

## Gerhard Neuweiler (1935–2008)

Gerhard Neuweiler, Emeritus Professor, Zoology Institute of the Ludwig Maximilians University at Munich, died on 15 August 2008 after a long illness. Having been the incumbent of one of the most prestigious Chairs in zoology in Europe, he retired from office on 1 October 2003. Since its inception in 1826 until 1958, the Institute of Zoology has had only five full professors: Heinrich von Schubert (1780–1860); Karl von Siebold (1804–85); Richard von Hertwig (1850–1937); Karl von Frisch (1886–1982) and Hansjochem Autrum (1907–2003). Karl von Frisch was the founder of the *Journal of Comparative Physiology* (which was called *Zeitschrift für vergleichende Physiologie* until 1972, with papers written exclusively in German). He was also the discoverer of the dance orientation and communication in honey bees, and established that bees could see colours. He shared the Nobel Prize for Physiology or Medicine with Konrad Lorenz and Niko Tinbergen in 1973. His successor Hansjochem Autrum's scientific contributions are legion and have become landmarks in physiology and zoology. Autrum made the *Journal of Comparative Physiology* an international forum for first-class scientific contributions. This was the hoary legacy Neuweiler inherited when he was appointed to the Chair of zoology and comparative anatomy in 1980. He had occupied a similar Chair at the University of Frankfurt-am-Main during 1972–80. There, with the assistance of the German Research Society (DFG), he established a working group for neurophysiology in which scientists from neighbouring universities such as Darmstadt and Marburg also participated.

In Munich, Neuweiler soon attracted brilliant students and collaborators to his department, working on the fascinating area of neuroethology. Most of his students today head departments of zoology in several universities in Germany; all continue their researches on neuroethology. Neuweiler's major scientific achievement was the successful integration of neurophysiology, neuroanatomy, behavioural ecology and psychophysics. Most of the leading American specialists on echolocation in bats, among them Nobuo Suga and George Pollack, had been Neuweiler's guests at the universities of Frankfurt and Munich. These collabora-

tions resulted in first-rate work on the adaptation of the peripheral auditory system of insectivorous bats for reception and analysis of the various components in orientation sounds and echoes. Neuweiler demonstrated that the essence of life was an uninterrupted dialogue between the organism and its environment, and that the brain had evolved sensory modalities to recognize and respond to the richness of the biotope: the brain served as the bridge between the organism and the environment in the process of an 'uninterrupted dialogue'. Neuweiler wrote an overview of the field with this theme (*Das Gehirn, die Brücke zur Welt*) as the title.



Neuweiler was born on 18 May 1935 in Nagold in the Black Forest, as the fourth son of the school teacher Friedrich Neuweiler and his wife Luise. His schooling was in the nearby picturesque town of Calw, the birthplace of Hermann Hesse, and was followed by studies in the universities of Tübingen and Munich between 1955 and 1962. He obtained a doctorate *summa cum laude* in 1962. His research supervisor was Franz Peter Möhres, holder of the first Chair in Germany for zoophysiology (in Tübingen). In 1963, when it was customary for German students to make a bee-line to a good university in USA to do postdoctoral research, Neuweiler came to the Zoological Research Laboratory, University of Madras as a postdoc of the German Academic Exchange Service (DAAD). The reason he gave for this unusual move was that his doctoral thesis had been on the physiology of vision in the flying fox, *Pteropus giganteus* and India

was home to the flying foxes. In 1963, I was a Ph D student in the Zoological Research Laboratory and ever since I have had a ringside view of the life, work and career of Neuweiler. His stay in Madras 45 years ago was anything but comfortable, and within a week of his arrival he even became ill; the German Consul General Dr Fischer and his family nursed him back to normal health. About this period he wrote in a letter to me: '20.4.2003. Forty years ago began a one and a half year adventure, which has made of me what I am today. I came to a culture, of which I did not have the faintest appreciation, which overwhelmed me by its pragmatic wisdom, with its attendant dynamism and aesthetic intensity. I learnt in India that to forego possessions sets one free; yet I possess half a house. I also learnt, first and foremost, that there can be nothing more rewarding than to learn to reflect upon the different values of other cultures and thus to free oneself of prejudices and presuppositions' (free English translation).

Neuweiler was a very private person and cherished his privacy vastly. His self-willed social isolation became even more pronounced after the death of his wife Edda in 1989 – a trauma he never got over until the end. Along with S. Krishnaswamy (1926–88), he was the co-architect of the Indo-German Project on Animal Behaviour, a binational venture under the 'Cultural Exchange Programme' between the UGC and DAAD, between 1978 and 1988. Neuweiler conceived in its entirety the extremely successful 'All India Intensive Training Courses in Neurophysiology', which I organized and offered at the School of Biological Sciences, Madurai Kamaraj University in 1978, 1979 and 1981. Günther and Gerta Fleissner, G. Neuweiler, G. Schuller, H. Schweitzer, R. Rübsamen and K. Hausen did the actual teaching and supervision.

Based on his neurophysiology and field-ethology studies in Madurai, Neuweiler reported that bats which forage in open spaces have the most sensitive hearing for the 'constant frequency' portion of their echolocation calls. For example, among the Madurai bats, the frequency in which hearing is most sensitive is 18 kHz (best hearing frequency (BHF) in *Tadarida aegyptiaca*, 25 kHz in *Taphozous melanopogon*, 35 kHz in

*Rhinopoma hardwickei* and 50 kHz in *Pipistrellus mimus*. The higher the BHF in these species the lower they fly, and the more restricted their foraging area. The insectivorous bats in Madurai forage in three modes: (i) surface gleaning, (ii) foraging within foliage and (iii) open-air foraging. An important and entirely original outcome of this study was the demonstration that the constant frequency/frequency modulation features and the bursts, and of trains of 150–250 ultrasonic pulses per second emitted by the bat while hunting, varied adaptively according to the mode of foraging and topographic features of the feeding habitat. Neuweiler summarized his findings in an authoritative review of the field of echolocation in bats.

The traits of Neuweiler that I personally valued were his sense of fair play and forthrightness. He defended his convictions with courage. He became well known in academic circles for an open article he wrote in a reputable daily, *Die Zeit* in 1969 under his real name, when student unrest in Europe and USA was in full spate. In the article he criticized the feudal attitudes of the German Ordinarius ('Full') professors and cited his own boss as the epitome of these qualities. At the time Neuweiler was a mere Assistant, that is, comparable in most attributes to an American postdoctoral fellow and much at the mercy of the boss. An Assistant had to get the lecture theatre ready, and the display charts and materials in place for the 'Herr Professor' to begin his lectures. The period was one of enforced servility of scientific assistants to the all-powerful Ordinarius. Only years

later could the Assistant hope to get the freedom to teach (*venia legendi*) and become a Docent. Neuweiler's act of exposing the tyranny of the Ordinarius was an act of courage of conviction of a high order. As a result of his outspoken tirade against the Ordinarius professors, he had to face mild suspicion of that group. Later, when he became an Ordinarius himself, he was a model of fair play and transparency in his transactions with his colleagues and students. In fact, on occasion he stretched the very limits of his sense of fair play. At one stage, when he was still a Docent, he agreed with the complaint of his students that, regardless of the placement of Neuweiler's name in the list of authors, the publication was attributed to him, owing to his standing in science. Neuweiler's solution: they would write papers without names of authors and the attribution would read 'Arbeitsgruppe Neurophysiologie'. He told me later that Autrum also felt that, while the idea was generous and laudable, there could be practical problems, such as in citations by other authors.

Later in his career, in his capacity as Chairman of the Science Advisory Committee, Neuweiler came back to his favourite topic of professors in German universities and the prevailing academic institutions and made statements that went contrary to tradition and the *status quo*. His ideas about having to draw a subtle line between professors who only taught and those who, in addition, also did research, were also not widely celebrated. He expressed his views in an article in *Nature* (1996, **384**, 305) about the futility of that German institution of Ha-

bilitation and the *venia legendi*. The outcome was that a powerful alliance of the four German research foundations (Max Planck Society, Consortium of University Vice-Chancellors, DFG and the Organization for Support of High Priority Research) was united in its view that it was time to elect a new Chairman for the Science Advisory Committee before his term was over. An unrepentant Neuweiler returned to his researches on bats.

Academic recognition came his way and he was elected member of the Bavarian Academy of Sciences, Academia Europea, Leopoldina and the Austrian Academy of Sciences, and Honorary Fellow of the Indian Academy of Sciences. On being officially informed of his election to the Indian Academy of Sciences, he wrote (translated) 'Of all the honours which I have received in the past few years, the Membership in the Indian Academy of Sciences is for me the most satisfying and the most meaningful'. He was a recipient of the Karl von Frisch Prize of the German Zoological Society and the Felix-Santschi Prize of the University of Zurich. In his death, science has lost a biologist of deep social commitment, vision and an engaging personality.

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