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The Rational Animal

A Search for Clues in Cognitive Biology

With numerous illustrations

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Eine kognitionsbiologische Spurensuche)

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Content

Introduction

1. A Historic Outline of the Fundamental questions of Animal Cognition
2. Can Animals be Rational?
3. Use of Tools
4. Understanding Causality
5. Seeing into the Future
6. Episodic Memory
7. Metacognition
8. Reading Thoughts
9. Do Animals Have Language?
10. Do Animals Have Consciousness?
11. How Do Animals Think? A Summary in 7 Bullet Points

Epilogue: What Can We Learn from This?

Bibliography

Index

Index of Persons

Index of Species

Introduction

Whether animals have the ability to be rational and have consciousness is one of the most exciting and controversial questions of biology and comparative psychology [1]. And even though Charles Darwin [2; p. 488] predicted that psychology would be based on a new foundation, namely that of the “necessary acquirement of each mental power and capacity by gradation” (and that in the process “light will be thrown on the origin of man and his history”), biologists and psychologists have located the problem of animal consciousness outside the realm of respectable research for a long time, discounted it as an issue about which nothing can ever be known and which therefore required no further contemplation, let alone research. Even those scientists who research higher forms of cognition in great apes, dolphins or corvids, who concede that they think about their physical and social environment, that they have a sense of time, make tools, act according to a plan and can switch perspectives, refuse to answer the question of whether we can ascribe rationality, intentionality and consciousness to animals, and if we could, to which species and to what extent [3-5]. This is primarily related to three problems: First of all, it is still not clear what consciousness, which is connected to the other capabilities mentioned above, actually is. There are many diverging opinions even about the consciousness of humans, its neuronal mechanisms and its functions. This leads us to the second problem, the so-called “hard problem”: subjective experience. Consciousness is a complex phenomenon; subjective experience is its most mysterious aspect. Not only do our brains collect excitations and give them meaning, they also create a lively interplay of experiences and emotions: seeing green, feeling hungry or being amazed by philosophical questions. Being yourself is an emotion; and no one else is ever going to know this as immediately as you yourself. Thirdly, the investigation of animal consciousness brings up the question of the special role of humans.

As early as 1976, the US-American biologist Donald Griffin broke a taboo that had prevailed until then in relation to research into animal consciousness with his book *The question of animal awareness* [6; see also 7]. In light of the rapidly growing knowledge, the time has now come, forty-five years after Griffin’s book, to examine the most controversial questions of animal cognition, i.e., rationality and consciousness. There are many books on animal thinking, but they are often anecdotal and superficial. Some of them present lovely stories, beautifully illustrated for laypersons, but – garnished with a big helping of anthropocentrism – they lead to unfounded or non-verifiable conclusions. They do not deal

with the truly burning questions and the current approaches to answer them based on solid scientific findings. They hardly help us answer the question of animal thinking.

This book aims to examine different aspects of consciousness and rationality, but I wish to approach these from a primarily *functional approach*. Even Griffin was convinced that the reasons for the traces of human-like consciousness in animals would be found in the evolutionary process: The hypothesis is that consciousness wouldn't have developed if it didn't fulfil functions beneficial to survival. The most current research seems to imply that the original role of consciousness was the facilitation of intentional movements. With these, an organism was able to target its awareness better and focus precisely on that which is crucial to its fitness and survival. In possessing representations of objects and events in the world, the ability to create connections between different representations (*awareness*), the ability to focus on one of them (*intention*), and the ability to plan how to reach the intended goal, some animals had the central functions of human consciousness at their disposal. The fact that humans possess many other abilities beyond that, such as being aware of their own conscious processes and to communicate this to others in great detail, is beyond dispute.

But even self-monitoring, "metacognition" in technical terminology, not only occurs as early as childhood in humans but also in some animal species. Moreover, some animals have the ability to think about the knowledge of others, to anticipate their actions and thus share their perspective in part. Some animals can be innovative and creative – they find solutions for completely new problems on the spur of the moment by recombining earlier experiences or by selectively copying fellow members of their species. Some are not only able to use tools efficiently, they can also increase their effects through purposeful modification or even come up with entirely new tools. Animals can act with preparation not just when using tools, some can think ahead to future events in general and plan their actions accordingly, whereby they suppress their current need in favour of a future need. Some animals make decisions by weighing goals, by selecting the most efficient ways to reach them and by considering current and future motivations. With these abilities they fulfil some (though not all) criteria of practical-rational acting.

In this book, I intend to present the big and most difficult questions of comparative cognitive research – I call them the sextet of animal intelligence – by using suitable examples, discussing them in all their facets and finally answering them with the necessary caution. Beginning with the question of human rationality, whose history is initially examined and which is introduced as a conceptual framework, most current research findings that either question preferred interpretation schemata or demand new ones are going to be covered. It is

especially important here to critically question prematurely made categorisations often derived from the human species as well as from vernacular psychology and to consider animal (mis)performances from the perspective of species-specific, natural requirements. I am also going to examine language in great detail, both its evolutionary origins and diverse forms of communication as well as its most complex manifestations in the animal kingdom found so far. And finally, I am going to examine forms, origins, degrees and criteria of consciousness, sketch its underlying neural processes and finish with man's ability to be aware of his consciousness.

Why is it important to know whether animals can act rationally, intentionally, or consciously in the first place? The answer: because it is of both theoretical as well as practical relevance. It is theoretically relevant in two respects: it is in and of itself beneficial to understand animals better; but the knowledge derived from this is also of great importance for our self-evaluation. The practical relevance follows from that: Not only are we surrounded by animals, we live *with* animals, we live *off of* animals and we use them in many other ways. Still, we see ourselves as separate from them in important aspects. Consciousness, language and rationality are essential characteristics with which we justify our human uniqueness and thus our superiority and ultimately our right to dominate and use animals in various ways. If an animal can experience pain, we feel obligated to prevent it from suffering unnecessarily. And yet we do not award it the specific intrinsic value and the dignity associated with consciousness and rationality. This has far-reaching consequences for human actions and for the coexistence of humans and animals.

Even the contrast with *the* animal (singular) is often a sign of human hubris. Because, of course, there are not just one but roughly nine million species of animals. The title of this book, however, still refers to the "animal," because on the one hand, I defend the fact that this is not a mere object of experience but also a name for a construct that only becomes understandable within the framework of cultural organisational patterns. In human language, terms are not just exact descriptions of an object or fact but also abstractions, symbols, categories.¹ On the other hand, I would like to use this to emphasize the fact that animals are individuals and not just (nameless) representatives of their species. Modern cognitive biology in particular recognizes and appreciates the oftentimes big individual differences and one

¹ I owe the note that the construct of "the animal" is not a normatively neutral one to my colleague Judith Benz-Schwarzburg. For centuries, we have referred to "the animal" in the singular and opposed it to the human without looking at animals in the plural, at what they are and what they need. Therefore, it is not simply an organizational pattern but a pattern of subordination. See [8].

would not go amiss in referring to personalities even in non-human² animals, of whom we shall meet many here, including Alex, Betty, Figaro, Guillem, Kanzi, Kermit and Sarah.

From an ethical point of view, current cognitive research questions traditional attitudes towards animals, especially their instrumentalization, whether as food or laboratory animals. Huge changes are on the horizon here. Great apes are no longer consumed by humans, and perhaps very soon all apes will be, after that possibly all mammals and birds, even fish and cephalopods could disappear from our diet at some point. The experience of pain and even suffering of animals is a major motivation for rethinking traditional attitudes and opinions. They are strongly related to the attribution of consciousness. I am going to outline the ethical consequences and implications arising from the latest results of comparative cognition research at the end of this book.

New perspectives also emerge for the self-understanding of humans. By understanding the ways in which animals can be rational, we are challenged to rethink our own rationality. Perhaps our thinking is much more detailed and particular, much less theoretical, more integrated into and conditioned by our environment than we have previously assumed. The possibility of attributing relatively complex animal behaviour to a plurality of relatively simple, domain-specific processes might cause us to re-evaluate our presuppositions and prejudices about human rationality. And we would have to ask ourselves whether it is right to apply double standards to human and animal rationality. An informed and unbiased look at rationality may show that there is no sharp demarcation between human rationality and the way animals think. Comparisons between different animal species and between animals and humans, especially children, with regard to certain talents and ways of thinking can show to what extent certain abilities are based on common (homologous) or at least convergent (analogous) processes and in what way these processes reveal rationality. These insights will also increase the understanding of human rationality by shedding light on its development.

In light of this, here are three major themes, each with two distinct areas, that deserve special attention: 1) the creative production of tools and 2) other forms of technical intelligence (causal understanding); 3) extending one's thinking towards the future (preparation and planning) and 4) into the past (episodic memory); 5) thinking about one's own knowledge (metacognition) and 6) about the knowledge of others (switching perspectives and reading thoughts). These six mental capabilities are the main hallmarks of rational thought in a broader

² Throughout the book, I am going to use the attribute “non-human” to remind us from time to time that us humans are, in a biological sense, animals too.

sense. Whether these aspects of rationality should be given a different term to save the specificity of human rationality, or at least its potential for normative justification and decentring (thought transfer), remains a question for philosophers.

The individual chapters deal with those thought processes of animals that can provide scientific evidence for their rationality. These are processes that are not possible in humans without consciousness, such as the creative use of tools, switching perspectives, insightful problem solving and “time travelling” (episodic memory, planning). In the first chapter, I am also going to discuss concept formation, logical reasoning, volitional action, intentionality and the so-called executive functions. This list is not complete, but I should like to omit those areas where experimental, systematic and standardised research is still in its infancy, such as rational imitation, creativity and teaching.

Not only does the book aim to present what we know now (at the beginning of the third decade of the 21st century), but also how we came to know it. Therefore, a large number of studies of a predominantly experimental nature³ are presented. In particularly critical cases, where interpretations and conclusions depend on a precise understanding of the methods used, I will go into more detail and describe the experimental set-ups and the reasoning behind them. Sometimes the results also need to be presented at greater length and at times illustrated, because it is often difficult to understand experimental set-ups without having a clear picture of the equipment and objects involved, the different steps, the stimuli and the animals themselves. Many examples stem from my own research, in which cases I have often gone into greater detail and added personal comments.

[...]

1. A Historic Outline of the Fundamental questions of Animal Cognition

A cat runs across a meadow because it is being chased by a dog. When it arrives at an oak tree, it changes direction at the very last moment and saves itself by climbing up a neighbouring maple tree. The panting dog fails to pay attention for a moment, overlooks the cat’s quick manoeuvre and barks at the oak. The cat is safe. This realistic example has been used by

³ When the attribute “experimental” is used to describe animal research, it often has the connotation of being “invasive”. Unfortunately, experiments on and with animals are also connoted negatively. This is regrettable and misleading, because experiments and trials are good and important instruments of empirical research. Thus, not only has my own research of more than thirty years remained exclusively non-invasive, in this book I also describe results that were exclusively obtained in a non-invasive manner.

philosophers such as Norman Malcolm [9, p. 13] and Donald Davidson [4, p. 319] to discuss the question of whether animals can err – since the dog is, at least at first glance, making an error by barking up the wrong tree. But is that really what it is doing? Or is an error only possible when someone has the ability to distinguish between true and false? Only someone who is convinced of something, has an opinion or can form a judgement, can subsequently err.

Already in Antiquity and the Middle Ages, philosophers (and later theologians, jurists and natural scientists too) found different answers to the questions of whether animals can think, make decisions, have goals, plan actions – and finally also whether animals perform acts of which they are fully conscious. Often the question of thinking in animals was posed in such a categorical and general way that no consideration was given to the possible differences between various animal species or even individuals, nor to the possibility of different categories of thinking. The question “Do animals think?” was posed in such a general way because one wanted to point out a decisive, categorical difference to thinking humans. In the so-called “anthropological difference” it was and is a question of all or nothing. In the question about human nature, in the sense of human self-knowledge, animals were and still are important indicators.

[...]