

Eckhart Simon, a German physiologist's connections with physiology in Japan

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Eckhart Simon's research in the fields of Thermal and Regulatory Physiology is distinguished by exemplary relations with Thermal Physiology in Japan. The essay outlines the fields in which he has cooperated with Japanese physiologists. A list of joint publications documents their contributions to Eckhart Simon's and his department's scientific achievements.

Even the shortest possible account of Eckhart Simon's contributions to Physiology in general and his relations with Japanese physiologists in particular, would exceed the proposed length of the essay the author has been asked to draft. Therefore, he has tried to outline Eckhart Simon's motivations and propensities as a scientist and to complement it by presenting Eckhart Simon's own and his department's publications (co-)authored by Japanese Physiologists.

Eckhart Simon started his education in Medicine at Marburg University in 1953. His first and foremost goal was to become a competent general practitioner. As a primary school teacher's son, born 1933 and grown up in a rural pietistic environment, he felt that his natural gifts might qualify

him for a profession which required an attentive mind, intellectual as well as manual skills, and seemed personally rewarding and useful for the community. While still a student, Eckhart Simon was looking for a topic suitable to do his M.D. thesis (then a "must" for a medical doctor, although often of little scientific value). He found a mentor in the Pathology Department of Marburg University who was interested in functional aspects of the vascular system. It was the time when the Wezler-Böger-Method¹ was widely used for non-invasive, repetitive cardiac output measurements; it combined plethysmographic arterial pulse wave recordings and statistical morphometric data about the arterial "windkessel," for which, however, only circumstantial estimates existed. Acquiring quantitative data from *post-mortem* preparations of the large arteries and their evaluation required preparatory surgical skills and delving into the theory of vascular dynamics; it was just fun for Eckhart Simon as a medical doctor-to-be and it aroused his interest in bioscience. His thesis was accepted by a respected medical journal² as the first (and only) quantitative analysis of windkessel properties in humans as functions of age and hypertension.

After having passed his final medical examination in 1959, Eckhart Simon set aside biomedical science to use the mandatory 2-year practical training period and some more time to gain experience in basic surgery and obstetrics and in diagnostics of internal medicine with the aim to be prepared for the envisaged job: a general practitioner. At that time, it was difficult for an MD to get a position in a noted clinic for further training. A professor of cardiology offered Eckhart Simon a position on condition to spend 1–2 y in medical science. The professor recommended to him the William G. Kerckhoff Heart Research Institute of the Max-

Planck-Society (then its official name), and this is how Eckhart Simon came to Bad Nauheim in 1961. Rudolf Thauer, the institute's director invited him to introduce himself personally. He was somewhat flabbergasted by the solemn grandeur of the institute's memory hall, where he had to wait before meeting his future boss: an impressive figure who radiated authority. Rudolf Thauer involved him in a quite informal interview concerning his views about medicine and science; as the result, Eckhart Simon felt that he could survive in this highbrow environment; he was accepted on the basis of a stipend.

From the Institute's name and with his MD thesis background Eckhart Simon had expected to be assigned to the institute's vascular physiology research group headed by the renowned physiologist Otto Gauer. To Eckhart Simon's slight initial embarrassment he was assigned to the thermal physiology team which was under Thauer's personal supervision. The research field had been out of his scope, so far, and it appeared to him rather vague. It was particularly true for the task he had been enjoined to do: To identify deep body temperature sensors outside of the brain. The prevailing dogma rejected their existence; there was questionable evidence that such sensors might exist, but there were no clues where and how to search for these enigmatic sensors. After a few months – with several short spells of frustration – Eckhart Simon began to appreciate the objectives of his research. They met his scientific propensity to elucidate primarily not an organ function and not a cell function, but rather a complex biological system; the task was intellectually inspiring and required intuitive, if not speculative, trial-and-error approaches. In retrospect, it provided ideal starting points to scrutinize functions of organs and of cells of putative

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relevance for the system under investigation and, moreover, to probe the functions of non-thermoregulatory control systems contributing to temperature regulation of homeotherms.³

Eckhart Simon's first report on his discovery⁴ of a structurally identifiable thermosensory region outside of the hypothalamus, the vertebral canal, in 1963, is co-authored by Masami Iriki. He had been granted a Humboldt-Stipend and had chosen the Kerckhoff-Institute to do research on temperature regulation and was adjoined to the team of Eckhart Simon and his mate Werner Rautenberg. Masami Iriki was the second of a long sequence of future Japanese visiting scientists at the Kerckhoff-Institute. Kokichi Ohara had been the first in 1958. He was a pupil of Professor Yas Kuno (the founder of thermoregulatory research in Japan) at the University of Nagoya. Mitsuo Kosaka, a pupil of Kentaro Takagi, Yas Kuno's successor at Nagoya University, was the next to work with Eckhart

Simon. He stayed for 3 very productive years (1965–68). After Mitsuo Kosaka had established himself at the University of Nagasaki, connections were maintained by mutual visits and by many visiting scientists from Kosaka's laboratory working in Bad Nauheim.

Apart from his growing interest in physiological research, Eckhart Simon's final decision to aspire to a career in science was fostered by 2 motives. First, he admired the way in which Rudolf Thauer ran his institute. Although a strong authority, he did not execute it in a formal manner. There were many seminars held by invited scientists, but formal staff seminars were usually held only when oral presentations of Thauer's assistants to be presented at upcoming congresses had to be rehearsed. A daily "tea time" in a common tea room around 10:00 to 11:00 a.m. for everybody, in which Thauer often participated, served the exchange of ideas and suggestions in a very informal manner, non-scientific issues being not

excluded. These casual daily meetings encouraged cooperation between research groups and provided Rudolf Thauer with information about his department's activities. Second, if Rudolf Thauer had become convinced of an assistant's productivity, he set him free after 1–2 y, or so, to follow his own ideas independently. In this respect, Rudolf Thauer was an exception. As a rule, according to German tradition (different, e.g., from conditions in the USA) aspiring to a leading position in science was indispensable for becoming independent as a researcher. Eckhart Simon felt that he could manage a team along Thauer's lines. Thus, he decided to qualify himself in 1968 by "habilitation" to obtain the license for teaching physiology. In 1971 he was appointed Honorary Professor of Physiology in the Medical Faculty of Giessen University. Of course, his chances were slim to obtain a leading position enabling independent research in Germany. Eckhart Simon took it easy, however: he knew he could return to practical medicine if he should fail. Moreover, his case was a special one: He had not accepted a post-doc position in the USA to improve his international standing because he had not yet decided to stay in science when it was offered to him. He had not applied to a permanent position but was recommended in 1972 to the Max-Planck Society's Biology/Medicine Section to be evaluated for eligibility as a Scientific Member in Bad Nauheim; it meant a promotion within his home institute – almost a no-go in Germany. Anyway, he was elected as Scientific Member in 1973; at that time, the focus was on the question whether the candidate had made relevant discoveries (which he had⁴⁻⁶) but not so much on the prestige of the journals in which they had been published.

With his habilitation work, Eckhart Simon had acquired techniques of electrophysiology to record single fiber activities and techniques for local multi-channel blood flow recordings in functionally diverse vascular sections. How life goes! Early in 1969, Eckhart Simon received a SOS letter of Masami Iriki telling that the 1968 student riots had spread to Tokyo and prevented him from entering his lab, let alone to work in it! Rudolf Thauer was a man of quick decisions. A few weeks



Figure 1. Eckhart Simon, MD, Professor, Director Emeritus, Max Planck-Institute for Heart and Lung Research, W.G. Kerckhoff-Institute, Bad Nauheim, Germany. Photo: E Simon, private.

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Box 1. References with Japanese (co-)authors having contributed to Eckhart Simon's and his department's research. Abbreviations: CIRC, circulatory physiology; ENDO, endocrinology; FEVER, fever research; FLUID, body fluid balance; METAB, metabolic control; NEURO, neurophysiology; THERM, thermoregulation.

later, Masami Iriki and his family were back to Bad Nauheim with financial support by the W.G. Kerckhoff-Foundation. What followed were 2 y of extremely fruitful cooperation. Masami Iriki was involved in the discovery⁵ of differential sympathetic efferent responsiveness in the control of blood flow adjustments and in the detection of afferent spinal cord fibers responding to changes of vertebral canal temperature.⁶ Ever since then, connections with Masami Iriki were maintained until 2012 by mutual exchanges of his and Eckhart Simon's coworkers as visiting scientists.

When Eckhart Simon succeeded Rudolf Thauer as director of the institute's Physiology department in 1974, he chose the strategy to foster interdisciplinary research by proceeding from thermoregulation, neurophysiology, and circulatory physiology to endocrinology, fluid balance, metabolic control, fever, and behavioral physiology with the ultimate aim to elucidate their interactions with thermoregulation as a "switchboard" in the autonomic, endocrine and behavioral control of homeostatic systems.³ In 1974/75 Eckhart Simon started to cooperate with Harold Ted Hammel at the Scripps Physiological Research Laboratory in La Jolla, USA. Important insights into avian thermo- and osmoregulation were gained, and Ted's subsequent election as External Scientific Member of the Max-Planck-Institute in Bad Nauheim furthered the

institute's prestige to attract more visiting scientists from many foreign countries. Eckhart Simon's Visiting Professorship in 1982 at the Physiology Department of Osaka University headed by Teruo Nakayama, a pupil of Yas Kuno, established cooperation with his team and with Nakayama's former teammate Tetsuro Hori, Head of the Physiology Departments of Saga and later of Kyushu Universities.

During Eckhart Simon's directorship from 1974-1999, scientists from abroad working in his department were always encouraged to be accompanied by their families and to live in the institute's guest apartments; it created a motivating atmosphere of lively exchange with members and families of the department's resident staff. More than 20 scientists from Japan have contributed importantly to the scientific achievements of Eckhart Simon's department, as documented by the references in Box 1, and have substantially furthered its international recognition. Eckhart Simon's former teammate, Werner Rautenberg,⁷⁻⁹ and the author¹⁰⁻¹⁴ as one of Eckhart Simon's close former coworkers have continued the tradition to cooperate with scientists from Japan in their own departments at the universities of Bochum and Giessen, respectively. Eckhart Simon's election as Honorary Member of the Japanese Physiological Society in 1996, and conferment of the Order of the Rising Sun, Gold Rays with Neck Ribbon, in

2000, testify to an exemplary scientific cooperation between Japanese and German institutions (Fig. 1).

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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