of human brain structure to that of other mammals, leading to the development of novel methods in neurophysiologic measurement and explanation. Rose would later segue mid-career into studies on the cooperation between the auditory cortex and thalamus, resulting in increased understanding of its functioning, structure, and anatomy. During the final saga of his long, fruitful career, Rose explored the electrophysiology of the auditory system, leading to novel methods using modern technology. Ultimately, the vast breadth of Rose's contributions to neuroscience has diminished the field's mystery, setting forth momentous groundwork for future discovery, and the inspiration to carry on in the spirit of his bold curiosity.

1. Introduction

For decades, neuroscientists have observed the behaviors of the brain to determine its function and anatomy. A select number of neuroscientists, such as Dr. Oskar Vogt and his wife Cecile, searched for a correlation between the anatomy and the psychology of the brain in the 1920's [1]. Others, such as Cornelius Ubbo Ariëns Kappers labored to discover the simple anatomy of the brain around the same era. In the present day, Dr. Yin's work with cats reveals the functioning of the brain by tracking the eye movement of the animals [2]. Much of the work Dr. Tom Yin does at the University of Wisconsin-Madison would not be possible without the advancements and contributions of Dr. Jerzy Edwin Rose [3].

Jerzy Edwin Rose (Fig. 1) was born on March 5, 1909 in what is currently Poland. Rose grew up Polish in both nationality and name and the environment he was raised in was both intellectually stimulating and challenging. Rose's father was a teacher of literature, Latin, and Polish. While Rose never developed a strong interest in either literature or language, his father instilled in him the essential work ethic that contributed to the success Dr. Rose saw throughout his life. Outstanding scholarship was a resounding theme in the childhood home of Jerzy. Early in his life, Rose completed his medical training in Cracow, Poland. His uncle, Dr. Maximilian Rose was a famous neuroscientist and the director of the Brain Research Institute in Vilno, Poland. It was there, and under the direction of his uncle, that Rose received his postgraduate degrees in psychiatry and neuroanatomy. His uncle suggested training at Wilhelm Institut für Hirnforschung in Berlin, Germany (Fig. 2) under Oskar Vogt. In Germany, Rose met his wife Annelies Argelander, who was a Professor of Psychology [4].

His studies in Europe were cut short, however. While at sea with his wife in 1939, Germany invaded Poland. With a quickly drafted letter of recommendation from Professor Ariens Kappers, who Rose worked with in Poland, he was granted employment in the Phipps Psychiatric Clinic at Johns Hopkins University. At Hopkins, Rose was finally able to continue his European studies. It was during his time at Johns Hopkins that Rose began collaboration with Dr. Clinton Woolsey and a lifelong partnership was formed [5]. From this partnership would come a number of influential works. After the onset of World War II, Rose spent a brief time as a psychiatrist in the Army and eventually returned to Johns Hopkins [6]. In 1959, Rose made the decision to leave Johns Hopkins and follow Woolsey to the University of Wisconsin-Madison where he was appointed Professor of Neurophysiology [7]. Wisconsin served as a birthing ground for Rose's passion in auditory neurophysiology. It was there that Rose continued his research for the rest of his life.

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http://dx.doi.org/10.1016/j.jocn.2016.02.035
0967-5868/

Fig. 1. Jerzy Rose later in his career [15].

2. Early European brain illustrations and mapping

Rose first studied the physical structure of the brain while in Vilno by examining stained structures of various mammalian brains. These often extremely thin brain sections were embedded into paraffin material and colored violet for easier viewing. Rose determined the volume of the nuclei by projecting the outlines of the nuclei on cardboard and drawing them out. In this method, he corresponded the thickness of the cardboard with the degree of magnification of the projector. Now, having a cardboard object proportional to the volume of the actual brain sample by degree of magnification, Rose was able to measure the volume by displacement in water. This volume was used to calculate the volume of the nuclei [8]. By the measurements Rose gathered through this data by methods adapted from his uncle, Maximilian, Rose was able to create accurate maps of certain mammalian brain sections.

Studying the volume of brain sections and the structure of mammalian brains, Rose concluded in his paper "The Cell Structure of the Mammillary Body in the Mammals and in Man" that three groups of nuclei can be distinguished in well-developed mammalian brains. These groups were given the names medial, lateral, and dorsal because of their locations in the brain. Rose also found that certain groups reduced in volume as the mammal became larger. The dorsal nuclei group specifically was found to undergo a reduction in higher mammals. From this Rose was able to conclude that humans also undergo a reduction in the dorsal nuclei group [8]. In the words of Rose [8], he concluded in his summary, "The dorsal nuclear group, very well developed in lower mammals, undergoes a reduction in man and probably in the other higher mammals as well..." This historical research set a foundation for the brain mapping that exists today. The work Rose completed for this paper and many others similar to it began in Vilno while studying under his uncle and was continued and completed once Rose relocated to Johns Hopkins. While mapping the brain, Rose developed an interest with certain functions and relations in the brain, specifically the thalamus and cortex.

3. Thalamus and auditory cortex relation

As Dr. Rose's career developed, his scientific interests did as well. While in Baltimore at Johns Hopkins Rose became invested in research of the thalamus region. In 1950, Rose [9] published a detailed work entitled "Some Modern Aspects of the Functional Anatomy of the Thalamus." In this paper, Rose highlighted the work of previous researchers who studied the thalamus. To supplement previous research, Rose included methods that had been developed for further study of the thalamus. A select few of these methods stemmed from the blossoming field of electrophysiology which would later become the focus of Rose's career.

Only a year before the article that was previously discussed, Rose worked with his colleague, Clinton Woolsey, on the relationship between the thalamus and the auditory cortex. According to

Fig. 2. Wilhelm Institut für Hirnforschung in Berlin, Germany, 1913. *Note*: Photo ansichtskarten-pankow.de/buch.