A Clockwork Orange—served with whipped cream?

Dunedin, 1 November 2110 – At the dawn of the last century, a remarkable consensus began to emerge among statisticians, dieticians and biologists (in those days called molecular biologists). An epidemic of obesity was sweeping the rich, developed countries, bringing in its wake an outbreak of metabolic syndrome on a truly gastronomic scale. To a student of twenty-first century history, the consequences are as well known as the wars of the twentieth century were to our ancestors of those times, although perhaps just as avoidable.

It is truly amazing to look back at the headlines of 2010 and note that ‘nuclear proliferation’ was considered a far more serious issue than adipocyte proliferation. Yet in the decades that followed, billions of dollars were devoured by pharmaceutical corporations in search of a miracle drug to fight the pernicious effects of what came to be known as the ‘epigenetic theory of fat’. This was despite the fact that its mechanism was so invisible and elusive that no consensus was ever reached over what it actually was.

Compared with some of the more outlandish theories that had preceded it, this one did seem eminently plausible. One widely touted idea postulated the existence of an unseen, maternally transmitted endosymbiont, akin to *Wolbachia*—well known in insects—that brought about a global, selective sweep of otherwise maladapted mitochondrial genotypes. Poorly controlled cybrid-cell studies purported to show that ‘modern’ mutant DNA types were deficient in natural uncoupling mechanisms that would have allowed excess calories to be burnt harmlessly.

Since this was also the age of preposterous conspiracy theories, another widely believed explanation for the sudden and massive increase in waistlines across North America, Europe, China and finally even Africa, was that the drug companies of the day had cynically engineered a highly transmissible virus

to disrupt metabolic regulation. Indeed, several respectable laboratories reported the isolation of a putative culprit that was even given a name, but this was later shown to be a comparatively benign phage of *Helicobacter*.

Finally, the discovery that white and brown adipose tissue had a common developmental origin and could even be interconverted by an appropriate cocktail of growth factors, led to the hypothesis that obesity was a side effect of a common pesticide, food additive or recreational drug that disrupted the ‘white–brown axis’. Thousands of papers were published between 2010 and 2025 that supposedly identified every known environmental chemical as the key inhibitor of adipokine signalling, even the elevated atmospheric levels of carbon dioxide and methane were implicated—another early twenty-first century preoccupation that is fortunately no longer with us. Soon thereafter came the moratorium on organic farming, later relaxed so as to restrict only the use of animal manure, driven by the fervent proponents of the methane hypothesis and aided by the backlash launched by the chemical fertilizer industry. A worldwide ban on artificial sweeteners was enacted in 2022, on the basis of a large body of similarly spurious research. Undoubtedly, these measures only contributed to the problem they were supposed to alleviate.

The most obvious explanation for the obesity epidemic—namely that everyone was simply eating too much—seems not to have been seriously entertained until the first world food crisis of the 2040s. Yet even then, the result was decades of futile and ultimately catastrophic attempts at behaviour modification, commencing with the ill-fated neuroactive appetite suppressants (NEAPS), that proved to have exactly the opposite long-term effect.

Public health campaigns aimed at promoting dietary restriction were, of course, an

equally dismal failure. Given that the sharpest upturn in global food consumption coincided with the implementation of the worldwide smoking ban, this is hardly surprising. Fiscal measures were even less effective: government addiction to sin taxes was so entrenched that most historians consider the introduction of ACT (Added Calorie Tax) to have been little more than a cynical move to plug gaps in public revenue. The fiasco of the ‘BMI Charge’ was equally predictable, culminating in riots inspired by the British poll-tax revolt of the 1980s and the Tea Party uprising of 2011.

The resulting disorder, combined with what had become a crippling economic and social burden, finally forced the draconian measures of the 2070s, the calamitous aftermath of which we are still suffering. The history of antilapse therapy for alcoholism was so well documented that it is astonishing, in retrospect, that bulimomimetics were ever seriously considered, let alone administered involuntarily to the entire population, after the pro-choice option failed so spectacularly. The widespread collusion of scientists with this policy is an enduring shame. Thousands of such experts joined willingly in the effort to ensure that anyone whose blood glucose level rose above the limit prescribed by the UN was induced into a fit of violent nausea lasting many days. There is simply no moral value in the defence that this was merely the culmination of decades of mistaken public policy in which obesity research had been funded to the exclusion of virtually everything else.

In the twentieth century, totalitarianism was the last gasp of empires whose inevitable collapse had precipitated the World Wars. Ironically, the superficially benign system of global governance that emerged from the embers led to the calamitous repetition of such mistakes on a worldwide scale. Long ago, scientists should have warned of the dangerous futility of using scientific knowledge to develop instruments of social

control. That warning had already been issued by the great futurist writers of the twentieth century: Orwell, Burgess, Huxley and others. As we emerge from this foreseeable and preventable disaster, we need to remain

vigilant. Science is for finding out how the universe works, not for reshaping it into the form we would like it to be.

All predicted events in this account are by definition fictional and any semblance

to actual future events will be entirely coincidental.

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Our daily bread

Science & Society Series on Food and Science

A bowl of rice, a schnitzel with fries or a 30-course menu—no matter what form it takes, food is the most basic need for humans and a staple of civilization. It is also a major factor in our health and well-being; not having enough food causes disease and sickness, as does having too much of it. Malnutrition in impoverished nations is as much of a problem as the epidemic of obesity and associated diseases that are haunting developed and developing countries.

Given the enormous importance of food for humankind, it is puzzling that more money is spent on finding cures for the diseases caused by malnutrition, than on increasing our understanding of the effects of food on our health and how to make better use of such knowledge. Nonetheless, science has taken up the challenge of producing more and better food for a growing human population, and of developing a clearer understanding of the relationship between food and health. It is against this background that EMBO reports launches a series of articles under the general theme of ‘food and science’.

The biological sciences have, of course, much to contribute to the understanding of nutrition and health. Biologists must develop the knowledge to enable the production of sufficient food to sustain a human population that is expected to hit the 9 billion mark by 2050. In addition to raising food production without further degrading the environment, biologists and breeders are also looking at ways to increase the nutritional value of food; the famous ‘golden rice’—with an elevated content of vitamin A precursor—being one of the first examples. Molecular biology research is also needed to improve the analysis and processing of food. Wine making is one area in which plant biology, microbiology, molecular biotechnology and other fields have converged.

Science is also at the forefront of efforts to improve food safety, by tackling chemical

and microbial contamination. This remains a global public-health problem that affects all nations, as the recent scandal of *Salmonella*-infested eggs in the USA demonstrated. Microbiology and biotechnology are important for the development of tools to guarantee that our food remains free from pathogens and toxins.

Science is also unravelling how food influences our health. One particular area that combines the biological and social sciences is the understanding of why humans like and dislike particular foods. This has significant implications for public health; in the light of an epidemic of obesity, a better understanding of the biological and social causes of individual food preferences would help to develop public-health programmes to teach children and their parents how to choose a healthy and balanced diet.

Lastly, the natural sciences—chemistry, biology and physics—have enabled the development of new ways to prepare food, including molecular cooking. Famous chefs such as Ferran Adrià in Spain and Heston Blumenthal in the UK, as well as scientists such as Hervé This and Davide Cassi are revolutionizing cooking. An understanding of food and cooking processes at the molecular level has inspired and informed ingenious ways to prepare and present food.

It is not only biology that analyses our relationship with food; the social sciences are equally important, as our cultural and social environments have a huge influence on what and how we eat. As the series’ first article by Jane Wardle and Lucy Cooke (p816) demonstrates, many findings about individual food preferences, including the formative influence of parents and peers, have come from social science and psychology.

Media coverage of food scares and benefits also shapes our preferences. Once again, social science can show how reporting of the latest findings about the health risks and

benefits of foods, including broccoli, coffee and chocolate, affects consumer choices in the supermarket or restaurant.

Being able to choose our diet is actually a luxury for a minority. Many humans do not have such a choice; they eat what they can scrape from their land or whatever their limited means can afford. The spike in basic staple prices in 2007/2008 that triggered food shortages and riots in poorer countries is a reminder of how vulnerable millions of people are to the anonymous market forces that dictate global food prices. The economics of food has gained more attention lately: are market prices dictated purely by supply and demand, or are other factors at play? What could be done to temper sudden fluctuations in the future and ensure that markets do not cause hunger and riots again? Will the increasing contribution of science to food production price it beyond the reach of those who need it most?

Agricultural subsidies, particularly in North America and Europe, threaten the livelihoods of millions of poor farmers in developing nations. These subsidies might also have a negative influence on public health in rich nations, by encouraging the production of foods with low nutritional value, such as those with a high carbohydrate content. Economists and nutritionists have begun to look at the links between agricultural policies, food production and consumer preferences.

Science has many challenges to face in food research. It is not only about producing more food, but also producing more nutritious types of food to fight malnutrition. Science is also needed to analyse the link between food and health and to inform public-health programmes. EMBO reports now aims to publish primary research submissions from this and other applied areas of molecular biology.

Ultimately, it will require contributions from all the sciences to achieve these goals. The articles in the ‘food and science’ series will highlight how the natural and the social sciences are meeting these challenges, in diverse areas. We hope that you will enjoy this menu of articles over the coming months.

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