The Sensitivity of Animals and Application of the Three Rs

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Summary

It may be impossible to understand the minds of animals, but it is our moral duty to try. We study their natural history, senses, and psychology, and yet we stubbornly continue to care for animals and use them as if they were interchangeable scientific equipment. Even when a species is known to respond to human expectations or stimuli outside our perceptions, this may not result in husbandry changes. At best we minimize these factors, as if experiences outside our reach deserve only to be eradicated. Pigeon homing and dogs detecting cancer went unstudied for decades because we hesitate to study that which we do not understand. Our protocols might change considerably if we assumed animals know their fates and see directly into our minds. Would we be more likely to seek alternatives to animal use if one of the groups we had to explain ourselves to were the animals themselves?

Keywords: alternatives, animal welfare, sentience

1 Introduction

When you are carrying out hands-on research, it can be very tempting to think that those in administrative or regulatory roles don't really "get it." We pay lip service to the 3Rs as an ideal but rarely step back to think deeply about why they are important and what we should be doing to truly achieve them. This paper will take rather a different approach, looking not at the 3Rs themselves but at how we came to find them important in the first place.

As a researcher, I know I was focused on getting the job done. Generally, the wider conceptual work about whether it should be done at all and whether it should be done this particular way had been settled long before administrators turned up with their paperwork to fill out and hoops to jump through. The research model had been handed down through generations, and I was unlikely to suddenly stop using animals or embark on a new animal model so long as the current track was widely considered valid and acceptably productive. I often glossed over the issue when ticking that box that said: yes, I searched for alternatives to animal use or sighed heavily before throwing together a convincing but *post hoc* risk-versus-benefit analysis.

Sometimes, it is only with a little distance that we can give these questions their due – distance in terms of time, or place, or through the involvement of a third party, such as a veterinarian, IACUC panel, or even a family member or friend.

2 The sensitivity of animals

I am by no means supporting the idea that researchers do not care about animal welfare or are driven by ambition and money, as some vilifying abolitionist portraits would have us believe.

But researchers do have a duty to contemplate the ethics of using animals, which may sometimes be neglected. And thus it is important to listen to the officials, ethicists, and other third parties who do have time and resources to consider these issues in more depth and breadth and at more length.

One basic underlying issue is: just how sensitive are animals to the impositions of life in the laboratory? When we consider this question, our understanding of the inner word of a non-human animal has some persistent problems. Our imperfect understanding of the subjective life of animals rests on a series of assumptions, each of which is burdened with flaws and limitations.

For example, a long-used rule of thumb is anthropomorphism: to assume animals are like us except in ways that they clearly differ. When Lorenz observed a newly hatched gosling for a few hours and then tried to pass it to a goose foster parent, the gosling taught him that there are specific gosling imperatives that will cause this plan to fail. Lorenz responded to the failure of his anthropomorphic assumption by creating a new module for understanding animal behavior, now known as imprinting (Lorenz, 1970). He was, in effect, learning to recognize how goslings goose-o-morphise their relationships with humans (when other bird species base their relationships on different starting assumptions and may ignore or flee from humans).

Sometimes accommodation of a "failure of expectation" is not so immediate. For example, the most widely used definitions of the abnormal behavior patterns, referred to as *stereotypy*, includes the requirement that the behavior "*appears to serve no function*" (Berkson, 1968). By which we mean, of course, no function that the human observer can easily discern and relate to. This has variously led to the suggestion that stereotypies are not bad for, or may even be good for, animal welfare. Decades passed before meaningful research was carried out to establish

what the animal is motivated to achieve when it carries out a stereotypy, on the assumption that such a function – even if beyond our understanding – must exist.

Another approach is to start with the assumption of the nil or mechanistic animal. In this case the animal was assumed to know, think, or feel nothing at all unless there is specific contrary evidence, which sometimes had quite a high bar for acceptance. (I would note that the behaviorist tenet, while often misrepresented as saying animals do not think or feel, is that the subjective lives of animals cannot be scientifically established – not that they do not exist. But, in effect, it does have a tendency to lead to the same errors of conservatism, Cox and Ashford, 1998). Specifically, this paradigm underlay the effort to minimize the animal's environment, creating barren boxes that provided for rudimentary physical needs, thus inflicting upon animals the physical and emotional consequences of severe environmental deprivation.

It is simplistic to say that minimalism is without merit, however. While it is not too great a leap to say that a cat would feel pain if operated on without anesthetic or analgesia, it is another thing entirely to suggest that your cat breaks your possessions at night because she resents the time you spend with the dog. The further we travel from what can be directly measured to what is concluded, the more vulnerable our conclusions are to a change in context, or assumption, or the existence of alternative explanation such as, for example, that cats are active, playful… and nocturnal. Minimalist approaches help us to distinguish between what is observed and reliable and what is concluded, and therefore, to a greater or lesser extent unreliable.

The truth is that we cannot avoid having assumptions, and it is difficult to avoid allowing these assumptions to bias our conclusions in a way that we may find difficult to detect. For example, everyone knows the story of Pavlov's dogs, but have you heard of Pavlov's mice? In 1929 Pavlov presented data collected by an assistant aptly named, or at least referred to as, Studentsov. As part of a research project into the inheritance of acquired attributes in animals, and remembering that Lamarckian theories were the norm in Russia at that time, Studentsov trained a conditioned response in five generations of mice. The number of trials necessary to achieve the response declined rapidly across generations from 300 to 100 to 30 to 10 and then 5 (Sebeok, 1978). Having gone in looking for evidence that learning that occurs in an animal's life time can be passed on to the animal's offspring, this is exactly what they found.

However, six years later Pavlov arrived at the opinion that the improvements achieved came from the improving skill of Studentsov in eliciting a conditioned reflex, and that the mice's ability to acquire the conditioning had not in fact changed at all. Pavlov had assumed that any changes demonstrated by the mice reflected changes in the mice. Ultimately, the best way to determine whether we are falling for a self-fulfilling prophecy is to imagine how we would explain the data if the prophecy was reversed. To place oneself in a mental world where the operating assumptions are upside down and the behaviors demonstrated by the mice may in fact reflect changes that occurred in the man.

For example, our tendency to think of animals as being essentially human-like imperfectly captures the extent to which basic mammalian experiences are shared across species (although certain species-specific experiences are not). The remedy is to reverse this assumption and consider the extent to which an animal's experiences are utterly alien to us. Philosophers are fond of making this particular point: for example, Thomas Nagel's essay "What is it like to be a bat" (Nagel, 1974) or Wittgenstein's assertion that "if a lion could speak, we could not understand him" (Wittgenstein, 1953).

This approach is vulnerable to the same problems as the empty animal assumption, because the alien animal cannot be assumed to be like a human, except to the extent that it is assumed to be sentient. As such this assumption supports the use of a "best guess" accommodation of animal needs based on what we can observe of the animal's technology, unconstrained behavior, and native environment. It is on this basis that we provide species-specific enrichment and consider captivity a higher imposition on an animal whose natural range is particularly large, complex, or otherwise radically different from what we can, or do, provide in captivity.

The real missing quadrant in our considerations is the all-knowing animal. Our tendency to assume animals know little or nothing needs to be balanced by thinking about what it would be like if animals knew as much as us, or more about their situation than we do. Many people know the story of the horse *Clever Hans*[*].What is often not appreciated is that Clever Hans developed his ability to count and answer questions because he was trained by *Herr von Osten*, who genuinely believed that animals had intelligence of a human type and scale but that this was only revealed with proper training. *Oskar Pfungst* determined that the horse was reading the body language of people to arrive at the correct answer, and that he was most accurate when the person believed he could answer correctly. What occurred in the study of Clever Hans was not just a simplistic triumph of truth over fallacy. Only by believing Hans was intelligent did von Osten discover that he had a marvelous ability. Only by refusing to believe that the horse was intelligent did Pfungst reveal the exact nature of that ability. And only by moving from one assumption to the other was the ability of the animal both revealed and understood.

This issue became even more clear when Dr Robert Rosenthal issued students so-called "maze bright" and "maze dull" rats that

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[*] There has been a long history of horses that are able to count, spell or perform other unusual feats that are difficult to comprehend if you assume a horse knows little other than what is deliberately taught to it. In the late sixteenth century a man named William Banks had such a horse named Marocco which performed to great acclaim in England, but when he took the show to France he was brought up on charges of sorcery and narrowly escaped with his life – not because the horse proved itself to be ordinary, but because it proved itself to be Christian by bowing to a cross.

were, in truth, all from the same stock. The students achieved the results the predefined label for their rat suggested (Rosenthal and Fode, 1963). Had they misinterpreted the rat's behavior or by their conduct caused some rats to be better performers?

Taking a step even further back, was this particular use of the maze nothing but an illusion created by our own belief that mazes measure intelligence? For example, when considering the *Hebb-Williams Maze*, rats from impoverished barren environments make more errors in the maze, leading to a widespread belief that barren caging makes them less intelligent, or in the modern parlance, cognitively impaired. But what of the studies that show that an electric shock or more intense hunger raises the performance of these dull animals to that of their privileged peers (Woods et al., 1961)? Are we to believe that pain or hunger makes a rat more intelligent? We may, in fact, have stepped into the fallacy of the maze as soon as the maze was invented, and by our assumptions from that moment forward, never found our way out again.

So if we have a number of different imperfect assumptions about animals that tend to lead to a number of different mistakes, the solution is one of plurality, flexibility, and balance. I would suggest that underestimating animals and the impact of the human-animal bond remains the dominant problem of modern animal-based science. In fact, underestimating the abilities of animals has stunted investigations in a number of areas. As one more example, consider the ability of pigeons to return to their caretaker and their home loft over great distances and across unfamiliar terrain, an ability that has been known since antiquity and has been under scientific scrutiny for fifty years (Wallraff, 2005). In the early years, however, from the 1930's until the 1960s, some of the most productive research into this phenomenon was conducted by parapsychologists such as Dr Joseph Pratt at Duke University (Pratt, 1953).

Given that homing ability can be demonstrated with profound regularity and reliability, it is hard to understand why more mainstream researchers neglected this impressive ability – unless it was because they could not understand *how* the animals accomplished this feat and thus were averse to studying that they *could*. Only as the distinctly non-human sensory systems of the pigeon became better understood, specifically the use of multiple redundant navigation systems based on the perception of magnetic fields, solar position, landmarks, and directional odor cues – did the study of homing take off in the scientific mainstream. And even this was not a simple process.

In the 1970s an Italian team led by Papi produced a great breakthrough in exposing the navigational use by pigeons of atmospheric odor cues (Papi et al., 1972). This newly revealed mechanism was widely rejected for many years, despite significant and growing data supporting it, because the use of odor in long distance navigation simply seemed to be too implausible to us as relatively "nose-blind" humans. One of the common demands made of parapsychology by conventional scientists is that: "extraordinary claims require extraordinary evidence." But what is often not appreciated is that reading a "smell map" is not

extraordinary if you happen to be a pigeon. Nor are a great many other animal abilities that go largely unappreciated and are not accounted for or catered to by laboratory housing.

Robert Merton (1948) introduced the idea of a self-fulfilling prophecy in the context of racial discrimination, showing that an assumption of inferiority quickly led to a perception and then a creation of race-based disadvantage. The solution is to correct the false assumption that the races are unequal in ability. But in the case of non-human animals, for a number of empirical and ethical reasons, there is no easy correction to be found. We are not yet widely capable of understanding just what it is like to be a rat or an octopus – although I do not consider it impossible that in the far future we might achieve this.

What we currently have are not false assumptions and correct assumptions but a series of assumptions, all of which are to some degree correct and to some degree false. Historically, our tendency has been for mainstream thought to move from one paradigm to the next under an illusion of progression from lesser to great accuracy, rather than understanding that the fundamental validity of scientific data is revealed by its ability to stand even when the culture of the discipline changes. Because as data that can be used to make such a transition between paradigms (such as Newtonian to Einsteinian physics or behaviorist to cognitive psychology) it must be unusually reliable.

It is fundamentally inefficient to make these transitions only when huge societal shifts occur – as the same outcome can be made within a single research team or even a single human mind. Our tendency to think of animals as humans, mechanisms, or aliens allows us to take certain productive approaches and make certain predictable errors. For these reasons it is important to work with animals with an explicit awareness of the assumptions you have made and the ability to change these assumptions, at least speculatively. That is, to indulge in thought experiments where we consider data from the point of view of a world that is different from the world we intuitively believe we inhabit.

We are not yet widely capable of having a fully accurate understanding of the needs and sentience of non-human animals. However, more light can be cast on this question by using multiple, overlapping, and partially successful strategies in an effort to triangulate the general area of the truth. This is especially the case when these strategies are based on fundamentally different paradigms that reach their best accord where they align most closely with reality, rather than with the prejudices of a shared tradition. Vinciane Despret (2004) proposed that if Rosenthal had issued rats to his students and told them to act "as if" the rats were maze bright or maze dull, he would have obtained the same results. I wonder if this is true.

All of this is really just an introduction to a thought we should at least occasionally entertain. A thought that, when raised, has sometimes caused offense or led to derision. What if animals understood everything that was going to happen to them? You do not have to believe this is possible in order to imagine it. For if we are really to understand how sensitive or how intelligent

or how aware animals are, we cannot attack the question solely from the *empty animal* up, or the *anthropomorphic animal* sideways. The best and most accurate discrimination of the animal's real state is likely to require feeling our way across from the *alien animal* and down from the *omniscient animal* as well.

If you imagine an animal that knows what will happen to it from birth to death in our care, what would that animal actually be thinking? What would it think of the validity and worth of its life, of its role, and ours? Would it support its own use, or would it reduce, refine, replace, or eradicate it – for what reasons and at what cost? What question would that animal ask us, if we gave it that opportunity? Would the animal, or could it, have a good life? If not, could we justify the sacrifice to the *animal itself*? It does lead one to consider why tests of dubious validity and models of dubious validity have persisted, and why simple considerations such as reversing light cycles for nocturnal animals are too often still not provided. Why are experiments often not blind or, when possible, double blind? Asking these questions should be considered part of the work of science, and it should not be belittled or found offensive, unscientific, or time-wasting. This is because, without these questions, what is wasted is the opportunity to give research animals the best life possible and to use them to the best benefit of humans and animals. We have made great strides in the area of refinement and reduction, but how often is replacement seriously considered or achieved?

3 The 3 R's

The ethicist Ben Mepham (creator of the "Ethical Matrix", 2000) makes a case that a person making a moral decision must try to the best of their ability to be blind to their own identity. He characterized this as like putting a blanket over yourself so that you might just as easily be any morally relevant stakeholder in the situation, because you are making the decision for all of them – including the decision of just how much power and influence each is given. The use of animals in research is both a duty and a privilege subject to ethical justification. And it is worth considering, no matter how speculatively, whether that justification serves a greater purpose than to tick the right boxes, free up the necessary resources, and deflect the usual protestors.

Animals are morally relevant stakeholders in research activities. And to pass Mepham's test as the ethical decision maker, I would suggest that we need to be able to imagine that the animal, just for a single lucid moment, could understand exactly what was happening to it and form an opinion. If the ethicist under the blanket were a research animal, would it find the reason for its presence and its role, and that of its peers, to be compelling and the experimenters' actions just. Many different valences and strengths of answer could be reasonably and sincerely given to that question and each must be respected – except perhaps the unwillingness or inability to even consider turning one's mind to such a place, even for a moment.

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