

Professor Dr. Eberhard Horn †

With sadness the ELGRA community addresses the death of Prof. Dr. Eberhard Horn. He passed away on September 12, 2016, losing the struggle against an aggressive cancer disease. From 1993 to 2008 he used 3 NASA-Shuttle, 5 Sojuz missions, one satellite mission and 2 parabolic flight campaigns to perform neurobiological experiments with tadpoles, fish, crickets, flies and scorpions, nine of them as a principal investigator.



Prof. Eberhard Horn after his successful last Sojuz mission in 2008.

The most fundamental and extensive ones were those performed with *Xenopus laevis* tadpoles. By studying the vestibulo-ocular reflex during different developmental stages under microgravity he proved that a critical period exists in the development of the sense of gravity – similarly as it is known from the development of vision since decades. In 2011, he published the results under the title "Gravity-Related Critical Periods in Vestibular and Tail Development of *Xenopus laevis*" in the *Journal of Experimental Zoology*.

Born on August 1, 1942, in Frankfurt (Oder) Eberhard Horn studied biology and mathematics at the Johann Wolfgang Goethe University in Frankfurt am Main. His scientific education has been affected by the spirit of the German understanding of comparative behavioral research taught by Martin Lindauer in the tradition of the Noble Prize Winners Karl von Frisch and Konrad Lorenz. Additionally he was influenced by the upcoming cybernetics, which allowed the modeling of regulatory processes in behavioral science.

From the very beginning the gravitational sensory system in insects was of great interest to him. His dissertation focussed on the geotactic behavior of bumble bees and honey bees and the influence of gravitational stimuli. Later studies dealt with the influence and interaction of gravitational and visual stimuli in moving insects. They were performed at Zurich University (Switzerland), as well as at Karlsruhe University (now Karlsruhe Institute of Technology) in Germany; here, he held an associated professorship until his retirement in 2007. During his Karlsruhe period he took a sabbatical in order to improve his knowledge in insect neurophysiology at the Zoological Institute of the University of Cambridge (Malcolm Burrows); furthermore he started vestibular research in *Xenopus laevis*.

In 1985, changes in Eberhard Horn's scientific life arose from three persons: Hans Helmut Kornhuber, head of the Department of Neurology at the University Hospital of Ulm, gave him the chance to establish his own research group "Experimental Neurology and Gravitational Physiology" with an emphasis on experimen-

tal epilepsy; Ottavio Pompeiano, head of the Institute of Physiology at the Medical Faculty of the University of Pisa (Italy) invited him to study the regulation of vestibulo-spinal reflexes and their pharmacological manipulation in cats; and last but not least Wolfgang Briegleb, a pioneer in space biology from the German Aerospace Center DLR, convinced him to use space flights to study the influence of microgravity on the development of the sense of gravity.

The German Spacelab mission D2 showed Eberhard Horn the way. In contrast to young *Oreochromis* fish *Xenopus* tadpoles responded to the deprivation of gravity as recognized by changed vestibulo-ocular reflexes. Henceforth his aim was to verify a critical period during the development of the sense of gravity. At that time he never suggested it would last him 15 years; in 2008, the Soyuz mission TMA13/TMA12 fulfilled his dream.

As a hard-working and open-minded scientist he appreciated the interdisciplinary discourses with his colleagues worldwide and the cooperation with research groups from Nancy, Toulouse, Madrid and Ismailia (Egypt) during the different space missions. Many of Eberhard Horn's proposed space projects were selected by the different international space agencies to be flown in space. Due to the support of the agencies and due to his worldwide scientific cooperation and reputation he was lucky that most of his proposals could be realized in space. With his different topics he contributes fundamentally to the subject area of Neurobiology of the German national space program. The space management within the German Aerospace Center DLR appreciated very much his fully activities, his reliable cooperation and his deep belief in space research under weightlessness.

Furthermore he enjoyed working together with engineers of the space companies OHB, EADS or Kayser Italia to design new survival systems for small animals or to advance incubators like STATEX and BOTEX. Because of his expertise he was appointed member of the Insect Habitat Committee for the ISS. Initiated by Wolfgang Briegleb he wrote a draft program already in 1985 to establish Gravitational Biology as a specific field in animal research. After years he recognized a chance of realization by supporting Ulf Merbold, Germany's first astronaut, to be appointed professor for space technology at the University of Ulm. Unfortunately, the political framework did not match.

Eberhard Horn was not only an engaged scientist but also an empathetic university teacher and author of two textbooks, one about comparative sensory physiology. During his scientific career he published a monography about brain-based protective mechanisms during epileptic activity and nearly 200 articles and reviews in his research fields. Inspiring young scientists and his own students as well as pupils was important to him. During the French Andromede Mission to the ISS he was responsible of the German part of a French-German-Russian school project. In the course of the project "Zoom-into-Science" young pupils visited his lab at the University of Ulm to mention only one of his public activities.

Eberhard Horn was member of ELGRA from 2000 to 2015. In 2001, he also joined the American Society for Gravitational and Space Research, where he served on the Board of Governors from 2003 to 2006. He will remain in our minds as an extraordinary person and colleague, convinced that science needs both enthusiasm and patience.

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