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Beasts and boundaries: An introduction to animals in sociology, science and society

Abstract

Traditionally, sociology has spent much more time exploring relationships between humans, than between humans and other animals. However, this relative neglect is starting to be addressed. For sociologists interested in human identity construction, animals are symbolically important in functioning as a highly complex and ambiguous “other”. Theoretical work analyses the blurring of the human-animal boundary as part of wider social shifts to postmodernity, whilst ethnographic research suggests that human and animal identities are not fixed but are constructed through interaction. After reviewing this literature, the second half of the paper concentrates on animals in science and shows how here too, animals (rodents and primates in particular) are symbolically ambiguous. In the laboratory, as in society, humans and animals have unstable identities. New genetic and computer technologies have attracted much sociological attention, and disagreements remain about the extent to which human-animal boundaries are fundamentally challenged. The value of sociologists’ own categories has also been challenged, by those who argue that social scientists still persist in ignoring the experiences of animals themselves. This opens up notoriously difficult questions about animal agency. The paper has two main aims: First, to draw links between debates about animals in society and animals in science; and second, to highlight the ways in which sociologists interested in animals may benefit from approaches in Science and Technology Studies (STS).

Keywords

Human-animal boundary; Boundary-work; Science & Technology Studies; Identity; Ambiguity; Actor Network Theory

Animals in sociology

Defining what it is that separates humans from non-human animals has been an important task of moral philosophers for centuries. Descartes is often cited in these debates, for his famous (or infamous) notion of beasts as machines, without sentience and without moral standing. Against this view are critics who argue that animals have rights (e.g. Regan 1984), or have morally relevant interests that should be taken into account (e.g. Singer 1975) (see Garner 2005 for a recent review). For those who support these positions, to discriminate against animals on the basis of

their non-human status amounts to “speciesism”, in the same vein as racism or sexism (see Ryder 2005). Some of these philosophical debates are quite abstract but nevertheless have had a profound practical impact. In Jasper and Nelkin’s words, philosophers have served as midwives to the modern animal rights movement (1992: 90). More broadly, Lynch and Collins (1998) show how the subjects that Descartes was considering – about the distinctions between person, animal and machine – remain crucial to the social and cognitive sciences.

In contrast to significant philosophical consideration, the human-animal relationship, and the role of animals in general, have historically been less central to sociology. As Tovey writes, “to read most sociological texts, one might never know that society is populated by non-human as well as human animals” (2003: 197). There are three types of explanation for this traditional lack of attention: First, sociologists have traditionally focused their efforts on discussing relations *between humans* and the construction of social categories such as gender, ethnicity and class. Some may worry that the notion of oppression will become cheapened if speciesism is included as a form of discrimination (Arluke 2002); Second, sociologists may be wary of attracting charges of paternalism if we are seen to be “speaking for” animals (Munro 2005). However, this may partly reflect the “linguicentric” nature of contemporary sociology since G.H. Mead (Sanders 2003 and see Konecki 2005); And third, the relative neglect of animals as a topic of study may be part of a broader tendency to narrowly equate the social world with living humans. Given that anthropological research has shown that in non-Western societies, gods, plants and animals can also occupy social actor status, sociology has also been accused of an ethnocentric bias (Lindemann 2005).

However, the last few years have seen increasing sociological activity around human animal relations. This is particularly noticeable in the area of animal rights and social movement study. In the same journal issue as the 2002 Arluke article, Kruse argues that “the sociological literature, although somewhat sparse, is growing” (Kruse 2002: 375). This, he suggests, has been helped by new fora such as the *Society & Animals* journal and the acceptance by the American Sociological Association of a new section on this topic. In the UK, academic networks are still emerging, including the new British Sociological Association Animal/Human Studies Group (founded in 2006) and an ESRC research stream on animals and genomics. In addition, the first edition of *Qualitative Sociology Review* claims to “promote qualitative understanding of social phenomena, human being and other species” (Konecki 2005: 1). As will be become apparent in this article, the increasing sociological interest in animals is paralleled in other fields such as geography, history and Science and Technology Studies (STS). One theory is that this rising academic profile of animals is associated with a rising public profile of animal issues, and historical shifts in the human-animal boundary – more of which below.

As a researcher planning empirical work on this topic, this paper is motivated by the desire to make sense of many different strands of literature, and to draw some links between more traditional sociological accounts and work in STS. The discussion will hopefully be of interest to those not working on animal issues but who nevertheless may be intrigued by wider debates on boundaries or about the relationship between science and society. What follows is divided into two main sections: “Animals in Society” and “Animals in Science”. Under each heading I will first set the scene in terms of boundaries, then consider evidence of boundary blurring, and finally highlight the role of ambiguity and identity. As will be concluded, my own boundary-drawing between two domains of science and society is itself

problematic. The conclusion also provides some suggestions for future sociological research.

Animals in society

The importance of boundaries

For social scientists interested in the construction of (human) identity, animals may be of interest in so far as they function as the ultimate “other”. For example, Franklin maintains that animals are “good to think with” (Franklin 1999: 9) and concludes that “the issue is not the ethical consideration of the ‘other’ but the moral consideration of ‘ourselves’” (Franklin *ibidem*: 196). Michael also argues that “we get a partial grasp on who and what we are by getting a partial grasp on who and what animals are, and vice-versa” (2001: 214). One rationale for studying animals or the human-animal boundary is thus to better understand what it means to be a member of human society.

Another research agenda is to investigate the consequences of human-animal boundary-drawing. A result of identifying animals as other is that they are left out of the moral universe. Using Bauman’s (1990; 1989) work on boundaries, Roger Yates (2004), a sociologist and animal activist argues that:

Boundaries effectively produce ‘moral distance’ with regard to constructed ‘others’; thus boundaries keep ‘them’ at bay, serving to emphasise distance and difference...A sufficiency of distance (social and moral) can apparently result in untold cruelty and utter disregard for the rights of those successfully classified as ‘other’.

For the author, this “untold cruelty” includes the way that animals are routinely used by humans as if they were food, clothing, research models, or sources of entertainment. However, as Yates discusses, this kind of analysis has implications beyond the topic of human-animal relations and can arguably tell us much about human behaviour in general. For example, rather than analysing the Holocaust as a one-off event or a temporary surfacing of pre-modern barbarism, Bauman (1991;1989) claims that mass murder was the result of the very modern tendency to exclude whole groups of beings from the moral universe. This exclusion is often achieved by constructing the other as *less than human* or *non-human*, a strategy also highlighted by Ritvo (1995), and by feminist authors (e.g. Birke 1994). Building again on Bauman’s ideas, Yates discusses how children are taught to see animals as the other, and learn the ability to distinguish between animals as pets and, through moral distancing, those animals that can be eaten.

In summary, these arguments suggest that the drawing of boundaries is a crucial part of what it means to be human, and goes wider than just seeing the animal as other. In addition, boundary drawing is not just an intellectual exercise but has ‘real world’ and sometimes dramatic consequences. Assuming this is so, the next section steps back to consider whether and how boundaries have shifted over time.

Boundary blurring in society

In his brief summary of the literature, Mike Michael states that before the rise of science and the Enlightenment, “the difference between human culture and non-human nature was blurred” (Michael 2001: 212). Most people had routine contact with animals as part of everyday life. From the thirteenth to the early eighteenth centuries, there are even cases of animals being tried for crimes and treated as

responsible actors in law (Lindemann 2005). The birth of modernity heralded the strict separation of nature and culture (Latour 1993ⁱ). In terms of the human-animal relationship, increasing urbanisation reduced daily contact and resulted in a romanticisation of animals and nature (Thomas 1983). This romanticisation contributed to a symbolic separation of humans and animals.

According to Franklin (1999) the human-animal boundary has once again been dismantled via three processes associated with a shift from modernity to postmodernity. First, he identifies a growing *misanthropy*. Modernity relied on a positive view of humanity with animals seen as a legitimate resource to aid human progress. Medical research and industrial husbandry could thus be justified by reference to the greater (human) good. However, this sanguine view of humanity is now replaced by a view of humanity as “a species which is out of control, deranged, sick or insane” (Franklin *ibidem*: 54). As the human capacity to destroy the environment became more apparent, so did the view that animal and human interests are tied up together. “It became possible therefore to identify with animals under conditions of common adversity” (Franklin *ibidem*: 55).

Second, Franklin uses Giddens to argue that *ontological insecurity* is changing the relationship between humans and animals. Ontological insecurity is associated with the “churning nature of postmodernity”, and the anxiety that this state of constant flux promotes. In response to social and economic changes, the personal ties that used to morally bind (for example in marriage) have now become weakened. Franklin thinks that our relationship with pets or companion animals is highly significant and claims that “Animals become substitute love objects and companions precisely because they can be involved in enduring relations of mutual dependency” (Franklin 1999: 57). This potentially disrupts the old boundary between human and animal in terms of who/what is considered part of intimate personal relationships.

And thirdly, there is the notion of *risk-reflexivity*. Before the 1970s it was generally assumed that there was a wild area where animals were able to roam free from human interference. This has changed so that “there is no wilderness or perhaps no nature since everything everywhere is subject to human control” (Franklin 1999: 59). According to Beck, current “risk society” is characterised by new catastrophic environmental risks that can impact on the whole planet, for example as a result of a nuclear technology. The impact is a loss of distinction between nature and culture (cited in Tovey 2003: 205), and an associated weakening of the boundary between human and animal. Much of the literature taps in to one of more of these themes to consider “the porosity, ontological veracity, fluidity, blurring and relational configuration of the longstanding dividing line between society and nature” (Buller and Morris 2003:216).

Accounts such as Franklin’s could be criticised for implying an oversimplified historical trajectory. For Tovey, for example, there is in fact “no single ‘modernist’ understanding of these boundaries” (Tovey 2003: 206). It is also important to note here that some of the theoretical accounts of postmodernity or risk society are written with Western society in mind, and appear to underplay cultural differenceⁱⁱ. However, the main point to take forward from this section is that the boundaries between human and animal, and the nature of the relationship between human and animal, are not fixed or static. Even those who may feel that the literature overemphasises macro social shifts can still agree that the human/animal boundary is socially and historically constructed, and relates to broader sociological topics such as nature or risk. A later section will discuss how this argument is also applicable to science. The next section looks in more detail at the symbolic meaning of the animal category.

Ambiguity and identity

For sociologists interested in human identity construction, the idea of animals as other is clearly a useful starting point, as is the recognition that the relationship between humans and animals has shifted over time. However, this does not mean that there is a fixed animal identity. Citing Franklin's work, Michael (2001: 214) argues that the symbolic role of animals has become "astonishingly complex". In short, "animals are symbolically very slippery, impure [and] ambiguous". Humans construct animals as symbolising both sides of dichotomies such as wild/tame, subject/object, and victim/aggressor (Michael *ibidem*; and see Haraway 1989). Michael uses this observation to explain why there is current public unease about new genetic technologies: The genetic modification or "technical bespokeing" of animals means that they become understood as objects "off the peg" that can be made. This potentially reduces their symbolic ambiguity and hence the capacity of animals to help articulate human identity. In other words, new technology may be resisted because it can result in a *narrowing* of meaning. Turkle (2006) also expresses similar worries about narrowing, in her case by looking at machines: She concludes that people's relationships with a new generation of robots or "relational objects" may be compelling and educational, but ultimately cannot adequately reflect the ambivalence and complexity of the human life-cycle.

Recognising the importance of symbolic ambiguity has relevance for how sociologists analyse public attitudes. Poll data on a variety of topics has traditionally been used to show a public misunderstanding of science or to bemoan the public's attitude as "anti-science" (Hobson-West 2005). By contrast, Michael cites those who claim that recent polls on public attitudes to animal testing show their ability to weigh up cost and benefit issues. However, Michael's (2001) own interpretation of such research is more persuasive: that such surveys actually reveal a cultural volatility, based on our multiple identities in relation to animals. The implication is that no matter how much ethicists try to:

distil the essence of moral arguments there is underpinning practical moral discussion a deep-seated ambivalence borne of the profound symbolic ambiguity of animal (and thus human) identities. (Michael 2001: 216)

This type of argument represents a challenge for social scientists to develop sufficiently open research methodologies that enable this ambivalence to be adequately captured and explored.

In addition to highlighting the symbolic ambivalence of animals, another strand of sociological thinking points out that animal and human identities are constructed *through interaction*. For example, Sanders (2003) shows how humans and their companion animals cooperatively create an "interspecies culture" and, when out in public, assume a couple identity and engage in collective action. The implication drawn is that sociologists should "reject (or at least bracket) conventional social scientific and cultural beliefs about the qualitative differences between human and non-human animals" (Sanders *ibidem*: 420). Whilst likely to be sympathetic to this conclusion, other ethnographers have problems with interviews as a source of data for exploring interaction. Using video and a conversational analytic approach, Laurier, Maze and Lundin (2006) show how dog walking in a park is a joint accomplishment between dog and human.

To recap, this paper has so far suggested that the topic of boundaries is a useful theoretical starting point and also shown how the human-animal boundary has shifted over time. I have also highlighted the complex symbolic ambiguity of animals,

and some methodological implications for sociologists. The Introduction claimed that there has been a rising sociological interest in this topic. Arguably this is partly associated with some of the shifts and boundary blurring characteristics of postmodernity.

Despite this general increase in scholarship, however, Tovey argues that “animals remain largely invisible in social science texts”, even more recent ones (2003:196). This is not to say that topics involving animals are not studied at all, but rather that *the way* animals are talked about in sociology – as whole species or as part of nature – still means that their own experience is ignored. For example, academic discussion of BSE (“mad cow disease”) is inevitably about consequences for humans, rather than animals. What is needed, she claims, is a new paradigm to;

introduce into sociology the recognition that we are not alone in the world, that other animal species exist, have similar environmental experiences to our own, and are in many cases included within significant social relationships. (Tovey *ibidem*: 210)

This point is similar to Fudge’s (2006) argument about the traditional exclusion of animals from the way we write history, and the need for a new approach which includes animals but crucially avoids seeing them as “blank pages onto which humans wrote their own perceptions”. These research strands gets us into notoriously difficult debates about whether animals can be said to have actor status or *agency*.

Following the work of Callon and Latour, one theoretical approach, for which the question of non-human agency is central, is Actor Network Theory (ANT). In 1986, Michel Callon wrote a piece about the way a group of research scientists tried to highlight and respond to declining scallop populations in St. Brieuc Bay, France. Callon proposed a “sociology of translation” which starts with various principles. These principles include “free association”, which requires the analyst to abandon prior distinctions between the natural and the social, and commit to following the actor to see how *they* define things. Furthermore, Callon argues that identity and goals are formed and adjusted through action. Building on the work of Bloor (1976), the principle of “generalised symmetry” requires that we treat all sides in a controversy equally, but also that we use the same language to describe natural and social actors – whether they are humans, animals, technologies or microbes. Hence, in the St. Brieuc Bay example, Callon constructs scallops as actors –or “actants” - who can negotiate and even dissent from the process instigated by the scientists. Through a process of “inscription” (Latour 1990), the scallops are also represented in the conference rooms, by graphs, tables and statistics. Overall, Callon argues that before the controversy, the fisherman, scallops and researchers were separate and didn’t communicate with each other. By the end of the process, these actors had been unified in an association or network. In other words, what Latour and Callon demonstrate is that order is made up, not just of social groupings of humans, but of *mixtures* of humans and non-humans (Harbers and Koenis 1996).

Not surprisingly, such arguments have generated a huge amount of criticism and debate within STS. For example, Collins and Yearley (1992) object to way that animals and non-humans are discussed and want to maintain the pivotal role for humans. They claim that ANT may appear to be philosophically radical but, in practice, is highly conservative, as indicated by Callon’s reliance on scientific accounts of scallop behaviour. My main aim here, however, is to note how ANT ideas have proved useful to a wider set of researchers. For example, Laurier et al do not adopt ANT explicitly but do acknowledge that this approach shares some intellectual

affinity with their own. By arguing that dog walking is a joint accomplishment, Laurier et al (2006) seem to be granting a certain agency to non-humans. They are also stressing the joint nature of action, in a similar way that Michael (2000) looks at how objects, humans and machines are combined as a singularity or unit. Likewise, Fudge (2006) argues that animals in history are “change-making creatures”, rather than simply recipients of human action. For Fudge, animals can be said to have agency, *if* we appreciate that agency is relational, rather than something static that is possessed by an individual. Sociologists committed to the study of interaction or networks may thus find aspects of ANT attractive.

What this brief reference to ANT has hopefully alluded to is the idea that it is possible to look at human-animal relationships, without getting totally hung up on explicating the differences, at least not in terms of agency. If we start from the position that society is *performed*, rather than a kind of vessel in which social action takes place, then it becomes possible to accept Strum and Latour’s argument (1999:199) that animals, for example, baboons, are “social players actively negotiating and renegotiating what their society is and what it will be”. Note that these authors still recognise key empirical differences between human and baboon societies. However, these differences are not about whether or not agency is possessed. Rather, the difference is that humans possess a wider variety of practical means by which to implement their vision of social change, and can thus create more stable alliances or networks.

Animals in science

The importance of boundaries

The start of this paper cited Yates (2004), and his use of sociological work on boundaries to explain the exclusion of animals from the moral community. In some respects, this strand of sociological thinking ties in with STS research around the idea of “boundary-work” in science (Gieryn 1983). Gieryn sidesteps epistemic debates, about whether the production of scientific knowledge is different to other systems of knowledge, to ask how actors draw boundaries between science and non-science in day-to-day practice. Like the privilege afforded to those designated human, the science label carries with it certain social, cultural and economic advantages. One of the ways that boundary-work is achieved is through the expulsion of others considered by insiders to be non-real members (Gieryn 1995). These “others” that actors try to exclude could be maverick scientists or maverick ideas. In competing for resources or authority over a particular topic, the other could even be whole fields such as politics (Jasanoff 1990), or other sub-disciplines of science. It seems that the boundary drawing discussed at the start of the article under the heading of “society” also occurs in relation to science. So how can this help our understanding of animals?

First, we might accept that the social meaning of the human-animal boundary is socially and historically constructed, but expect that surely there must be stability and agreement within science about species differentiation. However, several authors point out that there is no one universally accepted definition of species. Rather, ecologists tend to stress ecological niches, biologists interested in evolution will focus on evolution, whilst those interested in morphology focus on morphological characteristics. The implication is that even the concept of species is “interest relative” and a social construction (see Yates 2004). Furthermore, scientists are likely to engage in boundary-work to protect their favoured definitions. Indeed, as Ritvo (1997) has shown, all classification exercises (including those designated as

“scientific”) reflect social and political commitments, rather than what “just is” (and see Douglas 1966). In other words, science is not the place to look if you are expecting a neat, universal, stable or “value-free” definition of the human-animal boundary.

Second, as well as producing knowledge about differences between species, science as a form of work has a very practical association with animals: Animals have a crucial role to play in the day-to-day practice of many labs, as models for human diseases or as testers of pharmaceutical safety and efficacy. This role for animals has ancient origins and Maehle and Tröhler (1987) discuss early examples of vivisection, dating as far back as 500BC. However, sociologists need to explain how and why vivisection became so dominant by the end of the nineteenth century. One explanation relates to the emergence of experimental psychology which used animal experimentation as a tool of legitimisation. The same analysis is also applicable to medicine: The desire to appear more like a science and less like an art meant a willingness to embrace the experimental method which in turn meant embracing vivisection (Rupke 1987). A sociology of the professions type analysis, or the concept of boundary-work (this time between art/science or between experimental psychology/other fields), may thus help explain the current importance of animal use in biomedical science.

And third, the idea of boundaries is also relevant for sociologists interested in studying the identity of laboratory scientists. As will be discussed later, ethnographic research suggests that scientists have a complex role to perform and have a highly ambivalent relationship with laboratory animals. Scientists themselves draw boundaries – for example between themselves and other scientists, between the more “rational” public and animal rights protesters, and between animals they are personally willing to experiment on and those they are not (Michael and Birke 1994). Birke, Arluke and Michael (forthcoming) discuss how biology students have to *learn* to draw some of these boundaries and to manage complex identities. This suggests that moral boundary drawing is a fundamental part of the socialisation of scientists, just as with the socialisation of children.

Boundary blurring in science

Taking a long historical perspective on the human-animal boundary, Ritvo (1995) argues that;

Since the renaissance, scientific consensus has gradually diverged from the traditional assertion of absolute, unbridgeable separation and shifted toward acknowledging relationship – and an ever closer relationship at that. (p. 483)

It would be possible to object to the sweep of such an argument, in the same way that critics cited above have objected to some accounts of boundary-blurring in postmodernity. As Ritvo herself shows, there has been significant resistance to the idea of human-animal similarity and heated debates in different periods over exactly how to define the human. Whilst recognising the inherent problems with defining epochs and universal shifts, it is still interesting to consider whether new developments in science and technology have changed the construction of the human/animal boundary and the meaning of human and animal.

At a recent conference on animals, ethics and biotechnology in Washington DCⁱⁱⁱ, some of the speakers were at pains to stress that human selective breeding of animals in agriculture has been going on for centuries and has been relatively un-

remarked upon. To focus so much debate on new genetic techniques is thus to unfairly expect these techniques to shoulder the entire ethical burden. In response, Mike Appleby from World Society for the Protection of Animals argued that “genetic engineering sharpens the questions”. For critics, then, the increasing standardisation and commodification of animals makes it easier to see pre-existing problems with agricultural or biomedical processes. The use of new genetic technologies may also serve to galvanise opposition. As Munro warns, genetic engineering, the production of hybrids, and the associated altering of an animal’s telos may “unite animal lovers, environmentalists, consumer and health advocates, as well as ordinary God-fearing carnivores” (Munro 2005: 190). Focus group research into UK public attitudes to genetically modified animals does suggest deep concern about “going against nature” (Macnaghten 2004). Whilst recognising that hybrids are not new (Latour 1993) and boundaries were probably never fixed, we can be fairly confident that “genomics and associated biotechnologies offer new levels of analysis and new practices for the *continued revision* of the human-animal conceptual coupling” (Harvey 2006, my emphasis).

So how are humans distinguished from other animals in science? As we have already seen, there is no consensus on the definition of a species. The assumption that language or tool use can help draw distinctions between humans and animals has also been challenged by recent animal behaviour studies. More strikingly, genetic research, and the claim that humans and chimp genes are 98.7% identical in their DNA sequence (cited in Harvey 2006), arguably points to similarity. Animal activists have used this finding to restate what they see as a “contradictory logic”; where animals are seen as biologically similar enough to humans to serve as good research models but different enough to morally justify their sacrifice (Urbanik 2006).

There is some evidence that these questions of similarity and difference are debated within “the scientific community”, although more detailed ethnographic research on this specific issue would be useful. In a fascinating opinion piece published in *Trends in Biotechnology*, Hoeyer and Koch (2006) discuss how functional genomics (the study of gene function and interaction) allows a more intensive comparison between species. The finding that sequences of the human genome are also found in other animals has significant implications: “With the indistinctiveness of humanness, the legitimacy of sacrificing the ‘non-human’ for the sake of the ‘human’ is challenged” (Hoeyer and Koch *ibidem*: 387). In conclusion, they argue, “functional genomics has a price”. If it abandons anthropocentrism then the moral foundations of animal research are shattered. On the other hand, clinging to anthropocentrism and the continued infliction of suffering on animals might actually erode public trust in science and, ironically, erode our respect for what it means to be human. “In summary, the problem we need to address is a research practice that undermines its own legitimising principle” (Hoeyer and Koch *ibidem*: 388). The point about eroding respect for humanity sounds very similar to the claim, cited earlier, that new genetics may potentially disrupt processes of human identity construction (Michael 2001).

Others have come to a different conclusion about the impact of new developments in science and technology. Urbanik (2006) builds on recent developments in animal geography, a field which claims to unite concepts of place, identity and ethics. She argues that although the creation of hybrids such as transgenic mice is significant, laboratory researchers themselves have not reconceptualised the way they see the mouse as a model. On the contrary, Urbanik argues that the creation and patenting of animals like Oncomouse^{IV} suggest an uncritical acceptance of the mouse as just another research tool, devoid of

subjectivity. Advances in our understanding of genetic connections with animals have explicitly *not* led to a reduction in speciesism. Humans have kept their (superior) identity intact.

Furthermore, Urbanik argues that this continued speciesism is visible in the arena of social theorising, for example in the discussion of hybridity by Haraway (1997) and Whatmore (2002). To map “technoscientific hybrid geographies”, as these authors aim at, does not necessarily promote a more relational and ethical way of treating animals. To move forward, Urbanik wants geography to focus more on animal subjectivities, and what they themselves are doing. This echoes Tovey’s criticism (cited above), that sociologists who do talk about animals continue to ignore animals’ own experiences. It also chimes with a recent review which argues that academic research on cloning, genetic modification and xenotransplantation, still focuses on what these technologies might mean for humans, for example in terms of identity (Michael 2001) or regulation (Brown and Michael 2004); “What is happening to *the animal* is inconspicuous” (Harvey 2006: 2, original emphasis).

As well as focusing on new genetic techniques, other authors have looked at how human and animal boundaries have been changed by the application of new computer technologies. The production of a new generation of robots has already been mentioned (Turkle 2006). Another fascinating example in the field of STS is Fleischmann’s (2003) US based research on cyberfrogs. Cyberfrogs are computer generated frogs which can be used as alternatives to dissection in school science lessons. Fleischmann shows how the manufacturers of cyberfrogs and animal advocacy organisations both benefit from their alliance with each other (see Hess 2006 for other examples of social movement-technology alliances). As well as arguing that the cyberfrogs are cyborgs that unite the physical and virtual worlds (Haraway 1991), Fleischmann claims that they should be understood as ‘boundary-objects’ (Star and Griesemer 1989), because of the way that they unite the two domains of information technology and animal advocacy. Social movements that utilise boundary objects and engage in boundary-work have been labeled as “boundary movements” (Brown et al 2004), in order to capture the way they blur categories, for example between expert and lay identities (see Epstein 1996; Eden, Donaldson and Walker 2006). Scholars interested in studying political institutions have also identified “boundary organizations” that straddle the apparent science-politics boundary (see Raman 2005). The question of boundaries and boundary blurring thus seems to be a key research trend, beyond the issue of human-animal boundaries.

Ambiguity and identity

Thus far, the discussion of “Animals in Science” has tried to show how boundaries and boundary-work matter, and how the human-animal boundary has arguably shifted and blurred over time. I have also alluded to the implications that this has for human identity. This section will concentrate more explicitly on the question of identity and look at the multiple constructions of the laboratory animal.

Existing accounts differ in their detail, but all seem to stress the ambivalent role and complex symbolism of the lab animal. Birke (2003) captures this particularly well by highlighting two intertwined strands of metaphor. First, lab animals have come to represent scientific endeavour and medical progress. Lab rodents in particular now “stand alongside the ubiquitous double helix as icons of the laboratory in western culture”. Given the rich cultural symbolism of rats as disease carriers, this representation is particularly striking. In short, “the rodents themselves are

transformed from evil, disease-full vermin into sanitized, germ free angels of mercy". After studying the adverts used by animal breeding companies to sell their products, Arluke (1994) also noted the construction of the lab animal as pure and uncontaminated. Birke's second metaphorical strand is of the lab animal (and particularly the laboratory rodent) as "not quite an animal". All lab animals are "doubly othered ethically"; they are other to humans, as was discussed earlier, but are also other to other animals, and are thus subject to treatment that would usually be prohibited outside the lab.

In order to become "not quite an animal", the animal needs to change its symbolic status. In his classic lab study of neuroscientists, Lynch (1988) discusses how the animal is gradually transformed from a sentient, holistic *naturalistic* individual, which is the animal of common sense and the one campaigned for by animal activists, into an *analytic* object. The latter is understood as data, as a cultural artefact or sacred object. Through a process of inscription, the eventual result is a tiny set of figures, just as with the transformation of Callon's scallops into graphs. In Latour's memorable phrase, lab practice is devoted to "the transformation of rats and chemicals into paper" (1990: 22). Lynch suggests that the scientists' use of the "sacrifice" metaphor to describe the killing of animals is not simply euphemistic but actually hints at some of the transformation in meaning that is going on. Arluke (1992: 34) also picks up on this and argues that the term is the primary device for coping with, and giving meaning to, animal death in the laboratory.

Other studies have concluded that the "complete objectification of animals is difficult" and that laboratory workers do often acknowledge lab animals as sentient, sometimes affording them pet status (Arluke 1990:199). Many scientists also express significant discomfort, emotion and ambivalence about their work and their own identity (Arluke 1992; Birke et al forthcoming). Evidence also suggests an anthropomorphisation of animals, so that "lab animals can be seen and treated simultaneously as more object-like and more-human like than they in fact are" (Arluke 1994: 156). Overall, the literature suggests that the picture is highly complex, with competing constructions that coexist.

Indeed, Lynch himself wants to stress the interdependency of the relationship between the naturalistic and analytic animal; he is not simply saying that the animal moves from the natural into a completely divorced cultural domain. Rather, Lynch (1988) wants to show how the latter is derived from the former:

The relation between the naturalistic and analytic animal is not simply a dichotomous one. The naturalistic animal provides the conditions for achieving its analytic counterpart. (p. 280)

For example, scientists still need to use everyday "subjugated" understandings of how to handle living animals, even if this tacit knowledge is written out of official accounts. The implication for sociologists of science is that whilst science may not openly acknowledge these common sense or cultural understandings, it is nevertheless reliant on them. For our purposes, the important implication is that even in science, too often assumed to be a neutral, objective space, uncluttered by culture, the animal still has complex meanings and representations. These meanings have to be carefully negotiated by laboratory scientists when explaining their actions to each other and a wider audience. Echoing the sociological work cited above on the interactional nature of identity, the identities of scientists, publics and lab animals construct and depend on each other (Birke, Arluke and Michael forthcoming).

Discussion of the "identity of scientists" should not be taken to imply that there is a single thing called a scientific identity, especially not in relation to animal

research. Perspectives differ within the research hierarchy; between principal investigators, research technicians, animal caretakers and veterinaries (Arluke 1990; Arluke and Groves 1998). Research also shows a difference in how these various groups learn to deal with the public “stigma” of their work (Birke, Arluke and Michael forthcoming). Similarly, discussion of “animals” should not detract from the differences in how species are treated (however we define species). As already implied, rodents have a particularly important place in the modern laboratory. In the UK, for example, rodents accounted for 85% of the total number of procedures carried out in 2005 (Home Office 2006). There is also a long and interesting history of how mice were standardised to become *the* research model of choice (Rader 2004).

To take another example, primates occupy a particularly significant place in ethical debates and are the subject of widespread media interest, (e.g. BBC 2000), policy examination (e.g. Weatherall 2006), and social science research. Drawing on Haraway’s work, Rees (2001) argues that non-human primates occupy a space in western culture that is highly confused and contested (and see Ritvo 1995 for a historical trajectory). Rees interviewed primatologists who demonstrate a keen awareness of the way their objects of study are seen as straddling the nature/culture boundary. If primates are located at this boundary, what can debates in palaeoanthropology about “missing links” tell us? After studying a particularly controversial episode of where an apparent human-ape chimera was found in 1912, Goulden (2007) suggests that, paradoxically, the missing link concept *protects* the human-animal dichotomy by creating a “literal no-man’s land between the two frontlines”, thereby side-stepping potentially difficult questions. One of his conclusions is that altering our standard human-animal binary would result in considerable practical and philosophical costs to humans. This sounds similar to Hoeyer and Koch’s (2006) warning that “functional genomics has a price”, because of the potential impacts of human-animal boundary breakdown.

Conclusion: Animals in science/society

In reviewing sociological and other social scientific literature, this article has identified interesting links between debates about animals in society and animals in science. This was achieved by utilising three conceptual themes: boundaries, boundary change or boundary blurring, and ambiguity and identity.

First, following Bauman (1991; 1990; 1989), boundary-drawing was revealed to be an important part of modern human activity that goes far beyond the human/animal dichotomy, although designating the other as animal or less than human does appear to be a particularly important strategy. Symbolic othering was shown to have serious consequences. Gieryn’s (1983) concept of boundary-work is a useful way of understanding a diverse range of phenomena relevant to the animal issue, from the historical rise of vivisection as a legitimate scientific methodology (Rupke 1987), to the discourses of laboratory scientists trying to negotiate and explain their own position (Michael and Birke 1994). Overall the conclusion is not just that boundary-drawing is a political or strategic activity, but that the boundaries themselves – and thus the categories delineated by boundaries – are themselves neither stable nor politically neutral. Human and animal categories are no exception.

The second conceptual theme was boundary blurring. If we take Franklin’s (1999) trajectory seriously, then a partial breakdown in the cultural boundary between human and animal is part of a broader postmodern (re)blurring of dichotomies such as nature and culture. New technologies, and the creation of hybrids or cyborgs, are just one mechanism by which these boundaries are blurred. In this context, asking

questions about what separates humans and animals (or perhaps, normatively, what *should* separate humans and animals), and whether humans have the right to experiment on other species, are to be expected. The rising social scientific interest in animals and in science and technology is evidence that the birth of apparently new objects, whether transgenic mice (e.g. Urbanik 2006) or boundary movements in health (Brown et al. 2004), do enable us to “sharpen the questions”. Of course, it is always possible to overstate epoch changes; as historical work shows, boundaries have always been contested and multiple definitions of species predate any cracking of genomes. Overall, analysts should not get so excited by instances of boundary blurring that they forget to explain how categories and binaries become stable, and are often extremely resilient to change.

Third, the paper identified themes of ambiguity and identity as vital for those studying human-animal relations or boundaries. Ethnographic work highlighting the symbolic ambiguity of the laboratory animal, and animals in general, is particularly compelling. The issue of whether sociologists should interpret this ambiguity/complexity as persuasive evidence for the instability or breakdown of dichotomies is still open to question. The argument that the identity of lab animals, publics and scientists are constructed through and depend on each other (Birke, Arluke and Michael forthcoming), will not appear particularly controversial to sociologists who have long argued that identity is produced in action (e.g. Sanders 2003).

That I have succeeded in drawing links between literatures by applying the same broad conceptual tools to look at animals in science and animals in society should not be seen as surprising, given the science and society are not really two separate domains. Indeed, the entire field known as STS was originally energised by the idea that science is just another social activity. This is not to deliberately denigrate science or scientists, but rather to encourage research which looks at what actually goes on scientific practice, and how the common construction of science as neutral and separate from society, politics, economics and so on, is achieved and contested.

With this in mind, is not the structure of this article evidence of my own boundary-work? Whilst eager to draw links and associations, critics could object that I still chose to utilise two separate headings of science and society. One explicit way of trying to capture the interdependency of science, technology and society, but without promoting determinism, is to adopt the concept of *co-production* (Jasanoff 2004). This approach demands that the analyst investigates how the ordering of nature (through knowledge and technology) and the ordering of society (through power and culture) simultaneously underwrite each other. The methodological challenge of ensuring the capture of complexity and ambiguity has already been identified above. My interpretation of co-production is that we need to show how scientific theories of what constitute human or animal nature are related to cultural understandings of human-animal boundaries. However, at the same time, we also need to demonstrate how regulations on animal research, for example, depend on ideas of species and sentience, concepts that are themselves constructed through scientific experimentation.

Another conclusion of this paper is that sociologists interested in human-animal boundaries will find it difficult to avoid tricky questions about animal agency. To some extent, therefore, traditional disciplinary anxiety about attracting charges of paternalism (Munro 2005), are understandable. Despite increases in sociological attention, critics such as Tovey (2003) and Urbanik (2006) still argue that the way we think and write about animals is problematic. In short, the experiences or motivations

of animals themselves are seen as unimportant, or are lost within broader categories of species, nature, or symbolic identity. For some sociologists, this situation will be seen as wholly justified. For others who would like the discipline to at least try to accommodate animals as social actors, work within STS may be able to help. Admittedly, ANT was designed to accommodate all non-human entities, not just animals, and critics could object that, at the end of the day, the fundamental “aliveness” of the scallop is lost through the comparison with artefacts. This may indeed be a fair point. If so, then the next question becomes: What is the meaning of aliveness, and what distinguishes human aliveness from scallop aliveness? We are back, it seems, to debating with Descartes.

Endnotes

- i In *We Have Never Been Modern*, Latour (1993) argues that modernity relies on the theoretical separation of nature and culture. Paradoxically, however, our continued attempts at *purification* actually results in *translation*, or the production of hybrids of human and non-human objects. For a classic account of purification and how culture deals with anomalies see Douglas (1966). Latour’s ideas on actor networks and agency are returned to later in my article.
- ii Jasanoff (2004: 14) writes that “Cultural specificity survives with astonishing resilience in the face of the leveling forces of modernity”. Applied to animals, this suggests that there is no universal “human-animal boundary”. In short, relationships between humans and animals differ between cultures, religions and regions. A full discussion of this is beyond the scope of this particular paper.
- iii *Animal Biotechnology: Considering Ethical Issues* (2006) Conference sponsored by the Pew Initiative on Food and Biotechnology and Michigan State University, October 18, Washington D.C.
- iv Oncomouse is a transgenic mouse with an induced mutation of a human gene that is linked to the development of breast cancer. Oncomouse became the first multi-cellular living organism to be patented in 1988 (Urbanik 2006 and see Haraway 1997).

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