Obituary

Eberhard Gwinner (1938–2004)

MAX PLANCK INST. ORNITHOL.

Pioneer of circannual clock research

You don't have to be an ornithologist to be overawed by the spectacular annual migrations of many species of birds — anyone who has witnessed the tens of thousands of cranes or storks flying over the eastern Mediterranean in an astonishing show of synchrony and purpose will never forget the sight. But how is this migration triggered? How do birds navigate? How does migration link to other stages in the annual cycle of birds such as moulting and reproduction? Eberhard Gwinner's pioneering research over 40 years tackled many of these questions. Most notably, his work revealed a remarkable internal calendar, the circannual clock, which tells birds deep in the tropics that it is time to depart for their breeding grounds in Europe.

The concept of an internal daily rhythm (the circadian clock) was already established by 1964, when Gwinner completed his PhD on the social behaviour of ravens under the supervision of Gustav Kramer and Konrad Lorenz. Fascinated by biological rhythms, Gwinner moved to another department of the Max Planck Institute for Behavioural Physiology, situated in the beautiful Bavarian village of Andechs, famous for its beer and pink monastery. There he joined Jürgen Aschoff, one of the founding fathers of circadian clock research. Aschoff had shown that, when kept in constant environmental conditions, birds and other vertebrates, including humans, showed 'free-running' daily rhythms of behaviour and physiology; these rhythms, he concluded, were controlled by an internal clock. The fact that the rhythms deviated in predictable ways from 24 hours lent support to the notion that they were not driven by some unidentified external cue but were indeed 'endogenous'.

It was initially thought that by measuring changes in day length, the daily clock could also act as a calendar for seasonal events. But Gwinner, struck by the fact that many animals live for part of the year in places where there is no obvious change in day length, yet time their annual events precisely, took a different view. Stimulated by Aschoff, he set out to test whether a separate endogenous clock might control annual, as opposed to daily, cycles. This was a daunting project, given that the equivalent of a ten-day experiment on circadian rhythms would take ten years for annual rhythms. As a staff scientist in the Max Planck Society, Gwinner was fortunate to have sufficient and secure long-term funding to embark on such a venture. This would be very difficult in the present-day university environment — one wonders what kinds of investigations have effectively become off limits because of their timescale.

For his project, Gwinner worked with captive migratory songbirds, notably willow and garden warblers, and stonechats. He showed that, even in constant photoperiodic conditions of 12 hours of light each day, the birds continued to show annual cycles of gonad growth, moult and migratory activity. These cycles persisted over many years and, just as free-running circadian rhythms differed from 24 hours, annual rhythms differed from 365 days. His longest-running experiments lasted for 12 years and are unlikely to be matched: they were a remarkable feat of vision, persistence, animal husbandry and rigour in record keeping. Following many twists and turns, Gwinner showed that both the direction (measured in circular orientation cages) and duration of migration are controlled by internal annual time programmes, which are themselves influenced by seasonally changing environmental factors.

These circannual rhythms are thought to be linked to environmental changes via the circadian clock, but this matter remains unresolved. Some of Gwinner's most recent experiments, as yet unpublished, brought him closer to unravelling the mechanism he was seeking. But with his untimely death on 7 September 2004, answers to the question of whether there is a central generator of circannual rhythms, comparable to the suprachiasmatic nucleus, the master circadian clock in mammals, may now not emerge for a long time.

As a child, Gwinner was inspired by a local ornithologist, and instead of going into the family locksmith business he became a zoologist. He was an accomplished and enthusiastic naturalist, and made field trips to many parts of the world to collect birds for his research or to carry out fieldwork. Although much of his research involved analysing rhythms at the whole-organism level, he was interested in physiological mechanisms and embraced neurobiological and molecular techniques.

As a director of the institute in Andechs, he eschewed the normal trappings of his position: he was always more at home in shorts and open-necked shirt in the laboratory, involved in experiments or poring over data, than besuited in the boardroom. He ran his institute as a place where work and play merged into each other, and where all activities were motivated by questions and discussions about rhythm research and the latest results. In his last few years, he argued forcefully and successfully within the Max Planck Society for the creation of a Max Planck Institute for Ornithology, and thereby the continuation of ornithological research after his retirement.

'Ebo' Gwinner was very much a family man. His wife Helga, also a zoologist, worked with him, and he was immensely proud of his three children and five grandchildren. He was not only one of the most influential ornithological researchers of the second half of the twentieth century, but also a remarkable friend, colleague and mentor. **Roland Brandstaetter and John Krebs**

Roland Brandstaetter is in the School of Biosciences, University of Birmingham, Birmingham B15 2TT, UK.
e-mail: r.brandstaetter@bham.ac.uk
John Krebs is in the Department of Zoology, University of Oxford, Oxford OX1 3PS, UK.
e-mail: john.krebs@zoology.ox.ac.uk