

The material histories of food quality and composition

Peter J. Atkins

Department of Geography, Durham University, Durham DH1 3LE, United Kingdom

Abstract

This article argues for material histories of food. In recent decades food historians have tended to emphasize the cultural factors in consumption, in addition to the already well-established social, political and economic perspectives, but what is still missing is the stuff in foodstuffs. With reference in particular to milk and wine, the suggestion here is that physical and chemical composition is a major influence in what we might call the biographies of particular items of food and drink. Product characteristics are rarely static for long and today's mass-produced bread is different from that of the past, but then so are the flour, the yeast, and the even the butter that is spread on it. Adulteration was a particularly interesting aspect of composition in the nineteenth century and was the key to the emergence of two different traditions of understanding and valuing food quality.

Introduction

There is a Spanish saying, 'blanco y en botella, leche', which roughly translates as 'it's obvious'. But does a white liquid in a bottle always have to be milk? Is the identification of the essential qualities of foods in their natural state really so easy? The answers, as we will see in this paper, are emphatically no. On the contrary, even commodities usually consumed raw, such as fruit, or simply processed, such as olive oil and milk, may vary greatly to the organoleptic senses of sight, taste and smell. It was even more so in the past, before the standardizing machinery of corporate capitalism decreed that we should lose much of the genetic diversity of our fruits, vegetables and cereal cultivars. We are presently witnessing an attempt to make Nature itself yield to the imposition of norms; but not without resistance because the second lesson of this paper is that the materiality of food is bloody-minded in its reluctance to be tamed and essentialized. We will see that the history of food has really been the history of *foods*, each with a different trajectory.

The paper will first discuss why it was so problematic, particularly in the nineteenth century, to find suitable scientific means for describing and knowing the components of foods. The history of organic chemistry plays a part here but so does the need to conquer what was perceived to be the evil of adulteration. Second, these compositional and quality

histories will be further complicated by the story of the contingent circumstances of national regulatory and legislative contexts. Finding ways to police foodstuffs led in some countries to legal definitions as a basis to exclude deviant foods and prosecute their producers. This is of great significance at the present day because it will be argued that two distinct traditions of food quality – the Anglo-American and the continental European – were born at this time and continue now to influence our thinking.

Overall, I want to introduce the concept of commodity ‘biographies’ as the sum of these developments. At first sight this may seem like an uncontroversial way of introducing a time dimension to a discussion of food quality. In practice it is more than that. Philosophically it amounts to an ontology of becoming. Heraclitus is said to have remarked that one cannot step into the same river twice, which is the sentiment I invoke here. The bread of two hundred years ago, artisan-made or domestic, was very different from the mass-produced, factory article of the same name today. But then the consumers are also different, as is the flour, the yeast, and the even the butter that is spread on it. To make sense of this we need a history of knowledge-making that amounts to a material history. In other words, the changing composition of foods is the result of many stories of human intervention but, in turn, the evolving make-up of those foods has been guided by the materiality of organic and inorganic molecules. Building the knowledge necessary to understand the physical and chemical potential and constraints of foods has been a fundamental background to their histories.

Although we will not discuss it in detail in this paper, it is also possible to argue that the materiality of food is a major factor in how food chains are assembled and how quality is constructed; this certainly deserves more attention from both historians of food and historians of science. The notion of material quality has also been undervalued in economics, to the extent that Michel Callon calls it an ‘under-conceptualised and fragile notion’ [1]. He proposes an ‘economy of qualities’ in which a good is a bundle of qualities that together help to establish its singularity [2]. There is no essence, as such, just hybrid characteristics, which, in a different combination, would make up a different good or a variant of the same good. These qualities are emergent. The temporal dimension is important for product characteristics and these change, with the material playing a role in the process of becoming, as does the consumer. These metamorphoses require further investment for what Callon calls qualification-requalification, in order to stabilize and standardize goods for the market. Just as a popular car model may be redesigned several times, with a new engine, different components, and perhaps variations of body shape, so foods are adjusted through time by

new methods of production on the farm, additions or subtractions in processing and manufacture, and innovations in marketing strategies. This may be easy to imagine for branded goods such as can of soup or a fizzy drink but my argument is that even generic staples such as milk, wine and bread also have careers in which their composition is best understood as a history.

Measurement and adulteration: the example of milk

The starting point is what I call the ontopolitics of measurement and precision [3]. This concerns the difficulties encountered in finding a scientific consensus on the best methods and equipment to investigate the natural variability of the constituents of say, milk. Simply stated, these are butterfat, protein, sugar and water and it was well known that there were differences in these between mammal species and also among the breeds of dairy cattle. As early as the 1790s in Paris, Parmentier made experimental observations using evaporation and the animal chemistry of the first half of the nineteenth century introduced reagents in order to control or isolate certain components of milk. Advanced gravimetric and volumetric chemistry followed in the second half of the century but dozens of different techniques existed and results tended to vary according to the method used.

Physics was also pressed into service. There were experiments using light but the most frequently employed technique, because of its simplicity, was the lactometer. This was an inexpensive instrument that could be mass manufactured and so used in the field by inspectors and by members of the dairy trade. It measured the specific gravity of milk and, by implication, whether the sample was genuine or not. Here we come to a key point in milk's biography. It was so frequently adulterated with added water that trust was low and a great deal of regulatory and scientific effort was expended in controlling the supply and judging whether it had been tampered with. On average in London in the 1870s milk contained about 25 per cent of added water and the consumer was justifiably cynical about ever being able to purchase the real thing.

But was the lactometer a way to judge? Not according to the famous analyst, Alfred Wanklyn, who claimed in 1874 that 'there hardly ever was an instrument which has so utterly failed as the lactometer' [4]. It seems that the fraudsters had long since realised that when they added water the specific gravity fell, but if they then removed some cream it rose back up to a normal reading. As a result, a more accurate and reliable method was required.

It was not until the 1880s and 1890s that we can say that dairy science had reached a point where the intricacies of milk composition and variability were emerging. Then two

developments made it possible. In America the Babcock method came to the fore, and in Europe the Gerber method. Both used acid to dissolve everything in the milk other than the butter fat, which was then separated by centrifugal force and its amount could be read off in specially manufactured glass bottles known as butyrometers. The second development was the adoption of mass testing by the burgeoning dairy companies of the day. They were determined to eliminate any cheating by their suppliers and to boost retail sales by making claims of genuineness to their customers. Use of the Babcock/Gerber technology made this possible at a relatively low unit cost. For the first time, tens of thousands of samples were tested every year.

This accumulation of knowledge made it possible in the 1890s to estimate, for the first time, what could be called compositional ‘norms’. The materiality of chemical composition was being revealed here as never before and both dairy companies and city authorities felt confident enough to tell their suppliers what thresholds they would use in future to judge adulteration. There were even some nations that followed. In Great Britain, for instance, 3 per cent butterfat and 8.5 per cent solids-not-fat were established in 1901 as the limits below which a fraud would be presumed to have taken place. These ‘presumptive’ standards remained in place until Britain’s regulations were brought into line with those of the European Union in 1993. They had survived so long because an uneasy balance of economic and political forces that prioritised the interests of British dairy farmers and the industry that served them. The introduction of the European Single Market in 1993 and the abolition of the Milk Marketing Board in 1994 introduced a new set of logics that, in theory at least, were supposed to shift the balance towards the interests of consumers. As a result, the composition of British milk has changed and there have been many changes in the ways it is processed and retailed.

Falsification: the example of wine

What is wine? The thought of having to give a legally binding definition makes those of us who are not oenologists go weak at the knees. We are aware of the astonishing variety of wines on sale and we are regularly humbled by our inability to tell one grape from another, let alone a wine’s quality. It is reassuring to fall back on reading the label and convincing ourselves that a wine’s close association with its terroir is all we need to know.

But is it? If we look at the material biographies of wines we can see a much broader and more complex story, which begins in France in the late nineteenth century. There were similarities with milk because the addition of water to wine was a problem at that date, but

there was also the addition of chemicals, and serious regional clashes over quality standards. The watering was common because, to minimise the tax (octroi) charged on goods entering cities, high alcohol wines were brought in and then watered down. In the 1880s added water accounted for one sixth of the volume of wine consumed in Paris. Putting plaster in wine was also common, this time among Mediterranean vigneron, to stabilise it and prevent spoilage in transit [5]. Other trade practices included the addition of sugar and the production of wine from imported dried grapes. Together, these may sound like ways to defraud the public of a wholesome, natural product, but they were all perfectly legal until either limited or banned between 1889 and 1894.

The new laws did not, as hoped, stabilize the French domestic wine market. The devastation of phylloxera in the 1870s had reduced output and during the recovery period fierce rivalries opened up between the regions about each other's methods of wine-making and the relative quality and authenticity of their products. The shortages of the late nineteenth century turned to surplus in the early twentieth century and, coupled with the spectre of competition from cheap Algerian imports, this forced everyone in the industry to think of possible solutions. The first steps came with attempts to protect place of origin in 1919, and in 1935 the Ministry of Agriculture established the *Institut National des Appellations d'Origine*, which was instrumental in developing definitions of quality in collaboration with the stakeholders [6]. This helped to build quality and value out of artificially created scarcity, and from connexion with geographical locality, or terroir. In addition to the spatial logic of the Appellation d'Origine Contrôlée (AOC), there are clear, strict rules about grape varieties, yields per hectare, the size of lettering on labels, and much more. Rather than the unpredictability of both quantity and quality being a problem for products such as wine, the French system uses a classificatory hierarchy that provides the consumer with the necessary information and, above all, it celebrates difference [7].

Arising originally from concerns about composition, adulteration, quality standards and public health, the French intellectual response and the resulting system of regulation have been formidably influential. Their 1905 law, in particular, which sought administrative definitions of products and legally enforceable compositional norms, became a model for many European countries, and in the 1990s it was incorporated into the legal framework of the European Union. In effect, it provided a basis for disciplined market transactions, for instance by controlling the impact of technological innovation in the food sector. The French reaction to the inconvenience of organic variability in their wines has been cleverly to make a virtue out of necessity and, in effect, to brand by place and by label rather than by corporate

logo. Much wine snobbery is therefore wide of the mark if no account is taken of the historical origins of the AOC.

Contested expertise

Is your judgement of food quality better than mine? I might be willing to defer to your expertise if I thought it was superior to mine but the lesson of food history is that competitive vested interests tend to lead to continuous struggle. A good example of this is to be found in the fiery debates about analytical techniques between local authority and government scientists in late nineteenth-century Britain [8].

After series of scandals in the 1840s and 1850s about poor food quality and widespread adulteration of basic items bread, beer and milk, there was a parliamentary enquiry and a Sale of Food and Drugs Act was passed in 1860 that in theory outlawed the various frauds. The commercial politics of the day were such, however, that there was no means of enforcement, and it was not until 1875 that a system of sampling and testing was established. Local authorities employed chemists to undertake analyses on their behalf and the results were used in court. There were no agreed laboratory protocols, however, and it seems that some of the work was unreliable. In the Sale of Food and Drugs Act (1875) a provision was made for anyone dissatisfied with these local results to send a reference sample to the Inland Revenue laboratory in Somerset House, London. Here government scientists provided their own analysis and in many cases they varied from the original results, usually giving the benefit of the doubt to the trader. In the period 1881-1885, for instance, they disagreed on 42 per cent of the milk samples submitted to them, to the fury of the local analysts.

The tension between the two centres of expertise was palpable over two decades until the 1890s. M. Henry, editor of the journal *Food and Sanitation*, was particularly critical. In 1894 he spoke of ‘the existing wretched, ignorant, and utterly untrustworthy system of food analysis at Somerset House.’ It was a ‘poor, bungling department struggling to perform work for which it has not got the skill or knowledge.’ In his opinion, ‘scientifically the Somerset House chemists are dead, and there exists no shadow of an excuse for their remaining unburied’ [9].

Although there were personal animosities involved between Somerset House and the public analysts, the simplest way to summarise this debate is that it was the result of disagreements about which laboratory techniques were most appropriate. There were also arguments about the formal qualifications that were required for an expert to be taken

seriously in courts of law. All of this was the result of the inchoate nature of organic chemistry and the difficulties therefore faced in agreeing on the ‘genuine’ composition of a food. The friction was by no means unique to Britain, although, as Vera Hierholzer shows for Germany, there were other countries where solutions were found that avoided public contention [10].

In retrospect we can contextualise this type of struggle within the fragile nature of expertise, which in turn was institutionally specific. My instinct here is not immediately to reach for the item in the historians’ tool kit marked ‘social constructionism.’ This might be tempting given the obvious social, economic and even political interests that contributed to the evolution of food knowledge and expertise. But, rather than drawing solely upon human agency, I prefer Andrew Pickering’s approach in his book *The Mangle of Practice*, in which he argues for ‘the irreducibility of material performances to the social’[11]. For him the emergence of scientific knowledge and its technical application is about the inherent resistance and messiness of socio-natures. Some materials, with the organic properties of foodstuffs for instance, are so difficult to deal with that science often muddles through without achieving the depth of knowledge that was initially desired. As a result, observations are partial, contingent and amount to compromises; they may also be temporary until more work can be done.

The role of the law

So far we have found that the materiality of food and drink has made difficulties for those who would judge its genuineness and set themselves up as authorities on composition and quality. But if food science proved to be problematic, what about the law? In this section I will propose, modifying the words of Graham Burnett, that for historians of food ‘the courts beckon’ [12]. In other words, it is jurisprudence, the judge-made law of the King’s or Queen’s Bench in Britain, the Court of Cassation in France and the various Supreme Courts of the American states, that provides some of the answers we need. Here cases were examined that were right at the edge of existing rules and thereby threw light upon key principles and, in some cases, were even responsible for the creation of new legal understandings. Let us highlight three strands that illustrate this point.

First, there is the key principle of responsibility. Until the middle of nineteenth century this was *caveat emptor* or ‘buyer beware’. In small, organic communities, where face to face transactions were the norm, this principle was not unreasonable and the seller certainly had an incentive to behave appropriately because reputation was all. But population

growth, urbanization and the increasing complexity of modern industrial economies in the nineteenth century meant an increasing distance between producer and consumer and a loss of mutual dependence, familiarity and goodwill. In the case of Britain, this separation was deepened by the early development of railways and by an emerging philosophy of free trade, which encouraged raw materials to be brought from all over the world. In such circumstances it was not only difficult to maintain the quality of perishable items but to decide who was to blame for any problems. Was it the farmer, the wholesaler or the retailer?

Surprisingly, food historians have not addressed the notion of ‘system trust’ in depth. We know from modern research that public trust in food, food producers and manufacturers, food retailers, and the institutions supposed to guarantee food standards, is quite variable from country to country and that there are high-trust and low-trust societies. In Europe the citizens of northern countries such as Finland are both trusting and resilient during food scares. They trust their public authorities to keep them informed and protected, whereas in Germany trust is vested more in experts and in consumer organizations than in government. By comparison, consumers of former communist countries such as Estonia, Lithuania, Poland and Slovakia are less trusting of the state. Least trust in the various actors in the food system is found in southern Europe, in Greece, Italy and Portugal [13].

Our second legal principle is that system trust can be restored and maintained by the use of warranties, marks, labels and brands. In other words, legally-enforceable contracts became a solid basis for everyone in the chain to believe the claims of their supplier, or at least to hold them accountable for any claims that might prove to be false. Warranties, either on paper or in some mark or symbol on a container or vessel, were particularly important in perishable food chains, where freshness, purity, and honesty were crucial lubricants of trade. There is a vast history of common law cases in milk in Europe and North America in which struggles over warranty represent attempts to find the ultimate locus of responsibility for quality. These early debates about warranties under the Food and Drugs Acts in Britain were important in the formative period of a new concept of ‘strict liability’. Rather than having to prove criminal intent, the test for the defence was now to be one of ‘reasonably foreseeable consequences’ with regard to the condition of the product.

Third, in the realm of food law there has been a great deal of debate about what is ‘natural’. A food such as milk is highly variable, according to the breed of cow but also what she is fed and whether she is healthy. In Britain the situation was different and the Sale of Milk Regulations brought out in 1901 confirmed the expectation that all retail milk would be ‘as it came from the cow’, nothing added and nothing taken away. This sounds like a

reasonable definition of a true, unadulterated product, but consider the following cases, both of which were so important that they reached the King's Bench.

- *Hunt v. Richardson* (1916). The court quashed a conviction for adulteration. The farmer had fed his cattle on wet pastures and green maize. He had not added water but the milk was nevertheless very thin and watery. Three judges saw it as unadulterated whole milk and upheld the appeal. The minority of two disagreed, suggesting that, being outside the 1901 compositional target, the milk was not merchantable.
- *Grigg v. Smith* (1917) established that there was no need for milk to be the outcome of an entire or uninterrupted milking. The cow in question had not been fully milked, leaving some in the udder for a suckling calf. This meant in effect that the farmer had delivered the thinner fore-milk to his customers and kept back the richer strippings for his own profit. The majority of judges agreed that this had been his right.

The point here is that these judgements, and the many others under various national jurisdictions, have helped to define what natural means and to establish secure grounds upon which we can debate food quality and composition. As a result, as students of food we have a better chance to write biographies of our commodities of interest in a fresh way. This approach to understanding the legal contribution is only just beginning but it has great potential.

Conclusion: two traditions of quality

As we have seen, the Anglo-American vision of food quality throughout most of the twentieth century was based upon the building of scientific knowledge, backed by systems of control that used sampling and laboratory-based analysis. The common law tradition incorporated scientific testimony as far back as the late eighteenth century but expertise has never sat comfortably with the adversarial tone of cross examination and, anyway, how can we judge who are the best experts to call for the prosecution and for the defence? The uncertainty of the science associated with food in particular has caused many bitter disputes and these have been solved only through the slowly evolving pragmatism of common law jurisprudence. This is different in two important ways from the continental system of codified civil law, centralised administrative structures and reference standards of quality.

First, to return to our examples of milk and wine, it is as if there were different biographies on either side of the Channel. In Britain the only standard for milk from 1901 onwards was a presumptive one. The 1901 standards were rather low and allowed for a very

wide range of natural variations before assuming that any tampering had taken place. Compositionally milk had to be whole, ‘as it came from the cow’, and the only graded liquid products related to modes of heating to remove bacteria or the testing of cattle to reduce the risk of diseases such as bovine tuberculosis. In countries such as Denmark and the Netherlands, however, which had important butter industries, extracting part of the butterfat was taken for granted and was not frowned upon as yielding an ‘unnatural’ product. In 1976 the European Community decided that it would legalise the standardization of milk composition. But this was an alien concept in Britain, where semi-skimmed milk was not even market tested until 1981 and where retail fat designations such as ‘0.1’, ‘1.0’, ‘2.0’, and ‘4.0’ per cent fat were not legitimized until the Drinking Milk Regulations of 2008.

Second, in Britain regional foods were annihilated or marginalized by cheap imports from around the world in the second half of the nineteenth century. But free trade in other European countries was carefully managed by their governments in order to prevent the destruction of domestic agriculture. As a result, ‘quality’ in countries such as France and Italy has continued to be associated with the peasant and artisan foods that have long been typical of a region in terms of local skills and the comparative advantages derived from soils and micro-climate. Intriguingly these place-based interpretations of food quality were enshrined in law of the entire European Union in the 1990s and, ever since, the power of terroir has grown to the extent that it is now being retro-fitted as ‘relocalization’ into Anglo-American food culture, where place associations have now entered our regular discourse. Without any wish at all to denigrate the wonderful foods and wines produced in France and these other countries, we have a duty as historians to recall that the establishment of place branding was often at first a measure of ‘defensive localism’, for instance by wine producers hoping to protect their reputations and their trade in the early twentieth century [14]. So successful has this been that the origins of the idea have been forgotten in the enthusiasm of the early twenty first century for quality alternatives to the mass-produced ready meals and branded processed foods of the supermarket age [15].

My overall conclusion to this paper is that what is needed now is a re-orientation of food history towards understanding the origins of food commodities and the evolution of their composition and qualities. Above all this demands that we acknowledge emergent materiality and reject any fixity in the make-up of basic foods such as milk, wine and bread, or indeed their highly processed counterparts. Such a task requires a major psychological shift for some historians but it is essential if we are to engage, first, with *stuff* of foodstuffs and, second, with the food scares of yesterday and today, which tend to be about

scientific/technological uncertainty and the need for better regulatory and legislative frameworks for dealing with the instability and unpredictability of the materials that make up our foods.

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