

## Editorial

Adaptive Behavior  
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The study and simulation of adaptive behavior in natural and artificial systems have always involved the convergence of several disciplines, interests, and methods. Since its inception, the pages of this journal have reflected a cross-fertilization between the sciences of the artificial, the sciences of living systems, and the sciences of the mind. As a result, *Adaptive Behavior* has been, and continues to be, a forum for innovative, creative, yet rigorous, work on complex adaptive systems, robotic and computational investigations of behavior and cognition, as well as novel theoretical developments and applications.

The success of research across disciplinary boundaries is sometimes paradoxical. It is often the case that novel ideas make their appearance first in interdisciplinary forums such as this journal, and as they mature they develop into their own new branches of specialization with their own journals, workshops, and conference series (e.g. swarm intelligence, nature-inspired computation, evolution of communication and language, and cognitive robotics).

Hence, our particular aims are constantly on the move, driven not only by the general advance in knowledge, as it occurs within any single well-defined research discipline, but also by the birth of new research programs and entire fields out of the stimulating intellectual milieu of interdisciplinary debate and collaboration. As has long been noted by anthropologists, a clash of cultural systems, each with its own unreflected certainties, offers unique opportunities for learning and transformation.

Yet the general mission of *Adaptive Behavior*, as times change, does not itself change fundamentally even as the journal, like any good adaptive system, assimilates and accommodates to new challenges and open questions. The mission for this journal remains to be the source of new ideas, the forum for novel recombination, and a place to ask difficult questions that are rarely asked at the core of individual disciplines.

Today this mission means encouraging high-quality publications and debate in exciting and emerging research areas. For example, *Adaptive Behavior* is well-positioned to contribute to the consolidation of new approaches to cognitive science, especially research

related to “4E cognition” (embodied, embedded, extended, and enactive cognition), including the predictive coding framework, autopoietic and sensorimotor theory, as well as dynamical and ecological approaches to psychology. In accordance with these approaches, this journal is equally a fitting home for expanding research on the possibilities of intelligence without a central nervous system, such as behavior-based approaches to the origin of life, plant cognition, and the adaptive capacities of multi-agent and social systems. Another important area is living technology, which includes morphological computation, deep neural networks, and other advances in the methods and practical applications of bio-inspired self-optimization.

In particular, we identify the following research challenges:

- To better understand the adaptive and cognitive capacities of (bio-)chemical systems;
- To concretize predictive coding into a framework that can be more easily applied to advancing actual examples of cognitive robotics;
- To replicate biological autonomy in artificial systems (or to demonstrate why this cannot be done);
- To determine whether the various new approaches to the sciences of mind are compatible or, alternatively, to determine their competing predictions;
- To better understand what (if any) are the limits of intelligence without a nervous system and intelligence without representations;
- To clarify the nature of the normativity inherent in living systems in such a way that it could improve cognitive robotics and living technology;
- To better understand the conditions under which multi-agent and social systems generate collective properties that benefit their components;

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- To search for new materials that allow for more adaptive robot bodies.

The ongoing mission is reflected in current and forthcoming changes to the Editorial Board, plans for new special issues, and new ideas regarding formats that promote discussion and debate. It is also an appropriate

time for one of us (E.D.P.) to step down as Editor-in-Chief after several years and to pass on the torch to the other (T.F.). These changes, we think, will encourage renewal while remaining true, at the same time, to what the aims of the journal have been since its beginning.

### About the Incoming Editor



**Tom Froese** is a faculty member of the Department of Computer Science in the Research Institute for Applied Mathematics and Systems (IIMAS) at the National Autonomous University of Mexico (UNAM). He is a member of the Center for the Sciences of Complexity (C3) and the coordinator of the 4E Cognition Group. He received his MEng in Computer Science and Cybernetics from the University of Reading, UK, and his DPhil in Cognitive Science from the University of Sussex, UK. He has worked as a postdoctoral researcher at the Sackler Centre for Consciousness Science, at the University of Tokyo, and at UNAM. He is coordinating a diverse range of projects with the aim of analyzing and integrating the dynamics and phenomenology pertaining to life, mind, and sociality.