

# Social History of the Science of Food Analysis and the Control of Adulteration

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This chapter is about the problem of knowing whether the food that we consume is genuine. Because of the complex underlying science, it has always been difficult for ordinary consumers to judge purity and authenticity, and hence throughout history there has been scope for manipulation. It is not the intention here, however, to slip into facile moral judgments because one person's fraud is another's product innovation. Rather than identifying "genuine" and "falsified" as different and separate categories, we can see them as modulated answers to the same question: what is food? This chapter, then, is a contribution to the ontological politics of food. This is the recognition 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" (Mol 2002: 6). Thus bread has no essential characteristics of its own, but when it is baked, sold, and eaten it becomes bread in the unfolding of these practices (Atkins 2011).

This chapter is arranged according to four dimensions of literature that have dominated the historiography of adulteration. In the past these have lacked a comparative frame, being researched within national boundaries and through narrow disciplinary perspectives such as the legal or the economic. A suggestion will be made at the end for writing different kinds of adulteration histories that are in effect archaeologies of quality.

## ADULTERATION AND HEALTH

There is evidence from the eighteenth century onward of public concern about the health implications of adulteration (Filby 1934). In 1820, a jobbing chemist of dubious reputation, Friedrich Accum, published a book, *A Treatise on Adulteration of Food and Culinary Poisons*, that caught the public imagination in London (C. A. Brown 1925; Burnett 1958, 1989). Among the adulterants he identified were poisonous salts of lead,

copper, and mercury, used mainly for coloring. But Accum's book was essentially a cut-and-paste job from newspaper cuttings, not the result of laboratory research (Sumner 2007). His style of borrowing and exaggeration classified him as an adulterator of science in the eyes of opinion formers such as Humphry Davy. Accum's humiliation and exile back home to Germany in 1821 was less to do with his alleged defacement of library books than his misfit identity in the new world of professional analytical science. Yet he initiated the theme of adulteration and risk, which has remained powerful right down to the present day (see Kjærnes, Chapter 24, this volume).

The anxieties about food heightened by Accum's revelations have since been extended and elaborated into several strands. Toxins introduced during manufacture are one dimension. Here researchers have emphasized dramatic cases, such as the arsenic from bungled sugar processing that killed seventy beer drinkers in England in 1901 (Phillips and French 1998), the guinea pig books that caused fear among U.S. consumers in the 1920s and 1930s (Coppin and High 1999), or the dioxin scare in Belgium in 1999. Equally, there is scope for histories of everyday impurities, such as trans fats, which, it could be argued, are a form of adulteration since they are artificial, harmful, and of benefit only to the food processor.<sup>1</sup> The fine lines between contamination and adulteration, and between accidental and deliberate acts by the food provider, are potentially valuable areas of research because they reveal much about our understanding of food quality.

In Accum's tradition of exposing the addition of substances to food that are deleterious to health, there have been three major incidents in recent years.<sup>2</sup> First, in 1981, 600 people in Spain died and over 20,000 were made ill by consuming rapeseed oil intended for industrial purposes but sold on street markets as "olive oil." Then, in 1985, a number of Austrian wineries were found to have illegally used diethylene glycol (a toxic ingredient of antifreeze) to make their wines appear sweeter. This was an organized fraud employing wine chemistry, and much modern adulteration is technically advanced in this way. Because there is usually no health risk to consumers, this type of fraud is low on the priority list of regulators and local authorities. Testing is expensive and "at the bottom line, no one wants to test. It is amazing that the marketplace is as fair as it is" (Wilhelmsen 2000: 3873).

An even more shocking event came in 2007 when thousands of babies in China were hospitalized with kidney stones and renal failure, and over three hundred thousand were affected to a lesser degree. The problem was traced to contaminated milk and baby formula produced by a dairy company in Hebei province in the north. This was not an accident but purposeful adulteration of high technical sophistication (Xin and Stone 2008). The motivation was to increase profits by watering the milk and then adding melamine, a type of resin, to boost its apparent protein content. Melamine is nitrogen rich, thus fooling the testing procedures (Xiu and Klein 2010). The draconian response of the authorities was to execute two of the factory managers and jail others implicated, although the fraud seems to have been quite widespread in a trade habituated to using "protein powder" with no questions asked.

These three examples, and the many more that could be cited from around the world, demonstrate that the chemical modification we call adulteration remains a threat to public health.

### *Food Fraud and Composition*

What is food? What is adulteration? The answer to both questions is a matter of understandings and expectations. If I ask for a coffee and it arrives with milk added, has it been adulterated? No, I am happy to consume this coffee-milk hybrid. But if the coffee contains chicory and the milk is watered, my response would be different. I would feel cheated even if the taste was identical. This is because I have a mental model of the organoleptic and compositional characteristics of the products I consume. But these models are simple and their tolerance levels broad because my cognitive skills are insufficiently fine-tuned to identify subtle variations. Tom Mueller's (2011) book on olive oil shows just how easy it is to dupe consumers into thinking that they are buying a quality product.

For the full implications, think of wine and milk. Wine is a commodity well-known for its variations according to grape, vintage, and micro-environment (see also West, Chapter 12, this volume). So the price of wine varies according to quality indicators that have been developed over several centuries. By comparison, milk until recently was relatively undifferentiated. In the minds of most retail customers, milk was milk. In Britain from 1901 onward, the legal description of this commodity was "milk as it came from the cow," with nothing added and nothing taken away. Similarly, the Spanish have a saying, *blanco y en botella, leche*, which roughly translates as "it's obvious—if it is white and in a bottle, it is milk." But, in truth, milk as it came from the cow was highly variable according to its composition of fat, protein, and water, mainly due to the breed of animal and how it was fed. This meant milk drinkers were consuming a product sharing some of the characteristics of wine but without either the knowledge or the expectation of its degree of variability. Only in the last decade or two has milk become an industrially standardized product.

The consequences of these points are profound. It so happens that over the last 200 years wine became the main food quality concern of France, whereas in Britain it was milk, and together they approximate the views of southern and northern Europe respectively. Wine for the French is important for their culinary culture and national identity (K. M. Guy 2003). Their regulatory objectives have been to expose any form of falsification, for instance bogus claims of quality or the addition of chemicals. Worries about milk, on the other hand, particularly in Britain from the nineteenth century onward, were about its "adulteration" with water. This was partly about the economic rights of consumers, but also about degraded nutritional qualities.

As a result, the administrative and legal practices of control have yielded two rather different conceptions of food quality. In France, the well-known idea of *Appellations d'Origine Contrôlées* (see West, Chapter 12, this volume) followed from a 1905 French

law that sought to outlaw adulteration across all food and drink products (Stanziani 2004). In seeking administrative definitions and legally enforceable compositional norms, its approach became an exemplar for many European countries, and in the 1990s it was incorporated into the legal framework of the European Union (EU) as the EU's way of disciplining market transactions through the establishment of trademarks that were to be the collective intellectual property of region-specific producers of ham, cheese, wine, and other products. This tradition of place-based quality is the intellectual forbearer of current ideas about local food, and its influence has now spread around the world (Trubek 2008).<sup>3</sup>

The very different milk-based tradition of Britain and North America was based on a compositional vision of food quality. The ontopolitics here were of measurement and precision rather than of place, centered around finding suitable methods and equipment to investigate the natural variability of the constituents of milk and other foods (Atkins 2010). We can now see that the two most powerful intellectual genealogies of food quality are divided by cultural, legal, and economic traditions, resulting in mutual misunderstandings and trade wars between the United States and the EU.

### *Expert Systems: Food Chemistry*

No reliable tests for the adulteration of foods existed until about 1800, but the science of organic substances began to make progress in the early nineteenth century. Anglo-phone historians, because of their focus on Accum, have undervalued early work on the chemistry of adulteration in France, Sweden, and Germany, which gradually yielded tools for describing the natural variations of food composition and determining levels of adulteration. This was a new world because, as Barry and Slater remark, these practices “do not just reflect reality as it is. They create new realities (calculable objects) that can, in turn, be the object of economic calculation” (2002: 181).

In all of this, whose expertise counted? On one hand, there were the traders with their organoleptic skills. On the other, the “objective” expertise of science came increasingly to the fore, for instance in the microscopy of Arthur Hill Hassall, who between 1851 and 1854 published lists of traders guilty of adulteration (S. D. Smith 2001). Here science appeared to occupy the moral high ground above the corrupt practices of trade, and yet some products resisted scientific investigation. Wine, for instance, requires the knowledge, experience, and sense-based skills of specialists, even if these are not always strictly scientific.

The first major city to establish a municipal laboratory to investigate and pronounce on fraud was Brussels in 1856 (Scholliers 2007), followed by Paris in 1878 (Atkins and Stanziani 2007).<sup>4</sup> At first these laboratories tended to serve traders who were suspicious of their suppliers, and market regulation was certainly more significant than public health at this early stage. Interesting, in many countries the peak of adulteration came in the last decades of the century, *after* analytical control was established (Stanziani 2005).

In Britain, laboratory expertise was fragmented and contested. Government scientists frequently disputed the analyses of their local authority colleagues and there was conflict about scientific expertise for several decades at the end of the nineteenth century. The same problem was found in Germany, where there were disagreements between food chemists in government employ and those working for the food industry (Hierholzer 2010). In France, the debates were between laboratories in provincial cities and the officially designated one in Paris.

Building a scientific consensus about “genuine” foods and about the methods of detecting fraud eventually came in the early twentieth century, with the role of industrial food chemistry being decisive. The large dairy companies and, later, other food processors and manufacturers invested in large-scale testing that was quick, efficient, and of a low unit cost. The knowledge generated by their standardized laboratory protocols enabled such companies to establish technologies of trust in controversial areas. As a result, although the number of analytical samples increased, the proportion found to be adulterated decreased in almost every product.

Wilhelmsen indicates that food adulteration remains a problem today in Europe and North America, in subtle ways difficult to detect (Wilhelmsen 2000). Examples he cites include corn syrup in honey, hydrolyzed inulin in apple juice, grapefruit juice in orange juice, various food oils in olive oil, and many others. Solutions lie in testing technologies that are more advanced than those employed by the adulterators. There are many of these,<sup>5</sup> including chromatography and spectroscopy, stable isotope and enzyme analysis, and DNA-based methods. A common feature is searching for a chemical profile or marker that is different from that of the genuine article, for instance by statistical comparison with a database of the compositional characteristics. In some countries the constituents of particular food products are codified and methods of analysis specified.

### *The State: Legislation, Regulation, and Litigation*

In Europe and North America, a period of rapid urbanization in the nineteenth century put great pressure on existing frameworks of control. City administrations were already unable to cope with poor sanitation, social dislocation, and crime, and so food adulteration was yet another difficult challenge for them (E.J.T. Collins 1993). One common assertion was that food quality was deteriorating (Atkins 2010), partly because the increased distance from producer to consumer meant that supply chains were stretched and there was therefore a diminution of system trust. Complaints included watered beer and the addition of alum (hydrated potassium aluminum sulphate) to whiten bread made from low-quality flour.

Legal and administrative definitions of the adulteration of food and drink were threefold. First, adulteration was said to have taken place if any important constituent had been omitted or substituted. Second, the deliberate concealment of damage or inferiority was an issue, for instance mislabeling or misbranding. Third, adulterants were ingredients added to improve appearance or increase value, for instance by bulking out

to increase weight. These frauds were possible because of the asymmetry of information in the market, favoring the trader, but food control, when successful, tipped the balance toward the consumer.

Significant food quality legislation was passed in France (1851, 1905), Britain (1860, 1872, 1875), Germany (1879), Belgium (1890), Austria (1896), Switzerland (1905), the United States (1906, 1938), and Spain (1908), but there were four reasons for the delayed effectiveness of these laws (Dessaux 2006; French and Phillips 2000; Guillem-Llobat 2008; Hierholzer 2010; Young 1989). First, it was not always clear whose interests were served. As Peter Scholliers comments, discourses of safe food were vague about the meaning of “the public” (2007: 81). There were obvious vested interests of commerce, but consumers were not homogeneous in their habits and views. Thus alumed bread was an attack on the poor but watered milk affected the middle and upper classes.

Second, systems of enforcement were variable. Germany, for instance, had analytical institutes and guidelines for food inspection in urban markets from 1876 onward; but there were substantial regional differences of practice and no imperial food standards. Bavaria was better prepared than Prussia in the number of food samples taken and in the training of the chemists to analyze them, at least until the decade before the First World War (Teuteberg 1994). There was this kind of geographical complexity in most countries, but it is unfortunately absent from histories of adulteration.

Third, the link between regulation and science depended upon a consensus about food standards. In some countries this was difficult to achieve given the different interests that made up the food system. There were two types of solution. On one hand, the Association of German Food Manufacturers and Retailers published the Federal Food Code in 1905 with a view to putting its views in the public realm (Hierholzer 2010). On the other hand, in some countries it was the state that sought to define the natural compositional limits of foods and so show up adulteration as beyond the agreed standard. In Austria, the *Codex Alimentarius Austriacus*, which began in 1897, was a compilation of descriptions of foodstuffs, appropriate analytical methods, and food standards. Its conceptual base was similar to that of a drug pharmacopoeia and it had a global impact in the twentieth century (Spiekermann 2011).

Fourth, the law courts took decades to make sense of anti-adulteration law, particularly in common law jurisdictions, where precedent is so important. Any social history of food standards must include this dimension because, in a sense, it was the jurisprudence that put meaning into the law. There is no doubt that the analyst, as expert witness and originator of authoritative reports, was a key figure in this drama. Perhaps even more important was the emergence of the contractual arrangements between the various parties in the food system as a guarantee of quality and trust in the sale of goods. In the early nineteenth century in Britain, for instance, the balance of the law was toward *caveat emptor*, based on the tacit assumption that the buyer would view the goods before purchase (Barton 1994; P. Mitchell 2001). Later, such copresence became unlikely and warranties were demanded as undertakings that the food delivered would be whole and untampered with. Although there were many technical difficulties with



warranties, they symbolized an important shift of responsibility toward *caveat venditor*. Lack of attention to such legal arrangements amounts to a serious gap in histories of food quality.

In view of the increasing international trade in raw and manufactured food products in the second half of the nineteenth century, it became increasingly obvious that some debate about standards and convergence was desirable. A medical congress in Amsterdam in 1879 seems to have been the first occasion for this, followed by the International Commission on Adulteration established at a congress in Vienna in 1887. The latter led to the publication of the *Revue Internationale Scientifique et Populaire des Falsifications des Denrées Alimentaires* in Amsterdam.<sup>6</sup> The International Chemistry Congress in Brussels (1894) then set up a commission to prepare an international book of food composition, and discussions at the Geneva Congress (1908) saw the founding of the Society of the White Cross. Its *Annales de la Société universelle de la Croix-blanche de Genève* was a relaunch of the *Revue*.<sup>7</sup> The Paris Congress (1909) saw the compilation of a fifteen-hundred-page book of international food standards. Again, scholarship in this area deserves encouragement (Dessaux 2006; Zylberman 2004).

Despite such initiatives, the fight against adulteration remained largely at the national scale, with many countries establishing bodies to provide regulatory means for the enforcement of food quality legislation.<sup>8</sup> Most famous by far is the Food and Drug Administration of the United States, which gradually grew to be powerful in the American system.<sup>9</sup> In Britain, it was not until 2000 that an independent government department with centralized regulatory powers, the Food Standards Agency, was established, followed in 2002 by the European Food Safety Authority (Prosser 2010). Both had been initiated in response to the food scares of the 1990s.

After the Second World War, the International Standards Organization confirmed the desirability of standardization and its Agricultural and Food Products Committee has since produced over 500 standards. This was followed by the Codex Alimentarius Commission, set up in 1963 as a joint enterprise of the Food and Agriculture Organization and the World Health Organization. One of the concerns at the time was the increasing use of additives in industrial food products, many of which were undeclared on packaging yet considered potentially dangerous for health. The main objective of the Codex is protecting the health of consumers and ensuring fair practices in the food trade by promoting coordinated international food standards. It has 165 member countries and more than 220 food commodity standards that cover hygiene and risk assessment, labeling, sampling and analysis, contaminants, additives, and residues from pesticides and veterinary drugs. The global significance of the Codex was ensured by a reference to it in the Agreement on the Application of Sanitary and Phytosanitary Measures, which has been in operation since 1995.

Many countries in the Global South are members of the ISO and the Codex, but their regulatory journeys are only just beginning. In fact, since the majority of the world's population continues to live under loose food controls, any overall conclusion concerning progress with adulteration has to be provisional. After independence in 1947, India

made improving its food standards an objective of its drive to modernity. What had been under the British a decentralized system of regulation was brought under unified control in the Prevention of Food Adulteration Act (1954), which remained in force until recently. There has been progress, with the issue taken seriously by the courts and in the media, but low-level fraudulent practices are still common. As we have seen, China faces a similar scale of problems, but the state's reaction has been less transparent and less effective. The critical social science literature on food quality in developing countries is nascent, but so far there is little research with a historical sensibility (Guyer 2009; Hilton 2007).

### *Activism and Citizenship*

Ordinary people are largely absent from the historiography of adulteration. This is surprising given that we know that one of the original motivations of the cooperative movement in Britain from the 1840s was cutting out adulteration in what seemed to them a distorted and corrupt food system (Kassim 2001). Up to now most research on European consumer-citizens has been on the period following the Second World War, but a body of empirical work is emerging that is revealing the depth of organized activism in the nineteenth and early twentieth centuries.<sup>10</sup> There were consumers' leagues, for instance, in Paris in 1902, Switzerland in 1903, and Germany in 1907, followed by Italy, Spain, and Belgium. Kroen (2004) aligns these developments with the maturing of democracy, particularly the empowerment of women. Even further back, in the 1870s and 1880s in Germany, a movement of citizen self-help associations mobilized against the adulteration of food (Hierholzer 2007). The first was founded in Leipzig in 1877. This soon had 500 members and within a year or two the idea had spread to twenty or so cities. In Britain also, food quality was a central concern, leading to the formation of groups such as the Anti-Adulteration Association (1871) and the Food Reform Society (1877) (French and Phillips 2003; Oddy 2007).

The second half of the nineteenth century also saw the publication of self-help manuals written for people to detect adulteration at home. Although not all would have been aimed at housewives, there was certainly an emerging pedagogic discourse in domestic science and women's magazines addressing the practical skills of choosing affordable quality foodstuffs (see Brembeck, Chapter 16, this volume). There were also many prominent women campaigners for pure food, some of whom were able to influence the policy agenda, particularly in the United States (Goodwin 1999).

## **MARKET BUILDING: INFORMATION AND TECHNOLOGY**

In an important paper, Marc Law (2003) has presented a "market-building" hypothesis that anti-adulteration regulations, if successful, help to build trust in those commodities perceived as the most susceptible to manipulation. This thinking draws together several types of evidence.



First, there are accounts of the various regulatory efforts across Europe that stressed fairness and honesty in the moment of sale, for instance the London Assize of Bread (1266–1815) and the efforts of the guilds in Germany with regard to both beer and bread (Teuteberg 2007). Although such histories are mainly concerned with weights and measures and prices, there is scope for arguing that their significance is deeper. The mental standardization that accompanied the process of defining honest trading can be thought of as part of the emergence of governmentality through the development of legal precedent and accompanying legal concepts (Dean 2010).

Second, markets abhor uncertainty and the adulteration of food was a major risk factor, both for the reputation of traders and for system trust overall (see Kjærnes, Chapter 24, this volume). One option was for producers, merchants, and retailers to use warranties, trademarks, trade names, labels, and third-party certification to establish niches for acknowledged quality (WIPO 1997). Emerging in the eighteenth and nineteenth centuries, these, along with geographical indications (GI) and other tools of intellectual property, are a kind of promise to the consumer as well as a statement of property rights and a lubricant of fair trade. Then, in the twentieth century, the brand introduced a conceptual thumbnail symbolizing trust and the possibility of associating with an ideology or lifestyle.

Although trademarks and brands came increasingly to offer a consistency of quality that was a refuge from adulteration (Strasser 2004), they also added a mystique, because many used secret ingredients or recipes. Their labels and symbols kept the customer informed and brought some order to an anarchic marketplace (Collins 1993; Law 2003). H.J. Heinz, for instance, had many competitors, but his slogans on purity and health were more convincing and his marketing messages about customer satisfaction could be backed up with high-quality products (Koehn 1999; Petrick 2009). Advertising was an extension of this building of trust capital through the provision of information. An example is Dr. Oetker's use of his doctorate and background as a pharmacist to establish credentials for quality that helped his Bielefeld-based baking powder factory (founded 1893) eventually to become a global player in food manufacturing.

Trademarks are usually the property of an individual or a corporation. They can be bought or sold and represent an important building block of modern capitalism. In order to prevent fake products reaching the market, with the inevitable dilution of quality and trust that would involve, there have been a number of international treaties and bilateral agreements between countries to protect the intellectual property associated with manufactured food and drink. These have not, however, prevented trade disputes, for instance resulting from the profound gulf in understanding between the United States and Europe regarding GIs. The United States has an individualistic notion of quality vested in the freedom of companies to develop their own products, but it has no legal concept of the collective reputation and environmental signature that goes with the food and drink typical of particular regions in France or Italy. In contrast, the Europeans cannot conceive of anyone owning the rights to, say, Parma ham, and local producers are encouraged to use GIs if they can meet basic standards of quality. The United States insists that its citizens have the right to use names such as parmesan and champagne because of

their vernacular currency (Creditt 2009; Nation 2011), and also claims that GIs have a protectionist and market-narrowing element that is inconsistent with the free trade principles of the World Trade Organization. Although the TRIPS Agreement is accepted by all of the signatories to the WTO, only wine is covered in the full sense of a GI, and the United States is resisting the extension of that concept to other commodities.

A third aspect of market building has been the role of food technology. A good example of the fine line between fraud and product innovation is the invention of “oleomargarine” in 1869.<sup>11</sup> This stood for the ambition and scientific achievements of an increasingly technological, industrialized, modern world (Burns 2009: 24). As such, it sat in a symbolic category opposed to its “natural” rival, butter.

But when does compositional innovation stop and cheating begin? Margarine’s entry into the market was immediately and vigorously opposed in many countries (Stuyvenberg 1969). In Canada it was banned altogether from 1886 to 1949, and in the United States over a similar time span there were regulations in many states that meant that yellow-colored spreads were heavily taxed.<sup>12</sup> Ruth Dupré’s account of this history is particularly instructive (Dupré 1999). There is no doubt that unscrupulous traders in both Europe and North America were prepared to pass margarine off as butter and anxious to pocket the windfall profits from a product that was half the price. Demands for proper labeling and for police action against fraudsters were therefore justified, but denying a fair wind to margarine sold as such was a restraint on trade and the direct result of special interest lobbying (G. P. Miller 1989). Dupré recalls that the lobby, particularly in the dairy states, was powerful enough to influence the political debate until the 1960s. Producer politics are still important on both sides of the Atlantic, but the twentieth century saw the gradual rise of the consumer voice to balance such vested interests. The science behind margarine has not changed, but as a product it had a very negative image at one point, on a par with alcohol or narcotics. There is no longer any association with the rendered fat of dead animals and, in the best tradition of the postmodern, the simulacrum is beginning to steal the limelight of the “real” original because of butter’s association with circulatory disease (Genosko 2009; Pantzar 1995).

## DISCUSSION: REGION AND MATERIAL

As we have seen, the historiography of adulteration reveals thematic clusters of work but many gaps. In this final section a suggestion for a way forward will be made based on the need for comparisons across national boundaries and legal jurisdictions, and between commodities. This is based on the main unresolved issue of food quality stretching back 200 years—the binary between place-based conceptions and other intellectual traditions such as compositional quality and the use of trademarks. These are not mutually exclusive categories, but misunderstandings and mistrust have arisen between the major proponents, indicating the need for further research to reveal their respective conceptual genealogies.

Geographers and historians of material culture have begun to work on the regional element. In recent years the former have published a significant corpus of work on local

food and place-based articulations of what have been called alternative food networks (Goodman, Goodman, and DuPuis 2011). The latter, working mainly in the anthropological and sociological traditions, have used ethnographies and other qualitative methodologies to reveal the performative construction of quality (Harvey et al. 2004, Paxson 2011). Such studies reveal a whole spectrum, from “artistic” interpretations of quality to the claims making that accompanies the reinvention of tradition. The history of trademarks and intellectual property is also relatively well developed, although less so with respect to foodstuffs. One hopes for more, and also for work on the compositional “careers” of commodities. In the latter case a new approach to adulteration is in sight.

Callon, Meadel, and Rabeharisoa (2002) privilege the material itself and argue that the qualities of goods are emergent rather than designed. This insight into ontological slipperiness can be matched by two others. First, as Benjamin Cohen (2011) reveals, the difference between “superficial” appearance and the “reality” that lies underneath was still under debate in the nineteenth century. The visual dissonance between the novel technologies of the photograph and the microscope amply illustrates this point. Physics and organic chemistry became ways to know food as never before and they provided frameworks to develop concepts such as genuine, pure, authentic, and natural.

Second, the modern era has been one of reassessment of taken-for-granted ideas about trust in food systems, as in other aspects of daily life. It came as a shock to many in the mid-nineteenth century to discover that commodities such as milk were universally tampered with and that an “honest pint” was therefore almost impossible to find. This was seen as a damning commentary on the “orders of worth” in society (Atkins 2010: chapter 6). Eliminating adulteration and falsification became a way of putting society on the right moral road.

Histories of the last fifty years are less about the grosser forms of fraud than about finer distinctions of quality. It seems to the present writer that now is the time for these histories to look into the emergence of the valuation and the materialities of foodstuffs. This demands comparative work but, above all, a holistic contextualization in terms of the social, scientific, legal, and economic threads. A proposal for research on one commodity, milk, that could be extended to others, may be found in the book *Liquid Materialities* (Atkins 2010).

## NOTES

1. Note the tension here between those (Beck 1992) who write about food scares such as BSE and food poisoning as emblematic of a modern age of anxiety or maybe even of a new era—the “risk society”—and historically-based narratives that alert us to 200 years of unease about food-related morbidity and mortality (Atkins 2008; Ferrières 2002; Scholliers 2008).
2. Defining adulteration has become problematic in recent times. The prions that cause BSE and new variant CJD were the cause of much debate about food risk, but the prolonged mad cow scare was about contamination rather than adulteration.

3. Since 1966, the World Intellectual Property Organization has administered the “Lisbon System” for registering “appellations of origin,” but more important is the Trade-Related Aspects of Intellectual Property Rights Agreement (1994).
4. The relatively small amount of comparative work done on food history is to be found in the publications of the International Commission for Research on European Food History and Institut Européen d’Histoire et des Cultures de l’Alimentation.
5. See the chapters in Ebeler 2007 and Sun 2008.
6. Renamed in 1889: *Revue Internationale des Falsifications*.
7. This became the *Annales des falsifications* (1912–1916), then the *Annales des falsifications et des fraudes* (1917–1959).
8. See Phillips and French 1998 for a critique of the British system.
9. This had its origins in the 1840s and before 1930 went under various names, such as the Bureau of Chemistry and the U.S. Department of Agriculture (Hilts 2003).
10. The emphasis in this section is upon Europe, but for similar developments in America, see Coppin and High 1999, C. F. McGovern 2006, and Glickman 2009.
11. *Oleo* is Latin for oil, and Mège-Mouriès mistakenly thought his process involved margaric acid.
12. Yellow margarine remained illegal in the province of Québec until 2008.