Where is Cognitive Science Now?

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Introduction

An important goal of cognitive science, identified by many earlier practitioners and proponents of the field, was to form a well-integrated study of the mind within a coherent theoretical framework that would bring together several existing disciplines including cognitive psychology, linguistics, philosophy, artificial intelligence, neuroscience and anthropology (Collins, 1977; Gardner, 1987; Miller, 2003; Boden, 2006). There is little doubt that cognitive science is, and has been, *multi*-disciplinary — it fosters the interchange of ideas from multiple disciplines. However, it is less clear whether cognitive science has developed into the envisioned integrated *inter*-discipline, with a cohesive theoretical framework and common methodologies (Van den Besselaar & Heimeriks, 2001). Although often used interchangeably, multi- and inter-disciplinarity are different (Choi & Pak, 2006) and have distinct educational, theoretical, and institutional implications. Speakers in this symposium will address this question using qualitative and quantitative evidence and further discuss their visions for the future of the field given its current status.

As early as 1990, cognitive science researchers began expressing the view that interdisciplinary research was not as typical as originally conceived (Rogers, Scaife & Rizzo, 2005). Near the two-decade mark of the Cognitive Science Society, event organizers already recognized a 'general perception that the annual conference [had] become rather narrow, representing some segments of the cognitive science community but not others' (Langley & Shafto, 1997). By the 2000s, these concerns manifested as special editions of *Topics in Cognitive Science* discussing the role of various approaches within cognitive science (Barsalou, 2010), particularly anthropology (Beller, Bender & Medin, 2012) and philosophy (Brook, 2009). In parallel to internal discussions based primarily on theoretical insights and personal observation, scientometricians have used citation patterns in cognitive science as a test case to evaluate models of multi- vs. interdisciplinarity in scientific fields (Leydesdorff & Goldstone, 2014; Van den Besselaar & Heimeriks, 2001).

Many previous efforts to understand the disciplinary makeup of the field have focused largely on research publications. However, exclusively examining research products is insufficient to understand the state of cognitive science *and the mechanisms by which it operates and changes*. To address this, Núñez et al., (2019) sought to characterize the current and projected state of disciplinary integration using a suite of bibliometric and socio-cultural indicators designed to evaluate not only the publication output of cognitive science, but the ways in which disciplinary knowledge has been institutionally structured and propagated through educational programs. Citation analysis of articles published in the Society's flagship journal — *Cognitive Science* — from 2000 to 2018 replicated previous findings that the journal's publication environment has increasingly come to be dominated by cognitive psychology (Van den Besselaar, 2018). A second bibliometric analysis was conducted to determine the institutional affiliation of authors in *Cognitive Science*, finding that researchers affiliated with psychology programs constitute the majority of contributors to the journal. These measures (if imperfect) indicate a lack of diversity in the knowledge bases of cognitive science. Recognizing the possibility that cognitive science may still be a young, *multi*-disciplinary field which is poised to transition to an integrated

inter-discipline, Núñez et al., sought to characterize the resources available through current institutions to foster future generations of increasingly interdisciplinary researchers. Firstly, the disciplinary backgrounds of faculty employed in the (only) four PhD granting departments of Cognitive Science were examined and revealed a trend toward overrepresentation of psychology backgrounds relative to other areas of cognitive science and noteworthy variation in the representation of other disciplines. Secondly, the authors characterized the undergraduate coursework requirements of all 33 North American institutes of higher education that provided Bachelor's degrees in cognitive science as of 2018. Among these programs, there was a general dominance of coursework (often outsourced to other disciplines) which indicated a dependence on psychology. In contrast, not a single program clearly required an anthropology course in its curriculum. However, more striking was the general diversity of curricula – there was not a single course title (or indeed departmental affiliation) which was required by all programs. Based on these data Núñez et al. concluded that cognitive science has failed to achieve the level of integration originally envisioned, remaining too diverse to be characterized as an integrated interdisciplinary field. Additionally, they point out that the disciplinary makeup of its training environment does not support a view in which cognitive science is poised to become a well-integrated cohesive interdisciplinary field.

Recently, Núñez et al. (2019), has been the subject of a special issue in *Topics in Cognitive Science* with eleven scholarly commentaries (Gray, 2019), three of them authored by speakers in this symposium. The presenters in this symposium will further discussions from these publications by presenting their informed views of the current state of multidisciplinarity, interdisciplinarity and academic integration. In addition to this descriptive endeavor, this symposium seeks to serve as a forum to continue normative debates about what values and practices will best benefit the field's continued development.

Carson Miller Rigoli, co-author in Núñez et al. (2019), will offer an overview and rationale for the bibliometric and sociocultural indicators presented in that article and contextualize that work in discussions about future cognitive science institutional policy. Andrea Bender will elaborate on Bender (2019) where she presents a view of cognitive science based on alternative bibliometric measures which is more disciplinarily diverse and which offers reasons to be hopeful for the role of anthropological approaches within the field. Ashok Goel will continue the discussion from Goel (2019) wherein he outlines the partially-overlapping histories of cognitive science and AI and offers suggestions to better integrate these areas of research based on experience as co-chair of CogSci 2019. Robert Goldstone will elaborate on Goldstone (2019) which provides a theoretical framework to understand cognitive science as a dynamic, integrating science. Rafael Núñez will moderate discussion.

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