Preface

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The papers in this special issue were read at a symposium honoring Walter F. Heiligenberg, neuroethologist extraordinaire, who was killed in an air crash September 8,

1994. The sense of loss as well as the worldwide admiration and affection for the man led to the plan for a symposium on a selection of his favorite topics, combined with personal reminiscences by a few of his friends. This was held in La Jolla January 9 and 10, 1995, sponsored by "Vice Chancellor of the University Edward Frieman, the Director of the Scripps Institution of Oceanography.

The tributes to Walter in this symposium, both by those presenting scientific contributions and by friends who had only some minutes to reminisce, form part of a series of events in his honor, some continuing into the future. The first was a memorial service 'In celebration of the life of Walter Heiligenberg' held September 30, 1994, at the Stephen Birch Aquarium of S.I.O., with a large and international attendance. One of the statements in homage at this occasion appears in this issue, followed by an abbreviated curriculum vitae and a bibliography of Walter's own works plus others from his laboratory. A memorial portion of the annual meeting in November, 1994, of the J.B. Johnston Club (an organization devoted to comparative neurobiology) included both personal and scientific contributions. A memorial concert was presented on the UCSD campus, April 10,

1995, by celebrated artists, cellist Ron Leonard and pianist David Golub. A special event was held at the Fourth Congress of the International Society for Neuroethology in Cambridge University, England, September 6, 1995, where some of his students and young postdoctoral associates reported on progress in the rapidly expanding field of electrosensation and motor control.

The ongoing remembrance of this man has included a Heiligenberg Memorial Visiting Scientist Program. Supported by the Director of the Scripps Institution of Oceanography, this has brought a series of seasoned investigators for working periods to his laboratory, which was kept open and operational for the five Ph.D. students and two postdoctoral associates who were working there when he died. The visitors provided a senior presence for frequent, informal consultation over ongoing projects and conducted their own research, which will be published in due course. At this writing there have been fifteen such Investigators: Charles Keller, John Dye, Masashi Kawasaki, Carl Hopkins, Gunther Zupanc, Gerhard von der Emde, Leonard Maler, George Akoev, Yuriy Andrianov, Vladimir Baron, John New, Sacit Karamiirsel, Heinrich Vischer and Ekkehart

Trenkner as visitors for up to several months and one for a longer term, James PrechtL

An endowed chair has been created at the University of California, San Diego, the Walter Heiligenberg Chair in Neuroethology. This was made possible by major gifts from a former student of Walter's, together with partly matching funds obtained from the University and contributions from many individuals across the globe.

The symposium speakers, most of whose original scientific papers are printed here, were chosen to represent a broad range of neuroethology, both in terms of approach and of taxonomic groups.

Bass and Baker, drawing on data from teleosts, amphibians and mammals, give us an unusually synthetic essay on the ontogeny and phylogeny of the cranial neural circuitry that generates rhythmic behaviors in vertebrates - from cardiac and respiratory rhythms to vocal, elecBmotor and extraocular patterns. They propose that intrinsic oscillatory properties of neurons and ensembles were inserted into networks as innovations in certain rhombomeres and that from the same genetically specified compartments of the embryo-

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onic hindbrain later additions produce the pattern generators for vocal and other systems and the rhythmic climbing fibers that target cerebellar Purkinje cells.

The paper of Bell, Bodznick, Montgomery and Bastian is also synthetic but unusual in another way. Four laboratories, working for the most part independently, have cooperated to provide an integrated account of several of the ways the nervous system deals with expected input, especially when such afference could interfere with deflection of unexpected input, as when locomotor or respiratory movements strongly influence receptor organs needed for sensing novelties in the surround. The examples presented come from elasmobranchs and teleosts and involve the cerebellum and allied structures. Some have the added feature of plasticity, 'learning' within a few minutes what input to expect when a change takes place in the surround.

Hopkins, Shieh and McBride represent electric fish and their special sense modality - the group of animals and the modality associated with Walter's name, and an expanding, rapidly moving field. These authors have produced a close study of the hitherto less understood aspect of electroreception, the detection and location of current sources, not by the active use of their own electric organ discharge fields but by the passive use of the fields generated by other electric fish or dipole models of them. Receptive fish were found to be unable to compute the straight line direction to a source several body lengths away but to make well-directed approaches by following the curved field lines to the source, orienting at a zero angle to the local electric field.

Huber, Orzeszyna, Pokorny and Kravitz illustrate quite another approach in linking amines and their metabolites to aggressive behavior in lobsters. Notable is the success in quantifying aggression (extending some of Walter's early work on freshwater fish!) and in modifying it in subtle ways with amines. Metabolites are excreted in the urine and may serve as social signals.

This model system gives promise of biochemical dissection of mechanisms underlying decision making.

The paper by Weeks, Jacobs, Pierce, Sandstrom, Streichert, Trimmer, Wiel and Wood is our only sample of the large and active field of insect neuroethology and at the same time represents a developmental study of plasticity in a particular behavioral act, a larval proleg withdrawal reflex in certain species of moth. It shows how a close inspection can uncover hormonally mediated regression of dendrites and actual death of predestined motor neurons. Distinct from these changes are short-term, activity dependent changes of several kinds, including two simple forms of learning in these larval stages.

Terrestrial vertebrates were represented at the symposium by elegant new experiments of E.I. Knudsen and P.F. Knudsen on developing owls, regrettably not printed here. Also unprinted are the insightful remarks made under the rubric of Prospects and Perspectives in Neuroethology by members of a panel of sages: Mituhiko Hisada (Sapporo), Franz Huber (Seewiesen), John Montgomery (Auckland), and Larry Squire (San Diego).

Complementing the words of respect and affection of the speakers for Walter Heiligenberg was the strong feeling among those who knew him that he would have appreciated the biodiversity in the stories narrated, the sophistication of the respective approaches and the exciting glimpses of future progress that shone between the lines — in addition to unknowable lighter touches he would have injected.

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