# Making meat collectivities: entanglements of geneticisation, integration and contestation in livestock breeding

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## Introduction

The issue of UK trade magazine *Farmers Weekly* dated 27th November 2009 carries a supplement dedicated to AgriLIVE, 'agriculture's new food, technology and business event', to be held a couple of weeks later in December 2009 at Stoneleigh Park, Warwickshire, the home of the Royal Agricultural Society of England. A feature article (Balsom, 2009) within the supplement uses a case study of a farm in Oxfordshire to highlight a recent trend in UK meat networks. The article refers to the farm's relationship with the Dovecote Park/Waitrose 'Cattle Connect' scheme, to make a case for the value of 'being part of a designated supply chain … [which] … emphasises integration of the supply chain by linking dairy and beef suppliers' (p.4). Supplying beef solely to the Waitrose supermarket chain, via Dovecote Park abattoir and meat processing company, itself similarly dedicated to Waitrose, is argued to increase farm production efficiencies and profits by coordinating the demands of the retailer with on-farm cattle rearing practices. The farming practices which Waitrose and Dovecote Park jointly aim to influence through such integration include breeding, and in particular Dovecote Park selects which bulls are used to sire the cattle which will eventually be sent to their abattoirs. In doing this, Dovecote Park, amongst other things, uses particular *genetic* knowledge-practices in attempts to ensure as far as possible that bulls will pass on desirable traits (in terms of such things as growth rates and meat quality) to their offspring.

To explore some of the contours of this meat 'supply chain integration' - 'the phrase of the moment' according to *Farmers Weekly* - this chapter draws on research conducted as part of a project exploring the effects of the emergence of particular types of genetic knowledge-practice in beef cattle and sheep breeding in the UK and their entanglement with 'traditional' ways of knowing and valuing livestock. The research is interested in the production and circulation of genetic knowledge-practices in agriculture, in examining how such knowledge-practices become established and gain legitimacy, how they become tangled up with visual and other traditional knowledge-practices, and in the effects of genetic knowledge-practices on how cattle and sheep are bred and managed and on human-nonhuman animal relationships in livestock farming. The research has increasingly led us to explore the process of

'geneticisation' beyond the farm gate, to look at how the establishment of particular genetic truths or ways of rendering 'life itself' (Franklin, 2000) are entangled with processes of restructuring and differentiation within UK food systems. On the one hand, there are possibilities for some large corporations in the food sector, particularly supermarkets, to use the existence and increasing sophistication and complexity of genetic techniques to exert greater control over the on-farm breeding and management of animals whose meat they later come to retail. For these retail corporations, their demands for efficiency, standardisation, traceability and an ability to increasingly regulate and monitor all aspects of their suppliers' activities (Burch and Lawrence, 2007) are driving the reshaping of the meat supply system. But on the other hand, there is evidence that geneticisation as it is currently conceived and practised can be contested, particularly by those breeding livestock and marketing meat products partly or wholly outwith the 'conventional' corporate food system.

In this chapter then, we use the results of work with UK sheep and cattle breed societies and a range of commercial and research institutions and industry bodies associated with these agricultural sectors to examine some of the dimensions of geneticisation of beef cattle and sheep breeding, specifically in relation to how this process might be associated with greater corporate-led and -dominated integration of the various actors in meat networks. We also explore the ways in which both geneticisation and integration are being resisted in some parts of the beef and sheep sectors, on the basis that genetic techniques are inappropriate for breeding animals whose meat is intended for some of the more specialist, niche marketing strategies. Our argument is less that the potential for geneticisation is driving integration and (further) differentiation in the food system, and more that geneticisation, as the deployment of genetic 'truths' and the instigation of particular practices informed by those truths, highlights particular aspects of systemic changes in how food is farmed, processed, retailed and consumed, and gives insight into how particular entanglements of different types of agricultural 'knowledge-practice' (Mol and Law 2002) are tied to changing food network power-knowledge relationships.

We begin below by outlining an analytical perspective – Foucault's biopower – which we have found increasingly useful in making sense of some of the power-knowledge relationships associated with the shifting political economy of the livestock sector and with the geneticisation of livestock breeding. We then outline two particular genetic techniques that between them have become the core of the research project. Next, we develop two empirical sections, the first looking at the emerging relationships between geneticisation in ''integrative' meat systems, the second exploring the contestation of geneticisation in 'non-integrative' systems. The chapter ends with a discussion of the implications of the role of geneticisation and its discontents (Bridge et al, 2003) in food system differentiation. Here, we briefly address wider debates about the supposed differences between 'conventional' and 'alternative' food networks. Questioning the tendency to associate concerns with food 'quality' and food system 'reconnection' with so-called 'alternative' food networks (e.g. Morgan et al, 2006), we conclude that both 'quality' and

'reconnection' are being defined and enacted in different ways in different systems. In sum, then, the chapter is interested in a number of different entanglements: first, between different livestock breeding knowledge-practices, second, between different modes of food production-consumption, and third, between the various humans and nonhumans in meat supply networks.

**Power, knowledge and life**

That food – in terms of the way it is produced, processed, retailed and consumed – is political, has long been recognised. Detailed examinations of the changing political economies of agriculture produced during the 1980s and 1990s focused, for example, on the problematic position of relatively small, independent farm businesses vis-à-vis processes of integration and corporatisation in the wider capitalist economy (e.g. Marsden et al 1986a, 1986b, 1987, 1992). More specifically, and more relevant to the theme of this chapter, studies examined the changing agricultural bioeconomy, exploring the expanding roles of large biotechnology companies and food industry conglomerates in crop-genetic and agri-chemical experimentation and 'technology transfer' (see Goodman et al 1987; Goodman and Redclift, 1991, and for a more recent study, Gibbs et al, 2009). Discourses of progress, modernisation and rationalisation in relation to food production have become significant, and are similarly important in the case of the advancement of genetic knowledge-practices in livestock breeding. While this important work on political economic power relations in the food industry has continued (see, for example, Morgan et al 2006), more recent work has begun to pay more attention to the politics of food consumption, arguing that consumption practices are as embedded in power relations and struggles as production and processing practices (e.g. Lien and Nerlich, 2004). In some cases, work has aimed to integrate production and consumption relations by looking at supply chains or networks, focusing for example on how value and meaning is produced at the different nodes of the system (e.g. Jackson et al, 2006).

As an alternative approach to examining some of the power relationships, or power-knowledge relationships, associated with genetic knowledge-practices in livestock agriculture we have increasingly found the concept of *biopower*, as set out by Michel Foucault (1990, 2004, 2007) and particularly as read by Rabinow and Rose (2006), to be effective. We expand on these ideas in some detail elsewhere (see Holloway et al 2009; Morris and Holloway 2009), but here provide a summary of the concept, argue that a conceptualisation about humans is also appropriate for thinking about humans *and nonhumans* in their entangled relationships, and explain exactly how we find it so useful.

For Rabinow and Rose (2003, p.24), biopower involves both a 'knowledge of vital life processes' and 'power relations that take humans as living beings as their object'. As Rose (2007, p.53) suggests, biopower comes out of struggles to understand and intervene in the lives of subjects, 'a multitude of attempts to manage their life, to turn their individual and collective lives into information and knowledge, and to intervene on them'. Foucault himself said, in his 1977-1978 lecture series *Security, Territory, Population* that 'By [biopower] I mean a number of phenomena that seem to me to be quite significant, namely, the

set of mechanisms through which the basic biological features of the human species become the object of a political strategy' (Foucault, 2007, p.1).

Rabinow and Rose (2006) provide a schema for understanding the functioning of relations of biopower in any particular situation. First, biopower is associated with particular truths which are told about life, and which gain in legitimacy through their association with particular authorities regarded as competent to speak that truth. In Foucault's examples of the emergence of the nation state and the bureaucracies tied to emergent understandings of particular human populations in late eighteenth and early nineteenth century Western Europe (Foucault, 2004), it is an understanding of *population* in terms of certain biological processes (like birth, death and morbidity rates) which take on significance and are constructed as key 'truths' concerning life. Second, biopower is in part a set of interventions in the 'life itself' of individuals and populations. If life is understood in terms of *processes*, for example, it is processes which are intervened in. So, the particular strategies for intervention which attempt to influence those (always uncertain and complex) processes, for example through the implementation of particular health regimes, are seen to relate directly to a specific conception of life. Third, biopower also works through regimes of subjectification, through which individuals are enrolled into particular truth discourses, and work on themselves and others in accordance with the truths they embody. For example, they may act to foster their own and their families' health and fitness.

Foucault argues that, in this way, biopower accounts for humans (and constitutes humans) at two different scales: as both individuals and as populations. It consists of an anatamopolitics, which focuses on the individual, their body and their subjectivity, and a biopolitics, which focuses on the dynamics of populations. The joint concepts of anatamopolitics and biopolitics are articulated for Foucault (1976) particularly through processes of normalisation or regularisation, by which both individuals and populations (characterised in terms of their statistical qualities) can be assessed in terms of their closeness to or distance from norms. Rabinow and Rose (2006) and Rabinow (1999) extend Foucault's conception of populations as human groupings tied to nation states, to think about what they term *biosocial collectivities*. These entities are non-territorialised human groupings whose shared biological (and particularly genetic) characteristics bring them together as communities with shared interests. Their examples are drawn from medicine, referring to people who share the experience of particular illnesses.

In the research on which this chapter draws, however, we are clearly dealing with both humans *and nonhumans*, and this requires us to further extend Foucault's and Rabinow and Rose's conceptions of populations and biosocial collectivities. This requires a rethinking of how agency and subjectivity are understood in relation to Rabinow and Rose's (2006) threefold parsing of biopower (see Holloway et al, 2009). Our argument is that in relation to genetic techniques in livestock breeding, particular truths are established alongside the establishment of forms of authority, and that particularly 'genetic' interventions take place. That this is in relation to nonhumans does

not actually matter – the 'life itself' of humans and, for example, cattle and pigs can be rendered in very similar ways as the effects of the constitution of genetic truths about life itself. Similarly, human and nonhuman life can be regarded in terms of processes, and can be fostered through both anatamopolitical and biopolitical interventions. As Youatt argues (2008, p.409), 'the 'bio' in biopower should be taken seriously as involving all of life' (see also Holloway et al, 2009; Shukin, 2009; Twine, 2007). What is perhaps more problematic is Rabinow and Rose's (2006) third element of biopower – subjectification. It is difficult to conceptualise animals working on themselves in response to truth discourses in the same way that humans might. In response, we have articulated the notion of *heterogeneous biosocial collectivities*, extending Rabinow's (1999) terminology to encompass situations like livestock breeding where human and nonhuman animals exist in entangled relationships, and in which the humans work on themselves *and* on the animals in accordance with particular truth discourses. In such collectivities, the subjectification of humans simultaneously and necessarily affects the lives and bodies of nonhuman animals, and the work which is done, the agency in the situation, can be articulated as an effect of the collectivity rather than something which is simply centred in either the humans or the animals involved. In the empirical sections of the chapter, we thus attempt to delineate different heterogeneous biosocial collectivities, associating these with 'conventional' and with 'alternative' meat networks. Truth discourses, authorities, interventions and subjectivities are articulated in different ways, and to different ends, in the different collectivities.

Returning to earlier political economic conceptualisations of agricultural industrialisation and corporatisation, we can provide a new inflection on the processes to which such approaches draw attention by viewing them through the lens of biopower, not because biopower (as Foucault is clear) is an explanation or theory, but because of its analytical potential. Biopower is, perhaps, a way of seeing these structural processes such that how they are involved in the 'fostering' of life comes into clearer focus. As such, the particular political economic processes we explore below in relation to the livestock sector – integration, corporatisation, etc – can be seen as bound up with the sorts of truths, authorities, interventions and subjectifications identified by Rabinow and Rose (2006). The conceptualisation of biopower also provides space for us to understand resistance to these processes in the same terms. Jeffrey Nealon (2008) for example, argues that particular forms of resistance and contestation are urged and made possible by the particular power-knowledge relations the concept of biopower attempts to define. His suggestion is that, as modes of biopower represent both an intensification of, and the saturation of all social spaces by, disciplinary power-knowledge relations, resistance too is intensified, yet more subtle, as it permeates the mundane spaces of everyday life (such as the production, processing and retailing of food). For Nealon, 'As power becomes increasingly more invested in the minute details of our lives, so too have our modes of resistance become increasingly subtle and intense' (2008, p.108). In the empirical case this chapter focuses on, the everyday spaces of livestock breeding can be framed in terms of how they are, on the one hand, permeated by anatamopolitical and biopolitical strategies associated with corporatisation and integration which

render the life of livestock animals increasingly in genetic terms, and on the other hand, in dialectical relation to this, sites of some resistance to such genetic knowledge-practices.

From here, then, we move to explore the specific case of the rise of genetic knowledge-practices in livestock breeding. The process of 'geneticisation' (Gannett 1999; Haraway 1997; Keller 1992, 2000; Rose 2001) has been recognised in relation to various, particularly medical, fields, and suggests an increasing scientific preoccupation with understanding and intervening in life on the basis of genetic 'truths'. But, establishing and legitimising such truths and normalising particular interventions in new fields such as livestock breeding takes work and in practice is contested, depends on forging and sustaining sometimes fragile new relationships, and is tangled up with other knowledge-practices. So, although in many of the diverse and everyday sites involved in livestock production and the processing and retail of meat products, genetic truths may be gaining in legitimacy, in other sites the truths and authorities associated with geneticisation and its particular take on the life of livestock animals is being challenged. In the empirical sections of this chapter, we explore both of these perspectives.

**Genetic knowledge-practices: Estimated Breeding Values and genetic markers.**

Two particular genetic knowledge-practices have formed the focus of the research. Their increasing profile in livestock breeding is emphasised in the following quotation taken from the UK trade publication *Farmers Weekly*:

> 'For centuries, farmers have used phenotype to improve livestock. They selected the best looking and performing animals to produce their next generations. Then they had *breeding values*. These gave an estimate of the animal's ability to pass its desirable genes to the next generation. But now we can go further. Our knowledge today goes right down to the *gene*…With this knowledge we can identify animals with the potential to produce larger litters, more tender meat, fight disease or retain bodily condition'. (Hardy, 2005, emphases added)

In this comment, reference is first made to visual assessment of phenotype and ancestry. This relates to established and culturally significant knowledge-practices of selecting animals 'by eye' and on the basis of pedigree records and so on (Derry 2003; Orland 2004; Ritvo 1987), but such knowledge-practices are increasingly open to challenge by the promoters of genetic knowledge-practices. In the quotation above, breeding values and genes (genetic markers) are mentioned as particular techniques contributing to the geneticisation of livestock breeding. Breeding values, more usually referred to as *Estimated Breeding Values (EBVs)* are a 'classical' genetic technique based on statistical relationships between genetically related animals in a breed population. They are developed from a series of measurements taken from animals' bodies (for example, weight at various stages, amounts of fat and muscle in key bodily locations) and records of animals' performance and productivity (for example, in relation to calving ease/difficulty or milk production). The measurements and relationships are processed using a Best Linear Unbiased Predictor (BLUP) programme, and the results purport to show, for any animal, how likely they are to pass on particular desirable

qualities to future generations. Animals can thus be selected for breeding on the basis of their statistical genetic profile. EBVs have generated new ways of seeing and understanding animals (Holloway and Morris 2008, Holloway et al 2009); for example this quantitative approach provides new ways of ranking animals in relation to each other.

EBVs have been in use in the UK for several decades, although they are not universally accepted and, indeed, much work is done by various industry organisations and 'progressive' breed societies to persuade breeders of the advantages of using EBVs. *Genetic markers*, in contrast, are only beginning to emerge as a commercially-viable technique for selecting breeding livestock. Genetic markers relate to actual genetic material which, its promoters claim, can be associated with particular commercially-valuable corporeal traits such as liveweight gain, meat tenderness (i.e. its quality) and resistance to particular diseases. Genetic markers are identifiable via quite straightforward tests on blood or hair samples which breeders send to one of the small number of commercial companies selling such tests in the UK. Again in contrast to the way EBVs generate probabilities which have a greater or lesser degree of accuracy, genetic markers, it is claimed, are always highly accurate because they can determine very clearly the presence or absence of genetic material. What is perhaps less accurate, according to some, is the extent to which the genetic markers precisely relate to the traits they are claimed to do. As such, both EBVs and genetic markers are open to contestation.

In the following empirical sections, we draw on material collected during our research into how breeders are engaging with these genetic knowledge-practices, how they become entangled with established livestock breeding knowledge-practices and techniques such as embryo transfer and artificial insemination, and into how they are transforming the wider knowledge-practices and geographies of livestock breeding in the UK. Focusing on the sheep and beef cattle sectors, the project involved interviews with representatives of twenty one breed societies (organisations which maintain records of the animals belonging to their particular breed and which also promote the breed), thirty one 'institutional' interviews with representatives of various research institutes, industry bodies and commercial organisations associated with the livestock sector (including abattoirs, meat processing companies and retailers), and twenty five pedigree and 'commercial' livestock breeders (adopting terminology used in the sector, pedigree breeders breed 'pure-bred' animals which are registered members of a particular breed; commercial breeders produce often cross-bred animals mainly for slaughter. In practice, these activities frequently overlap). We also held discussion groups with members of two beef cattle and two sheep breed societies, and formed a project Consultation Panel which received and discussed research findings at an early stage and contributed to the formulation of research strategy.

Here, we specifically use material taken from the 'institutional' and breed society interviews. Rather than trying to produce an overview of the empirical

material collected, we focus in more detail on a small number of illustrative breed society and institutional case studies[1], looking first, at the way in which joint processes of geneticisation and integration are occurring in a co-constitutive way, and second, more briefly here, how in other instances, geneticisation is being resisted. The former approach can be associated with a strengthening or intensification of power-knowledge relationships within this particular part of the food supply system; the latter approach with those types of 'alternative' food network (notwithstanding the problematics of this terminology – see Holloway et al 2007; Ilbery and Maye 2005; Watts et al 2005) which exist in part to resist corporate domination of how food is produced, processed and retailed.

## Geneticisation and integration – tying up meat production with 'genetic' knowledge-practices?

In this section, we turn to the ways in which genetic truths, authorities, interventions and subjectifications are contributing to integration processes in meat networks. Rather than discussing food system integration per se, a wider theme beyond the scope of this chapter, we focus specifically on geneticisation as a discourse or set of knowledge-practices which is involved in enacting particular integrational processes in the UK beef and lamb sectors. We do this by presenting material from interviews with three companies, all of which are intermediaries between farmers and large retail multiples in their respective meat networks. The three case studies demonstrate varying levels and kinds of integration, ranging from the informal network to formalised contractual relations, and similarly genetic knowledge-practices play variable roles in the nature and extent of the integration which is demonstrated. We start with the least (formally) integrated and finish with a company where relations of integration have become quite intensified. We end the section by commenting on this empirical material from the analytical perspective of biopower and heterogeneous biosocial collectivity, thinking particularly about truths, authorities, interventions and subjectification in these integrating meat networks.

*Company A: informal integration of supermarket meat supply.*
Company A processes and packs meat exclusively for a major UK supermarket chain, taking responsibility for about half of that supermarket's beef supply. In this demanding and challenging position, the company acts as a broker between the supermarket, and the farmers and abattoirs who rear and slaughter the cattle. This has meant they have needed to extend their role into attempting to influence what abattoirs and farmers do, in various ways, in order to achieve a continuous supply of consistently sized and packaged meat of a consistent quality. As the interviewee said,

> 'Whatever [the supermarket's] criteria is, this is where I come in to say [to the abattoir company] this is what we want. Can you deliver it? What are your volumes like? And then *how do we move that in one direction or another*? *How do we tell the farming community* that we do want Anguses or we do want them grazed for six months? Or they ought to be fed vitamin E or something like that in the last 90 days. I help with

[1] Interviewee and organisation names have been removed to protect interviewee anonymity.

> that communication role, *making sure we have got the right message on the ground and the abattoirs know what they are doing* … my primary role is about availability to make sure we can fill meat demand, but then it is about improving quality' (emphasis added)

The work of communication and intervention is emphasised here. In doing this work with various actors in the meat network, the genetic techniques we are interested in were not mentioned as a primary mode of intervention; instead, emphasis was placed on animal welfare before slaughter (as stress prior to slaughter can have a detrimental effect on meat quality), animals' diet and vitamin intake (again, related to meat quality), and on the use of particular breeds to ensure consistency and quality.

> 'But yes we all work together. We have all got the same objectives at the end of the day and we need to sell meat … So once you have got the processing facilities right, the lairage[2] facilities right, your next thing is to target *down the chain onto the farm* and it is a hard thing to do especially when you are dealing with the numbers that [the supermarket] are' (emphasis added)

There is clearly recognition that integration in such a network is challenging and problematic, due to the fragmentation of the farming sector and the particular nature of the commodity being 'made'. We were told, 'we are dealing with a very backwards industry. In what other industry do you take a product and then chop it all about and sell it differently? Everyone else you have an assembly line. We have a disassembly line'. In the case of Company A, integration is relatively informal, so that although it's possible to identify how power and knowledge within the network are being redistributed towards large corporations, the actual farmers are nevertheless still relatively independent actors.

An important way of trying to guide farmers' conduct is by aiming to provide them with more information on the 'performance' of their animals when slaughtered than they would usually get. A consistent theme in the research has been that genetic interventions such as the use of EBVs and genetic markers in livestock populations have been 'held back' as most farmers tend to sell finished (i.e. ready for slaughter) animals 'liveweight' through auction markets. In that system, the purchasing abattoir provides minimal feedback to the farmer using an unsophisticated grid that summarises the 'performance' of each animal as a carcass on the basis of subjectively appraised 'yield' (i.e. proportion of muscle) and fat content. Under this EU-wide scheme, no price premium is awarded for the great majority of the attributes both EBVs and genetic markers measure, providing little financial incentive for their uptake. In response, Company A is working to provide much more information to farmers in efforts to help them provide more consistent animals. It is claimed that this also helps farmers to rear their animals more efficiently, decreasing the costs of raising livestock. So, in general terms, Company A is acting within an informally integrating network, translating the demands of its supermarket customer into specific interventions in other actors in its meat network.

[2] Lairage is the area of an abattoir where animals are kept prior to slaughter.

As we were told, genetic knowledge-practices in this particular network are subsumed into wider strategies for intervention into the entangled lives of humans and animals. They are seen as having potential in the longer term rather than being a current focus. In this regard, the 'hyping' of genetic knowledge-practices evident in much agricultural research and some farming practice (Holloway and Morris 2008) is importantly played down here; for this interviewee at least there are some more basic and fundamental changes which need to be made in the pursuit of consistent meat products, before attention can be turned to the possibilities presented by EBVs and genetic markers. As she said,

> 'So I will do a sort of pyramid of quotes. Let us get the lairage right, let's get the farmers efficient and focused on the business model and then let's look at the breeds. Which breeds are more efficient as far as the farmer goes? … Because if we get the breeds right to start with then we can work on the genetics of the breed. That is where you can then work with the [breed] societies to say look at EBVs, look at genetics in general and then we can work on the actual science of it'.

Despite this caution, genetic knowledge-practices are being explored as the possible basis for future interventions. The interviewee said that their supermarket customer would like to be able to use genetic techniques to guarantee quality, and Company A will be involved at the level of identifying the right breeds and within that ensuring EBVs work and the right ones are examined. They may be in a position in the future, possibly, to specify particular figures and traits to farmers who supply them with animals. In this, then, the potential for future further integration is set out, as this particular network changes to reflect some of the processes commented on below in relation to some of the other case study companies.

*Company B: genetic interventions and dedicated meat networks.*
Company B plays a similar intermediary role to Company A in its meat network associated with another supermarket company, but is also an abattoir. Like Company A, Company B emphasises the dedicated supply chain role it occupies in relation to its supermarket customer, with the interviewee saying 'we are 100% really dedicated to [the supermarket]', and going on to discuss how.

> ' …[W]e are totally focused on one customer, one retailer. We are geared up 100% dedicated to them and also to our producers [farmers] who quite a majority of those will now be dedicating to us, so … the producers [farmers] get a lot nearer the front end than they would do in other retail chains I think really'

In contrast to Company A, however, genetic knowledge-practices are much more significant in Company B's attempts to intervene in meat network heterogeneous biosocial collectivities. This is evident from the interviewee's comments on how they achieve the quality and consistency the supermarket requires. The aim is to

> ' ... deliver a more consistent and quality eating product for [the supermarket], so we are looking at on the front end of the farm, we are looking at EBVs and genetic traits within bulls to improve growth rates … [and also] … looking at [genetic] markers for the tender gene'

For Company B, then, genetic knowledge-practices are expected to work alongside a set of other mechanisms deployed as a way of disciplining farmers, to ensure that the required standards and consistencies are met – for example, only animals of a certain age and weight will be accepted, and animals must arrive at the abattoir direct from the farm in under six hours. Careful pre-slaughter care is given to avoid stress. Integration in this case then allows Company B to 'try and reduce the peaks and troughs of any variability within tenderness and succulence by the processes we have before slaughter'.

Genetic knowledge-practices are part of increasingly intensive modes of integration, with particular genetic truths and interventions associated with work done on the subjectivities of the farmers involved, as they are exhorted to work on the lives of the animals they rear. Increasingly, then, Company B plays a role in on-farm breeding of cattle, selecting bulls with particular genetic qualities and expecting farmers to use them to sire cattle intended for its abattoirs. Increasingly, then,

> '[W]e are having input into the bull side of it. We are buying a lot of semen, we buy quite few bulls and place them on the farm … So we do help as much as we can on the genetics and feeding side'

That genetic truths are increasingly powerful in this meat network was indicated in a separate interview with the supplier of some of the semen used in this way, a separate company, in which EBVs and genetic markers were described as 'a revolution'. However, it was interesting that genetic knowledge-practices were discussed in quite complex ways in the interview with Company B. In some ways, the truths they embody were represented as increasingly imperative. For example, 'some breeding has been left in the dinosaur age and it is needed really fast and we are still working with the scientists now to quickly implement genetic improvement … Tender gene markers, that is going to be a must'. But at the same time, some rather more subtle views about their entanglement with other ways of assessing animals, and future of integration vis-à-vis genetic knowledge-practices, were expressed.

First, the representative of Company B argued that their supermarket customer is dealing with sophisticated consumers, 'you know they are very, very switched on and educated people and they also understand quality of meat.' As such, particular meat qualities are required and genetic truths and interventions are a significant part of achieving those: 'so that is always a target for us to try and work with the farmers again and through genetic traits, and bulls we are trying to isolate that to pick bulls who breed tender and some degree of marbling within their genetic make up'.

Second, however, the specific, high value sector of the market Company B is integrated into means that, although EBVs are used extensively, they are used in a particular way and given a particular inflection:

> ‘For us quality is about flavour, tenderness of product, it is slightly different [than just going for weight gain] … I can see the industry splitting into more extensive beef and then intensive beef and if you are going intensive then I don’t think you ever question EBVs … […] … So, we do recommend to producers to use them but as a guidance rather than an absolute must’

The foregoing comment argues that, for beef networks drawing on more intensively reared cattle to supply relatively cheap meat, then EBVs (which have tended to focus on traits such as rapid weight gain) are suitable. However, for Company B’s meat network, which draws on more extensively reared cattle to supply relatively expensive meat, then characteristics other than those assessed by EBVs should also be taken into account (and indeed, this accords with some of the comments made by actors in ‘alternative’ meat networks in the next empirical section). While EBVs have provided some important benefits, then, ‘that doesn’t necessarily fit with everything that we do because EBVs are a tool, particularly if they are live weight gain and conformation traits, that doesn’t necessarily meet our spec[ification]’. Clearly, then, integration of meat networks is not a simple and single process, but can take different forms and differently involve genetic knowledge-practices, truths and interventions in constituting quite different heterogeneous biosocial collectivities.

*Company C: Intensive integration*

Company C occupies a rather different position in its meat network than Companies A and B, as it engages in a much more intensive form of integration by establishing formal contractual relations between itself and farmers who are paid to rear carefully-bred calves in carefully-specified ways. Calves thus bred and reared should be consistent and of an appropriate quality for Company C’s customers in the meat network. According to the company’s representative, their approach to integration was at the time of interview unique in the UK; as he put it:

> ‘So [Company C] controls the chain, if you like, from the animal being born and being sold to us, through to it being slaughtered here. When it’s slaughtered here, the actual slaughtering arm is [another company name] which is a sister organization. In a nutshell, what it is, is an integrated supply chain, okay.’

The process is described in detail in the following comments, which are worth quoting at length here because of the way they exemplify the intensity of this particular integrative relationship and set of interventions in this biosocial collectivity.

> ‘What we’re trying to do is a total system in that, all to do with meat quality basically. So we’ve got a bull that we know is genetically superior … Producing us calves that grow quickly. We’ve got a rearing system which we…it’s a very prescribed system, alright, different from other organizations. Other organizations usually sell the calf to the rearer, let them pick up all the bills and do it how he wants to and then buy the calf from the other end. We don’t. We actually contract the rearer to rear our calves, pay them a fee, we put in all the medicines, all of the feed, all the milk powder, alright. So we dictate to that rearer … We dictate protocol, health protocols, feed protocol as well. They follow that and basically what we want is, the whole crux of the system we put batches of calves in to order, everything we rear is presold before it goes in.’

For Company C, genetic knowledge-practices are only part of a bigger set of complex management processes which must all mesh together in that pursuit of consistency and quality; Company C is able to do this through its contracting and integration. However, genetic truths have clearly been established here, so that 'genetics is the initial foundation step, alright. If you get the genetics right, and you get the right bull with the right potential, then it leads on to more efficiencies down the chain'. A direct and immediate genetic intervention is thus made; Company C, in partnership with a major UK cattle breeding company, has selected an Aberdeen Angus bull with the desired genetic characteristics, and supplies semen from him for artificial insemination of the dairy cows who will give birth to the calves which enter their contract rearing system. The bull was chosen to have a combination of high production trait EBVs and specific genetic markers, he has 'high EBV, good tender gene marker, good rib-eye scoring gene marker, good liveweight gain and easy calving'.

Genetic markers are regarded as having a great potential future contribution. Company C's representative, however, wanted to engage with the production of genetic knowledge-practices rather than simply adopt what was made commercially available. He thus criticised a situation where, in his view, companies offering genetic marker tests were more interested in generating profits *now*, than in engaging in longer-term and more thorough testing regimes which would establish particular tests as valid and useful in the future and for particular cattle populations. As he said:

> 'I think it's in its infancy really. I mean, you … to me, I could see, if I, you've got [a genetic marker company], they've done the easy route[3] … but what they should be doing is also coming to commercial people like myself and evaluating it within a system … […] … It's understandable, but what I would be doing is like, this bull here, we'll do a total gene marker on him, as much as we can, then get our bull, the progeny of that bull on farms, through the system, and we could monitor all the way through and then come out with some, even to the meat end of the operation, it's going to come out with some validated evidence, you know. That's where I think we should be going.'

For Company C then, their already intensively integrated and self-styled 'dictatorial' system provides opportunities for the further development and extension of genetic knowledge-practices; indeed, without modes of integration which foster the tracing and recording of animals at all stages of rearing (from birth to slaughter) and the construction of 'centres of calculation' (Latour 1999) surrounding them, the further establishment of genetic knowledge-practices is unlikely to happen.

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We finish this section by briefly reviewing some of the general points which emerge from these three case study companies, using biopower as an analytical lens. It is clear that to varying degrees, genetic truths and modes of

[3] The interviewee is here referring to how the genetic marker company mentioned is currently selling tests which, in his view, yet need further testing and validation for particular animal populations. The rush to get tests to market is his criticism.

intervention are becoming established as legitimate ways of fostering 'supply chain integration' (to re-use the expression from *Farmers Weekly*). Whether genetic knowledge-practices are regarded as of secondary importance (e.g. Company A) or as the foundation of integration (e.g. Company C), in all cases they are entangled with other processes and practices, including interventions aimed at remodelling farmers' subjectivities in efforts to intervene in how they breed and manage their animals, and interventions aimed at altering how abattoirs handle animals prior to slaughter in efforts to reduce stress and improve meat quality. In these cases, what farmers are expected to know and do is altered so that their subjectivities and interventions are more aligned with both integrative strategies in general and geneticisation in particular. Thinking and acting within a genetic paradigm involves some surrender of a farmer's autonomy. The farmer-and-herd/flock is woven into a network of standardised comparisons and measurements across new rigorously (re)defined populations, stretching beyond the bounds of the farm and into modernised, globalised, homogenised industrial systems. Farm-level heterogeneous biosocial collectivities thus become constituted differently as the life itself of livestock animals becomes viewed increasingly through the prism of genetic knowledge-practices.

Processes of supply chain integration point to redistributions of power and knowledge in meat networks, and this takes on particular inflections in relation to the emergence of genetic knowledge-practices where a range of other institutions are necessarily involved in generating EBVs and/or undertaking genetic marker testing. For those farmers who enter into these 'dedicated' supply chain relationships, decision making about how breeding should be done is increasingly something that involves the powerful intervention of these case study companies (and others like them) along with the range of institutions associated with EBVs and genetic markers. At the same time, of course, these intermediary companies' practices are strongly influenced by their own customers, the supermarket companies, and those in turn by what consumers 'demand' or have been taught to expect (e.g. Marsden et al 2000; Lang and Heasman 2004). Right through this, however, the 'life itself' of the livestock animals involved is understood, or reconstituted, in ways which increasingly include particularly genetic truths which are associated by these companies with the potential to provide meat product *consistency* and *quality*, both consistently named as the holy grails of their enterprises. Indeed, here, quality is defined partly in terms of consistency. Quality is constructed here in specific ways which are tied to the integrative requirements of supermarket buyers and to the purported expectations of customers (for example, the demand for leanness, tenderness and predictability). This definition of quality contrasts with other definitions associated with different meat supply networks, as we suggest below. At the same time, integration implies the forging of new types of connectedness between the various nodes in meat supply systems, in the name of efficiency and of making consistency and quality more probable. Again, this construal of connection can be contrasted with modes of connection sought in other kinds of meat supply network. We return to this point in the conclusions.

**Contesting geneticisation – resisting genetic 'truths'**

There is another side to all this of course. In this second, rather briefer empirical section we present the perspectives of some of those who are less likely to have become enrolled into relations of integration. In these cases, there is a related resistance to, or at least a wary questioning of, the genetic knowledge-practices which are part of meat network integration. Resistance to integration and resistance to genetic knowledge-practices are thus associated in these cases, suggesting that the production of particular knowledge-practices about livestock breeding is in fact closely allied to integrative processes which are displacing the locus of knowledgeability away from farms and towards companies. Our empirical material here thus reflects the perspectives of livestock breeders themselves, in contrast to the perspectives of the companies referred to in the previous section. We focus on two breed society representatives, the first speaking for a beef cattle breed society, the second for a sheep breed society.

*Breed Society A: breeding beef cattle for niche markets.*
Breed A is a so-called 'traditional' and 'native' breed, associated with south west England. Contrasting immediately with the idea described above of being dedicated to a particular supermarket supply chain, the breed society representative positioned his breed explicitly outside supermarket-driven notions of what is desirable in meat. As he said,

> ' ... because of the intra-muscular fat, they are not desired by a supermarket, so from the mid 1970s onwards they've rapidly declined because the supermarkets wouldn't buy them'

Yet, in common with dedicated, integrated supply chains there is at the same time a focus on meat *quality*. Here, this is described in terms of how the breed is reared, and in the detail of the meat produced and how it is cooked.

> 'the majority of our members are driven by producing a premium product … it is early maturing, so it is full flavour at 24-26 months. The meat's marbled[4] intra-muscular fat, so it cooks inside out. Because of the systems they are reared on, natural grass based systems, you get all the flavour of the herbs and whatever mixed pastures the cattle are eating. And trials have shown it's the best tasting meat in the world …'

Rather than supermarket customers, such premium meat is produced with other types of customer and consumer in mind.

> 'the market for the end product … are high street butchers, specialist retail outlets and farmer retailers, and they are supplying the upper end of the market … a lot of our members now are retailing their own steers in boxes … a lot of our members are saying that they retail their own meat for sale, that they don't need to advertise, [customers] come back repeatedly, time after time because of the quality and the flavour of the meat'

Positioning the breed and the meat in this way again rejects the supermarket-driven agenda which the companies in the previous section were closely aligned with. Instead, the breed is more closely associated with the sorts of

[4] Marbling refers to the distribution of intra-muscular fat in meat. It can be valued, as here, as it imparts flavour and tenderness to cooked meat, or it can be discriminated against due to consumers' apparent concerns about visible fat in meat.

‘alternative’ food network which focus, as many have noted (see, for example, Kneafsey et al 2008), on production-consumption relationships which foster particular modes of reconnection and care.

This positioning of the breed, then, is associated with a different response to the genetic knowledge-practices which are taking on such importance in more ‘conventional’ food networks. Like many breeds, Breed Society A as an institution does encourage breeders to engage with EBVs. This is related to their establishment of a formal Breed Improvement Committee and a tight inspection and classification system which regulates which animals are of a good enough standard to be used to produce future generations of the ‘pure-bred’ breed, evidence that interventions aimed at fostering the lives of (animal) members of the breed towards particular agricultural ends are in progress. However, the breed society has struggled to persuade breeders to adopt and use EBVs, and this is argued to be because the EBV system as currently constituted does not favour breeds and farming systems of the type Breed Society A is involved with. As we were told,

> ‘I think the reason for that [low rate of adoption of EBVs] is, we don’t sell a lot of crossing bulls on fast growth and muscling, and basically your EBVs are based on that’

Here then, EBVs as a particular genetic knowledge-practice are regarded as something which is more applicable to the requirements of supermarket retailers, because of their focus on ‘productivist’ traits such as growth rate. Where a breed is more concerned with a ‘quality’ defined in terms of flavour, texture, even *terroir* (e.g. Barham 2003; Goodman 2003), EBVs are less useful, perhaps irrelevant. Similarly, the EBV system has in the past tended to have paid less attention to so-called ‘maternal’ traits, such as milk production, calving ease and longevity, again making it less suited to a breed where, ‘[h]istorically we sold crossing bulls because of their docility and their fertility. And their ability to pass on this marbling to progeny’. EBVs are seen as associated with, and, constitutive of, particular breeding aims which are not suited to this breed.

This does not mean that genetic knowledge-practices are rejected by Breed Society A. As we were told, the current shift towards developing ‘maternal’ EBVs is likely to make the system more useful to them, and the society would be interested in the development of an EBV for meat marbling and also in genetic markers associated with meat tenderness. In this case, EBVs have the potential to become more entangled with the established modes of knowing and valuing this breed of cattle. Yet even then, the actual *need* for such markers is questioned because Breed Society A knows already that their animals’ meat is tender. Genetic markers, then, were represented as necessary for other breeds where the history of interventions rendering them more suited for ‘conventional’ food networks had resulted in a loss of what Breed Society A would call quality:

> ‘[T]he breeds who are solely producing commodity beef in the supermarkets are interested, very interested in it because they’ve got to get back, try and get back the meat quality, eating quality. The traditional breeds, I would say, uptake is fairly slim

> because we already have that eating quality and tenderness … So it is pointless testing for it because we already have that … I would say for us it is too expensive, because it's only going to prove what we already know'.

*Breed Society B: breeding a minority sheep breed*

Breed B is a large 'terminal' sheep breed, which although currently a minority breed, has a long history of use for crossing with smaller ewes to produce big lambs aimed at specific markets for meat. At present, in common with Breed A, there are specialist markets for such a sheep,

> '… there are certain sort of niche marketing people, who sell in farm shops and things, and perhaps who want larger carcases, or who want to trade on farms, sort of meat from older breeds'

And again in common with Breed Society A, Breed Society B positions its breed in opposition to prevalent supermarket-led food networks, this time drawing attention to the way some consumers and other customers (e.g. chefs and independent butchers) are looking for 'alternative' sources of meat products.

> 'I think it is probably because there is a reaction against the supermarkets. You see, the supermarkets have to have the standard product, and personally, we ourselves, sell the lambs … we sell them direct to the butchers … […] … the private butchers want something different. For example, they want a little bit more fat cover[5] … So, the private butchers and the quality market, restaurants and so forth, they want a different class of stock than the standard they sell in the supermarket.'

For the representative of Breed Society B, genetic knowledge-practices were rejected as irrelevant, with breeding selection 'by eye' remaining the primary knowledge-practice deployed: 'We have got no interest in the recording scheme'. This is not to say that breeders of Breed B have not experimented with EBVs, but according to this interviewee at least, their validity is strongly contested because the focus on EBV figures can lead to a neglect of other traits, particularly those for which EBVs have not been constituted. As we were told,

> ' … you can prove all sorts of things with figures, and I have seen one [breed name] flock that will be nameless, that he completely ruined it by recording because he went entirely on the figures and didn't bother about the legs and so the feet went. He didn't bother about the mouths and the mouths went. He got entropion … in growing eyelids. It is a genetic defect …'

In this case, and for this interviewee, the unanticipated effects of using EBVs make their use illegitimate as a breeding knowledge-practice, with this point reinforcing the sense that, as a breed which is not aligned with the agendas of supermarket retailers, for Breed B genetic knowledge-practices are of little value and are potentially damaging to this breed's heterogeneous biosocial collectivity. This collectivity, and Breed Society A's collectivity, for instance, is constructed in part around very different notions of quality and connection to those which pertain to the 'integrative' supply systems discussed in the

[5] This allows meat to be 'hung' for longer and acquire flavour, in contrast to the rapid processing of meat common to 'conventional' meat retail.

previous section. The desired qualities of taste or fat presence, and connection through inter-personal relations, are enacted through knowledge-practices which are very different to those which enact integration and *its* conceptions of quality and connection.

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We end this section with some comments from the representative of a national 'umbrella' organisation which represents most sheep breed societies. The interview emphasised that there are counter-discourses concerning both geneticisation and integration. This interviewee contrasted the mode of vertical integration described earlier in this chapter, which he associated with trends towards the homogenisation of the UK's sheep population, with the persistence of horizontal differentiation in livestock breeding, that is, in the continuing presence of large numbers of different breeds. On the one hand, the value of integration in providing opportunities for 'geneticised' interventions in livestock breeding was acknowledged:

> 'if the vertical integration worked and everybody played their part properly, there is, it is much easier to drive genetic change in the vertical supply chain than it is horizontal wise'

But on the other hand, vertical integration was also represented as creating a potential weakness because of its tendency to reduce diversity. Strength was seen to lie in continued horizontal diversity.

> 'We've got an industry which is really diverse, which gives it strength … You create a weakness by vertically integrating, so the horizontal diversity is the strength and you can make that comparison to the genetic world where if you become too narrow … it ends up in a weakness'

Here, a wider biopolitics is expressed in terms of concerns about the importance for current and future (perhaps as yet unknown) needs of fostering the genetic diversity of intra-species and intra-breed populations (see also Defra, 2006; Holloway and Morris, 2007). This biopolitics expresses too, a different 'truth' about life and what interventions are appropriate in the sort of non-integrative heterogeneous biosocial collectivities he is associated with. Clearly, this interviewee and the institution he represents have an interest in the continued existence of a large number of different breeds, yet these comments also reflect wider concerns which have been expressed about the potential for genetic knowledge-practices such as EBVs and genetic markers to reduce the genetic diversity or 'gene pool' of domestic livestock, with possible consequences for the availability of suitable animals in unknown future economic and environmental conditions (Holloway and Morris, 2007).

**Conclusions**

Using Rabinow and Rose's framing of biopower, summarised as 'a knowledge of vital life processes, power relations which take human beings as their object, and the modes of subjectification through which subjects work on themselves qua living beings' (2006, p.215), and drawing on a more heterogeneous sense of biosocial collectivity so that power relations entrain

nonhumans as well as humans, differences in understandings of genetics and 'life' between the examples of first, companies, and second, breed societies, used in the foregoing two empirical sections can be described as follows.

First, different 'truths' about life, associated with different structures of legitimisation and authority, are evident. In the case of the companies, genetic truths about nonhuman life are increasingly important and are associated with an intensification of the relationships of control between both the companies and breeders, and between breeders and their animals. As such, certain specific interventions (such as selecting a bull on the basis of his EBV record or fostering meat tenderness using genetic markers) become established and expected, founded on the authority of livestock genetic science to speak such truths. Genetic truths and interventions are nevertheless only one part of this set of interventions, and are entangled with other mechanisms (such as specifying how animals are to be fed and medicated) which aim to regulate breeding activities, fostering animal life towards particular ends. In the case of the two breed societies used in this chapter, however, genetic truths are less significant, or problematic in that they don't provide breeders with the knowledge about their animals that they need to have. Again, in these cases, genetic truths may be entangled with 'established' livestock breeding knowledge-practices and other truths about animals' bodies and animal life. These other knowledge-practices are founded on an authority associated with breeders' experience and with breed societies' established modes of recording and certifying animal 'members' of the breed.

Second, different processes of subjectification, in terms of what breeders are expected to know and do, are also evident. Associated with the companies, breeders are expected to become aligned with particular breeding strategies and interventions as a key part of the integration process, increasingly entraining genetic knowledge-practices. Breeders work on the bodies of their animals, but they also work on themselves, remaking their knowledge-practices and identities as breeders allied with modes of livestock production increasingly integrated with and controlled by other, corporate, actors such as supermarkets. As such, they lose some autonomy in making breeding decisions, and are enrolled into heterogeneous biosocial collectivities centred around integrative practices including genetic interventions in livestock populations. Contrastingly, breeder autonomy is fostered in cases where genetic knowledge-practices and integrative processes are questioned or resisted. Here, subjectification and heterogeneous biosocial collectivity occurs around alternate knowledge-practices which emphasise breeders' experiential understandings of their animals, animals' characteristics which cannot be captured by genetic techniques, and alignment with quite different breeding and marketing strategies.

On the one hand, then, the preceding empirical discussion outlines a process of differentiation within livestock breeding. From this perspective, we might identify two broad tendencies – integrative and non-integrative. Within 'conventional' food networks there is an ongoing process of integration and increasing levels of corporate involvement in livestock breeding. Existing and emerging genetic knowledge-practices are becoming significant within this

integration process, potentially giving retailers greater control over livestock breeding practices on farms. There is thus the potential for increasingly corporatised control over breeding practices and livestock agriculture more widely. Although the limits of such intervention have to be recognised – in particular, attempts to remodel livestock animals are constrained by the corporeal capacities of individual animals and of populations of animals – integration is, according to our interviewees, producing animals which increasingly embody the qualities they require. While genetic techniques are only part of this process (the process also demands other integrative mechanisms and redistributions of power in food networks) they represent the potential for integration to be intensified through the deployment of particular knowledge-practices. At the same time, associated often with 'alternative' food networks, there are livestock breeders and breed societies who are very resistant to such integration and geneticisation, seeing the quantities and qualities emphasised in the 'conventional' networks as inappropriate to what they are trying to do. In these different instances, genetic knowledge-practices become entangled with other processes and other knowledge-practices in particular ways. Where integration is occurring, genetic techniques are caught up in wider processes of attempting to reconfigure farming and farmer subjectivities. Where integration is contested, genetic techniques may be forcefully rebuffed, or tangled up with 'traditional' knowledge practices in complex ways (Holloway and Morris, 2008)

On the other hand, however, despite this apparent divergence there are interesting commonalities between integrative and non-integrative tendencies. This represents, perhaps, a transgression of assumed boundaries between 'conventional'/integrative and 'alternative'/non-integrative food networks, since a number of concerns appear in common to both, although they are discursively constructed and take material effect in quite different ways. As the empirical material illustrated, both are very much concerned with ideas of meat 'quality', although 'quality' is defined or at least affectively understood in rather different ways in the different networks. Similarly, both are very much concerned with reconnection. It's become something of a truism to identify the notion of producer-consumer reconnection with 'alternative' food networks, yet it is clear from the preceding discussions that reconnection is also central to efforts to create meat 'supply chain integration'. The representative of Company B, for example, argued that integration brought farmers nearer to meat consumers. Thus 'supply chain integration' suggests a collapse of the distancing between producer and consumer, in a different sense to that associated with 'alternative' food networks, but nevertheless raising interesting possibilities for the reconceptualisation of reconnection.

Our case study of genetics and changing knowledge-practices in livestock breeding is in a sense simply illustrative of processes going on in food networks more widely, including supply chain differentiation, the entanglement and contestation of different knowledge-practices, the emergence of different relations of control and authority, and the establishment of different types of producer-consumer relationship. Genetic knowledge-practices mark one way in which 'conventional', corporate production-consumption relations are being restructured in order to guarantee certain outcomes more effectively. That is,

they represent an intensification of control through the food chain by supermarkets and processors as part of a mode of biopower relations which involves genetic techniques and other ways of disciplining the everyday practices of livestock breeders. At the same time, however, integration is being contested through alternatives which also involve the contestation of genetic knowledge-practices.

Despite the commonalities identified above, what remains is great contrasts in the distributions and redistributions of knowledgeability and power between integrative and non-integrative tendencies. And that certain sorts of bodies and certain sorts of knowledge-practices are more appropriate for these different understandings of quality and reconnection. 'Conventional' integrative networks and 'alternative' non-integrative networks can be associated with different sorts of heterogeneous biosocial collectivity, in which different combinations of human and livestock animal lives are subject to different sorts of intervention related to differently constituted truths about 'life itself'. In the former, geneticised understandings of life promote particular sorts of intervention, fostering the life of living beings towards quantitatively measurable goals such as weight gains, consistency of size, or meat tenderness. Genetics illustrate, are part of and intensify integration tendencies and greater reliance is placed in off-farm authorities in deciding on the right interventions to be made. In the latter, more weight is given to qualitative assessments based in breeders' experiential knowledges, which may or which may not be entangled with genetic knowledge-practices. Interventions are still made at the level of the heterogeneous biosocial collectivity, but they are subjectively very different and resist corporatisation.

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