Apidologie

DOI: 10.1007/s13592-020-00794-x

Original article

A short history of studies on intelligence and brain in honeybees

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Received 20 February 2020 – Revised 24 June 2020 – Accepted 21 July 2020

Abstract – Reflections about the historical roots of our current scientific endeavors are useful from time to time as they help us to acknowledge the ideas, concepts, methodological approaches, and idiosyncrasies of the researchers that paved the ground we stand on right now. The 50-year anniversary of Apidologie offers the opportunity to refresh our knowledge about the history of bee research. I take the liberty of putting the founding year of Apidologie in the middle of the period I cover here. The nascent period of behavioral biology around the late 19th to the early twentieth century was intimately connected with a loss of concepts related to the mental functions of the brain, concepts that were rooted in Darwin's theory of gradualism in the living world including cognition in animals. This loss was celebrated both in ethology and behaviorism as the gateway to scientific impartiality. Using this apparently strict scientific approach, impressive discoveries were made by observing and strictly quantifying the behavior of bees. The first forays into the brain, however, uncovered a richness of structure and function that reached far beyond stereotypical input/output connections and opened the way to compensating the conceptual restrictions imposed on us by traditional ethology. Honeybee research provides us with a particularly exciting story in this context. The cognitive turn in behavioral biology is intimately connected to the increasing knowledge of how the brain works, also in honeybee research. What has been achieved so far is just the beginning, but it gives us a glimpse of a promising future. Teamwork between neuroscientists and behavioral biologists is needed to elucidate brain functions such as the expectation of future outcomes and intentionality as an entry to animal intelligence reflecting the flexibility and adaptability in behavior also seen in honeybees.

honeybees / intelligence / brain

1. INTRODUCTION

At the time the journal *Apidologie* was founded, behavioral biology was comfortably embedded in two parallel, rather independent streams of thinking—ethology and experimental psychology (behaviorism, Pavlovian psychology). Although there were considerable battles between the two disciplines, each found itself on a conceptually firm foundation. Ethologists preferred to look into natural behavior in the species-specific environment and selected those behaviors that could be released or induced reliably multiple times (Tinbergen 1951; Thorpe 1979). Behaviorists worked preferably in the lab creating conditions that led to repeatable test conditions using classified training schemes (Skinner 1988). Although the research strategies and terminology were very different between the two disciplines, they had a shared understanding that interpretive or intervening terms, particularly those that included hidden reference to brain functions, were to be avoided or even banned. Rollin (1990) characterized this attitude convincingly as "how animals lost their minds". Furthermore, an additional common ground of both schools was their harsh opposition to any form of "anecdotal cognitivism" and anthropomorphism (Jamieson

Handling Editor: Monique Gauthier

Published online: 13 August 2020