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Radioactive Sheep: Constructing the Identity of the BritishOvine Character in the Context of the Chernobyl Disaster

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Figure. A: Sheep on Lockerbie High Street[1]

In an attempt to mask the identification of Lockerbie with the tragedy of the Lockerbie bombings, a group of life-sized brass sheep statues were erected adjacent to the town hall in 2013.[2] As a memorialization of the largest lamb fair in Scotland, the town of Lockerbie sought to overturn their international identity by exploring their identity as a sheep town. Beyond Lockerbie, Britain as a whole is a quintessential sheep space. The sheep, likewise exists in this landscape, as a British entity. Beyond its non-human roots, the sheep has a British nationality and identity.

Narrative of Events

The effect on the UK of the fallout from the Chernobyl reactor explosion (April 25th 1986), re-constructed, reaffirmed, but also splintered the established British identity of the sheep. To prevent contaminated sheep meat entering the human food chain the Mark and Release Scheme

[1] IronsideFarrar Environmental Consultants., 'Lockerbie Town Centre: Public Realm Enhancement'., http://www.ironsidefarrar.com/lockerbie-town-centre.htm [12/04/16]

[2] ITV News., 'Controversial Sheep Statues go on Show'., http://www.itv.com/news/border/2013-11-27/controversial-sheep-statues-go-on-show/ [12/04/16]

was introduced. In the eight weeks immediately succeeding the disaster, all movement of sheep beyond its home pasture was forbidden. However, on discovering that irradiated sheep quickly became uncontaminated after grazing awhile on clean pastures, moving sheep to clean pastures became routine policy. Within this monitored movement to unpolluted pastures, sheep exceeding the Government prescribed irradiation limit were distinguished from the clean flock by green paint. These green marked sheep were rendered irradiated and unsuitable for slaughter, whilst unmarked sheep were deemed suitable for consumption. The government continued to monitor the sheep every three months. If a sheep exceeded the Government irradiation limit a second time it was marked with apricot paint, and thus the sheep marked green were no longer the contaminated bodies and were released from restrictions. This system of re-monitoring continued seasonally, working from green to apricot, apricot to blue, and blue back to green, to visually establish which sheep were supposedly unsuitable for human consumption.[3] However, these intensive government measures did not equate to the actuality of sheep radiation. 1600 miles away from the Chernobyl disaster the irradiated sheep was a construction of human concerns over nuclear activity and not scientific reality. This dissertation will consider Erica Fudge's theory of the real and symbolic animal, and determine that in a 'real' sense the biology of the sheep was little evolved by the disaster.[4] However, in a metaphorical context the sheep in the aftermath of the Chernobyl disaster took on human concerns and came to symbolize the British victim and the diseased, nuclear animal.

Historiography

Claude Levi-Strauss was famously quoted as saying that animals 'are good to think with'.[5] Considering this, the sheep has been little thought about and studied by historians. Phillip Walling has made a relatively un-academic historical contribution to the field. As a sheep farmer, turned lawyer, Walling's analysis is extensive, yet limited to the accounts he has accessed beyond those

[3] Ministry of Agriculture, Fisheries and Food., Jan 1986-Dec 1987., *Chernobyl Nuclear Accident: Response of the Ministry of Agriculture, Fisheries and Food (MAFF); Radioactive Monitoring, Sheep Restrictions.,* Kew Collection, MAF 298/191/2., London: The National Archives.
[4] E. Fudge., *Animal.,* (London,2002).
[5] C. Levi-Strauss., *The Savage Mind.,* (London,1962).

which concerned sheep breeding. Walling's history is useful as a depiction of sheep farming ideology, however, beyond this it is primarily a study of the human manipulation of the sheep. Similarly, Susannah Parkin's work 'British Sheep Breeds', reads more like an agricultural handbook than an informed history. Despite the absence of sheep within them, animal histories are becoming more common place. This dissertation will explore the sheep as an animal with personality and identity, admittedly an identity normally created and constructed by human concerns and cultures. The construction of animal identities has been proposed by leading scholars Erica Fudge and Harriet Ritvo, whose ideas are frequently cited within this work. However, extensive work on the identity and role of animals within human societies are still infrequent, and thus this work will therefore attempt to satisfy a lacuna in animal history, by considering the common and humble sheep.

To construct a history of the evolving sheep identity, the Chernobyl disaster will be used as a foil to illustrate the projection of human concerns onto animals. In studying social constructions, this dissertation will move beyond animal history to consider the cultural history of 1980s Britain, in order to discern how sheep identities were transformed in the period. Indeed, this dissertation will rely on some common cultural history methodologies, the work itself arguably belonging in part to the field of micro-history. Keith Thomas has been a prominent interdisciplinary player in both environmental and cultural history, borrowing methodologies, styles and concerns from both fields. This dissertation will mirror some ideas in Thomas' study of changing attitudes to nature in 'Man and the Natural World', by exploring the evolution of the ovine identity in the social and cultural context of the aftermath of the Chernobyl disaster.[6]

Methodology

In an exploration of constructed depictions and ideas of the ovine in the UK, this work will mostly rely on government reports authored by the Ministry of Agriculture, Fisheries and Food (MAFF), Welsh Office (WO) and Department of Energy (DoE). Produced by the British government, these reports are themselves cultural bodies, generated by public opinion and translated by officials.

[6] K. Thomas., *Man and the Natural World: Changing Attitudes in England 1500-1800.,* (London, 1983).

This dissertation is rooted in archival correspondence and scientific policy reports. Beyond archival sources, in discussing the reality and the fantasy of the sheep biology and metaphor, scientific data, such as statistics and graphs, will be considered alongside their natural counterpoint, paintings and literature. Through these two source categories the shape of the changing sheep identity will be presented.

Methodologically such sources, and environmental histories in general, need cautious evaluation. In all sources used, omissions from the narrative are common because of the ethics concerned in the irradiated sheep story. For example, there are infrequent and only implicit mentions in archival records, of the sheep culling involved in the aftermath of the Chernobyl disaster. Further, such archive sources show inconsistencies within regional areas. Between the WO and the MAFF there are variations between the English and Welsh depictions of the sheep. The disparities between the two regional offices' reports on sheep monitoring is clear in this dissertation's attempt to determine the reality of the irradiated sheep by means of data provided by authorities in Cumbria and North Wales. The WO, who rigorously documented the affair, have produced the most extensive statistics on the subject whilst Southern Scotland has no statistical projections readily available. It is clear that there are therefore unavoidable inconsistencies throughout the analysis of the real sheep across the UK.

As an animal history, this dissertation presides in an historical field with specific methodological necessities and difficulties. Although relying on narrative in explaining and analysing the aftermath of the Chernobyl disaster, imposing a narrative on a seemingly random, "natural" ovine body has complications for historians such as William Cronon, who determines the use of narrative within natural histories an 'unnatural' approach.[7] However, sheep, unable to speak to human understanding, need human narrative as our only available method to translate its plight and history. Narrative is an unavoidable method of human analysis, and by keeping an animal focus, within a framework of human concerns, this dissertation seeks to transcend the human narrative and create a thorough and decisive animal history. William Cronon presents another

[7] W. Cronon., 'A Place for Stories, Nature, History and Narrative', *The Journal of American History,* 78 (4) (1992),1349.

methodological constraint of this dissertation, that in the case of radionuclides, and the make-up of sheep as biological bodies, there must be 'ecological sense'.[8] This dissertation has considered and exploited numerous scientific studies of animal nuclide uptake and the method and character of radionuclides themselves, to ensure that the work on the real irradiated sheep does not become lost in fantasy.

Dissertation Plot

This dissertation will be split into three chapters. The initial chapter will consider the scientific reality of the irradiated sheep's plight. It will then illustrate the nuclear hysteria which fuelled the image that the sheep was irradiated. The second chapter will consider how this belief in the irradiated sheep became a transformative factor in the undermining and reaffirming of the British sheep identity. The perception of the sheep as contaminated served to undermine two major constituents of the British sheep's life and thus its British identity as a whole: its prided good flavour and its role as a subject of the unique stratified sheep system. The second chapter will also consider how the Chernobyl disaster reaffirmed and emboldened the idea of the sheep as British by evaluating the idea of the 'vulnerable sheep', as a British subject attacked by nuclear energy. The third and final chapter will consider how the sheep developed a new identity from the conception and perception of it as contaminated and sick. This will contemplate how this perception of the sheep was enhanced by popular considerations of what a nuclear animal actually is, before discussing how the image of the sheep as diseased, served to shape its normal death. This dissertation will continually question how the sheep's identity evolved under the auspices of British human concerns.

[8] Cronon., *The Journal of American History,* 1349.

Chapter One

Baa Baa Black Sheep

The Fantasies and Realities of the Nuclear Sheep

This section will explore the reality of the sheep deemed irradiated and unfit for consumption. In the aftermath of Chernobyl, the British government introduced a consumption limit of 1000Bq/Kg on the radionuclides Iodine-131, Caesium-134 and Caesium-137; and allowed the 'Mark and Release' scheme to exist without a defined end-point. These restrictions were not necessary based on the scientific actuality of radiation found in sheep. Although some sheep recorded high levels of radiation and failed monitoring as late as 2011, the sheep as a species was largely safe for human consumption. Extensively enacted government measures were more a response to a global fascination and fear of nuclear activity, than any actual problem. This captivation led even safe levels of radiation to be considered as dangerous by a hysteric public. Therefore, although the sheep was largely exhibiting safe levels of radiation, the ovine populous became contaminated in the human imagination.

The Reality

When asked during a House of Commons session on 23rd of May 1986, why the UK had chosen a safe limit of 1000Bq/Kg for irradiated lamb, MP Mrs. Fenner stated the level had been agreed by the National Radiological Protection Board and was appropriate for the emergency. Several more recent studies have refuted the necessity of this limit, claiming it was too high. Sir Walter Marshall's study of Chernobyl radiation from inhalation, determined that the dosage from the atmosphere would have been only 0.05mSv per person and the equivalent to smoking 3/10000 of a cigarette per week for thirty years.[9] Indeed, if we consider that 1000Bq/kg translates to a 1mSv dose per person, a dose doubled annually by natural radiation, the government imposed limit seems confusingly high.[10] The European Commission does determine that over 70% of risk dosage is contracted through consumption, and so the restriction of 1000Bq/Kg was to ensure

[9] W. Marshall, B. D. E. Cameron & S. J. Curl., 'Big Nuclear Accidents'., *AERE-R 10532.*

[10] Hicks, Bonell, Clough, Dunbar, Egan, Hall, Nixon, Bulloch, Luckhurst & Maccabee., 'The Chernobyl Accident and its Consequences'., *Atomic Energy Authority.,* (London,1987), 7.11.

that such highly irradiated animals did not enter the food chain for *consumption*.[11] Although this may suggest the reason for the low limit, in the modern day, radiation in consumption frequently surpasses this level (Appendix. A). For example, in considering limits applicable to consumption, it can be seen in Appendix. A that 1kg of coffee naturally contains 1000Bq, in which case, even if we are considering consumption, the British prescribed level seems over-cautious. Furthermore, rightly or wrongly, some European countries introduced consumption limits of 9000Bq/Kg, suggesting that the limitation of 1000Bq/Kg, was unduly extreme.[12]

The second decision regarding radiation precautions was in the time-frame of imposed restrictions. Restrictions to sheep movements were lifted from all farms in 2012.[13] I-131, Cs-134, and Cs-137 have half-lives of eight days, two years and thirty years respectively. The 26 year-long restrictions were in response to the half-life of Cs-137.[14] However, an experiment in Chernobyl's exclusion zone showed how quickly irradiated livestock subjects became uncontaminated when allowed to graze on clean pastures outside of the irradiated disaster zone.[15] This same phenomenon was recorded in British studies of sheep. If such a quick solution was applicable even in the most irradiated zones it is difficult to understand why the sheep and sheep farmer were confined for such a lengthy period. This dissertation section will explore the necessity of these actions in the context of the reality of radiation.

In considering the two well documented live-monitoring records of North Wales and Cumbria, there are major inconsistencies. Figures B and C refer to Cumbrian records. In Figure. B, the highest and lowest levels of radiation recorded in sheep around the region, have been chronicled. The recording of 3000Bq/Kg readings could potentially suggest an anomalous sheep, as an MAFF

[11] Department of the Environment., Jan 1987-Dec 1991., *Lessons and Effects of the Chernobyl Nuclear Accident: Post-Chernobyl Emergency Planning.,* Kew Collection., AT99/86., London: The National Archives.

[12] Ministry of Agriculture, Fisheries and Food., Jan 1986- Dec 1986., *Chernobyl Nuclear Accident: Response of the Ministry of Agriculture Fisheries and Food (MAFF); Radioactivity Monitoring Sheep Restrictions.,* [Government Report] Kew Collection, MAF 298/190/1., London: The National Archives.

[13] BBC., 'Post-Chernobyl Disaster Sheep Controls Lifted on Last UK Farms'., http://www.bbc.co.uk/news/uk-england-cumbria-18299228 [14/04/16]

[14] J. N. Bell & G. Shaw., 'Ecological Lessons from the Chernobyl Accident'., *Environment International.,* (2005) 31(6) 771-7.

[15] Kew Collection., AT99/86., London: The National Archives.

report suggests there were some *'isolated* readings found in upland sheep.'[16] However, Figure. C, contradicts this, demonstrating that in 1986 10% of sheep were failing the 1000Bq/Kg failure mark, suggesting that some sheep *were* irradiated beyond this level. Although available data for further years is seemingly unavailable for the Cumbrian district (in itself suggesting a rapid decline of significant radionuclide levels), Wales has thoroughly recorded and published the presence of nuclides up until 1991. If we consider Figure. D, constructed from a WO report, the rapid decline of sheep failing the nuclide test is evident. The swift waning of sheep failing monitoring, suggests that a significant scientific development, or government handling policy subsidized the decline.

Figure. B: Cumbrian Sheep Highest and Lowest Nuclide Recordings [17]

	Week Ending 9.10.1986		Week Ending 16.10.1986		Week Ending 23.10.1986	
	Highest	Lowest	Highest	Lowest	Highest	Lowest
Region A	2412	27	3051	-	1349	-
Region B	3645	63	2187	-	1944	-
Region C	2340	-	3168	-	2205	-
Region D	3339	-	2736	-	2088	177
Note: - = Not above background levels						

Figure. C: Cumbrian Sheep Failing and Passing Consumption Limit [18]

	Week Ending 9.10.1986		Week Ending 16.10.1986		Week Ending 23.10.1986	
	Passed	Failed	Passed	Failed	Passed	Failed
Region A	2035	279	2817	398	4617	489
Region B	1354	332	1700	388	2634	852
Region C	676	1722	1527	1838	1823	1897
Region D	2583	315	3380	369	3669	430
Total	6648	2648	9424	2993	12743	3668

[16] Kew Collection, MAF 298/190/2., London: The National Archives.
[17] Kew Collection, MAF 298/190/1., London: The National Archives.
[18] Kew Collection, MAF 298/190/1., London: The National Archives.

Figure. D: Sheep Failing Live-Monitoring in Wales [19]

Year	Tested	Failed	%
1987	175454	943	0.5
1988	165382	616	0.3
1989	158896	233	0.1
1990	137389	161	0.1

On discovering that sheep quickly became suitable for consumption when moved to clean grazing pastures, restrictions on sheep movements began to be lifted in August 1986. This human delay to government policy would suggest why sheep in Cumbria were still recording high nuclide readings in 1986. Further, considering the previously stated radionuclide half-lives, by April 1988 over 66% of the contamination caused by the Chernobyl disaster would have decayed. Although sheep certainly *were* irradiated by Chernobyl fallout, thirty-year long restrictions, poised until a complete dissipation of radioactivity, was inexplicable. Further, even if sheep were recording levels above 1000Bq/Kg in the immediate aftermath of the Chernobyl disaster, such a level was unnecessarily low for safe consumption. Although sheep were, relatively, contaminated and irradiated, the sheep's forthcoming dramatic construction as sick, infectious and threatening was a construction of nuclear paranoia and human imagination, not scientific reality.

The Fantasy

In the aftermath of the second world war, the danger of nuclear war and activity became a real fear within the British psyche. Perhaps originating with the shock of the effects on Hiroshima and Nagasaki, a wealth of popular culture and scientific studies emerged internationally regarding the threat of nuclear war. Much of the media which stimulated populist ideas of the horror of nuclear energy emerged from the USA. The film 'The Mouse that Roared' (1955) and 'Dr. Strangelove' (1964), both depicted the ease with which the world could enter into atomic war.[20] Further, the American novel 'Fail-Safe', ending with the advent of a nuclear war, sold two million

[19] Kew Collection, BD 94/4., London: The National Archives.
[20] S. R. Weart., *Nuclear Fear: A History of Images.,* (Massachusetts,1988).

copies after its publication, suggesting a popular preoccupation with the prospect.[21] Although all three of these cited items reached the UK, the British concerns regarding nuclear activity are more explicit in the published studies about the effects of a possible nuclear war on Britain. In particular Graeme Wilkinson's work 'London After the Bomb' (1982) cites horrific statistics and claims that 60% of Londoners would die of radiation sickness from a hypothetical nuclear attack.[22] Further, the advisory pamphlet 'Protect and Survive' was widely distributed in the 1980s by the British government. The inclusion of evocative phrases such as, 'make your family as safe as possible under nuclear attack', encouraged nuclear hysteria although intended to abate it.[23] Indeed, the establishment of the Greenham Common peace camp (1981) and the 300,000 strong attendance of an anti-nuclear rally in Hyde Park (1983), suggest that fears over nuclear activity presided in Britain long before the explosion of the Chernobyl reactor.

Returning to the case of British sheep, radioactivity as a fear and threat, fuelled the apparent discrimination of the entire sheep community. The sheep as a contaminated embodiment of radiation is clear in the sheep's separation from human contact. In a letter drafted to farmers, the WO points out that, 'wild rumours about the effects of fallout on the lamb crop,' were writhe.[24] Although veterinary experts assured that the effects of the disaster would not pass on to lambs, such concerns are continually evident in questions addressed to the government: 'What if my ewes have malformed lambs?'.[25] Further, in a series of aggressive letters from a Mr. Holiday, the MAFF were accused of accepting an overly high level of radiation in 1000Bq/Kg, something this essay has sought to prove was in fact the opposite. Mr. Holiday signifies the residual nuclear paranoia in the aftermath of the Chernobyl disaster, claiming that the government had failed to react appropriately to the threat: 'how can you be dogmatic about safety?'.

[21] E. Burdick & H. Wheeler, *Fail-Safe.,* (Ohio,1962).
[22] G. Wilkinson., *London after the Bomb: What a Nuclear Attack Really Means.,* (Oxford,1982)., 98.
[23] Central Office of Information., *Protect and Survive.,* (London,1980).
[24] Welsh Office., Jan 1986-Dec 1987., *Chernobyl Nuclear Accident: Monitoring of Radioactive Contamination of Sheep Meat; Movement and Marketing Restrictions and Sheep Compensation Scheme 1986.,* Kew Collection, BD 94/9., London: The National Archives.
[25] Kew Collection, MAF 298/191/2., London: The National Archives.

This fear of nuclear activity was transferred onto the sheep, as the British victim of Chernobyl. The public demonstrated this paranoia in their unwillingness to buy lamb in 1986/7 despite the preventative measures to stop contaminated lamb reaching supermarkets. Indeed, in an illuminating letter to the MAFF, a Mr. M. P. Watkins describes requesting New Zealand lamb in the knowledge that 'lamb from North Wales was not fit for consumption'.[26] However, Mr. Watkin's butcher refuted this belief, claiming Welsh lamb was in excellent condition and increasingly cheap because of discriminatory consumption, and handed Mr. Watkins an explanatory pamphlet. The cheapness of welsh lamb and the apparent need for a convincing pamphlet evidences the discrimination against the entire sheep species. The sheep took the brunt of nuclear fear and consequently its character as good quality meat suffered. The entire ovine population was believed to be more irradiated than it actually was because of a residual cold war atmosphere. The entire sheep population came to symbolize the failure and the threat of nuclear power, and was thus disdained throughout the country.

[26] Kew Collection, MAF 298/190/1., London: The National Archives.

Chapter Two

Mary had a Little Lamb

Re-constructing the Sheep's British Identity

Developing on Fudge's idea of the symbolic animal, the sheep will be examined in its role as a British body. In the context of the Chernobyl disaster, Joyce Salisbury pertinently states that 'the actual animal is almost irrelevant compared to its symbolic meaning'.[27] Although it was shown that in a real sense the sheep was relatively clean and uncontaminated, this was secondary to the cultural construction of the sheep as sick. The *belief* in the sheep as contaminated, and not its biological reality, is what determined the reactions, responses and ideas surrounding the sheep. The Chernobyl disaster transformed the identity and role of the British sheep by re-constructing major constituents of the former British sheep life. However, through the transformation of the British sheep's life and death in the aftermath of Chernobyl, the sheep remained a national symbol. Fear surrounding nuclear energy required a human proxy to represent the defenceless victim the UK felt itself to be. In this sense the sheep as a symbol of British land and pastoral heritage was cemented.

The British sheep prior to the disaster was constructed as a good quality edible product, and as a mobile subject of the unique British stratification movement. The first two parts of this section, will consider these constituents of the British sheep, the edible and the mobile ovine, prior to, and after the Chernobyl disaster, to illustrate the transformation of the norms of the sheep's life and death. For clarity within this section an overview of British sheep breeds and stratified sheep system is included within Appendix. B.

Edible Sheep

Although mutton is now considered a secondary meat product to lamb, it was once an essential protein on British tables. With, the eighth largest sheep population in the world, lamb and mutton, and the eating of sheep itself, has become a British tradition.[28] Indeed, in one 16th

[27] J. E. Salisbury., *The Beast Within.,* (London,2010)., 81.
[28] Walling., *Counting Sheep.,* 4.

century recipe book, one quarter of savoury dishes contained mutton.[29] Further, in supermarket adverts lamb reared within the UK is clearly described as 'British lamb', both to appease the current local produce movement but also because British lamb is fundamentally very good quality and a national staple.[30] This British pride in its lamb is evident from a WO report regarding French trade during the Chernobyl crisis, stating the inferior quality of French lamb, that it was not 'up to the mark [of British lamb]'.[31] British tastes have secured lamb in death as a much-prized British body. The Chernobyl affair undermined the ability of British sheep farmers to create and produce this renowned and good quality British lamb meat.

Sheep farming, more than any other type of British farming, relies on the geography and unique topography of the UK, for its good quality produce.[32] The stratification system, relies on the free movement and unrestricted access of sheep between British hill, upland and lowland pastures, to produce good quality stock lambs and breeding ewes. Without this unique British system and the utilization of free movement across the landscape, lambs would not fatten enough to realize the renowned quality of British lamb. The sheep breeds described as hardy hill sheep, rely on this system especially, as lambs must move from mountain pastures unsuitable for rearing fat lambs. In the aftermath of the Chernobyl disaster, the radioactive cloud which contaminated areas of Europe, rained most heavily upon the three regions Dumfriesshire, Cumbria and North Wales. With the three dominant hardy hill sheep residing in these regions respectively, the Scottish Blackface, Swaledale and Welsh Mountain, irradiation of their pastures will have affected the quality production of the sheep industry more so than if the cloud had rained upon a lowland or upland rearing area.[33] The Chernobyl disaster irradiated the hardy hill sheep regions predominantly, meaning they became the most restricted regions, despite relying on free movement the most. This governmental response to irradiated sheep meant a generation of

[29] P. Brears., *Food and Cooking in 16th Century Britain History and Recipes.,* (Birmingham,1985).
[30] Example at: SainsburysTv., 2010., *Jamie Oliver Easter Lamb Recipe.,* https://www.youtube.com/watch?v=hq9Mx8nXztY
[31] Kew Collection, BD 94/9., London: The National Archives.
[32] S. R. Parkin., *British Sheep Breeds.,* (Oxford,2015), 26.
[33] National Sheep Association., [01/04/16]

irradiated and clean stock lambs were unable to move and thus fatten to a stage suitable for slaughter.

Subsequent to the sheep's life, the sheep death similarly relies on the freedom of movement. Andrew Robichaud's project, 'Animal City' has provided an influential spatial history of slaughterhouses in San Francisco.[34] Although a study of an American city, the meat industry space was similarly remodelled in the UK following the advent of rail and road.[35] New vehicular technology served to create two separate sheep spaces, for living and for dying, potentially miles apart. Indeed, with only two Food Standards Agency licensed slaughterhouses within the Dumfries and Galloway area, the sheep assigned for slaughter will have had to travel, from Western pastures to Eastern abattoirs.[36] The Chernobyl disaster, by instigating reforms and laws to prevent irradiated sheep entering the food chain, shaped the passage of the sheep to the slaughterhouse. Thousands of ovine bodies, restricted from slaughter, and others culled on their home farms, did not make the journey to the abattoir. The government sanctions confined the sheep to a life and death of virtual stasis, undermining its normal freedoms.

Mobile Sheep

Phillip Walling explores how, although forced to accommodate various farming bodies and governmental agencies, the farmer was the leader and choice maker for his flock.[37] The farmer was the ultimate stakeholder for the success of the sheep industry, and fundamentally president of the wellbeing and intrinsic value of his livestock. Hugh Beach in his evaluation of reindeer herds in the aftermath of the Chernobyl incident, discerned that farmers no longer had unquestioned authority over their animals.[38] In post-Chernobyl Britain, power over sheep was transferred from

[34] A. Robichaud & E. Steiner., 'The Movement of San Francisco's Butchertown and the Spatial Transformation of Meat Production, 1849-1901'., *Spatial History Lab.,* (2010).
[35] Robichaud., *Spatial History Lab.,* 1.
[36] Scottish Government., 'Structure of the Scottish Livestock Industry'., http://www.gov.scot/Publications/2008/06/19154131/16 [01/04/16]
[37] P. Walling., *Counting Sheep: A Celebration of the Pastoral Heritage of Britain.,* (London,2014).
[38] H. Beach., 'Perceptions of Risk, Dilemmas of Policy: Nuclear Fallout in Swedish Lapland'., *Social Science & Medicine.,* (1990) 30(6) 729.

the local farmer to the state. The state achieved this through the assertion of Foucauldian methods of confinement and surveillance intrinsic within the 'Mark and Release' scheme.

Robert D. Sack states that a space is assigned boundaries and power as a result of regulations and rules of conduct.[39] Most pertinent to the study of sheep space, is Sack's determination that it is territorial rules which evolve a space into a place through their power to establish, 'what is in or out of place'.[40] By removing access for irradiated sheep beyond their home pastures, the pasture was created as sick and the sheep within it diseased. Further, Sack demonstrates the symbolic and imagined sense of such state restrictions. Ultimately the space was given the power of enclosure because of what was 'imagined would be the case if there were no such rules'.[41] The perception of the sheep as unhealthy, and the hypothetical chance of them reaching the human food chain, created the power of confinement.

In a spatial history of ghettoization, Tim Cole and Graham Smith illustrate this idea of space extracting and bestowing power. In their study, they show how this can shape the character of relationships and philosophies within the confined space.[42] Although in no way meaning to desensitize the Holocaust by comparing it to the plight of the British sheep, Cole and Smith's ideas of shared space and designated space are pertinent to this study. By dividing a formerly shared space into a space of 'sick' apricot, blue and green sheep, and clean unmarked sheep, the 'sick sheep' was constructed in a framework of the diseased other.[43] Although in many cases the irradiated and the clean sheep were kept alongside each other, a metaphysical space was still created through the visual identification of the sick under the 'Mark and Release' colour schemes. Following the ideas of Sack and Cole, the space of the sheep was re-constructed and created through restriction. The forced stasis of the ovine body created its place, and that place was designated as a space between the sick and the healthy through visual colour-coding of individual bodies.

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[39] R. D. Sack., 'The Power of Place and Space'., *Geographical Review.,* 83(3) (1993) 327.
[40] Sack., *Geographical Review.,* 326.
[41] Sack., *Geographical Review.,* 327.
[42] T. Cole & G. Smith., 'Ghettoization and the Holocaust: Budapest 1944'., *Journal of Historical Geography.,* 21(3) (1995) 300-316.
[43] Cole., *Journal of Historical Geography.,* 303.

The concept of surveillance also served to create a space, beyond the boundaries of confinement. The sheep industry devoid of the stratification system, was, as Michel Foucault suggests of a prison, 'a space between two worlds.'[44] The control of free movement created a space of limbo for the sheep. Confinement and surveillance stripped the ovine industry of the power afforded to it before such severe state intervention. By imposing new legal limits over the supervision and monitoring of sheep, the sheep space was created through surveillance and the control this enabled. Persistent radiation monitoring transformed the sheep from a pastoral and aesthetic entity to a monitored subject. As Foucault has suggested, surveillance itself, is the 'physics' of power, as the creator of confinement and control of a body. Although the sheep arguably had little power over its own body before, the increased surveillance surrounding its life in the pasture increasingly diminished the freedom and idyll identity afforded to it before the nuclear accident. The normalizing gaze of surveillance, distinguishing, dividing and confining, removed the vestiges of a free 'sheep' identity and transformed its role in British culture and life, albeit temporarily.[45]

Vulnerable Sheep

Although the Chernobyl disaster was a force which undermined two basic constituents of the British sheep, another feature of the British ovine was actually reaffirmed by the Chernobyl incident. The image of the sheep as a symbol of the quintessential countryside and pastoral heritage of the UK, was reinforced by the paranoia and upset following the nuclear affair. The sheep moved from a mere symbol of the British countryside, to a victim of the irradiated landscape. The reaffirmation of this concept of the sheep existed because of the nostalgic climate in the 20th century. This climate to an extent transcended the constructions afforded by fears surrounding the nuclear world. A study of the sentimental culture surrounding the sheep in the 1980s will be explored through the medium of art and culture to suggest how the Chernobyl disaster aided its reaffirmation.

[44] M. Foucault., *Discipline and Punish.,* (New York,1975)., 123.
[45] Foucault., *Discipline and Punish.,*123.

Prior to the industrial era, at the start of the Victorian period, and before, the common British person was continually faced with the presence and personality of animals.[46] However, as slaughter moved away from the city and was mechanized, animals took on a far more mythical role in the British psyche.[47] Beyond the aforementioned advent of transportation separating city and slaughter, the development of science removed the human from the vulnerable grasp of natural forces. As humans became removed from the mercy of geography and landscape, nature came to be looked upon less as the enemy and, as humans gained control, nostalgically.[48] Animals, as the animate metaphor for nature similarly began to take on this fondness in the developing world. Further, as the industrial revolution accelerated the two British lifestyles of factory and farm, the agricultural lifestyle lay secondary and threatened in the face of rising commercialism and industry. This nervous climate established the glorification of the old, simple way of life.[49]

Visual Art in Britain has depicted the sheep as a fundamental feature of British nature, as both a character in the fore, and the background of landscape painting. Livestock and the countryside have often been depicted alongside each other in British Art. Unarguably the most famous British landscape painter, John Constable, urged that landscapes need be studied to promote the 'rural scenery of England'.[50] Further, he described his renowned painting the 'Hay Wain' (1821), as an attempt to show 'Londoners who knew nothing of country life', what the countryside and the pastoral landscape looked like.[51] Considering this, it is significant then, that sheep have been widely depicted in this style of art. Within William Holman Hunt's painting, 'Strayed Sheep', sheep are very much at the foreground of the British landscape. Here the sheep is central, and at the heart of the natural British scene, and thus intrinsic to the British-ness of the country landscape. Further works have depicted sheep against the background of an idyllic and picturesque natural scene, as in William Taylor Longmire's work depicted in Figure. F. The sheep has been constructed

[46] H. Ritvo., *Animal Estate.,* (Massachusetts,1987)., 3.
[47] N. Vialles., *Animal to Edible.,* (Cambridge,1994)., 5
[48] Ritvo., *Animal Estate.,* 3.
[49] J. Turner., *Reckoning with the Beast.,* (Baltimore,1980) 28.
[50] D. Arnold & D. P. Corbett., *A Companion to British Art 1600 to the Present.,* (Oxford,2010)., 409.
[51] Arnold., *British Art 1600 to the Present.,* 325

as a British force through the medium of artistic culture. At the fore of British landscape paintings, it has been made into the emblem and myth of an idyllic pastoral heritage within the British psyche.

Figure. E: Strayed Sheep[52]

[52] W. H. Hunt., 1852., *Strayed Sheep.,* [Painting] London: Tate Collection.

Figure. F: View of Windermere an Langdale Pikes from Low Wood, with a Flock of Seventeen Sheep[53]

Further, British landscape art has also depicted the sheep as peripheral to the scene, as seemingly an essential and quintessential addition to a work devoted to translating the realities of the British countryside. In Samuel Palmer's 'The Valley Thick with Corn', the man and the countryside are the central focus, and at the left of the painting a flock of sheep can be seen. Indeed, the sheep absent from the central focus of the landscape perhaps give a greater insight into the sheep as a seemingly permanent aspect of the British landscape. The depiction of the sheep, to the viewer, as almost an afterthought, suggests the sheep's significance and stable role within British pastoral heritage. Through artistic depictions of sheep and landscape the ovine body can be seen to be intrinsically tied, intertwined and united with the British natural world. In the British mind and culture, the sheep body has historically symbolized Britain; Britain as a region of quintessentially sheep country.

[53] W. T. Longmire., Unknown., *View of Windermere an Langdale Pikes from Low Wood, with a Flock of Seventeen Sheep.,* [Painting] Townend: National Trust Collection.

Figure G: Valley Thick with Corn[54]

British literature and poetry has similarly aided the construction of the sheep as a classic body of the nostalgic British countryside. Perhaps no piece of British writing has depicted the sheep as such more so than Thomas Hardy's 'Far from the Madding Crowd'. In Phillip Mallett's observations of Hardy, he claims that Hardy's imagined Wessex holds that sense of 20th century pastoral nostalgia prominent at the time of the industrial revolution.[55] Further Jonathan Bate describes Hardy's work as a representation of nostalgia for the 'simple, honest, rustic way of life among the haystacks'.[56] At the centre of 'Far from the Madding Crowd' and the depiction of the British pastoral, are humble sheep. Hardy connects the sheep, in this work with British weather and season, 'it was now early spring-the time of going to grass with the sheep'.[57] Here again, the

[54] S. Palmer., Unknown., *The Valley Thick with Corn.,* [Painting] Oxford: Ashmolean Museum.
[55] P. Mallett., *Thomas Hardy Studies.,* (London,2004)., 206.
[56] Mallett., *Thomas Hardy Studies.,* 206.
[57] T. Hardy., *Far from the Madding Crowd.,* (London,1874)., 103.

sheep and British nature become one within British art. Further, the central, dependable, solid and quintessentially English character of Gabriel Oak, is ultimately tied to his dependency on the British sheep and the sheep industry, the death of his flock instigating social and economic ruin. In a piece enshrining the traditional British life, the sheep is depicted as the ultimate British livestock, harking back to a nostalgic historical time of sheep husbandry when relations of sheep and man were closely tied together.

The Britishness of the ovine populous meant that the irradiation and contamination of sheep was seen as an attack on the essence of Britain. Indeed, with restricted access to the British staple, roast lamb, the irradiated sheep served as an internal nuclear attack on the traditional life of Britain. The hysteria and overly-cautious restrictions regarding irradiated sheep emerged as a result of the construction of the sheep as a nostalgic and innocent symbol of British country life. The Britishness of the ovine body tied in with fears of nuclear power and war. The sheep in the aftermath of the Chernobyl disaster, as a quintessential part of the British landscape, came to symbolize a Britain under attack from modernity and a potential nuclear assault.

Chapter Three

Behold, the Lamb of God, who takes away the sin of the World!

Creating the Nuclear Sheep

Prior to, and since, the irradiation of sheep in the aftermath of Chernobyl, other sheep became infected with scrapie and foot and mouth disease. Harriet Ritvo has plugged an historical gap in examining both of these incidents within an environmental history context. This section will mirror Ritvo's structure, but continue a purely ovine and radiation focus. Ritvo's sensitive piece on cattle communities during the BSE epidemic, confirms the character of the bovine body as central to the effect and drama of the ordeal: 'beef and the cattle that produce it, holds a special place in British national mythology'.[58] The previous section attempted to illustrate the similar significance and Britishness of the sheep, and it is this British ovine identity, coupled with the nuclear fears at the time which gave the disaster the power to re-construct the sheep character into a sick and contaminated body. In Ritvo's second piece on foot and mouth disease she highlights the fact that 'the sheep were the most numerous victims of the outbreak', yet dying not at the hands of the virus, but at the mercy of the British Government.[59] This section will explore the realities of the ovine ability to "become sick", to contract illness and become irradiated based on a biological predisposition. It will then move on to examine how the end of the sheep life, the sheep death, was transformed by the disaster, moving from the former abattoir space, to a sudden death, culled, because of the belief of their infection.

In Neil Ferguson's study of foot and mouth disease he determined that the first animal to become infected was the sheep.[60] The explanation for this would require an extensive study into communicable animal disease. However, the case is the same within the aftermath of the Chernobyl disaster: sheep were the species most readily taking up radionuclides and becoming irradiated. This is far easier to explain, as it is determined by the grass and grazing pastures

[58] H. Ritvo., *Noble Cows and Hybrid Zebra.,* (Virginia,2010).,120.
[59] Ritvo., *Noble Cows.,* 187.
[60] N. Ferguson, C. A. Donnelly & R. M. Anderson., 'The Foot and Mouth Epidemic in Great Britain: Pattern of Spread and Impact of Interventions', *Science.,* 292 (2001)., 1157.

assigned to each livestock species. In section two, a study of the 1980s 'sheep space' was touched upon and it is clear from Figure. H that there is a higher density of sheep in the Northern region of England.[61] As this is where fallout rain is thought to have fallen (Appendix. C) it is not surprising that sheep, grazing in these areas, were the livestock most prone to irradiation. Mammals need Potassium and Potassium-40 from the soil for basic sustenance. In a scientific evaluation conducted by the MAFF, it was concluded that mammals easily take up radionuclides because of their similar molecular make-up to Potassium-40, making them difficult for the body to differentiate.[62] And thus, the sheep, not the cow, was the livestock grazing in irradiated pastures and taking up radionuclides disguised as K-40. The sheep and not another animal, was transformed into the nuclear body because comparatively no other livestock was as effected and irradiated in reality.

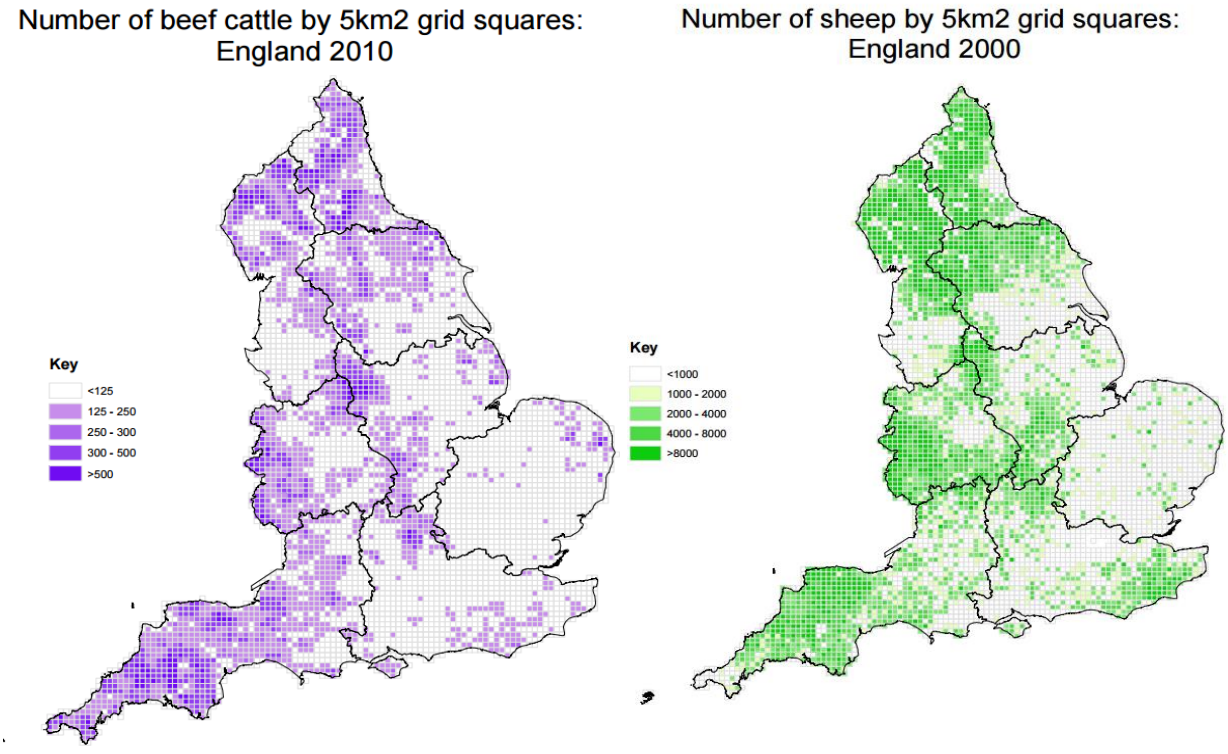

Figure. H: Distribution of Cattle and Sheep across the UK[63]

[62] Kew Collection, MAF 298/190/1., London: The National Archives.

[63] Department for Environment: Food and Rural Affairs., 'Maps of Livestock Populations in 2000 and 2010 Across England'., file:///C:/Users/pgcro/Documents/defra-stats-foodfarm-landuselivestock-june-detailedresults-livestockmaps111125.pdf [08/04/16]

Within the foot and mouth epidemic sheep developed lameness, within the BSE strand, scrapie, sheep behaviour changed and they suffered severe weight loss.[64] The symptoms of radiation sickness in highly irradiated sheep suggested thyroid problems, leukemic cancers and deformed offspring. The popular depictions of irradiated animals in current film and television would support this image of the nuclear animal. Within the film, 'Chernobyl Diaries' and the television show 'The 100', the human characters encounter various animals suffering from deformities bestowed upon them from the radiation (Figure. I and J).

Figure. I: Deformed Fish in 'Chernobyl Diaries'[65]

[64] Department for Environment, Food & Rural Affairs., 'Foot and Mouth Disease: how to Spot and Report it'., https://www.gov.uk/guidance/foot-and-mouth-disease [08/04/16];
National Cattlemen's Beef Association., 'Scrapie Clinical Signs/Symptoms'., http://www.bseinfo.org/scrapieclinicalsignssymptoms.aspx [08/04/16]

[65] *Chernobyl Diaries.* 2012. [Film] Bradley Parker, USA: Alcon Entertainment.

Figure. J: Deformed Dear in 'The 100'[66]

There are numerous similar images on popular websites such as Pinterest, Reddit and google images, which show the supposed 'realities' of lamb and sheep deformation within the Chernobyl exclusion zone. Not one of these images has a reliable citation. Indeed, in 2011 when National Geographic conducted a photographic study of animal deformations in Chernobyl, no two-headed or large-teethed mutant animals were pictured. Instead, a rather unsensational swallow was photographed, showing the vague differences between swallows inside and outside of the exclusion zone.[67] As a publication, one could expect the best and most "juicy" story depicting the deformed animals of Chernobyl, and in the absence of such, one can assume, that at least today, the levels of such sickness and physical mutation are virtually non-existent. Indeed, in this context it seems absurd that, given the low levels of radiation encountered by sheep, that an MAFF report suggested that lambs born the year after the Chernobyl affair may have deformities, although

[66] *The 100.* 2014. [TV Series] USA: Bonanza Productions.

[67] National Geographic., 'Pictures: Animals Inherit Mixed Legacy at Chernobyl'., http://news.nationalgeographic.com/news/energy/2011/04/pictures/110426-chernobyl-25th-anniversary-wildlife/ [08/04/16]

scientists did quickly refute this.[68] There is little explicit evidence confirming a reality to the animals pictured in Figures I and J, there is none to suggest this was the case for the sheep in Britain, although intense government restrictions would suggest that possibility. The manipulation of the normal sheep death reflects the social construction of the sheep as the imagined sick and irradiated being pictured in Figures I and J.

Considering the letter series between Mr. Holliday and the British Government for a second time, Mr. Holliday suggests implicitly that sheep were culled and the theory behind this: 'No buyers exist for worn out irradiated sheep'.[69] If stock lambs and sheep were irradiated and not suitable for slaughter, the farmer was faced with the choice to keep them as economic drains or dispose of them as intrinsically worthless. Further, documents within the MAFF archives suggest that sheep were culled and records of this were simply not taken. From the statement 'it may prove necessary to slaughter some sheep which show consistently high radiocaesium levels', it is clear that culling was a government endorsed solution.[70] Some reports even suggest that the choice to cull was not actually available to farmers, reconfirming the idea of a transfer of power to the state, as farmers were told to dispose of sheep after slaughter 'by incineration or burial'.[71] This implies, that those 943 sheep which failed the radiation monitoring test in Wales 1987 (Figure. D), met an end at the hands of their farmer guardian, under the auspices of the British Government. Harriet Ritvo brings this phenomenon back to the animal history field by questioning whether from the animal point of view, 'death in their home fields was a better or worse experience than the one that otherwise awaited many of them in a slaughterhouse.'[72] Impossible to know from a silent body, the sheep, meeting death either way, can be said to simply have encountered a different death in a different space. The disruption of the normal transport of sheep to their death in the abattoir, meant that some sheep died in their space of life, where

[68]Kew Collection, MAF 298/190/1., London: The National Archives.
[69] Kew Collection, MAF 298/191/2., London: The National Archives.
[70] Kew Collection, MAF 298/190/2., London: The National Archives.
[71] Kew Collection, MAF 298/191/1., London: The National Archives.
[72] Ritvo., *Noble Cows.,* 187.

their ancestors sick from foot and mouth disease had died before them, further shaping them to an identity which can be likened to that of diseased sheep.

Beyond the sheep's death as a 'miner's canary,' proximate of the potential contagion to humans, the sheep was culled as a human substitute to appease the threat of nuclear technology.[73] The sheep throughout religion and history has been the classic sacrificial animal, replacing the human as sacrifice to a 'divinity'. Phillip Walling makes this interesting yet somewhat tenuous connection in his work on the 'contagious cull' of foot and mouth disease, stating that the sheep has historically been a symbol of blood sacrifice.[74] The white lamb as the symbol of renewal and innocence is within Jewish, Christian and Muslim culture, often the sacrificial victim. Indeed, as Jesus, the Lamb of God, was sacrificed, animals have taken on the role of surrogate and substitutional candidates of sacrifice in the face of human concerns.[75] The sheep in the face of nuclear and international threat became a substitute for human panic and human sacrifice as an example of effective nuclear practices. Although Walling's argument does not consider individual agency and perhaps over-evaluates the human subconscious, the sheep's identity was certainly transformed by the decision to cull the animal.

The idea of sheep as human proxy suggests the sheep became a symbol of potential radioactive effects on the human body. As a metaphor for the threat of nuclear activity and consequent radiation sickness, the sheep was culled. The British Government used aggressive tactics against the "sick" sheep as an example of how they could effectively deal with a similar nuclear situation in the human world. Although, reflections on the government's response have been largely condemnatory, the contemporary government position was that it was 'clear that in speed of response and breadth of monitoring the UK's record was second to none'.[76] The sheep became

[73] P. L. Fradkin., *Fallout: An American Nuclear Tragedy.,* (Arizona,1989) 234.
[74] Walling., *Counting Sheep.,* 4.
[75] The King James Version, (John 1:29) 2243
[76] Welsh Office., Jan 1987-Dec 1987., *Chernobyl Nuclear Accident: Monitoring of Radioactive Contamination of Sheep Meat; Movement and Marketing Restrictions and Sheep Compensation Scheme 1986.,* [Government Report]., Kew Collection, BD 94/11., London: The National Archives.

a human proxy, to highlight to a hysterical British populous, how seriously the Government took the prospect of a nuclear attack. The sheep evolved from the emblem of British well-being and peace, to the British body under technological and military attack in the context of the cold war and nuclear power.

Conclusion

This essay has provided the discipline of animal history with a short narrative of how the identity of the sheep evolved and developed as a construct of British concerns in the aftermath of the Chernobyl disaster. In so doing, it has attempted to fill a lacuna in animal histories. Although a style of history claiming to be the 'ultimate history from below', animal history has often been reserved for romantic animals and not the livestock we manipulate and exploit every day.[77] Indeed, Jonathan Burt's Animal series has focused first on the traditionally majestic non-human such as 'Wolf', 'Bear' and 'Horse'. Burt's series with works on 'Cockroach' and 'Oyster' also suggests a recent historical turn to consider the "low-animal" as an illustration of the impressive abilities of historians.[78] However, within these developments it is the ordinary, unromantic, visible animals which are ignored. The sheep fits into this unreported category of animal history. This dissertation sought to look past the sheep's role as livestock and consider the animal's own life, how its character and personality was shaped by events in the 1980s.

Although this piece has presented quotations from scholars concerned with the significance of the symbolic animal, it has gone beyond a few lines discussing this. This dissertation has sought to develop a detailed study of how an animal identity is constructed; how an animal becomes a metaphor; and how an animal becomes an emblem. Erica Fudge is perhaps the only academic who has attempted to consider the identity of an animal in such a detailed way and has actually been successful in that approach, in her work 'Animal'.[79] Animal identities are constantly evolving and are enduringly malleable. This dissertation has proposed this theory through the study of the temporary constructions of identities in the aftermath of the Chernobyl disaster, at most lasting thirty years. Identities and constructions of animals are rooted in the historical moment of their construction.

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[77] P. Fass, 'Cultural History/Social History: Some Reflections on a Continuing Dialogue', *Journal of Social History* 37(1) (2003), 39.
[78] J. Burt., *Animal Series.,* (2001-2005, London).
[79] Fudge., *Animal*.

Since the second world war, and firmly established by the 1980s, the international feeling was one of tension and paranoia regarding nuclear war and energy. Britain was a victim to such fears and the explosion of the Chernobyl reactor exploited and encouraged this nervous energy. This cultural construct fuelled the discrimination against the sheep. As a believed radioactive entity, it was a symbol of that much-feared nuclear threat. The belief in the sheep as contaminated and irradiated, despite the reality of minimal irradiation, served to evolve the current identity of the sheep, and create a new one alongside it.

The sheep was primarily a British entity before the Chernobyl disaster. Although built upon numerous components, two features of the British sheep were its renowned good quality taste and its free movement as a subject of the unique and prided British stratification system. The belief of the sheep as sick and irradiated undermined these constituents of the British sheep by confining the sheep to a life of stasis. The human construction of the sheep as diseased, provided the state with a new power over the ovine body. The general life of the sheep, moving freely across the British landscape, was thus limited, undercutting the essence of the sheep as a feature of the British aesthetic.

However, this same belief of the sheep as contaminated, combined with the sentimental idea of the sheep as a nostalgic metaphor of British pastoral history, reaffirmed the British sheep identity. Coupled with the hysteria over nuclear activity in the British environment, the sheep became the victim of a nuclear attack. In this way, the sheep remained a British body, and its identity as such was, in fact, reaffirmed. As the body taking the brunt of the radiation from the Chernobyl disaster, the restrictions in place to prevent contamination of irradiated sheep, were also in defence of the sheep body. As a source of British pride and quality the defensive nature of the restrictions, and the concern and stress upon decontaminating the ovine in the aftermath of the explosion, re-created the sheep as an entity of the British peoples and landscape.

The Chernobyl disaster also enabled a moving away from this British identity, and bestowed upon the sheep a new identity, as a sick and diseased animal. The paranoia regarding nuclear activity

led the British populous to believe and fear the sheep to be more irradiated than it was in actuality. This nuclear climate moulded the sheep to the popular image of the animal mutant. Through this process a third natural constituent of the British sheep life, dying in the abattoir and reaching supermarket shelves as 'British lamb' was undermined. By depicting the sheep as contaminated, the sheep industry was encouraged to cull the sheep. The role of the sheep in the industry and its image and relation to the human, was thus transformed into one of disease, consumption of whose meat was avoided and stigmatized.

This dissertation is the story of the power of cultural phenomena and instances, and their ability to effect and shape the environment and the landscape. The sheep became sick because of the presiding social and cultural context of the era. The conditions in the aftermath of the Chernobyl disaster served to both undermine and reaffirm the construction and depiction of the sheep as a British body. Beyond this, the sheep's character transcended the confines of a singular identity, splintering into a dual one. This was facilitated by the power of the human imagination to re-construct and re-consider an image in a time of hysteria. The sheep in the aftermath of the Chernobyl disaster is an indication of such a constructivist phenomenon.

Appendix

Appendix. A: Levels of Radiation in some common materials[80]

Radioactivity in some natural and other materials

1 adult human (100 Bq/kg)	7000 Bq
1 kg of coffee	1000 Bq
1 kg superphosphate fertilizer	5000 Bq
The air in a 100 sq metre Australian home (radon)	3000 Bq
The air in many 100 sq metre European homes (radon)	up to 30 000 Bq
1 household smoke detector (with americium)	30 000 Bq
Radioisotope for medical diagnosis	70 million Bq
Radioisotope source for medical therapy	100 000 000 million Bq (100 TBq)
1 kg 50-year old vitrified high-level nuclear waste	10 000 000 million Bq (10 TBq)
1 luminous Exit sign (1970s)	1 000 000 million Bq (1 TBq)
1 kg uranium	25 million Bq
1 kg uranium ore (Canadian, 15%)	26 million Bq
1 kg uranium ore (Australian, 0.3%	500 000 Bq
1 kg low level radioactive waste	1 million Bq
1 kg of coal ash	2000 Bq
1 kg of granite	1000 Bq

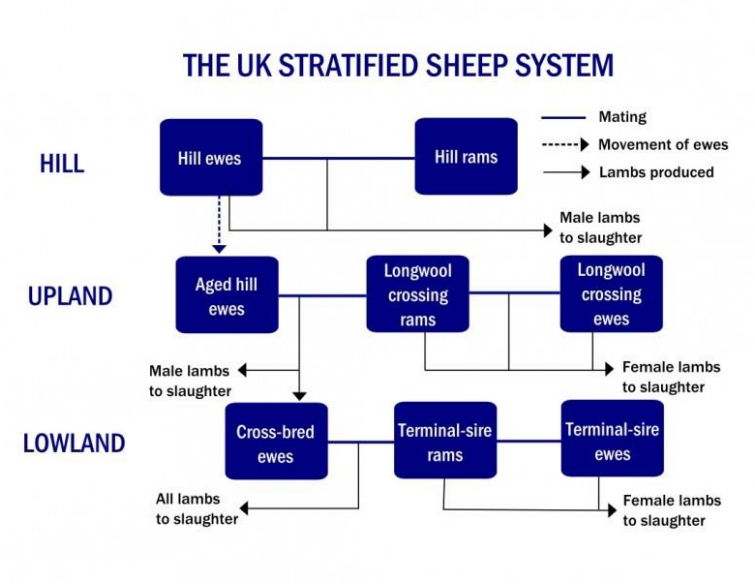
[80] World Nuclear Association., 'Radiation and Life'., http://www.world-nuclear.org/information-library/safety-and-security/radiation-and-health/radiation-and-life.aspx [08/04/16]

Appendix. B: Extract from the National Sheep Association on the stratification system[81]

"The **stratified system** is simply about sheep farmers playing to the strengths of different sheep breeds that are suited to particular habitats and environments. Hardy hill sheep can withstand the harsh conditions at the top of Britain's mountains, fells and hill ranges where no other food source can be produced, while lowland sheep are better adapted to producing meat on grassy pasture. By making the most of all our breeds and environments, the stratified system plays a crucial role in making the UK sheep industry productive and efficient.

The stratified system has three tiers: hill, upland and lowland.

Hardy **hill** sheep occupy the UK's highest and roughest terrain. Hill sheep include the Swaledale, Scottish Blackface and Welsh Mountain, and other breeds that are perfectly adapted to live in the rough, exposed areas of the UK. They are very hardy, thick-coated, able-bodied and bold, which enables them to survive such hostile conditions. The female adults (ewes) make excellent mothers and give birth to a baby lamb (or very occasionally a pair of twin lambs) every spring. The father of these lambs (the ram or tup) will usually be the same breed as the mother, meaning their offspring are pure-bred. If the lamb is a baby girl (an ewe lamb) she will be grow up to join her mother in the flock as a breeding female. If the lamb is a baby boy (a ram lamb or a wether) he will stay with his mother for the first few months and then be sent to lower ground to be reared for meat production, unless he is selected as having the right genetics to join the flock as a breeding male and father lambs himself. Hill ground is too harsh to fatten lambs for meat.



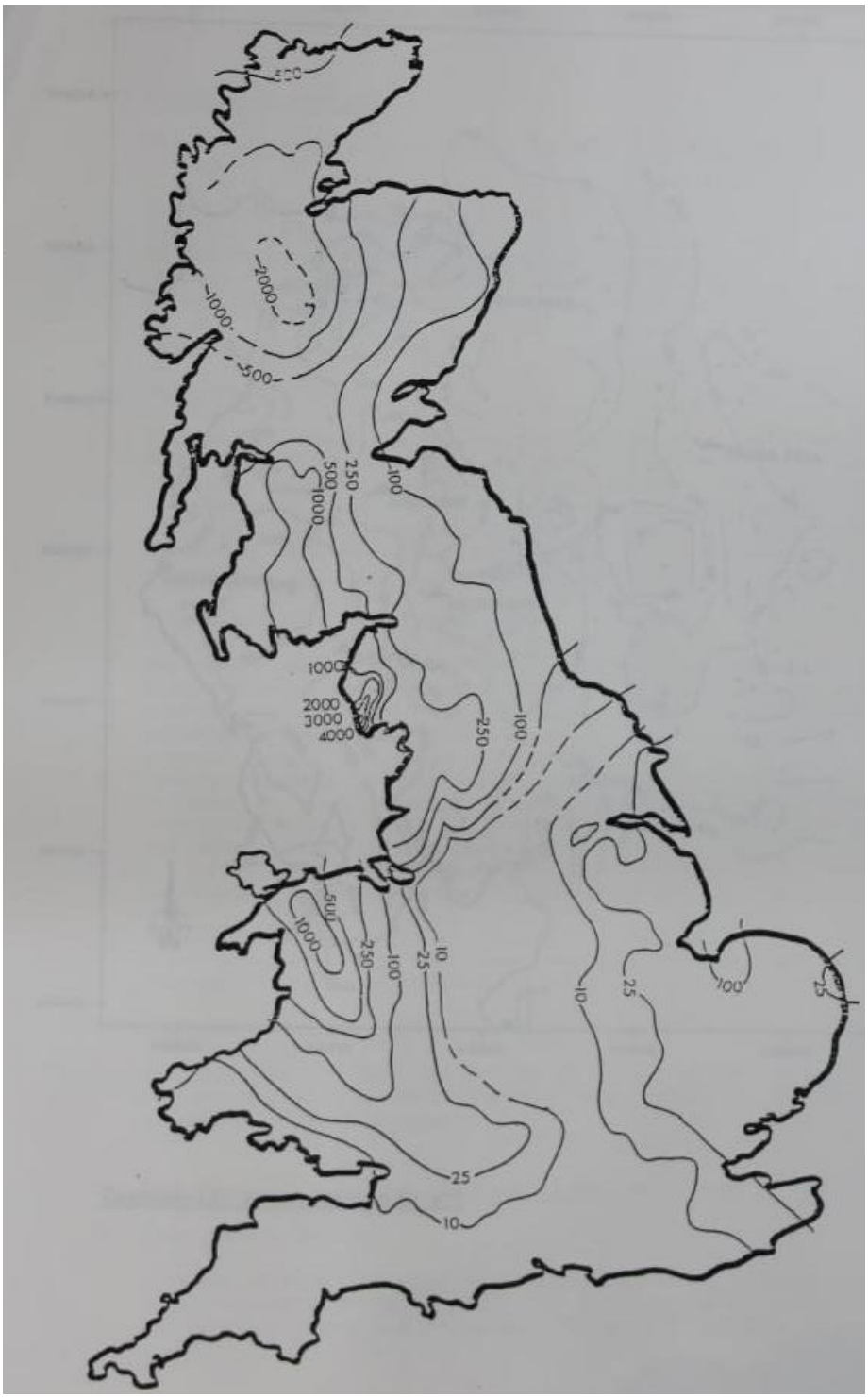
After a few years, the older ewes on the hill are moved to **upland** ground as draft ewes, as their age makes it more difficult for them to live on the hill farms. Upland farms are made up of hillsides and other high ground, but are lower and easier than true hill terrain. The draft ewes continue

[81] National Sheep Association., 'UK Sheep Farming'., http://www.nationalsheep.org.uk/know-your-sheep/uk-sheep-farming/ [01/04/16]

to have a baby (sometimes twins) every year, but this time the father is a different breed to the mother. The fathers are longwool upland breeds, such as the Bluefaced Leicester and Border Leicester, so the lambs that are born are cross-bred and referred to as Mules. You can get all sorts of Mules, including the Scotch Mule, North of England Mule and Welsh Mule. A female Mule lamb will grow up to be a prized mother on lowland farms, while a male Mule lamb will be reared for meat either on the upland farm where it was born or a lowland farm where more grass grows.

Lowland farms do not have the same tough terrain as hill and upland farms, are less exposed to bad weather and grow lots of delicious grass for sheep to eat. A Mule ewe on a lowland farm will stay in good enough condition to have twin lambs every year (and sometimes even triplets, quads or quins!)."

Appendix. C: Map of distribution of Caesium-137 from Chernobyl Fallout[82]



[82] Kew Collection, MAF 298/190/2., London: The National Archives.

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