Curriculum Vitae Prof. Dr. Dan-Erik Nilsson

Name: **Dan-Erik Nilsson**
Born: **1954**

Main areas of research: Evolutionary biology, ophthalmoscopic techniques, evolutionary algorithms, visual optics, evolution of the eye

Dan-Erik Nilsson is a Swedish zoologist whose research is focussed on evolutionary biology, the development of ophthalmoscopic techniques for small-scale animal eyes, the derivation of evolutionary algorithms and visual optics, as well as the evolution of the eye. His insights into the functioning and emergence of different types of eyes in the animal kingdom have contributed greatly to the further technological development of optical systems.

Academic and Professional Career

since 2010	Professor for Biology at the University of Lund, Sweden
2002	Professor for Cellular und Organismic Biology at the University of Lund
1999	Visiting Professor, Vision, Touch and Hearing-Research Center of the University of Queensland, Australia
1996	Visiting Professor at the Flinders University, Australia
1995	Professor at the Zoology Department, especially Functional Morphology, University of Lund
1989 - 1995	Lecturer at the Zoology Department, University of Lund
1989 - 1990	Research Stay at the National University Canberra, Australia
1987	Lecturer at the University of Lund
1984 - 1989	Research Assistant at the Zoology Department, University of Lund
1983 - 1984	Postdoc at the Neurobiology Department der National University Canberra, Australia

1983	Ph.D. in Structural Zoology at the University Lund, Sweden
1977	Bachelor of Science in Chemistry, Biology and Zoology at the University of Göteborg, Sweden

Functions in Scientific Societies and Committees

since 2010	Member of the Executive Board, Biology Department, University of Lund
since 2008	Member of the Supervisory Board, Sven Lovén Centre
since 2007	Member of the Swedish National Committee for Physiology und Pharmacology
2000 - 2006	Dean of the Faculty of Science, University of Lund
1999	Member of the Committee of Research Strategies, University of Lund
1997 - 2000	Member of the Biological Committee, National Research Board of Sweden
1996 - 2001	Chairman of the Planning Committee, Biology Centre, University of Lund
1996 - 1998	Chairman, National Board of Basic Research, Sweden

Project coordination, Membership in collaborative research projects

2006 - 2015	Project “The Origin and Evolutionary Adaptations of Vision“, Swedish Research Council (SRC)
2003 - 2005	SRC Project “Eye design and the evolution of vision”
2001 - 2016	Project “Ultimate Vision”, Wallenberg Foundation

Honours and Awarded Memberships

since 2005	Member of the German National Academy of Sciences Leopoldina
since 2003	Member of the World Innovation Foundation
since 2002	Member of the Academia Europaea
since 2002	Member of the Royal Swedish Academy of Sciences
since 1998	Member of the Royal Physiographical Society
1988	Florman Award, Royal Swedish Academy of Sciences
1997	Fellow, Wissenschaftskolleg Berlin

Major Scientific Interests

Dan-Erik Nilsson is a Swedish zoologist whose research is focussed on evolutionary biology, the development of ophthalmoscopic techniques for small-scale animal eyes, the derivation of evolutionary algorithms and visual optics, as well as the evolution of the eye. His insights into the functioning and emergence of different types of eyes in the animal kingdom have contributed greatly to the further technological development of optical systems.

His primary interest concerns the question of why the eyes of animals are so clearly superior to camera technologies in terms of visual function and efficiency despite taking up less space and using less material and energy and despite the fact that the eyes of animals must also make compromises between visual acuity, perception of colour and contrast sensitivity as dictated by ecological demands.

Through his research, Nilsson was able to settle a long-standing scientific controversy about the emergence of eyes in vertebrates. Well into the 1990s, the complexity of lens-containing eyes provided a basis for critics to deny the theory of evolution. Nilsson, who in collaboration with a colleague published a model for the gradual evolution of lens-containing eyes from flat eyepatches, was the first since Darwin's hypothesis to show a way that the eye as we know it could indeed have emerged in evolutionary time. His model for the evolution of lens-containing eyes in fish determined 1,829 necessary individual steps that could take place in 364,000 generations or, alternatively, years. This rate of change corresponds to steps so small that it was easy to imagine them occurring through genetic changes.

Nilsson was able to gain important insights by examining the eyes of nocturnal insects like moths and crepuscular saltwater crabs. In 1988 he discovered a till then unknown third type of eye on the velvet crab of the genus Macropipus that lives in the North Sea: a so-called superposition eye consisting of a single lens and a parabolic mirror. In the case of superposition eyes, which are typical for nocturnal insects, the individual eye "units" of the compound eye are not shielded from one another for their whole length so that overlapping of the individual images occurs. As a result, the animals are able to distinguish things even with low light intensity, at the expense, however, of keenness of sight.

Working together with the automobile manufacturer Toyota, Nilsson developed a patent for an automotive night vision device that automatically activates the brakes when an animal or pedestrian suddenly enters the roadway in the dark. Nilsson's work is also deemed to be an important source of innovation in the field of robotics and the development of computer screens.