WN *Feedback*

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WN *Project Phoenix*

If the time is not now, it will come

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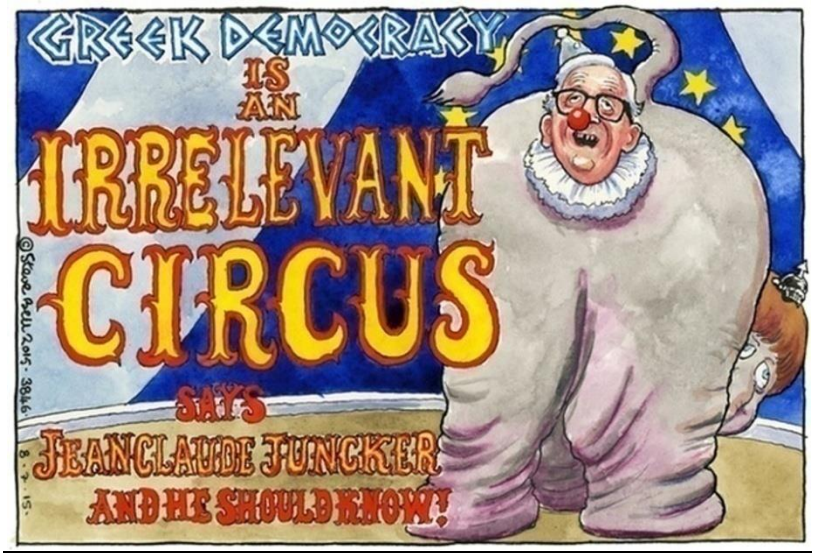
Access Raj's profile here

Access April 2015 Update on Project Phoenix here
Access May 2015 Update special on Project Phoenix here
Access June 2015 Update special on Project Phoenix here
Access June 2015 Mark Wahlquist, Claus Leitzmann, others, on Project Phoenix here
Access July-August Update special on Project Phoenix here
Access this issue commentary on Project Phoenix here

Project Phoenix team note

The *WN Project Phoenix* initiative concludes this month with a commentary outlining a whole new science fit to face the facts of this century. Here, world food policy authority and author Raj Patel, biologist and author Colin Tudge, two of the *WN* editorial team, and *WN* family member food technologist Anthony Fardet, make substantial comments on the nature and future of nutrition. Their emphases are different. They share one overall judgement. This is that the current convention is not absolutely wrong, so much as out of date – obsolescent and irrelevant, as specified in two of the *Project Phoenix* indictments. This amounts to what Thomas Kuhn in his *Structure of Scientific Revolutions* sees as a time ripe for a 'paradigm shift', to a new general theory of what works well in a world whose circumstances have changed, or when new knowledge forces a new integrated and effective way of thought and action. We agree. The new way is aptly seen as the phoenix arising from the ashes, able to fly. This thinking also shapes *WN* policy now and in future.



The crisis of nutrition science is part of a greater whole. The chaos inherent in the farcical and tragic impasse between the central European powers and the government of Greece is a current example of the still-dominant dogma that now must be replaced by sane, real and fair systems of governance

I write in response to the series of indictments published in *WN* since April (access them above, and see the final commentary in this issue). I became a nutrition professor this June, and have absolutely no place contributing to a discussion in a journal as prestigious as this, about the rebirth-through-fire of a discipline in which I'm barely a novice, writing among colleagues whose commitment to nutrition reflects decades of work. I do, however, have a history of working within professions whose houses are on fire.

If there's some small corner I might add to the discussion of how nutrition rises from the ashes, it's through some experience of coping with the grief of one's discipline in flames.

The five stages of grief

The Kübler-Ross model proposes five stages of grief. These are *denial*, when the shock of trauma has yet to register; *anger*, characterised by rage against the order of things; *bargaining*, in which deals are struck with a higher power to restore a loss; *depression*, when attempts to return to the past have proved futile; and *acceptance*, the bittersweet moment in which life continues, the scars of the past a permanent and fading reminder of loss.

Every discipline I've touched has at some point seen itself as making a deep and lasting contribution to the improvement of human affairs. All are, or have been, in grief at recognition of the impossibility of their task.

Let's begin with the discipline in deepest denial: economics. It still believes in an enlightened neutral position from which it can dispense good advice – and no orthodox economist is immune. While micro-economists might mistrust their macro-

economic colleagues, there's a deep connection between the tyrannies inflicted on Greece and the calculi of supply and demand. Occasional papers like *'Do good economists make bad citizens?'* are read as class assignments before Christmas, rather than a deep critique of prevailing assumptions and personnel of the profession.

Accomodation or revolution

Moving on, I've seen anger during my employment in the non-government organisation world, and as a student of sociology. Both are caught between the demands to make the world better, and the funding arrangements of capitalism that keep these approaches penned within a world they abhor. And those are the good NGOs and sociologists. The bad ones merely bargain with the established order, to make capitalism more survivable while doing nothing to move beyond it. Within sociology, the equivalent bargain has resulted in criminology, the boom industry of modern American social studies. If there's an analogue in nutrition, it could be that corner of the discipline that provides calorie counts for Coca-Cola, found in small print on the side of packages.

For depression, my current position in public affairs might fit - a slow churn of data-driven reports describe what ought to happen in public policy, even as the insane US political system makes reasonable discussion increasingly less relevant.

Is there a discipline in a state of acceptance? I was, briefly, a student of mathematics. I wonder whether the modern discipline would look the way it does, had it not been initially developed as a tool to describe the divine, the orbits of the stars and of all life below them. I suspect there's a Pythagorean moment that every field of study needs to pass through, one in which soaring aspirations are dashed, one in which the conditions that incubated the field in turn become the objects of study, to be examined and destroyed.

Perhaps Pythagoras isn't quite right – perhaps it's Oedipus.

Nutrition as a servant of power

Take a hard look at the conditions of the birth of nutrition science. Chinese nutritionists served temples and emperors, as did European ones, Galen in particular. The modern science of nutrition emerges through thinkers like James Lind, whose 18th century discoveries about lime juice helped the British navy avoid scurvy, or Staphen Babcock and Edwin Hart, whose single-grain experiments a century ago helped create the concentrated animal feeding operations that now produce so much cheap meat and expensive health problems.

Nutrition has always served the powerful.

The ability of a reborn nutrition to criticise power, particularly in capitalism's ecology, matters. In its new incarnation, to give a concrete example, public-private

partnerships wouldn't be the objects of envy or competition within the discipline, but subjects of study – and scorn.

A last call to prepare for action at a later better time, made by the US labour organizer Joe Hill before his execution exactly a century ago. If the time for transformation is not yet, now prepare for it

This is the kind of acceptance that I'd like to see nutrition embrace. I fear that this day is some time in the future, and in the meantime, we must – in the words of martyred labour activist Joe Hill - mourn, and organise.

*Patel R. WN Project Phoenix. If the time is not now, it will come [Feedback]. World Nutrition September-October 2015, **6**, 9-10, 744-747*

***WN** Project Phoenix*
Shifts to a holistic paradigm

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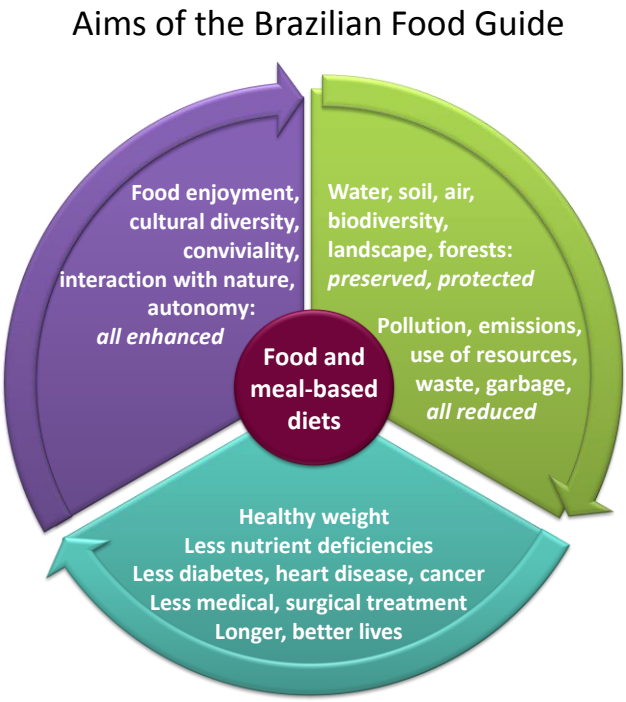
My theme in response to the *WN Project Phoenix* series (access these above) is 'defining a new paradigm so that a more efficient preventive nutrition arises from the ashes of nutritionism'. Today, nutrition science is undoubtedly in transition. As emphasised by Gyorgy Scrinis(1), David Jacobs and Linda Tapsell(2), and later by myself and Edmund Rock (3), the 'nutritionism' paradigm, which is to say reductionism, has largely prevailed. This attends to foods only as sums of nutrients.

This is not to say that nutritional reductionism is useless. It has indirectly saved very many lives, notably by elucidating the mechanisms of vitamin deficiencies. But reductionism is too prominent, to the point of being a dogma. Now its deleterious consequences are obvious.

Thus, reductionism has enabled and encouraged the fractionation and recombination of food ingredients in energy-dense, poorly satiating, ultra-processed food and drink products. If these were consumed occasionally in small amounts there would be no problem. But in many countries such products have become predominant, constituting in some urban populations the basis of their diet(4), contributing to the decrease of healthy life years. People in such countries may on average live longer than their parents did – but increasingly in a diseased state.

Diet seen as a whole



The new Brazilian food guide sees diet as a whole in all its aspects. As illustrated here, in the segments from top, left, these include the social, environmental and personal dimensions and benefits

Based on this finding and awareness, I propose five shifts amounting to a new paradigm for a new preventive nutrition to increase healthy life years. This has much

in common with the philosophy of the new *Brazilian food guide*, the benefits of whose recommendations are projected in the diagram above.

1 Shifting from a dominant reductionist approach to a holistic approach in nutrition research, which means considering nutrition as a holistic discipline with all its complex dimensions(3, 5).

2 Shifting from dominant curative nutrition to a more focused preventive nutrition, notably by studying more states of good health, not only searching for a differential effect between healthy and ill subjects(6, 7). Indeed, the healthy state has never been seriously characterised. By doing so, we will be able to elaborate new nutritional recommendations to maintain stable healthy states within the range of natural variation.

3 Ranking foods in epidemiological studies according to their degree of processing, to reach more solid scientific evidence as regards with association with chronic disease risks(8, 9), notably based on a classification such as NOVA (10). Indeed, increased prevalence of chronic disease risk is associated with a high consumption of ultra-processed food products(11, 12), not with food groups as such, like fruits, vegetables, dairy. This is well illustrated by the Western and Mediterranean diets, the former being characterised by a high quantity of ultra-processed products and higher risk of chronic diseases, and the latter by a high quantity of minimally-processed products and a lower risk of chronic diseases.

4 Defining food health potential based not only on nutrient density but also on food structure properties, vital to satiety, the synergy of nutrient physiological actions, and nutrient bioavailability(13-15), Nutrient composition is not sufficient. Food structure indices should now be developed, according to the extent which food is broken down, (16) and degree of satiety (17).

5 Shaping the framework or design of human interventional studies. When these are based and derived from a pharmacological approach or design (7) they do not correspond to real life and are not really applicable in preventive nutrition. New and future intervention studies should be of 'real life' situations, including quality of life, emotional factors, energy input and output (physical exercise), and also environmental impacts.

Acceptance and use of a holistic paradigm for epidemiological studies, and for characterising food health potential, is now necessary and indispensable. Nutrition education, based on food health potential according to degree of processing, including the role of food structure and nutrient density, should be promoted in primary and high schools and universities. In this way populations will be well-armed against the pressure of corporate advertising of harmful products.

A holistic vision of diets should encompass their global health effects, and their environmental impacts and socio-economic and cultural aspects. The definition of what is a healthy diet should not be dogmatic and normative, implying only one type of diet. By adapting to specific local or regional realities, it should respect cultural habits, religious beliefs, environment, the pleasure of eating, and also the well-being of farm animals. Healthy and sustainable diets are plant-based; dietary energy from food of animal origin should amount at most to one-sixth of total intake (18).

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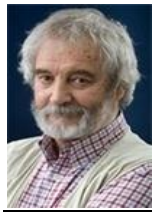
*Fardet A. WN Project Phoenix. Shifts to a holistic paradigm [Feedback]. World Nutrition September-October 2015, **6**, 9-10, 747-750*

***WN** Project Phoenix*

From facts to wisdom



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'Facts alone ar wanted in life', asserted the ferocious Dickensian schoolteacher Thomas Gradgrind. Only now is nutrition and biological science generally freeing itself from such rigid narrow confines

Apparently people are asking, 'Has nutritional science run its course? Have we answered all the main questions and should we move on?'

Of course not, is the short answer. In similar vein, Lord Kelvin (allegedly!) suggested at the end of the 19th century that physics was all done and dusted, apart from polishing up the odd coefficient. Then Albert Einstein came up with relativity and Max Planck made the observations that kicked off quantum theory, and physics, and indeed the whole world, were never the same again. There was still a lot to do even within the classical, Newtonian framework of the 19th century. More to the point, physics (and science, and all philosophy and art) were about to undergo what the

American philosopher of science Thomas Kuhn has called a 'paradigm shift': a complete change of perspective.

Within 'conventional' nutrition too there is still a lot to be done. But the perspective of the whole science – indeed of all biology – is shifting. What we have seen so far, as Winston Churchill said of World War II in 1941, is merely the end of the beginning.

Cryptonutrients

The past few decades have seen at least three huge developments within nutritional science itself. The first is the rising interest in what the pharmaceutical industry calls nutraceuticals, and the food industry calls functional foods – though stripped of all their commercial baggage they are properly called 'cryptonutrients'.

These include what surely will prove to be many thousands of materials obtained from food in minute quantities that are not exactly essential to health, in the way that vitamins are, but which in some people at least are beneficial. Very obvious examples, already well commercialised, are the plant sterols that often seem to lower blood cholesterol. (Relative) lack of plant sterols will not incapacitate or kill people in the short to medium term, as deficiency of vitamin C or A will do, but it might on average knock a year or two off people's livws, and line them up for chronic arterial disease that they might otherwise have avoided, and generally reduce their vigour. Thus, in action, a cryptonutrient is somewhere between a vitamin and a tonic.

If there is such a thing as a cryptonutrient, and there surely is, there could be many thousands of them. Furthermore, they will not operate in isolation, any more than any other nutrient or drug can do. Always, therefore, we will be looking at cocktail effects; and then the number of possible combinations approaches infinity. The effects on health will be elusive (how can you tell if a person's life has been lengthened or shortened by a small percentage? None of us come with doppelgangers to act as controls) and will vary from person to person, so it is very difficult to gauge the effect of any one cryptonutrient.

Given that there are probably many thousands, and a virtual infinity of combinations, there is not enough time left in the universe to pin down with anything resembling certainty what they all do, even if we spent the global gross national product on the research. So some scientists of the hard-nosed type may be wont to give up on cryptonutrients (except perhaps for commercial purposes). But biologically speaking, their existence and their significance is perfectly plausible, and indeed is to be expected.

Our physiology is much older than is the human species. Much of it is inherited from our pre-human ancestors, going back to our fishy days and before that to our protozoan and even to our prokaryote days. The evolutionary history of each and every one of us stretches back for nearly four billion years. Through all that time our ancestors have adapted to everything the world threw at them (either that, or endured

and possibly died) and that would have included billions of recondite molecules produced not least by other organisms, many of them pharmacologically potent.

Our ancestors must have evolved mechanisms to cope with whatever was potentially toxic, and – for evolution is marvellously opportunistic – in many cases would have turned whatever came their way to their own advantage. The classic example is oxygen. This is horrendously active, and the mother of all toxins for creatures not adapted to it, but is now essential to all the forms of life that we presume to call 'higher'. Without aerobic respiration we'd still be living in swamps. (But still we have to load our bodies with anti-oxidants).

So on such albeit arm-waving evolutionary grounds alone, it seems that cryptonutrients *must* be a fact of life. God only know what, over time, our ancestors have been exposed to, and what they have become adapted to.

Yet for logistic reasons– there are too many of them, and their effects are very difficult to pin down and undoubtedly vary from person to person – our knowledge of cryptonutrients must always be broad brush; either that, or confined to a very short shortlist of the more conspicuous kinds that can be turned to commercial advantage. The best we can say in practice is that animals, including us, ought to seek out a diet that is as various as possible.

Wild animals know this of course. Lions relish the guts of their prey and may leave the steaks for the vultures, while cattle and sheep given the chance eat a huge variety of herbs – and browse! – and when plied exclusively with custom-bred pasture and fed with nutrients and supplements measured to the nearest gram they still grow sick. They miss the variety, though the variety is full of unknowns. (There is at least anecdotal evidence that cattle allowed access to wild vegetation are less susceptible to bovine tuberculosis).

Gut biota

A second revelation has been the role of microbes in human nutrition and health in general. Dietary fibre turns out to be important largely because of its effects on the gut flora, which in turn among other things profoundly affect the nature of various organic molecules, including bile salts, that are reabsorbed from the gut and re-cycled.

Nature these days is full of articles describing the response of the flora in the gut and on the skin, to changing diets and other circumstances, and the knock-on effects are only beginning to be glimpsed. That cattle and other ruminants – and indeed all herbivores – depend absolutely on their gut flora has long been appreciated (though far from fully understood) but now it is obviously true of all species. By the same token, soil scientists now appreciate more and more that the organic farmers were right all along. The structure of the soil and the health of plants depends at least as much on the microbes that live in it as on the inorganic radicals that conventional agriculturalists take more seriously, that farmers are encouraged to add.

This elephant is not dead, but drunk, having raided a beer factory. Fermentation is a fascinating food process. It can enhance nutritional quality, and create delicious including psychoactive products

Microbes, in short, are emerging as the universal intermediaries between macro-organisms like us and oak trees, and the physical world. They are key players in our personal ecospheres. Antisepsis has its place beyond doubt, but the attempt to sterilise the whole world that pervaded both medicine and agriculture through much of the 20th century can now be seen to be counter-productive, or at least was taken much too far. My Granny used to say, 'Eat a peck of dirt before you die', and she was surely right; advice reflected not least in the modern vogue for dosing patients on faecal extracts. Eating dirt can be risky, of course, if unsupervised, but so can too much cleanliness. All in all, the microbiology of nutrition is a huge and exciting area.

The streams of cryptonutrients and of microbiology converge in the endlessly complex realms of fermentation. Fermented foods include some of the most important and most delectable of all our provender (bread, cheese and all the other fermented milks, booze, pickles from chutney to *sauerkraut, tempeh, miso*, and so on and so on) and also some of the most toxic.

The line between delectation and putrescence can be very narrow. Wild animals too benefit from fermented foods – from the many famous tales of drunken elephants (they raid palm wine factories and sorghum beer breweries), to Keats's drowsy autumn wasps zonked on mouldering pears. I reckon too, teleologically speaking, that dogs bury bones not simply for storage but to increase their pharmacological value. Who knows what cryptonutrients and antibiotics and all the rest may reside in a stinky skeleton.

What is 'truth'?

Thirdly, in all biology, I am struck by the rise of the idea of narrative, with its often anthropomorphic undertones, into respectable discourse. The biology I studied at university in the early 1960s was obsessively hard-nosed. It seemed to be assumed (as many still maintain) that science was leading us inexorably towards omniscience.

Buoyed up by logical positivism, it was taken to be obvious too that all other sources of knowledge were inveterately flaky, and were best ignored. As Thomas Gradgrind insisted in Dickens's *Hard Times,* 'Now, what I want is, Facts… Facts alone are wanted in life. Plant nothing else, and root out everything else'. A fact was perceived as whatever could be directly observed and measured. Mathematical extrapolation would take care of the rest.

In biology, in this vein, the great enemy was anthropomorphism. We were not allowed to ascribe human-esque concepts to non-human beings. In the experimental psychology course, the concepts of thought or emotion were banished. Animals were just machines that responded to stimuli, as Descartes asserted in the 17th century; and we humans, were somewhat more complicated machines. 'Stick to Facts, Sir!', as the redoubtable Thomas had put the matter.

Now the attitude has become more nuanced. What *is* a fact, exactly? (In a court of law it's what the judge says it is. The rest is 'inadmissible'). How can we be certain of anything? More broadly, it seems that everything we know or think we know is a story that we tell ourselves – a narrative; and what we take to be 'true' is a story we happen to find convincing. More specifically, it becomes more and more obvious that the old Cartesian view of animals as just responsive machines does not work. Like us – like all organisms in fact, conscious or not – they make sense of the world by telling themselves stories, and are in this crucial sense intelligent.

Intelligent beings, whether human beings or oak trees, differ from mere machines because they do *not* simply react according to the Newtonian laws of physics, to the stimuli with which they are confronted. Their responses are highly selective. They ignore some stimuli altogether (just as high court judges do) – oak trees and mushrooms have a great sense of what is irrelevant and what really counts – and they infer far more from some stimuli than the stimulus itself seems to warrant. In other words they treat all incoming data as grist to their own internal narrative. Machines do not.

The wisdom of uncertainty

This principle is very evident in the science of nutrition. Thus it has been clear for many decades (even when I was at university) that the feeling of hunger does not depend only on the amount of sugar in the blood. There are all kinds of other physiological and sensory cues, including extraneous sights and smells. But what perhaps matters most of all is expectation and *attitude*. Fasting is an obvious example. Many aboriginal peoples are forced to fast for some weeks of each year, and to get through it they seem simply to decide that they don't want to eat. When there isn't any food, that may seem straightforward enough, but fasting westerners can adopt the same technique even though surrounded by *petits fours* and *croquembouche*.

The conscious mind tells the body that food is forbidden and the body obliges by not asking for any, or sometimes may decide for itself. Either way, something we may vaguely call 'mind' mediates food intake, and to an unknown extent determines our response to the food we do consume. 'We are what we eat' is not quite true. The metaphor is altogether too mechanical. What we eat or decide not to eat can be seen as a sub-plot of our own internal narrative, or as part of our body's grand dialogue with the world at large (in which our conscious minds may play very little part).

The concept of cryptonutrients and the renewed appreciation of microbes are internal shifts in the science of nutrition that present huge challenges and possibilities. The general realisation that life is too complicated to analyse exhaustively, and that the future is innately unpredictable, is a true paradigm shift that affects all science. It knocks on the head forever the 18th century Enlightenment conceit that we are edging inexorably towards omniscience. The idea that all our understanding in the end is narrative, a story that we tell ourselves, including the insights of science, is both chastening and exciting. Life remains mysterious, and always will be.

The paradigm shift extends, or should extend, to all of life. For these past 200 years or so westerners have tended to put science on a pedestal, to look to it as the source not only of remarkable insights, which it does provide, but also of wisdom, which it does not. Thus politicians and tycoons speak of 'science-led policy', by which they mean for example that if some trial shows that some genetically engineered crop grows better in some circumstances than 'conventional' crops do, and is potentially profitable, then we should put political weight (and taxpayers' money) behind it.

But if they could only see that science itself deals in partial truths and innate uncertainties, and is itself a narrative, they surely would put it more into perspective. They surely would see that the people who have been living and coping with innate uncertainty for 10,000 years – traditional farmers – are telling a richer narrative, precisely because, however extensive their knowledge, in the end they know they must trust their intuitions. Cooks do the same – and physicians too. They know they must work with uncertainty. They are guided by science but in the end they rely on intuition.

So the science of nutrition stands where all sciences ought to stand. Not pretending to omniscience. Not seeking to override all other sources of knowledge. Accepting its own innate limitations, and content to contribute its own special insights to the general wellbeing of humanity and the biosphere. That is a far more realistic agenda and much to be preferred.

*Tudge C. WN Project Phoenix. From facts to wisdom [Feedback]. World Nutrition September-October 2015, **6**, 9-10, 751-756*