Preface

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The idea for the Twelfth Annual Karger Workshop on ‘Social Modulation of Brain and Behavior’ was patterned after and inspired by the 1998 Karger Workshop organized by Joe Dulka, concerning ‘Steroid Action on Brain and Behavior’. I greatly enjoyed that symposium and it started me thinking about applying the same general approach, but rather than focusing on steroids, we would focus on how social interactions modify brain and behavior.

This general topic has been of interest to me since 1988 when I began to study the neurobiology of sex change in fish with Andy Bass at Cornell University. When we began our studies on the mechanisms underlying adult sex change, the literature in this field was dominated, both theoretically and empirically, by studies focusing on the primary role of the gonad and its products in controlling sex change.

We decided to focus on the brain, because of the common theme of social control of sex change in most fish. The primary cue for initiating sex change was the removal of a dominant male, and this had obvious implications with respect to the role of the brain in the initial transduction of changes in social cues and the resulting cascade of events that culminates in complete sex reversal. We envisioned that the change in steroid profiles that was a characteristic of sex reversal was a later rather than earlier step in the process.

At that same time, John Wingfield and colleagues (including Greg Ball, a contributor to this volume) published their seminal paper on the ‘Challenge Hypothesis in American Naturalist’, which posited that the variability observed in testosterone levels in seasonally breeding birds was a reflection of their mating system, which in turn was a by-product of their environment. Thus, testosterone was viewed as not driving increases in behavior, but rather as a reflection of recent social activities. In short, the more aggressive interactions an individual had, the higher its testosterone level would rise, and this would feed back in a

positive manner on territorial and/or reproductive behavior. Although this hypothesis was established on the basis of studies on birds, these ideas gained a great deal of support from numerous studies on fishes with the work of Richard Francis and Rui Oliveira highlighting the importance of social dominance in the regulation of testosterone levels, rather than the converse.

In their summary, Wingfield and colleagues indicate that vertebrates are quite plastic with regard to their endocrine responses to social environmental cues and suggest that neural mechanisms for the transduction of these signals should also be quite plastic. It was the very plasticity of these neural mechanisms that was the topic of the Karger Workshop and the focus of this issue of *Brain, Behavior and Evolution*.

The general goal of the symposium was to approach the theme of social modulation of brain and behavior from four different perspectives: (1) history, (2) the comparative approach, (3) integration at multiple levels of organization, and (4) interaction and exchange of ideas amongst the participants. This volume addresses the first three of these goals, although I hope the fourth goal is addressed, in part, by each individual contribution.

The keynote speaker, John Wingfield, addressed the historical perspective through a summary of the early ideas that played a key role in focusing efforts on how social interactions affect the hormones and behavior of an individual. This includes the concepts that gave rise to the Challenge Hypothesis and the work, from Dr. Wingfield’s lab and others, that resulted from the many efforts to address and expand upon that idea. Both Wingfield’s presentation, and the second talk by Greg Ball (and Jacques Balthazart) build upon this early foundation and examine the neural mechanisms that Wingfield and colleagues alluded to in the Challenge Hypothesis paper.

I embraced the comparative perspective by choosing the remaining speakers such that their talks would provide a sampling from all of the major vertebrate groups and a representative invertebrate as an 'outgroup'. The idea of an invertebrate outgroup was again borrowed from Joe Dulka who invited Janice Weeks to talk about steroid affects on 'brain' and behavior in *Manduca* and I think this provided unique insights into the general question being addressed in that symposium. Greg Ball discussed rapid changes in brain peptides and gene expression patterns as a result of social interactions in birds, Robert Huber examined the role of monoamines in the regulation of aggressive behavior in crayfish, Jim Pfaus addressed rapid gene expression in response to social interactions in rodents, Cliff Summers talked about rapid changes in monoamines associated with social interactions in lizards (and rodents), and Andy Bass and myself addressed social regulation of brain, hormones, and behavior in fish.

Each speaker provided an integrative perspective and I applaud all of them for their efforts along these lines. Although most of the talks focused on rapid effects in the brain, there was still an overall coverage of issues ranging from ethology, to endocrinology, to molecular neurobiology

Finally, I need to give thanks to a few people who made it all possible. First and foremost to Dr. Thomas Karger for his continued generous support of the Karger Workshop. Next to Laura Bruce and Walt Wilczynski for their assistance and encouragement during the planning stages and to Joe Dulka for planting this seed in my head with the excellent symposium that he organized two years ago. Last but not least, this volume would have been impossible without the saving graces provided by Walt Wilczynski and Blinda McClelland.