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Industrial Food for Thought: Timescapes of Risk[1]

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ABSTRACT: This paper explores the temporal dimension of risks associated with the production, trade and consumption of food. The paper operates at many levels of substantive and theoretical analysis: it focuses on problems for understanding and action that arise from the invisibility of the hazards, explores the effects of those hazards on consumers and sets out the differences in risks that are faced by farmers, processors, traders and consumers. With its emphasis on that which tends to be disattended in conventional social science analysis – the temporal and the invisible – the paper has implications for social theory at the level of ontology and epistemology. It concludes with reflections on the role of social theory in such contemporary timescapes of risk.

KEYWORDS: Timescape, risk, innovative technology, food, invisible hazards

INTRODUCTION

In industrial societies, food scares are the order of the day: salmonella in eggs and chickens, scrapie in lamb, BSE (Bovine Spongiform Encephalopathy) in beef and beef products, pesticide residues in fruit and vegetables, hormone-disrupting chemicals in baby milk – the list is far from complete, indicating merely the range of food hazards that have arisen over the past decade. The increasing incidence of these health threats from food is indisputable; the scale of the problem impressive. Each one of these hazards is associated with the industrial production of food on farms and in the chemistry 'kitchens' of large corporations. Each one is invisible. All of them are time-space distantiated, thus difficult to tie down, establish causal connections, secure scientific certainty. Helplessness marks the reactions of the public, food producers, politicians, and scientists. The bewilderment is of course expressed very differently in each of these social spheres: politicians instigating one panic measure after the other; scientists disagreeing with each other and contradicting themselves in public; food producers worrying about their livelihoods, anxiously awaiting guidance and financial safety nets; consumers turning cynical or resigned, assigning blame to everyone but them-

Environmental Values **8** (1999): 219–238

selves and oscillating between abstinence from meat eating, opportunity buying and shutting the problem out altogether, wishing that it would go away, hoping that the timebomb was ticking in someone else's body. As the public are getting more concerned about food safety, agri-business and bio-tech transnationals are tightening their protective measures. The recent moves in the US to get food disparagement laws on the statute books are just one case in point. Designed to protect industry's profits, these 'food slander' laws are to prevent 'journalists and activists from expressing opinions that might discourage consumers from buying particular foods' (John Stauber, quoted in Lilliston and Cummings, 1997: 217).

With food more than with anything else we have relied on our senses to establish danger and safety. Throughout human history, we depended on the senses to tell us whether or not a food that is known to be edible was still fresh and fit for consumption. Today, we still rely on the nose to tell us whether a produce is fresh, ripe, or going off. From its look we can tell whether a piece of meat or vegetable is in prime condition, beyond its best or beginning its process of decomposition. A little squeeze can indicate the age of bread, for example, and the difference between staleness and freshness. Residues of pesticides, fertilisers, herbicides and growth hormones, however, do not show themselves in any way. Sight, touch, smell, even taste are of no help in establishing whether or not any of the above contaminants are present. Equally, meat from animals infected with BSE or scrapie does not turn green or slimy; it does not look or smell any different from uncontaminated meat.

At the substantive level, this raises questions about how to do battle with invisible enemies, how to combat what is beyond the reach of our senses and how to ensure that those who hold the keys to our well-being will act in a way that safeguards the livelihoods of current and future citizens rather than shareholders' profits. At the conceptual level, it raises doubts about the adequacy of empirical, factual analysis with its emphasis on materiality and space and its language of certainty, proof and truth. Instead, it points to the importance of that which is inaccessible to the senses – the invisible, the latent and all things temporal – and to the processes that highlight the inescapability of relativity and indeterminacy. Conventional analyses of the risks associated with industrial food tend to ignore the im/material, temporal dimension. When we therefore focus on what has thus far been disattended, we not only alter the ontology and epistemology of social theory but also introduce questions about its role in contemporary society. In this paper I thus consider food-based risks from a number of unconventional angles. I explore not only the invisibility of the hazards but also their temporal qualities. I focus on the variable risks taken by the providers of food – farmers, food traders and processing companies – and I distinguish these risks from the hazards faced by consumers. I conclude with some reflections on the role of social theory in such contemporary timescapes of risk.

TAKING RISKS: FARMERS, TRADERS AND LIMITED COMPANIES

Once upon a time and distant places it was and is considered 'natural' for the seasons, climate, weather and location to impose limits on human activities, just as it was/is taken-for-granted that these restrictions pose a challenge to human ingenuity: how to store and preserve food through the unproductive part of the year and bridge the gaps between periods of scarcity and plenty; how to safeguard the reproductive capacity of land, plants and animals from one year to the next and for generations to come. Despite their quest to overcome the vagaries of the weather and to transcend the climatic extremes of the seasons, people were/are embedded in the light and dark, wet and dry, cold and warm, growth and decay, birth and death cycles of nature's earthly rhythms. Their future 'laid out', not in detail but with an overall level of foreknowledge, people tend to conceive of themselves as integral parts of a continuum of past and future, predecessor and successor generations. This future which could and can be anticipated but not predicted, allows for planning ahead and for securing their own and successors' livelihoods. In those distant times and places, time is understood to be integral to things and processes: for everything there is a season and a place. As long as the human production of food remained seasonal, which also meant predominantly local or at least regional, and as long as the primary producers of food retained control over the means not just of production but reproduction, the system remained one of contextual, embedded, interdependent growth cycles. Under such agricultural conditions, risks are predominantly associated with the un/predictability of nature.

With industrial food production, the risks tend to be of a different kind and tied to different sources. Government and business, for example, establish export and trade rather than national and local self-sufficiency as the indisputable goal: only the former, it is suggested, will dramatically increase the flow of money and thus show up positively on a country's official measure of wealth, its Gross National Product (GNP). Political concerns determine agricultural policies and with it priorities, subsidies and taxation. Economic considerations define the relation of food production to the global market (see also Adam 1998, chapters 2 and 3). Once farming is locked into the ideology of this globalised economic system, it is not the ecological principle of networked interdependence between nature and agriculture or concerns about fertility and the long-term reproductive health of the land but, rather, political and economic considerations that dictate the nature, pace and intensity of agricultural practice. Explicitly and by default, therefore, governments and business are the dominant forces shaping the development of agriculture and food production and with it their collective effects on the environment and human health. Any analysis of risks associated with agricultural practices, therefore, needs to encompass globalised economic and political as well as scientific activities and aspirations. These shifts from the agricultural unit to inter/national politics and global finance and from self-

sufficient cyclical production to reliance on synthetic chemicals have implications which I want to outline in this paper.

When blame is to be apportioned about food hazards, farmers are always the first port of call. However, whilst there is no denying that modern farming methods are as much life-threatening as they are life-giving, farmers do not act with the freedom of independent agents. In addition to their dependence on global markets and government policies, we need to appreciate, even the biggest farms and agricultural enterprises are tiny players in this actor network of banks, national governments and transnational corporations which cover both agri-chemical businesses and food processing giants such as Nestlé and Unilever. Squeezed between these national and global players whose policies and interests constitute the farms' political and economic boundary conditions, what chances do they have for survival? The differences in power and room for manoeuvre can be illustrated with reference to the divergent ways with which the various actors in the food system approach their respective risks, that is, the way they deal with potential disaster and the uncertainties of the future.

Farmers conventionally handle/d the risks associated with weather, seasonal variation, disease and pests by growing a wide variety of crops and keeping a range of animals so that failure of one could be offset by the stability and success of others. Grain and seeds were/are kept for several years ahead so that failing crops due to lacking or excessive rain, cold or sun could be bridged from one year to the next. Thus writes a French colonial inspector of the Upper Volta to his government in 1932 about the change in this rural community's livelihood:

> One can only wonder how it happened that populations... who always had on hand three harvests in reserve and to whom it was socially unacceptable to eat grain that had spent less than three years in the granary have suddenly become improvident. They managed to get through the terrible drought-induced famine of 1914 without hardship. (Although their stocks were depleted, they were soon able to reconstitute them, at least until 1926, a good year for cotton but a bad one for millet.) Since then, these people, once accustomed to food abundance are now living from hand to mouth. (quoted in George, 1984: 22)

This is a story that is still repeated across the third world wherever industrial agriculture has been adopted and where mono-culture cash crops have replaced indigenous crops and agricultural methods.

Under the industrial regime, risks are dealt with in a way that is unique to that system: a dramatically *reduced* range and variety of crops and animals are raised to enhance rationalisation, calculability and predictability. Fertilisers are to even out variations in the productivity of soil and crops. Pesticides and herbicides are to eliminate any unwanted animal and plant matter. Insurance is to provide financial compensation for a limited range of disasters. Instead of the traditional farmers' reliance on variety and diversity as safeguards against catastrophe and misfortune, the industrial way is to eliminate uncertainty by seeking to control

both the physical conditions and the processes of industrial agriculture. This, suggest Tansey and Worsley (1995: 90), seems inevitably to lead to an intensification of production, resulting in increased use not only of technological and chemical aids but also of energy and externally supplied, science-based feeds, semen and seeds.

Industrial farmers therefore have to acquire skills different from those essential to the cyclical, no-waste form of agriculture and they need radically to change their orientation to the past, present and future. Instead of having to attain extensive knowledge based on experience and tradition, industrial farmers need to stay ahead of their times and their competitors: keeping abreast of the latest scientific developments in genetic engineering and chemical aids, embracing up-to-date innovations in mechanised precision farming. They have to know about equipment maintenance and the use of a wide range of chemicals as well as obtain accounting and marketing skills. Most importantly, they need high levels of bureaucratic skills in order to be able to deal with the tremendous amount of paperwork necessary to take advantage of the numerous (and continuously changing) subsidies and policies designed to even out the risks of modern farming.

Under an industrial scheme of agriculture, moreover, productivity and efficiency are understood in a very specific way, that is, with reference to individualised and particularised performance which is measured in abstraction from the long-term perspective of potential lifetime performance. The intensification of production thus entails a very particular relation to time: time is equated with money and speed with profit. This means, for example, that the shorter the period between seeding and harvest, birth and slaughter, the higher is the profit. For pig production, for example, this involved a dramatic speeding up of the maturation process: in 1800 it took two to five years for a pig to reach a slaughter weight of 60 kg. By the beginning of this century, it only took 11 months for the pig to reach a weight of 100 kg. Today that same weight is reached before the pig is half a year old: ready for slaughter before it has lost its milk teeth (Bartussek, 1995: 67). For the dairy farmer this means, the 'productivity' of a milking cow is measured not over her lifetime but, rather, by how much milk she gives per annum, per month and even per day. An average Northern European industrial milking cow today will give some 5-6000 kg of milk per annum for a duration of about three years (three lactations) which compares with 800-1,400 kg of milk per calf of non-domesticated animals. Under the industrial system of milk production, however, the milking cow tends not to reach even one quarter of her potential age. Instead, she is worn out at the age of 5 after her intensive period of continuous pregnancy and lactation. In the US her productive period is down to 2.2 years and in Israel it is reduced to 1.8 years (Figures from Postler, 1995: 59). The outbreak of BSE in the UK is taking this downward trend even further. Thus, under the industrial scheme of things productivity and efficiency imply the need to increase output over ever shorter time spans: the faster

something goes through the system, the better it is for business, the economy and a country's GNP. This pressure towards time compression is intimately tied to industrial agriculture's approach to the future.

Since gluts and lean periods increase the insecurity and instability of agriculture, the industrial response to risks associated with this fluctuation is to seek to eliminate these variations in both the conditions of agriculture and the prices farmers receive for their products. In Europe after the Second World War, the latter economic strategy was pursued at the political level through the Common Agricultural Policy (CAP) which was to become the basis for the creation of the European Economic Community. Its aim was to keep prices steady and guarantee farmers a market for their products (see Hewett, 1995: 75-9; Tansey and Worsley, 1995, Chapters 3, 6, and 9). This political strategy for averting risk had a number of highly problematic effects that increased rather than eased the economic pressure on farmers and agricultural food production: it intensified farming, produced tremendous surpluses, progressively reduced farmers' profit margins while extensively increasing the profits of agri-businesses and food-processing firms, and it forced record numbers of farms out of business. It has not delivered the objectives for agriculture but has enriched traders, transnational corporations and banks.

One group of actors that are doing particularly well out of the industrial system of farming are the food traders – the importers, exporters, brokers and merchants – who trade agricultural products on the global market. Two things are important to appreciate here: first, that the food trade is dominated by a few transnational corporations. With respect to grain, for example, six companies dominate the world's trade in that commodity (Tansey and Worsley, 1995: 106). For the entire food trade it is a mere 15 companies that account for about 80% of all trade (Brown, 1993: 51, 71). Secondly, for the trade in food, unlike for agriculture, the cost of a product is not crucial to wealth creation. Instead it is trade itself that is of importance: the more a commodity changes hands the better. Since the demand for commodities rises and falls with a number of predictable and unpredictable factors, the traders' prime concern, like that of the farmers, is to counteract that variability and future uncertainty. Their solution to handling risk, however, is very different from the strategies adopted by traditional and industrial agriculture. In response to their risks, traders have developed the 'futures market': they trade in the future prices of products. For them, not time but the future equals money.

The futures market is a commitment to buy and/or sell something of a specified standard, at a pre-appointed time and at an agreed price. To engage in this 'hedging', traders do not have to be in possession of that commodity. Rather, they trade futures for products in the hope and with the expectation that this contract can be sold on for profit before or shortly after the time is up to fulfil the commitment. This means that the same commodities may be bought and sold many times over. Such futures trading happens within the regulated context of

some 75 organised and electronically linked exchanges which are located in the major financial centres of the world. Moreover, this is not a new way of dealing with the uncertainty of supply in the food industry but, as Deirdre Boden (1999) explains in a fascinating paper on futures trading, it started with rice in seventeenth century Japan. Writing about the high-speed speculations of contemporary futures traders, she suggests,

> These young traders are trading in time itself, which is to say, in the momentary forward fluctuation of price and value. The latter are, by extension, expression of the most abstract sort: of money itself and, even more abstractly, of the price of money at some future point in time, in other words, in future interest rates. (Boden, 1999: 14)

> The future value of a commodity contract is not simply a matter of linear time – increasing or decreasing in some patterned way – but is linked instead to complex multivariate calculations: inflated, discounted, hedged and even expressly devalued. (Boden, 1999: 15)

The traders' power resides in the scale of their resources and their access to finance, in the integrated and networked nature of their operation and, finally, in their ability to manipulate not just the market but the future. Importantly for the issues I am discussing here, as Tansey and Worsley (1995: 108) note, futures trading 'is done by technical traders who do not and never will actually deal in physical commodities but will only speculate in the market'. The livelihoods of farmers, soil fertility, and/or environmental sustainability, therefore, clearly do not feature within the framework of the professional concerns of these 'time merchants'. This means, there exists no point of intersection, let alone overlap, where it could be argued that the interests of agriculture and trade converge except, that is, for their collective need to earn money through their activities. Thus, the future as money, as speculated upon economic potential, is difficult to reconcile with a future that is to sustain and feed current and future generations of humans in an environmentally sustainable way.

Food processing companies, a third group of actors in the food system, have yet another set of concerns and thus different ways again of dealing with risks and the vagaries of the future. Let me mention just a few. First and foremost, with the creation of limited liability companies, risks can be externalised, which means they are not borne by individuals and corporate entities but spread across society who has to pick up the bill for and shoulder the socio-environmental consequences of corporations' actions. A second way to minimise corporate risks is to externalise them to agriculture, to pass them on to the farmers who supply food processing companies with the raw materials. By stipulating tight contractual conditions about the time of delivery, the quantity, size, colour and uniformity of the product, and even about growing methods and chemical regimes to be used, processing companies have plenty of means to pull out of a contract, should the need arise, since failure on one of these conditions would constitute a breach of contract. Thirdly, transnational corporations can take their

custom anywhere in the world, that is, wherever they can secure the best deal for themselves: for a global operation there is always summer somewhere and always one agricultural producer willing/able to outbid the rest.

From this brief look at the different ways in which some of the main protagonists of the industrialised food system relate to risks and the uncertain future, we can see that farmers clearly occupy the riskiest position. Not only do they have the least effective means of dealing with the uncertainties they face in the course of their work but, more significantly, they are squeezed between capricious policies and the interests of traders and food processing companies who, in turn, even manage to off-load some of their risks back onto agriculture. The risks that have been discussed here, now need to be distinguished from the hazards that are faced by consumers of the products of this food system. That is to say, 'risks taken' need to be differentiated from 'hazards and dangers faced': the former entail the potential for calculation as well as some measure of decision and choice whilst the latter are beyond considered action, quantification and scientific certainty (Lash et al., 1996; Adam 1998; Adam et al., 1998). In the next section of this paper I therefore change my focus from the providers to the recipients of food produced, traded and processed. I begin with a discussion about food storage and the meaning of freshness as these issues straddle the boundaries between risks taken and the involuntary confrontation with hazards. Explicit attention to temporal matters can once more provide points of departure from established perspectives.

CONSUMERS FACING HAZARDS

Counterfeit Freshness

'For everything there is a season', suggests the bible (Ecclesiastes 3,1). Today, however, the original meaning of this statement is no longer applicable. Since export, movement/transport, and the creation of multiple trade chains are 'wealth-creating', thus crucially important from an economic perspective, our foods criss-cross the globe, busily adding to every country's GNP along the way. In order to suit this particular economic need, however, foods had to be adapted and redesigned to suit the new conditions of their 'labour'. Here, not speed but mobility and the capacity for decontextualisation are equated with money: where it used to be grown and consumed locally, the bulk of food today has travelled extensively. In transit, it had to ripen or be preserved in some form or other in order to arrive 'fresh' on the supermarket shelves. The consumer expects apples all the year round and strawberries at Christmas – so we are told. This and this alone, we are assured, is the reason why, as Joanna Blythman writes,

> The fruit and vegetable buyers for our large importers and supermarket chains spend their days chasing the sun around the world, in search of climates that can produce

> fruit and vegetables at times when they would be otherwise unobtainable or taste awful. Raspberries at Christmas, apples in June, and sugar snap peas in March. (Blythman, 1996: 24)

Because she thinks that, regrettably, global sourcing is here to stay, she provides her readers with rudimentary geographical knowledge and tips on how to be sure that this world-travelled food is 'seasonal' in its source country and has not already spent several months irradiated in some store.

Freedom from context – that is, from time and place – is one of the great achievements of science and industrialisation and for those with the necessary money it means emancipation from the cycles of want and plenty.

> Some 100 to 150 years ago, around 95% of what people ate had been produced within sight of their church steeple. This had both advantages and disadvantages. One could see and experience how the crops and animals that one lived from grew and flourished. One was, however, much more dependent than today on *whether or not* they grew and flourished. (Schneider, 1997: 86)

This transcendence of seasons and locale, this success story of industrialisation, as Manuel Schneider (1997) calls it, is achieved at a price: decreased diversity of kind and genetic material, decrease in vitamin and nutrient values, decrease in taste, coupled with an increase in risks from chemicals, irradiation and genetic improvements. On the positive side, it has to be said that the products of globally sourced food look better: bigger and shinier, perfect in form, size and condition. Beauty, the pleasure to the eye, is to offset lack of taste and some of the other minor consequences of jet-setting visual perfection. To achieve visual shelf perfection, fruits such as apples are harvested green which brings a number of advantages to growers, traders and retailers: not yet ripe, they do not bruise easily when handled, and thus cope well with haulage and packaging, that is, without any of the normal tell-tale signs of careless treatment. This particular practice makes the world-travelled beauties not only cheap visual delights but also guarantees that they will have an excellent shelf-life.

What then is the exchange involved in the decontextualisation of food? By being freed from seasons and locality, our diet has become less monotonous at any one period of the year. Gone is the time when winter kale and sprouts were the staple 'greens' for what seemed weeks and weeks and weeks. We can have tomatoes, peppers, cabbage, lettuce and cucumber all the year round: no need to eat winter greens followed by spring vegetables and an abundance of summer vegetables and fruit. Today, we have the opportunity to eat the same variety of apple, tomato, pepper, and lettuce all the year round. The relative monotony of a seasonal diet has been replaced with the absolute monotony of all-year sameness and uniformity as well as a staggering lack of taste. Lost is not just the vast variety of kinds and diversity of their tastes but the joy that comes with the expectancy and arrival of new seasonal foods: the first peas, carrots, cucumbers,

strawberries, apples. With the achievement of this all-year sameness and uniformity the meaning of freshness had to undergo some considerable changes.

The Concise Oxford Dictionary has a long list of attributes that denote the meaning of freshness. 'Recent', 'not preserved', 'pure and untainted', 'not stale, musty or vapid', 'newly made' are some of the characteristics most suited to the description of fresh food. In everyday language, 'fresh food' means food that has not been preserved by drying, salting, pickling, smoking, tinning, bottling or freezing. This understanding which contrasts freshness with preservation, however, leaves a large grey area, that of stored food. This food is 'fresh' in so far as it is not preserved by any of the traditional means but it is not fresh in the spirit of the word, that is, freshly harvested from fields and orchards. In addition to this difficulty, contemporary industrial methods of storage take the meaning of freshness into an altogether different realm.

The storage of food in cool, dark and airy places as a means of keeping decay at bay is an ancient method of bridging the gap between one harvest and the next. It is one of the many ingenious ways humans have invented to sustain their food supply during the dormant period between the seasons, between harvest and new growth. Each fruit and vegetable species and their individual varieties have their own time-frame within which the onset of decay can be delayed. In the course of human history, much knowledge had been accumulated about how to extend the period of available 'fresh' foods by cultivating different varieties so as to make use of their markedly differing ripening times, keeping spans, and patterns of decay. Moreover, since harvesting times and decay periods were part of common knowledge, consumers could work out with reasonable accuracy how old their purchased 'fresh' foods were likely to be.

Industrial food storage, in contrast, has moved away from an emphasis on variety towards an economy of scale where large quantities of the same foods are kept 'fresh' by a variety of means, namely controlled-atmosphere ripening, chemical preservation, irradiation and genetic engineering. These processes and their timescapes of harvesting and ripening, storage and decay no longer form an integral part of public knowledge. Consumers therefore are no longer in a position to work out the age of the 'fresh' food they are buying. Without laws stipulating the public identification of the date of harvesting, on the one hand, and method of preservation used, on the other, consumers are left in the dark about the temporal history of the foods they purchase. All there is at present is a system of providing a 'best before' date. This however is silent with respect to the issues discussed above. Thus, the risk of unknowingly buying industrially stored food is generally high but varies with socio-political and individual context. A brief look at some additional differences between traditional and industrial methods of extending the period of food 'freshness' will help to illuminate some of these generally disattended issues. Atmospheric ripening chambers, chemical treatment and irradiation will be my main examples for further exploring risks, hazards and food safety from a consumer perspective.

In 'The Food we Eat', Joanna Blythman (1996) informs her readers of the contemporary range of methods used for keeping food in a state of simulated freshness, thus foregrounding for public attention a social issue that otherwise tends to be largely invisible. She shows how, in computer controlled atmospheric chambers, for example, fruit can be ripened at will, according to just-in-time schedules, and its shelf life extended up to five times the length of traditional storage. Since, however, this method of manipulating atmospheric conditions is considered a mere variation on the natural composition of air, governments world-wide have decided that there is no need for this kind of storage to be declared. This means, that those buying atmosphericly controlled fruit and vegetables have no means of telling the difference between real and simulated freshness. In such cases, it seems to me, we are not dealing with a situation of informed choice but deceit: the vegetables are *meant* to look fresher than they are, supposed to simulate recent harvest and 'pure and untainted' condition. We are in the realm of *counterfeit freshness.*

Whilst the deceitful extension of the storage life of foods is not harmful in itself (as far as is known at the present, that is), health hazards arise with the extension of food chains associated with industrial production. Since contamination of food may occur at any point between source and consumption, any lengthening of the food chain as well as any increase in the scale of the processes involved will increase the potential for health hazards and decrease the potential for tracing the sources of contamination. With food-borne diseases on the increase world-wide, we are faced with a vicious circle of ever more of the harmful kind of bacteria, fungi, moulds, protozoa and viruses in circulation in a context where expanding networks of infection and cross contamination are created through jet-setting, globally sourced foods. During the summer of 1996, Japan experienced its biggest outbreak of food poisoning to date which affected 8000 people, 5500 of which were school children of the city of Sakai: the cause was *E. coli* 0157 bacteria, the source of infection not identified (Guest 1996: 187; *Nature* 1996: 388; Swinbanks 1996: 290). In the UK, local and national newspapers abound in reports on food poisoning in hotels, restaurants, hospitals and care institutions. In January 1998 the British Medical Association informed the House of Commons Agriculture Committee that in the UK during 1997 a record number of one million people were struck down by food poisoning, 200 of them fatally (Marks 1998: 12).[2]

Each of the traded 'bugs' have their own unique temporal profile, that is, the typical period between ingestion and the onset of symptoms. One time-based difficulty for dealing with this kind of public health hazard arises from the fact that the typical timespans can have a wide range of tolerance: whilst some symptoms occur within a few hours, as in the case of botulism, with listeriosis, for example, the timespan between cause and effect may extend from seven to thirty days, whilst the disputed incubation time of CJD ranges from about five

to 50 years.[3] Another relates to the mobility of the contamination and the time-space distantiation of the effect.

The risk and hazard potential of the artificial extension of the storage and shelf life of produce in a context of lengthening food chains is moved up a notch when chemical treatment, irradiation and genetic engineering are used to achieve 'improved preservation'. Chemically extended shelf life, for example, tends not to be declared. Consumers are not openly informed that their 'fresh' food has been chemically treated to simulate freshness over an extended timespan. The arguments to defend this secrecy are manifold: the chemicals are meant to have disappeared, which means they should have left no traces by the time we get to eat the foods. They are meant to be harmless for humans. They are meant to be present in such small doses that they constitute no risk to human health. Thus, Joanna Blythman explains with reference to a range of post-harvest preservatives:

> Take potatoes. Even stored in the cold and dark, these would eventually sprout – the potato's way of indicating that it is beginning to deteriorate. The standard method of dealing with this is to treat them with Tecnazene, a toxic fungicide that inhibits sprouting. Because this is applied at what is deemed to be a 'safe' interval before sale, it does not need to be declared on the label....
>
> Although these preservatives [Thiabendazole, Diphenyl, Oethophenylphenol and Sodium] have 'E' numbers (E230-233) which would have to be included on the ingredients listing in other food products, fruit and vegetables are mysteriously exempt from such labelling requirements.[4] (Blythman, 1996: 29)

Without declaration these chemical treatments remain invisible and unrecognisable to the consumer. This means, consumers are unable to make informed choices and risk calculations about the foods they are buying.

Consumers, we are told, are exposed to a minimum of risk because all the chemicals are thoroughly tested and, if applied correctly and with the appropriate time strategy, the chemicals are no longer in or on the fruit. Moreover, so the official argument goes, most natural foods are also toxic if taken to excess in terms of dose or frequency. Thus, rhubarb is toxic if we eat too much of it. Too much herbal tea can have a negative effect on health. Green potatoes contain solanin, a substance that is poisonous when taken during early pregnancy. Synthetic chemicals, so the promoters of such treatments argue, are no different: dose, frequency and timing are the issues that matter. As long as those who apply the chemicals use the correct dose at the right time and as long as the stipulated gap between application and consumption is rigorously observed, we are assured, preservatives are as safe as any natural food. But then, we need to ask, are all agricultural labourers literate? Are they all able to read and understand the instructions about the use of these chemicals? Can every one of them be relied upon to carry out the instructions to the letter? Do all businesses care about what happens to some anonymous consumer somewhere, some time, way down the

trade chain? Can we be sure that no one will be tempted to increase their profit by speeding up the process, that is, by not waiting for the required quarantine period before offering the foods for sale? There seems to me to be a fundamental difference between evaluating the risk of eating large amounts of rhubarb and the potential health hazards arising from financial greed, anonymity and ignorance.

Irradiation, the prolongation of the shelf-life of foods by means of radiation, had been hailed as the food industry's panacea for all its remaining ills associated with the long-term preservation of 'freshness'. It was to kill off all the bugs that had entered the food nets and increase further the time spans over which food could be kept 'fresh'. The irradiation of food works as a preservative in a dual way: first, it exposes food to high doses of radiation which achieve chemical changes that have a life-extending effect on the foods. Second, it kills some of the bacteria and organisms that are responsible for the decaying process. But, then, it also kills off vitamins and nutrients as well as all the life- and health-enhancing bacteria (Blythman, 1996: 290).

Soon, this answer to increasingly pernicious problems, came to be seen as part of the problem rather than the solution. In the UK, for example, some of the most eminent food scientists put their weight behind the Campaign Against Food Irradiation (CAFI) and were supported in their endeavours by organisations ranging from 'The National Federation of Meat Traders' to 'Parents for Safe Food' and the 'Women's Institute' (Elliott, 1990). I shall deal below with the safety debates that surround/ed this particular means of extending shelf-life. Here I just want to note that whilst irradiated food is required to be labelled by most countries, in the UK this stipulation does not apply for foods bought by restaurants and catering establishments and for processed foods where less than 25% of ingredients have been irradiated (Blythman, 1996: 291).

Again, the secrecy amounts to deceit since the people buying and eating those foods are none the wiser. With food that is sourced and traded globally, of course, the irradiation of food cannot be policed and is thus wide open to abuse.

From this brief encounter with simulated freshness, we can identify a number of further implications. First, the production of freshly harvested food for immediate sale has been rendered uneconomical by the many ingenious ways to simulate freshness. Too costly, it has become the preserve of a select few, but even they cannot evade the web of deceit that has been spun on the behalf of citizens and in the 'interest of the consumer'. The public are denied choice: not risk calculation but confrontation with invisible hazards are the order of the day. Secondly, we can see that the industrial storage of food has not only vastly extended the elasticity of the meaning of 'freshness' but, over the entire range of methods available to date, it has also blurred the boundaries between risk and hazard, hazard and safety: research produces contradictory results. Policy makers cannot come to agreements over levels of safety and risk. Governments world-wide come up with opposing legislation. In the light of this state of affairs, the issue of safety merits some additional attention.

The crucial distinction is further clarified when we focus on the issue of safety.

SAFE UNTIL FURTHER NOTICE

> You can always pick a slug off your lettuce or rinse the leaves to remove greenfly but unfortunately, you cannot buy 'conventionally' produced food with an opt-out clause – the chemicals are an integral part of the deal. (Blythman, 1996: 278)

Safety is difficult to establish in a context of time-distantiation and time lags, that is, where damage and harm are being produced out of sight, below the surface, for often unknown periods of time and where the symptoms do not necessarily allow for a backwards reconstruction to originating sources and causes. Whether we are dealing with pesticides, post-harvest preservation treatments or irradiation, there are two standard responses to this situation: such processes and their effects are considered safe until proven harmful or dangerous until proven safe. Both, of course, are based on the false assumption that 'proof' is obtainable. Both are steeped in a Newtonian science understanding of linear cause-and-effect chains that is principally inappropriate for time-space distantiated phenomena where the extent of time and space between initial condition and action and eventual symptom are irreducibly indeterminate. Moreover, not finding evidence of damage now does not mean that symptoms of irredeemable damage will not turn up tomorrow, the next year, 20, 100 or 1000 years' hence.

> We cannot prove the absence of a risk,… just as we cannot prove the absence of ghosts, say. No matter how many experiments you carry out where you find no ghosts, you cannot exclude the possibility that if you did one more experiment, you would find a ghost. (Fritz Diel from the Food Preservation Institute, Karlsruhe, quoted in Elliott, 1990: 45)

While this quote too suggests a bias towards a Newtonian science understanding through its use of the idea of proof, I like its powerful imagery: the notion that ghosts are there and not there and science has no means of establishing their non/existence. The opposing approaches to time-space distantiated hazards need, I want to suggest, to be rephrased into something like: we assume processes and methods to be safe because we cannot tell whether or not they are dangerous or, alternatively, we assume them to be dangerous because we cannot tell whether or not they are safe.

Despite assurances to the contrary, historical evidence suggests that the majority of governments the world over have tended to go for the first option: safe until proven harmful. Geoff Tansey and Tony Worsley (1995) cite examples of dietary changes, brought about by industrial mass production and preservation methods, that were subsequently found to have harmful effects on the population.

In the UK, for example, it was retrospectively established that refined and canned foods had dramatically reduced the nation's health.

> The scale of the problem became clear during the First World War when the British carried out a mass medical examination of 2.5 million men in 1917-18. They found that 41 per cent of men supposedly in their prime were totally unfit for military service, mostly as a result of undernourishment. (Tansey and Worsley, 1995: 45)

In Asia it took 15 years to establish the link between the refinement of rice and Beriberi, a debilitating disease that attacks the heart as well the nervous and digestive system. The husks of rice, it was eventually realised, contained all the essential minerals and vitamins which were literally polished away with the production of white rice, leaving the population open to disease and declining health. Tom Elliott (1990: 44) reports from India, a country that permits the irradiation of food, where a group of malnourished children were given chapatis from irradiated grain. The children were monitored and as they grew it was noticed that their cell growth, just like that of the mice that were tested simultaneously, showed abnormalities. Innocent until proven guilty, the programme was stopped only after the 'evidence' achieved a scientific level of proof. 'The history of agrichemicals', writes Joanna Blythman (1996: 277), 'is littered with toxic substances that were considered safe and then consequently withdrawn when they were shown to be dangerous long after doubts had been raised about their safety'. The transformation of herbivores into carnivores and the insistence that it is 'safe' to eat meat from cattle that are potentially infected with BSE – as long as their spinal cords and brains have been removed – is only the latest in a long string of 'safe until further notice' incidences associated with the industrial way of life in general and its production of food in particular.

What also seems clear from the historical data is that the poor have been elected to be the canaries of the food system. By ensuring that new industrial alternatives to traditional foods are cheaper, the promoters of these foods are guaranteed a captive consumer group, keen to try the latest innovation. Tinned meat and vegetables, refined foods, jetsetting foods from across the world that have been chemically treated for beauty and storage, irradiated food, hormonally treated milk, baby milk contaminated with Chernobyl radiation – all are foods that have been duly tested by the poor, with and without their knowledge and/or consent. Choice does not even come into it when the cheapest option is the *only* alternative to starvation.

We need to appreciate further that a healthy crop of hazards is good for the economy. Financial traders are thriving on them. The creation of hazards facilitates the circulation of money: nothing like some good disasters to create the financial markets' ideal conditions of volatility. The ceaseless inventiveness and innovative capacity of business means that hazards are appreciated as sources of new opportunities. Moreover, damage to health shows up positively on a country's GNP, on equal footing with export and war. It creates jobs, keeps

hospitals, scientists and politicians busy. From an economic and from a scientific perspective, therefore, a healthy dose of hazards is an unmitigated good thing. Consequently, from these quarters we should not expect too much effort in the direction of preventing the damaging effects of industrial economic and scientific activities since they constitute one central source of their future wealth. What we get instead are protectionist measures that prevent public information and laws that safeguard the profits of big business no matter what. This has turned food purchasing into a political act and for social theory it has not only conceptual but political implications.

REFLECTIONS ON RISKS AND HAZARDS IN THE INDUSTRIAL TIMESCAPE OF FOOD

Undetectable for ordinary citizens and vigorously marketed by their producers, food-based risks and hazards have become an integral and ineradicable part of our lives. In this context where the senses are effectively sidelined, the public's safety depends primarily on the anonymous power of scientific knowledge and on money. That is to say, only science, the knowledge system that has created the hazards in the first place, is able to identify their presence and, secondly, only the corporations who obtain their wealth from producing, marketing and distributing them have the necessary financial power to instigate world-wide monitoring systems and to develop means to counterbalance the consequences, that is, chronic ill-health, the long-term prospect of pathology and disability and the fatal diseases that arise from them. Between the ensuing conflicts of interests arises an important space for social theory in general and time(s) based analyses in particular.

The indeterminacies associated with such hazards permeate our social fabric and reach deeply into industrial societies' knowledge bases. As such, their impact is far more extensive than notions of uncertainty, unintended consequences and risk would lead us to believe: their effects are of an ontological-structural and epistemological-cosmological nature (see also Szerszynski, Lash and Wynne, 1996; Wynne, 1992, 1996). Emphasis on uncertainty, for example, stresses the temporary nature of not knowing or not knowing to any degree of certainty. It suggests that something is uncertain until further research and scientific investigation are able to provide the expected clarity and certainty. The idea of unintended consequences accentuates rational choice in the conduct of individuals, implying that people make rational choices but under conditions where not all the consequences are within their controlling grasp. The notion of risk, finally, implies the potential for decisions and calculation. This in turn relies on the belief that the past is a reliable guide to possible future states. From a temporal perspective, these assumptions are found wanting. Irreducible indeter-

minacy, the political dimension of action, the distinction between risks and hazards, and the impossibility of proof are just some of the issues that are brought to the forefront of our attention when contemporary situations of risk are analysed from a timescape perspective. The language of invisible, immanent hazards, manufactured uncertainty and indeterminacy that is associated with a time(s) based perspective stands in stark contrast to the current public environmental discourses of scientific proof, certainty, prediction of the future based on knowledge of the past, risk calculation, and 'safety in the normal sense of the word' – a term that gained great popularity with the British Government during the BSE crisis. Equally noteworthy is the marked difference between, on the one hand, the focus on invisibility, immanence and latency of many industrially induced environmental hazards and, on the other, the dependence on sense data and measurement, the assumed homology between materiality and the real, the belief in proof, and the almost exclusive focus on space.

At the level of theory, therefore, the focus on time(s) takes our analysis in a number of unconventional directions. First, perceptions of risk tend to be intimately tied to understandings of what constitutes for whom dangers, threats and hazards. Today, however, a significant number of technologically induced hazards, such as the ones discussed in this paper, are characterised by an inaccessibility to the senses. They operate outside the capacity of (unaided) human perception. This im/materiality gives them an air of unreality until such a time as they materialise as symptoms. Whilst analyses of the social distribution of risk remain an important task for social theory, risks that are yet to materialise as symptoms fall necessarily outside the remit of this work. Yet, as Ulrich Beck (1992, 1996) points out in his theory of the 'risk society', the tremendous hazard potential is a defining characteristic of contemporary societies.

> The entry into risk society occurs at the moment when the hazards which are now decided and consequently produced by society *undermine and/or cancel the established safety systems of the provident state's existing risk calculation.*(Beck, 1996: 31)

When potential hazards become ever more central structuring forces of contemporary life, they clearly need to feature in the social analyses and theories of those societies.

Secondly, the focus on time(s) moves us out of not only the empirically accessible world of social facts but also the sphere of pure social construction. This is so because, on the one hand, the materiality of technologically constituted hazards always includes the virtual domain of latency, invisibility and contingency. On the other hand, socially constructed risks are also lived as potential harm. This im/materiality constitutes a difficulty at two different levels: it forces theorists to transcend not only the choice between realism and constructivism but also the reliance on the empirically accessible world of social facts. This means,

at the very least, the need to scrutinise and re-consider realism and constructivism, two of key options that lie at the very heart of the social sciences' epistemology and methodology.

Thirdly, and more importantly, it means doing battle with the sciences' untouchable icons: facts, proof and objectivity.[5] Focus on the im/materiality and in/visibility of the threats that suffuse the 'risk society', we need to appreciate, puts natural scientists, social theorists, news workers and members of the public in similar structural positions with respect to the truth, objectivity and certainty of knowledge. It destroys the privileged position of science and recognises instead the inescapability of perspective and interpretation: 'facts' about manufactured risks and hazards become, as Beck (1992: 23) insists, '*open to social definition and construction*'. This in turn bestows tremendous strategic advantage upon those able to define (and/or legitimate) risks – the mass media, scientists, politicians, agri-business, the bio-tech industry, transnational corporations and the legal profession, for example – and forces those outside this charmed circle into the weak position of having to react to pre-set agendas. Beck consequently points to the importance of risk 'relations of definition' (Beck, 1999) which he understands analogous to Marx's 'relations of production'.

The high level of indeterminacy, we can conclude, means that there is no one truth and that there are no facts outside the relativising influence of interpretation which, in turn, is coloured by context, position, perspective, interest, money, and power. There is no innocent knowledge to be had. A time-scape perspective on contemporary risks thus exposes disembodied information as a farce and reveals instead that (a) knowledge is principally embodied, contextual and positional, (b) there are no unambiguous, objective, scientific 'facts' to be presented and (c) taking up a position and to be positioned is inevitably a question of ethics. Such re-constituted social theory is crucial not only for aiding the important task of re-thinking basic assumptions – the new motive of *The Ecologist* – but also for providing an essential conceptual resource for people who currently struggle in the reactive mode against the powerful interests of those who define food safety, are able to stipulate what consumers need to know and equate progress with big science developments and technological fixes. For social theory to play such a crucial social role, it needs to provide analyses not only of people's perceptions, definitions and legitimations of such risks but also of the sociality of hazards created by techno science, globalisation and contemporary business practices. It needs to consider the variable impacts of these socially constituted hazards on involuntary recipients and identify significant differences between those who take risks and those who have to face the resulting hazards. It needs to make the invisible tangible and embody it in relations of power.

NOTES

[1] This paper is based on research conducted during an ESRC Fellowship (L320273125) under the Global Environmental Change Initiative (1994-6) and draws on material presented in chapter 4 of Adam (1998) *Timescapes of Modernity*.
[2] This shocking statistic was widely reported in the broadsheet and tabloid press and on television news across the channels. Moreover, it coincided with a special report on the *E. coli* outbreak in Scotland and the substantial increase in UK food poisoning on BBC2's *Food and Drink* programme, Tuesday 13 January 1998.
[3] For a list of food-borne diseases, their symptoms and their temporal profiles, see Tansey and Worsley, 1995: 61; for BSE see Adam, 1998 chapter 5; and Lacey, 1994.
[4] Joanna Blythman argues that Britain takes a more secretive approach than other European countries and the US. She writes: 'In practice, European supermarkets nevertheless post up notices indicating which potatoes have been treated with a sprout suppressant. In Britain, this is unheard of' (p. 29). With respect to the preservatives E230-233 she suggests, 'in many European countries and in the USA these treatments are indicated at the point of sale. In the UK, however, these additives are not declared either on the label or by way of a sign above loose produce, and so remain invisible to the consumer' (p. 29).
[5] My recent *Timescapes of Modernity* offers an extensive discussion on these issues.

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