Peter Atkins
University of Durham, United Kingdom

The history of food exchanges: a new agenda

Abstract

This paper argues that the time has come for a new approach to food exchange. Using the literatures of geography and sociology, it points out that the social constructionism that is being used increasingly in food studies is inadequate. Its privileging of human agency has led to an underestimation of the importance of the materiality of foodstuffs. Three dimensions are proposed for a dematerialisation of research on food exchange histories.

Keywords
Food exchange
Dematerialisation
Social Constructionism

Food historians need humility. Their interpretations are necessarily based on flimsy evidence, usually without direct information on intentionality in cooking and eating. Those who would use old recipe books, for instance, cannot be sure that these are any more than aspirational for the cooks concerned. The same elusive slipperiness is true of inventories and menu cards – what exactly do they represent for everyday lives and ordinary consumption? How, then, should we characterise food and foodways in the light of the sparse and inconsistent data available to us?

The answer in recent scholarship has been to emphasise social constructionism. Borrowed from the sociology of science and technology, this argues that objective reality is not self-evident and that there are traces of human intervention in even the most "natural" of objects and environments. One example might be that even products such as milk are fully in the human realm, not only as a result of husbandry practices and the selection of the breed of cow, but also due to methods of standardising the butterfat content and heat treatment to kill pathogens.[1] A second example is the so-called

[1] Peter ATKINS, "Laboratories, Laws and the Career of a Commodity," *Environment & Planning D: Society & Space*, vol. 25 (2007), pp. 967–989; Peter ATKINS, *Liquid Materialities* (Farnham, 2010).

"typical" foods that are associated with particular regions, such as Parma ham or champagne. Some of these products are of such ancient pedigree that they have acquired an aura of the taken-for-granted, especially in view of the loyalty of local consumers, but constructionists would want to unpack the associated histories and examine the fingerprints of politics and social capital. Alessandro Stanziani has done this with French wines, for instance, showing that Appellation d'Origine Contrôlée designations initially arose out of defensive tactics in the face of cheap imports and problems of falsification, not through any true reverence for the environmental specificity of terroir.[2]

Social constructionism has become influential in food studies, to the extent that we may be losing sight of the rawness of the raw material, the food. So, the time has come for a sceptical critique. The present paper seeks to do this through a call for a greater consideration of material histories than has so far been evident. As such, it is not an anti-constructionist manifesto but, rather, an attempt to demonstrate that alternatives lie in the stuff of food*stuffs*. First, I will look at material potentialities and resistances in order to foreground genes, metabolisms and compositional properties. Second, I want to suggest a networked understanding of food qualities. This will help us to grasp the part-human, part-object character of food systems. Linked to this, I suggest, are the concepts of trust and civilization. Third, we will discover that material disorder is an under-appreciated component of food exchange.

All of this is predicated on the assumption of an indeterminate ontological politics, a terminology that is derived from the ethnography of objects and their associated knowledges undertaken by Annemarie Mol. She asserts that "ontology is not given in the order of things…instead, ontologies are brought into being, sustained, or allowed to wither away in common, day-to-day, socio-material practices".[3] In her world of hospitals, there are diseases and instruments and knowledges associated with their diagnosis and treatment, and these knowledges are enacted through practical, material events. She advocates attempts to study the multiplicity of material reality, and she dismisses social constructionism, which shows little interest in the fragility of object identity. For her, "matter isn't as solid and durable as it sometimes appears"[4] and for us this is equally as applicable to food studies as it is to her interest in the diagnosis of diseases such as atherosclerosis.[5] Take wheat, tomatoes or beef, for instance. Until relatively recently these and other food

[2] Alessandro STANZIANI, *La Qualité des Produits en France, XVIII^e–XX^e Siècles* (Paris, 2003).

[3] Annemarie MOL, *The Body Multiple: Ontology in Medical Practice* (Durham, NC, 2002), p. 6.

[4] John LAW, Annemarie MOL, "Notes on Materiality and Sociality," *Sociological Review*, vol. 43 (1995), pp. 274–294.

[5] Annemarie MOL, "Ontological Politics: a Word and Some Questions," in J. LAW, J. HASSARD (eds.) *Actor Network Theory and After* (Oxford, 1999), pp. 74–89; A. MOL, J. MESMAN, "Neonatal Food and the Politics of Theory: Some Questions of Method," *Social Studies of Science*, vol. 26 (1996), pp. 419–444; H. HARBERS, A. MOL, A. STOLLMEYER, "Food matters: Arguments for an Ethnography of Daily Care," *Theory, Culture and Society*, vol. 19 (2002), pp. 207–226.

commodities were of many different varieties, tastes, and degrees of perishability, so that both substance and quality were to a degree unpredictable through time and across space. This unruly behaviour of material was at the root of the difficulties in arranging inter-continental shipments of bananas or frozen meat until the second half of the nineteenth century. Knowing foods and understanding their potential for management has been continuously problematic. Technological interventions have become substitutes for organic processes, but this has been mainly in domains of simplification. Thus, uncertainty can be reduced by bringing a "known" variety under close scrutiny and control, in the way that McDonald's uses only a few varieties of potato (Russet Burbank, Shepody) for its fries and the world banana industry has invested mainly in one cultivar, the Cavendish.

Ontological politics are also to be found in the kitchen. Cooks do not always follow the recipe and anyway they cannot reproduce their ingredients and methods exactly on every occasion. My Chicken Madras is therefore an indeterminate cluster of potential rather than a certainty. Anyone who has eaten it will confirm that it does not always live up to its potential but this is as much due to the skills, or lack of them, innate in practice as it is to the ingredients and the recipe. To adapt Martin Heidegger's tool analysis, the properties of food are always at least partially absent and only become "present at hand" in one of its commonly agreed applications. Objects such as food to Heidegger should not be defined in terms of their properties, but rather in their systems of relations. Thus bread has no "essential" characteristics on its own, but when it is baked, sold and eaten it becomes bread in the unfolding of these practices.

1. Embodied Materiality

I begin with genes. This may sound strange in an article about food, but the belief is growing that our ability to metabolise certain nutrients is a function of our genetic inheritance. We are in a sense therefore hard-wired with benefits and disbenefits to be derived from particular foods. To a certain extent, we know this ourselves and avoid those foods that make us feel ill. In a discussion of food exchange this will affect the reception of foods and the meals made of them.

A well-known example of metabolism affecting trade is the enzyme lactase. This is readily produced by infants in order to draw sustenance from mother's milk. But a high proportion of adults in East Asian and some African countries are lacking this chemical means of digesting the milk sugar, lactose, with the result that they may get stomach cramps and other unpleasant side effects. Selling raw milk in these markets is therefore difficult and even processed dairy products are in low demand because of their lack of value in associated

food cultures. Although there is no intention here to be racially deterministic, geneticists nevertheless confirm that the ability to absorb milk after the age of five can be traced to herding groups about 9000 or more years ago. There was a conveyed evolutionary advantage in this lactose-tolerance mutation, providing a possible explanation for the spread of their genes, for instance to northern Europe. The allele is found in 99 per cent of people of Dutch origin but only 5 per cent of Chinese.

According to Nabhan, there are other genetically-related nutritional markers. Some are relatively benign, such as the distaste some people have for chillies or cruciferous vegetables.[6] Others can cause social breakdown, for instance the impact of alcohol on those whose bodies are unable to absorb it safely. A few genetic mutations and adaptations seem to have had remarkable consequences for health, such as the ability of the natives of Crete to assimilate large quantities of olive oil, with the result that their rate of heart attack is 40 times lower than the average in America. This seems to be due to a bodily adjustment that has taken place in a relatively isolated gene pool over several thousand years, and unfortunately is not something that the rest of us can realistically aspire to.

A final comment about the body-food nexus concerns the nutrition we receive in the womb. David Barker has discovered, using archives of patient histories, that there is a strong correlation between the foetal experience and disease risk in later life.[7] He found that low birth weight is a good predictor of ischaemic heart disease, stroke and diabetes in adulthood, although this can be no more than an indication of susceptibility because many other factors are brought to bear during an individual's lifetime. Overall then, the make-up of our bodies – either genetically or because of some nutritional advantages acquired before birth – represents, materially-speaking, a set of constraints on the cultural.

2. Food*stuffs*

Next we will look at material resistances of foods themselves. By this I mean the bloody-mindedness of certain materials with regard to exchange. For example, the perishability of some fruits and vegetables, of fish, and of milk, has had a profound geographical impact upon economy and diet. The high prices that result from the technical difficulties of preservation and transport have disadvantaged certain income groups. They have also patterned

[6] Gary NABHAN, *Why Some Like it Hot: Food, Genes and Cultural Diversity* (Washington DC, 2004).

[7] David BARKER (ed.) *Fetal and Infant Origins of Adult Disease* (London, 1992).

an economic geography of production and a consumption geography that includes regions of lack.

Historically, similar uncertainties have been associated with attempts to move food plants and animals from one region to another in order to introduce new possibilities of production. The new growing conditions may turn out to be transgressive for particularly valued species, forcing dietary and culinary adaptations for any migrant group who may have wished to reproduce their old food habits in the new home land. A relatively trivial but intriguing example of this is the broad bean enclave of Canada discussed by Daniel Gade.[8] This vegetable was carried by French immigrants in the seventeenth century but it was challenged by difficult growing conditions, along with other favourites, such as the grape vine. Today it survives only in the Lac Saint Jean region of Quebec, where the archaic Norman name *gourgane* is still used for what is now little more than a curiosity. This is a tiny island of cultural enthusiasm in a sea of indifference. The Americas have many other beans better suited to its agro-ecologies and to local tastes.

Another example is the long-run historical difficulty of knowing milk. This highly complex liquid contains roughly 100,000 types of organic molecules, most of which have yet to be researched in detail. There are lipids, proteins, carbohydrates in the form of milk sugar (lactose), and also gases and minerals. Milk is an emulsion of fat globules, a fine dispersion of casein micelles, a colloidal solution of globular proteins and a colloidal dispersion of lipoprotein particles. Over the last 200 years there have been vigorous debates about the normative compositional standards that one can reasonably expect of milk in its natural state, but there is such variability according to breed, feed and other factors that there was plenty of scope for adulteration by creaming or watering by unscrupulous farmers and retailers. In short, milk has proved to be one of the most problematic of foods to bring under the control of the law and state regulation. Any study of the milk trade or of the exchange of ideas about the consumption of milk – for instance its nutritional value or its role as a carrier of disease – must take this material fragility of the commodity into account.

This raises the material issue of quality. A number of recent papers identify the key dimensions of quality as: the naturalness of ingredients; qualities conferred by the method or place of production; food safety and traceability; nutritional value; organoleptic qualities and functionality; food's biological quality; and quality in terms of certification. Food quality is part of the more general question of how people choose what to consume.

The notion of material quality has been undervalued in economics, to the extent that Michel Callon calls it an "under-conceptualised and fragile

[8] Daniel GADE, "Environment, Culture and Diffusion: the Broad Bean in Québec," *Cahiers de Géographie du Québec*, vol. 38 (1994), pp. 137–150.

notion".[9] He therefore proposes an "economy of qualities" in which any object (food in our case) has shape at a particular moment in its history – a cross-section of its "career".[10] This is rather different from the insights of social constructionism. Callon privileges the material and the qualities of goods are seen as emergent rather than designed. Quality therefore cannot be taken for granted.

3. Space, Trust and Civilization

One of the strongest concepts to come out of the recent food literature is that of the network. The suggestion here is that ideas and materials circulate, not just in well-worn channels between farm and urban market, but more broadly in worlds of mutual regard and trust. Such food exchanges then have been researched in three dimensions.

First there is the filière or food chain concept, which looks at multiplications and complications of international food networks. Many articles have been published on the concept of "control at a distance" in the trade of raw materials from the Global South. Barrett and Freidberg's work on horticultural products air freighted from Africa is an example.[11] Other research has been conducted on the part played by retailers, whose power seems to be growing in reach, and on circulating capitals, knowledge, and the governance of chains.

Second, food exchange has been studied in work on rules and conventions. This has been a major thrust of action-oriented French pragmatism.[12] Starting in the 1980s, conventions theorists, operating in the territories of economic sociology and institutional economics, have been interested in the social relations associated with production and exchange. As they remind us, there is much uncertainty between actors, but this can be coped with through formal or informal agreements that arise out of situations that vary according to the product in hand. Conventions emerge over time through the successful repetition of particular actions and may have their roots in tacit agreements, without written rules. They are shaped by the material environment of action

[9] Michel CALLON, "Let's Put an End on Uncertainties," in C. MUSSELIN, C. PARADEISE (eds.), *Quality: a Debate*, *Sociologie du Travail*, vol. 47 (2005), S94–S100.

[10] M. CALLON, C. MEADEL, V. RABEHARISOA, "The Economy of Qualities," *Economy and Society*, vol. 31 (2002), pp. 194–217.

[11] Hazel BARRETT, "Globalization and the Changing Networks of Food Supply: the Importation of Fresh Horticultural Produce from Kenya into the UK," *Transactions of the Institute of British Geographers*, New Series, vol. 24 (1999), pp. 159–174; Suzanne FREIDBERG, *French Beans and Food Scares: Culture and Commerce in an Anxious Age* (New York, 2004).

[12] F. EYMARD-DUVERNAY (ed.) *L'Economie des Conventions, Méthodes et Résultats* (Paris, 2006).

and in turn become a guide for future action and a form of legitimation that can be renegotiated and modified.[13] Institutions may also arise in the long run, for instance to deal with disputes, and conventions may overlap with each other or be replaced, in time, by contractual obligations between parties.

Third, there has been influential work on admiration and emulation, especially in the exchange of ideas about what to eat and the manners to adopt. Drawing upon the foundational work of Elias, Stephen Mennell has argued that it is possible to trace the trickle down through the social hierarchy of table manners and that these can be treated as a surrogate of the spread of civilised behaviour.[14] Social difference was increasingly expressed in this way. The argument can be extended to the origins and spread of "good" food, as served restaurants in France in the nineteenth century. More recently, the advent of food advertising has continued to exploit our desire to be seen to be eating the right foods, for instance outdoing each other in consuming the healthiest items or those which do least damage to the planet.

The modern globalization of cuisines, although having its roots in the imperial adventures of the nineteenth century, has recently shifted a gear with the global expansion of restaurant chains such as McDonald's and the spread of "ethnic" restaurants in the wake of worldwide migration. The former has generated a convergence of cooking styles known as McDonaldization, and the latter has introduced metropolitan populations in wealthy countries to an unimagined variety of dishes.[15] Anneke van Otterloo has written about the foodscape of Amsterdam and shows how its cosmopolitanism has evolved over 50 years.[16] At first it was a matter of Dutch people experimenting with the foods of immigrants but now half of the city's inhabitants are of foreign origin, so that all elements of the food industry have to cater for what used to be minority, exotic raw materials, processed foods, and cooked dishes. Van Otterloo argues that the Dutch at one time or another have embraced all four positions of Warde's model of the diffusion of foreign and exotic foods: rejection, indigenization, restyling, and authentication.[17]

In this section I have sutured together some rather different schools of thought. But the common factor is linkage or relationship, which provides a

[13] L. THÉVENOT, "Convention School," in J. BECKETT, M. ZAFIROVSKI (eds.), *International Encyclopedia of Economic Sociology* (London, 2006), pp. 111–115.

[14] Norbert ELIAS, *The Civilizing Process* (Oxford, 1994); Stephen MENNELL, *All Manners of Food* (Champaign, IL, 1998).

[15] George RITZER, *The McDonaldization of Society* (Thousand Oaks, CA, 2004); Panikos PANAYI, *Spicing up Britain: the Multicultural History of British Food* (London, 2008).

[16] Anneke VAN OTTERLOO, "The Changing Position of Exotic Foods in Post-War Amsterdam," in Peter ATKINS, Peter LUMMEL, Derek ODDY (eds.), *Food and the City in Europe Since 1800* (Aldershot, 2007), pp. 177–188.

[17] Alan WARDE, "Eating Globally: Cultural Flows and the Spread of Ethnic Restaurants", in D. KALB, M. LAND, R. VAN DER STARING, N. WILTERDINK (eds.), *The Ends of Globalization: Bringing Society Back In* (Lanham, MD, 2000), pp. 299–317.

basis for understanding food exchange. One frequently proposed means of bringing the field even closer together is actor network theory. Geographers and sociologists in particular have applied ANT to food studies and they have argued that it stands for a new way of researching relational materiality. It has certainly proved to be the most popular of the non-constructionist materialisms.

The basis of actor network theory is socio-natural hybridity. Foodstuffs can thus be seen as a blend of human and non-human agency; simultaneously naturalized and socialized. They are hybrids: material objects blended with human action.[18] Networks, according ~~the~~ ANT theorists such as Bruno Latour, may include humans such as farmers and consumers; milking machines; "inscription devices" such as milk yield records and laboratory analysis results; cows; and materials like railway wagons and delivery carts. These are joined together in alliances that vary in strength and persistence. Some coordination and stability may be provided by "centres of calculation" such as official government laboratories, but this cannot be taken for granted and networks face constant challenge and change. Actor network theory is not really about spatially discrete networks in the sense of a sewage or a telephone system, nor is it structural as with a social network. A better metaphor is said to be the rhizome, which spreads itself unseen under the soil. Hybrids and networks are in a constant state of becoming, as a result of the process of "translation". One result of translation is the creation of "mixtures between entirely new types of beings, hybrids of nature and culture".[19]

A recent series of articles by Becky Mansfield illustrates the potential of a networked view of food exchange. She stressed the biophysicality of the food supply chains of fish and fish products (catfish and surimi). Her task is to understand how definitions of quality emerge in specific economic contexts. Rather than making a general distinction between nature and society or arguing for socially constructed quality, she looks at individual production networks in order "to understand how specific aspects of what we call "the natural world" participate in particular interactions".[20] Her idea of quality is different because she argues that it arises from assemblages of practices within commodity chains. These chains have particular histories that have established sets of relations and the commodities are differentiated as a result.

[18] Sarah WHATMORE, *Hybrid geographies: Natures, Cultures, Spaces* (London, 2002).

[19] Bruno LATOUR, *We Have Never Been Modern* (New York, 1993), p. 10.

[20] Becky MANSFIELD, "Fish, Factory Trawlers, and Imitation Crab: the Nature of Quality in the Seafood Industry," *Journal of Rural Studies*, vol. 19 (2003), pp. 9–21; Becky MANSFIELD, "Spatializing Globalization: a 'Geography of Quality' in the Seafood Industry," *Economic Geography*, vol. 79 (2003), pp. 1–16; Becky MANSFIELD B., "'Imitation crab' and the material culture of commodity production," *Cultural Geographies*, vol. 10 (2003), pp. 176–195.

Mansfield uses the spatial metaphors of distancing and entanglement to understand the trajectories of fish products in their commodity chains. She looks in particular at surimi, a Japanese fish paste which is a mixture of fish protein and starch. Because of its physical characteristics, surimi has a wide range of functionality, including products such as "krab" sticks (artificial crab). It can be made from a number of different fish species and so can be produced in many countries. Quality is based on fish biology, processing technologies, mouthfeel (texture, chewyness), whiteness, and the nature of the final product. Such issues can be dealt with at the local level and overseen by transnational food corporations, making this a food with a global reach.

Mansfield's conclusion is interesting, that "economic activities materialize meanings".[21] She insists that quality is relational. It is "neither a subjective judgment (what different people like), nor an objective measure (the characteristics of a commodity), but instead it is produced within relations of commodity production and consumption".

4. Order and Disorder

In this last section of the paper I will continue with my argument that material resistances have significantly influenced food exchange. Here the emphasis will be upon institutional contexts in which cheating, disorder and conflict play a part. The first sub-theme is that of falsification and adulteration. This has been an important factor affecting food choices in the nineteenth and early twentieth centuries, to be replaced since then by concerns about food additives. Accum's *Treatise on Adulteration of Food and Culinary Poisons* was the first to catch the public imagination in Britain.[22] He established the idea, later followed up by Hassall in the 1850s, that many foods were either falsified to give them the appearance of quality, for instance by the addition of dies that were toxic, or adulterated in order to stretch the supply and so increase profit levels.

French consumers were equally exposed to dishonest foods, as made clear in Chevallier's inventory of sharp practice in his *Dictionnaire des Altérations et Falsifications*.[23] Gradually, as more and more evidence of adulteration was uncovered, there was a crisis of confidence among consumers and among traders purchasing from each other. The second half of the nineteenth century

[21] Becky MANSFIELD, "From Catfish to Organic Fish: Making Distinctions about Nature as Cultural Economic Practice," *Geoforum*, vol. 34 (2003), pp. 329–342.

[22] Fredrick ACCUM, *A Treatise on Adulteration of Food and Culinary Poisons… and the Methods of Detecting Them* (London, 1820).

[23] J.-B.A. CHEVALLIER, *Dictionnaire des Altérations et Falsifications des Substances Alimentaires, Médicamenteuses et Commerciales* (2 vols, Paris, 1850–1852).

saw the establishment of local authority and state laboratories and sampling regimes in most European countries, and also the introduction of legislation.[24] This became an age of measurement and surveillance, although the early phase of food science was characterised by a lack of epistemological consensus and by debate among numerous, conflicting interest groups. Under the circumstances of widespread uncertainty, it is not surprising that reassurance was sought in branded goods, with food suppliers and retailers of reputation, and with those foods that were easiest to control. Where a commodity, such as milk, proved to be problematic – I am including here its role in the spread of epidemic disease – demand continued to be restrained despite increased spending power and better standards of living before the First World War.

The degree of material anarchy implicit in the account above suggests that social constructionism, with its over-confident attribution of human agency, cannot be the full story. Andrew Pickering picks this point up in his book *The Mangle of Practice*.[25] He develops a "dialectics of resistance and accommodation", and so moves away from the stronger versions of social constructionism and their sociological fundamentalism. Instead he sees society's institutions muddling along and adapting to the messy situations that arise. He wants to acknowledge non-human agency and to stress its performative temporal emergence. The particular "mangle" that Pickering has studied in greatest depth is science and technology, for instance in the nineteenth century chemical dye industry in Britain. The discovery of the new dye, mauve, in the 1850s was revolutionary but it was unexpected. Pickering's analysis of this early example of technoscience shows "the irreducibility of material performances to the social".[26] Physical and chemical properties were the key, and harnessing them was far from straightforward.

Geographers have been making similar arguments about the recent history of food scares. David Goodman's *crie de cœur* is that "ontology matters."[27] His point is that an appreciation of the active capacity of material is crucial to an understanding of the present crisis of confidence about food safety, particularly with respect to animal foods. Michel Callon has called this counter-

[24] Peter ATKINS, Alessandro STANZIANI, "From Laboratory Expertise to Litigation. The Municipal Laboratory of Paris and the Inland Revenue Laboratory in London, 1870–1914: a Comparative Analysis," in Christelle RABIER (ed.), *Fields of Expertise: Experts, Knowledge and Powers in European Modern History* (Newcastle, 2008), pp. 317–339; Peter SCHOLLIERS, "Food fraud and the big city: Brussels' responses to food anxieties in the nineteenth century," in Peter ATKINS, Peter LUMMEL, Derek ODDY (eds.), *Food and the City in Europe since 1800* (Aldershot, 2007), pp. 77–90.

[25] Andrew PICKERING, *The Mangle of Practice: Time, Agency and Science* (Chicago, 1995).

[26] Andrew PICKERING, "Decentring Sociology: Synthetic Dyes and Social Theory," *Perspectives on Science*, vol. 13 (2005), pp. 352–405.

[27] David GOODMAN, "Ontology Matters: the Relational Materiality of Nature and Agro-Food Studies," *Sociologia Ruralis*, vol. 41 (2001), pp. 182–200.

performativity of material an "overflowing".[28] We need to look no further than "mad cow disease" and the many other food-borne infections to see that unpredicted crises occur from time to time.[29] So "lively" has this and other zoonoses – such as E. coli O157, salmonella in eggs, and bird flu – been that Ulrich Beck have suggested that they are representative of a new historical era, the Risk Society. First, the scale of catastrophe is said to be beyond anything previously witnessed. Second, the impact has been global, crossing borders in an way that increasingly seems to be uncontrollable. Third, the authority of science and of the political process is said to have been undermined, and there has been a loss of credibility in official public health messages related to food.

An example of Pickering's mangle from my own research on water quality is the problem of the arsenic contamination of the groundwater in Bangladesh.[30] In the 1970s many infants and children there were dying from diarrhoeal diseases caught from drinking unclean water from ponds and rivers. This prompted an admirable response from the international community encouraging the drilling of tube wells down to aquifers in the sediment where the water was of a much higher quality microbially. What no-one anticipated was that this water carried a small but deadly load of arsenic, which over the subsequent decades has been responsible for internal cancers and skin conditions, putting tens of millions of people at risk. Geochemists have responded to this emergency, which incidentally is said to be the world's largest environmental health catastrophe, by publishing thousands of scientific papers on the chemical processes behind the release of arsenic, and there is also a growing social science literature of this "release" of mortality and morbidity by human intervention. The disaster has led to advances in field measurement and in technologies of mitigation on the back of research funding that would not have been justified otherwise, and here we have a mangle of scientific and administrative practice that was a surprise to everyone concerned, with outcomes that are still difficult to anticipate in the immediate future. The situation in Bangladesh gives the impression of an underground world that cannot be dominated, and which has shaken the self-confidence of all of the experts

[28] Michel CALLON, "What Does it Mean to Say that Economics is Performative?" *Working Paper* 5, Centre de Sociologie de l'Innovation, Ecole des Mines de Paris, 2006.

[29] Peter ATKINS, "Fear of Animal Foods: a Century of Zoonotics," *Appetite*, vol. 51, (2008), pp. 18–21.

[30] Peter ATKINS, Manzurul HASSAN, Christine DUNN, "Toxic Torts: Arsenic Poisoning in Bangladesh and the Legal Geographies of Responsibility," *Transactions of the Institute of British Geographers*, New Series, vol. 31 (2006), pp. 272–285; Peter ATKINS, Manzurul HASSAN, Christine DUNN, "Environmental Irony: Summoning Death in Bangladesh," *Environment & Planning A*, vol. 39 (2007), pp. 2699–2714; Peter ATKINS, Manzurul HASSAN, Christine DUNN, "Poisons, Pragmatic Governance and Deliberative Democracy: the Arsenic Crisis in Bangladesh," *Geoforum*, vol. 38 (2007), pp. 155–170.

involved, including those who recommend models of governance to cope with the vast scale of the hazard.

A final manifestation of disorder is conflict. Here we could talk here about the history of bread riots and the ability of hungry people to bring about change, but I prefer to think about the conditions of war. In her book *War is Good for Babies*, Deborah Dwork argued that the different political atmosphere of the First World War made it possible to introduce subsidised milk for babies who in peace time might have had to go without, to the detriment of their physical condition.[31] A similar analysis of the Second World War would show that welfare milk and school milk were greatly increased in scope and that vested interests were stilled which had held up progressive pre-war action with regard to adult hunger and malnutrition. British food may have been rationed in wartime but evidence suggests that nutrition was adequate and that food-related health was relatively good.

5. Conclusion: a New Agenda

It will be obvious by now that this has not been a review article looking at previous attempts to understand the historical geography of food exchange. I have not, for instance, touched upon the substantial theme of diffusion, which interested rural sociologists and cultural geographers throughout the last century.[32] Instead I have indicated three dimensions of food as material that are not adequately accounted for in social constructionism.

First, our bodies are maps of potentialities and resistances. In a few instances, such as lactose tolerance, this is thought to have influenced the direction of human evolution. For many people it makes no conscious difference to their eating lives, other than the avoidance of broccoli or milk. Perhaps more significant for most of us are the physical characteristics of foods, such as perishability or bulk. While human ingenuity makes it possible to eat curry at the South Pole and ice cream in the tropics, nevertheless there is a cost attached, and distance and other geographical supply factors are therefore scored into the foundations of food systems. Material makes a difference.

Second, we looked at networked visions of food exchange. In the now extensive literature networks come in many guises: filières, commodity

[31] Deborah DWORK, *War is Good for Babies and Other Young Children: a History of the Infant and Child Welfare Movement in England, 1898–1918* (London, 1987).

[32] P.J. HUGILL, D.B. DICKSON (eds.), *The Transfer and Transformation of Ideas and Material Culture* (College Station, 1988); Everett ROGERS, *Diffusion of Innovations* (New York, 2003); Daniel GADE, "Diffusion as a theme in cultural-historical geography," *Pre-Columbiana*, vol. 3, n° 1–3 (2004), pp. 19–39; Derek ODDY, Lydia PETRÁŇOVÁ, *The Diffusion of Food Culture: Cookery and Food Education during the Last 200 Years* (Prague, 2005).

systems, food regimes, systems of provision, value chains, and commodity circuits. They have been theorised variously, including ideas about social embedding, quality conventions, and even with metaphysically radical notions of the hybridization of the social and the natural. What matters most here is the recognition of the significance of linkages in the study of food exchange.

Finally, Pickering's "mangle of practice" insists upon the unpredictability and messy nature of food systems. The point here is that social constructionism takes insufficient account of the sometimes uncontrollable nature of material. Its focus upon human agency is partial. My own work on the history of milk has shown it to be problematic in every sense, from the definition of what is an acceptable composition, through to litigation about fraud in the courts. I have found that, in the absence of scientific consensus, judges were called upon to decide upon the natural limits of a natural commodity.

Overall, we need a rematerialized history of food exchange. We have surprisingly little literature about food*stuffs*. There has been a welcome surge of commodity histories recently on chocolate, salt, pasta, cod, peanuts, tea, spices, beans, citrus and other individual commodities.[33] But, with a few notable exceptions, the authors say little about the composition of these commodities, or even about their smell and taste. In other words, we are deprived of the *material* in food history.

[33] M. KURLANSKY, *Cod: a Biography of the Fish that Changed the World*, New York, 1997; M. KURLANSKY, *Salt: a World History* (New York, 2002); S. SERVENTI, F. SABBAN, *Pasta: the Story of a Universal Food* (New York, 2002); A.F. SMITH, *Peanuts: the Illustrious History of the Goober Pea* (Urbana, IL, 2002); S.D. COE, M.D. COE, *The True History of Chocolate* (London, 2003); A. MACFARLANE, *Empire of Tea: The Remarkable History of the Plant That Took over the World* (New York, 2004); J. TURNER, *Spice: the History of a Temptation* (London, 2004); K. ALBALA, *Beans: a History* (Oxford, 2007); LASZLO, *Citrus: a History* (Chicago, 2007).