Vigilance and perception of social stimuli: Views from ethology and social neuroscience
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To survive and protect their offspring, animals must detect threats before suffering damage. This requires efficient information-gathering, as well as rapid information-processing. Studies of nonhuman primate behavior reveal that individuals direct frequent and time-consuming vigilance (information-gathering via visual search of the environment beyond the immediate vicinity) toward members of the same species (conspecifics), particularly with increasing risk of aggressive competition. In addition, interactions with unfamiliar conspecifics are generally aversive. In a complementary fashion, electrophysiological and neuroimaging research on the human brain provides independent lines of evidence that socially-relevant stimuli are processed quickly (<200 msec) and processed by a phylogenetically-ancient brain region. Hence, we propose that the primate brain is adapted to rapid and sensitive processing of information about conspecifics, which derives from vigilance directed to the dynamic interactions of associates. We use this link to illustrate the potential for fruitful collaboration between neuroscientists and ethologists, and to suggest improvements to current practices in both fields.

1. Introduction

Cognitive ethology has the potential to unite two heretofore separate biological disciplines: neuroscience (the study of brain-behavior relationships) and ethology (the study of animal behavior). Despite separate histories and different investigative methods, neuroscience and ethology often address related and complementary topics. Neuroscientists' concentration on brain function has advanced our understanding of the proximate mechanisms underlying behavior. Ethologists' comparative, functional approaches have elucidated ultimate, evolutionary explanations for behavior. Anyone interested in sensory processing and information gathering behavior would gain from understanding the brain functions of their subjects. Likewise, anyone unraveling the secrets of the brain should understand the evolutionary history and past environmental pressures that shaped the cognition and behavior of their subjects. Cognitive ethology can advance both disciplines because it places information on how brain and behavior interact into an evolutionary context that explains why they do so.

In this chapter, we illustrate how brain research can inform ethology, and how in turn, the study of animal behavior can inform neuroscience. We happened on this collaboration by chance, unaware of the similarity of our research questions. Our intuition tells us that many fruitful collaborations between neuroscientists and ethologists never emerge because terminologies, techniques and theories appear mutually unintelligible. This chapter was designed to facilitate collaboration, using vigilance behavior to illustrate the utility of close communication between neuroscientists and ethologists. Our interdisciplinary approach, which could be useful in other domains of neuroscience and ethology, also suggests a modification to existing methods in both disciplines. Our focus is on the visual gathering and processing of social information related to members of the same species (conspecifics hereafter). Although many group-living species may show similar patterns of brain-behavior interactions involving several sensory channels, we concentrate here on visual cues used by primates.

1.1. Ethology can inform neuroscience

Social neuroscientists often present stimuli to elicit changes in their subjects' brain activity. For humans, the stimuli presented are often images of the faces of strangers. In these studies, the null hypothesis is that strangers' faces are neutral stimuli, with pleasing or aversive properties being generated by different facial expressions. This may create a problem if strangers are inherently aversive. Today, seeing a stranger's face is commonplace for humans, yet our brains are the products of millions of years of evolution under different circumstances. For our