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WN *Here I stand*

What they believe: 22. Ancel Keys
The man who knew it all, *and other stories*



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Access Geoffrey's profile here

Rio de Janeiro, Juiz de Fora. In my 'What they believe' series I appraise Ancel Keys, who since the 1940s has in various ways been the most influential nutrition scientist in the world. Then I commemorate Sidney Mintz, whose masterpiece *Sweetness and Power* shows that the triangular trade including slaves and sugar was the driving force of the Industrial Revolution. Then I say that Jean-Baptiste Lamarck was right all along when he claimed that evolution is driven at least in part by inheritance of acquired characteristics, not just by random mutation as Darwinists claim.

Those of you who work out in a gym will know the spiral above as the trademark of Nautilus, the ingenious machines that enable you to pep up all your bits in sequence and severity. Yes, I am working out, and also am working out the significance of physical activity, because I think most of the experts are wrong.

As flagged in our editorial, this is my final column for *WN*, because this is the final *WN* of which I am editor and a columnist. We all here are now preparing for our new website and journal *Nourish*, to begin for May. Until then! To receive regular newsletters, please send an e-mail to news@nourishnet.org



***WN** Nutritionists*

What they believe: 22. Ancel Keys
The man who knew it all



The US physiologist Ancel Keys (of the penetrating gaze, and on the cover of Time magazine) has proved to be uniquely influential. After sustaining the US army and studying the impact of starvation (top row) he identified saturated fat as a main cause of coronary heart disease, and promoted the 'Mediterranean diet'. Much of his work has turned out to be unhelpful, misleading, or wrong

The US physiologist Ancel Keys (1904-2004) was a titan of modern nutrition. He has had a greater impact on the nature and quality of US food systems and supplies, and therefore those of most countries, than any other scientist in the post-vitamin era. Supremely self-confident and assertive, his ideas in areas that interested him came to dominate dietary policy and practice. Some still do.

Most ambitious scholars climb to the top of their profession by being in the right place at the right time, or because of one great sustained achievement. Ancel Keys, a phenomenal master of collaborators, scored four triumphs. One was invention of the K (maybe for Keys) rations that sustained US soldiers in World War 2 and boosted production of ultra-processed products. Two was the mammoth 'Starvation Experiment' that should have proved finally that dieting makes you fat. Three was his relentless insistence that saturated fat is the leading dietary cause of coronary heart disease, which became the 'consensus position' for half a century until its recent disintegration. Four was his discovery – or invention – of unique protective properties of the 'Mediterranean diet'. Like some other celebrated scientists, his reputation rests on claims that became accepted official and mainstream policy, but which have turned out to be flawed, unhelpful, misleading, or wrong.

One. Brand K

Ancel Keys was energetic, zealous and persuasive. In his later 30s he got lucky. In 1940 he was called by Colonel Rohland Isker of the US Army Quartermaster Subsistence Laboratory, who asked him to devise a day's 'combat meals' to be carried in a pack or pocket. He was not a trained nutritionist and had never done anything like this before. But necessity drives invention. Col Isker and he devised a diet from hard tack, dry sausage, candy and chocolate that they purchased from a Witt's, a Minneapolis grocery store, packing them into plastic Cracker Jacks boxes. *This was adapted by the army as 'K' rations* for GIs in battle.

Supplemented with packets of salt, sugar, coffee powder, gum, cigarettes and matches, plus free soda supplied by Coca-Cola, this combination of dry mostly very energy-dense products, delivering 3,200 kilocalories a day, was just the stuff to give the troops. In 1944 wartime, production was 105 million rations. This explains the cry of urchins in Europe, 'got any gum, chum?' US soldiers got used to consuming packaged products. Food science and technology accelerated, shaping the US and then the global industrial food system. The legend – maybe correct – is that K stood for Keys. Aged 40 he was branded as a man who had helped to win the war.

Two. The Starvation Experiment

In 1944 Keys decided to mastermind study of the impact of food shortage, hunger and famine, then threatening or afflicting hundreds of millions of people. Opportunities for research were boundless. He masterminded a big team to undertake what became known as the *Starvation Experiment*, with 36 young men as subjects, carried out in 1944-1946. Funding came from famine relief organisations, the Sugar Research Foundation and the Dairy Council, and other sources. The findings were published in 1950 as a stupendous two-volume 1385 page Biology of Human Starvation. My good friend Claus Leitzmann sent a copy to me from the University of Giessen library, I read it as I researched the new edition of my book *Dieting Makes You Fat*, published in 2008, and it is on my desk here now.

The experiment had an unexpected result. After the men were no longer underfed, and told they could eat whatever they wanted, they gorged. After 20 weeks their weight was 5 per cent more than before the semi-starvation regime, and they were 50 per cent fatter. Over a year later they were still 2 per cent heavier and 5 per cent fatter. This finding seemed very important to me. It still does. But Ancel Keys had no special interest in obesity, let alone its causes.

The Biology of Human Starvation is a stupendous monograph. Very well written, it elaborates the physiological description and medical diagnosis of starvation. It is not concerned with the care and treatment of people who are starving, or about prevention of starvation. The fact that it was published too late to help organisations dedicated to postwar starvation and famine relief was immaterial. This was not its purpose. The experiment was pure science. It was not followed up long-term. Ancel Keys moved on, as mastermind in a new type of war.

Box 1

A celebration of Ancel Keys

This is an edited version of an uncritical account of Ancel Keys, found on the internet, with additions from his Wikipedia entry. An interview with his Seven Countries long-standing colleague at the Unversity of Minnesota Henry Blackburn can be accessed here.

Ancel Keys (1904-2004) was born in Colorado Springs. He had many jobs to support himself before becoming a renowned physiologist. As a boy he worked in a lumber camp for a while, and then shovelled bat guano in an Arizona cave. He served as a powder monkey in a Colorado gold mine and later as a clerk in a Woolworth store. In 1939 he married Margaret, a biochemist, and they would go on to work together studying physiology and nutrition.

Keys' initial work led him to study how the human body reacts to starvation. He had also been performing blood tests on himself in the Andes Mountains to see how the body reacts to high altitudes. The War Department heard about his work and in 1941 asked him to develop pocket-size food rations for Second World War paratroopers. This led to the legendary K rations (K for Keys) given to hundreds of thousands of American troops. The initial ingredients were procured at a Minneapolis grocery store – hard biscuits, dry sausage, hard candy, and chocolate. There were many complaints from the soldiers about the small nutrition-packed meals. But some others were thankful, like the 25 men who survived for ten days in a half-submerged transport plane with nothing but K rations and a gallon of water.

Later in the war, Keys and his colleagues at the University of Minnesota recognised the need to treat starvation safely, because simple overfeeding would be risky. In 1944 he devised and controlled his 'Starvation Experiment', with 36 conscientious objectors to war as test subjects. They were given a strictly supervised low-energy diet, obliged to become very physically active, and were measured as they became emaciated. The results were not collected and analysed until after the war. They were circulated to relief organisations in Europe and published in 1950 as the 1,385 page *Biology of Human Starvation*.

The saturated fat doctrine

In 1958 Keys began what was then the biggest epidemiological initiative of its type. This was the *Seven Countries Study.* It followed 12,000 healthy middle-aged men living in Italy, Greece (Crete), Yugoslavia, the Netherlands, Finland, Japan and the US. One striking finding was that in Finland and the US, where consumption of animal fats was then very high, the rates of heart attacks were far higher than in other countries – notably Crete, where consumption of fat from olive oil was measured as very high, but of saturated fat was low.

This and other findings led Keys to confirm his hypothesis that saturated fats are the main dietary cause of heart attacks. Following this he made it his mission to encourage people to eat less saturated fat, mostly from foods of animal origin such as meat, milk, butter and cheese, in order to protect against heart disease. For this and similar work he was featured on the cover of *Time* magazine in 1961. Since then, over 800,000 lives have been saved following his advice. He once said 'There's a little hotel in Brussels that I stop at now and then, and every time I go in there the *maitre d'* says, 'Ah, Monsieur Cholesterol!'

Positively, Keys determined that a traditional Mediterranean diet, which he identified as high in olive oil, pasta, bread, fruits and vegetables, protects against heart disease. In the early 1970s he and his wife Margaret moved permanently to Pioppi, a viilage in southern Italy near Naples, and he died there in 2004 aged 100.

Three. Saturated facts

In 1955 Ancel Keys got lucky again. He was already intrigued by the number of US men who were dropping dead from heart attacks. He guessed that the reason was fatty diets. Then he worked with collaborators also in Italy, Spain, South Africa and Japan, confirming that high rates of heart disease and of dietary fat correlated, and *vice versa*.

He got lucky because in 1955 the then US president war hero Dwight (Ike) Eisenhower (in office 1953-1961) suffered the first of a series of heart attacks. The leading heart disease specialist Paul Dudley White (1886-1973) appointed the president's personal physician, was a buddy of Keys. They both enjoyed vacations in southern Italy, and had seen for themselves that rates of heart disease and of fat consumption were very low in the northern Mediterranean. So Keys got unprecedented human, material and financial support for what became the Seven Countries Study, which began in 1956. He decided that he would solve the problem of heart disease in the US and worldwide, after testing his fat hypothesis on populations in the seven countries of the US, Finland, the Netherlands, Italy, Greece, Yugoslavia and Japan.

This initial idea did not work out. What jumped out of the data as presented, was a tight correlation between rates of heart disease and consumption not of fat in general, but of saturated fats, until then unknown except to nutrition specialists. Another result, based on findings from Crete where the peasants studied had few signs of heart disease, was that monounsaturated fats were innocuous. The subjects were recorded as consuming an average of 40 per cent of dietary energy from fat, much the same as people in the US where coronary heart disease had become the number one killer, but mostly from olive oil.

So long before the Study results were first formally published in 1970, Keys made his mind up again and refined his new hypothesis, stating categorically that the chief dietary cause of heart disease was saturated fat as contained in milk, cheese, butter, lard, beef and pork, and in margarines, shortenings and chocolate. He was backed by the American Heart Association, dominated their dietary guidelines committees, and stamped on alternative theories, including those that implicated sugar and in general refined carbohydrates. On 13 January 1961 he was lionised, on the cover of Time magazine. Saturated fats became demonised.

But there is a problem with the Cretan results, which *following a report in 2003* I *pointed out in 2004.* Cretan peasants then were practicing followers of the Greek Orthodox religion, which requires fasting for 200 days a year, on low-energy diets high in vegetables, legumes and fruits, and low in – olive oil. But astonishingly, the Study overlooked these periods of fasting, which meant that overall consumption of fat and of olive oil in Crete at that time was not high. Why? Perhaps Keys as an atheist was not interested. But it is hard to believe that his collaborators in Crete knew nothing about the dominant Church's dietary proscriptions. Could they, and Keys, have preferred not to know?

Box 2

Books by and about Ancel Keys

Most of Ancel Keys' work is published in scientific journals or as monographs. Books and reports that list him as author were never written by him alone. They include *The Biology of Human Starvation (co-authors Josef Brozek, Austin Herschel, and many collaborators)* 1950. *Eat Well and Stay Well* (with Margaret Keys), 1959. *Coronary Heart Disease in Seven Countries (editor),* 1970. *The Benevolent Bean* (with Margaret Keys), 1972. *Eat Well and Stay Well the Mediterranean Way* (with Margaret Keys), 1975. *Seven Countries. A Multivariate Analysis of Death and Coronary Heart Disease* (with Christos Aravenis, Henry Blackburn, Ratko Buzina *and many others*) 1980. *Lessons for Science from the Seven Countries Study* (with Henry Blackburn and many others) 1994. By other authors. *The Great Starvation Experiment: Ancel Keys and the Men Who Starved for Science* (Todd Tucker, 2007). *Genius and Partnership. Ancel and Margaret Keys and the Discovery of the Mediterranean Diet* (Joseph Dixon, 2015).

The 1983 report was from Crete's leading nutrition scientist Anthony Kafatos, and I corresponded with him. *His published letter in reply* states

> It still remains unknown whether the results of the Seven Countries Study in Crete, which have been very widely cited and have crucially influenced dietary guidelines and industrial practices all over the world, were about olive oil in particular, the Mediterranean diet in general – or the beneficial effects of fasting in the sense of regular restriction of certain foods, notably those of animal origin. From our own recent studies, we are sure that the effects on serum lipids and longevity of fasting according to Greek Orthodox Church practices would have been significant, if relative data had been made available in the Seven Countries Study. Geoffrey Cannon was right to propose this.

Given also the shattering confounding factor of *trans*-fatty acids, whose consumption correlates tightly with prevalence of coronary heart disease, Ancel Keys' saturated fats theory, which until a few years ago was dominant, may be a house of cards.

Four. His Mediterranean diet

Finally, 'everybody knows' that 'Mediterranean diet' is especially healthy, that olive oil is a staple part of that diet, and that olives have been grown in the Mediterranean region for 4,000 years or more. In his 1975 book *Eat Well, Stay Well, the Mediterranean Way*, coauthored by Margaret his wife, written after they had left the US to live in southern Italy near Naples, Keys celebrates his discovery of the Mediterranean diet as uniquely life- and health-preserving.

But there is no one 'Mediterranean diet'. The term actually applies to the traditional and originally ancient diet of the north and eastern part of the region where olive trees are abundant, and in particular Greece (including Crete), and southern Italy, France and Iberia. Also, while there are general universal rules for good health – meal-based diets mostly made from a great variety of foods of plant origin, for example – the best specific dietary pattern for any part of the world is that which works best in that specific culture, climate and terrain.

Box 3

A criticism of Ancel Keys

This is an edited version of a critical account of Ancel Keys's saturated fat hypothesis by John Tierney published in the New York Times in 2007

In 1988 the US surgeon general, C. Everett Koop, proclaimed ice cream to be a public-health menace right up there with cigarettes. He announced that the American diet was a problem of comparable magnitude, chiefly because of the high-fat foods that were causing coronary heart disease and other deadly ailments. He introduced his report with these words: 'The depth of the science base underlying its findings is even more impressive than that for tobacco and health in 1964'.

This was a ludicrous statement. The notion that fatty foods shorten your life began as a hypothesis based on dubious assumptions and data; when scientists tried to confirm it they failed repeatedly. It may seem bizarre that a surgeon general could go so wrong. After all, wasn't it his job to express the scientific consensus? But that was the problem. Dr. Koop *was* expressing the consensus.

Unable to keep up with the volume of research, doctors look for guidance from an expert — or at least someone who sounds confident. In the case of fatty foods, that confident voice belonged to Ancel Keys, a prominent diet researcher a half-century ago. He became convinced in the 1950s that Americans were suffering from a new epidemic of heart disease because they were eating more fat than their ancestors.

To bolster his theory, Ancel Keys in 1953 compared diets and heart disease rates in the US Japan and four other countries. Sure enough, more fat correlated with more disease. But critics noted that if he had analysed all 22 countries for which data were available, he would not have found a correlation. The evidence that dietary fat correlates with heart disease 'does not stand up to critical examination', the American Heart Association concluded in 1957. But three years later the AHA changed position — not because of new data, but because Dr Keys and an ally were on the committee issuing the new report. It asserted that 'the best scientific evidence of the time' warranted a lower-fat diet. The AHA report was big news and put Dr Keys on the cover of *Time* magazine, which devoted four pages to the topic. That set the tone for decades of news media coverage.

Keys casts a long shadow

Sceptical scientists were sidelined and the public debate and research agenda became dominated by the fat-is-bad school. Later the National Institutes of Health held a 'consensus conference' that concluded there was 'no doubt' that low-fat diets 'will afford significant protection against coronary heart disease' for every American over the age of 2. But when the theories were tested in clinical trials, the evidence kept turning up negative. The low-fat recommendations, besides being unjustified, may well have been harmful by encouraging people to switch to refined carbohydrates.

Edward Ahrens, a lipids researcher, spoke out against the low-fat consensus. In the late 1970s he was asked at a Senate hearing headed by George McGovern to reconcile his scepticism with a survey showing that the low-fat recommendations were endorsed by 92 per cent of 'the world's leading doctors' He replied 'I recognise the disadvantage of being in the minority', but pointed out that most of the doctors in the survey didn't work in this field themselves. 'This is a matter of such enormous social, economic and medical importance that it must be evaluated with our eyes completely open. I would hate to see this issue settled by anything that smacks of a Gallup poll'.

The wise guy

Nutrition – like other sciences – is not just a dispassionate methodical search for and discoveries of facts that become identified as evidence eventually accepted as 'the truth'. That's what many scholars like to think. This is a myth. The reality is much more inclusive and interesting. As *Karl Popper* states in his *Logic of Scientific Discovery,* with all really original work ideas come first, followed by concepts and principles, all then tested against reality, including what is 'out there' – situations and circumstances.

Scientists also are not disinterested. They may think they are, but most important is their situation, passion, ideology and character. The quest of many ambitious researchers is for the big idea which they then transform into findings they strive to own, either by the momentum of publication, or by recognition by prizes up to the big one – the Nobel, or by patent protection.

Further, to rise to the pinnacle of fame and power, nutritionists – and other scientists – typically need zeal, luck, charm, pull and force. Ancel Keys had all these going for him plus war, always a supreme driver of new technology and catalyst of innovation and initiative. Wars are usually won by the best supplied and fed forces, and lost by those that run out of food or become deficient in specific nutrients. Keys became a dictator, marshalling mind-boggling arrays of data accumulated by teams of researchers, designed to prove his points. He knew that ideas come first. He also knew that his big ideas were true simply because they were his ideas. In slang language, he was a 'know-all' or a 'wise guy'.

Few great personalities are wholly good or bad. Acts also have unforeseen consequences. Ancel Keys could be judged as follows. K rations sustained the US army but accelerated the technology of ultra-processed products, now wrecking the health of populations throughout the world. The colossal Starvation Experiment has helped people who are starving in the real world, and its evidence that low-energy dieting regimes cause the problem they are meant to solve has never been influential.

His hypothesis that saturated fats are the leading cause of coronary heart disease was supported by tendentious data, was ignorant of the vast confounding factor of *trans*-fatty acids, rejected evidence against sugar and refined carbohydrates, concentrated its attack on fresh and less processed animal foods, and was mystifying. The 'Mediterranean diet' as he formulated it is also based on partial data, and is just one example of dietary patterns based on appropriate regional or local foods which take different forms all over the world.

Little of this would matter if Ancel Keys was just another nutrition scientist. But he is the Napoleon of nutrition, supreme during his times of triumph, who after his death remains a shaper of official and professional thinking, policies, decisions and actions. Leading policy-makers and scholars believed in his hypotheses because they believed in his doctrines and in him as fervently as he did. They still do now, even without knowing much if anything about him. On the whole, I reckon that his impact on world health has been and still is disastrous.



WN *Sugar. SidneyMintz*

Slavery, sugar, and global power

Access October 2007 The Guardian Ian Jack on Sidney Mintz here
Access 2012 Follow the Things Anita Badejo et al on Sweetness and Power here
Access this issue Geoffrey Cannon on American sugar politics and tax here



'Europe supported by Africa and America'. This 1796 engraving by visionary William Blake is the frontispiece of Sweetness and Power by anthropologist and historian Sidney Mintz, showing that slavery and sugar fuelled capitalism, drove the Industrial Revolution, and made Britain imperial

Uncanny. These days I have been reading Peter Ackroyd's biography of William Blake, and consulting Sidney Mintz's 1985 book *Sweetness and Power* as I drafted my *Update* on *US and Caribbean power politics* for this issue of *WN*. Both books are on my desk. Then Mark Wahlqvist and Marion Nestle let me know that Sid died on 26 December, age 93. So I write this short tribute to Sid on the day before this *WN* is sent to be mounted to go on line.

William Blake (1757-1827) is now best known as a painter and as composer of the rousing hymn 'Jerusalem' which ends every year's 'Prom' concerts in London. He was also a poet, engraver and visionary who like many Britons in the period of the American and French Revolutions was immersed in radical politics. He did not risk

prison by writing broadsides. Instead, he envisioned earthly heavens and hells in his art. Sidney Mintz made the inspired choice of Blake's engraving 'Europe Supported by Africa and America' as the frontispiece of his masterpiece *Sweetness and Power. The Place of Sugar in World History*, published in 1985.

Sugar, capitalism and imperialism

In her tribute to Sid, Marion writes

> When my colleagues and I started Food Studies programs at NYU, we considered *Sweetness and Power* to be *the* seminal work in the field. So did everyone else. We polled academics working on food issues about what should be included in a Food Studies 'canon - a list of books that every student ought to master. Only one book appeared on everyone's list: *Sweetness and Power*.

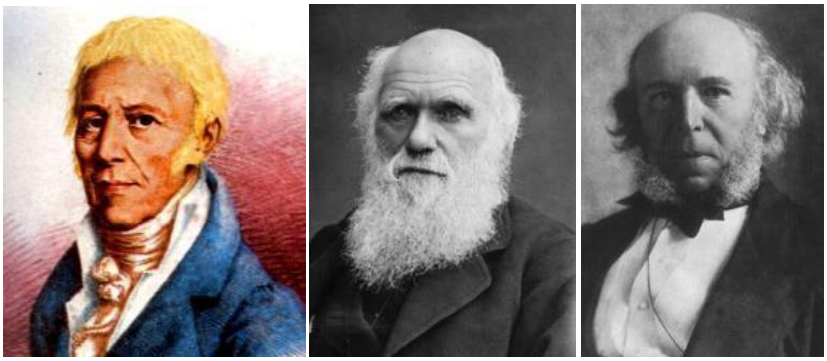
Amen to that. Sugar is usually perceived by people concerned with diet and nutrition, as a nutrient supplying energy, or a foodstuff, or an ingredient, preservative, bulking agent or sweetener. This is all true and important, but the whole story of sugar is much, much more interesting and serious. What William Blake's engraving evokes, and what Sidney Mintz shows in *Sweetness and Power*, is that the 'triangular trade' involving the shipping of slaves from Africa to the Americas, and the production and export of sugar from the Americas to Europe, fuelled capitalism, the Industrial Revolution, and the British Empire – for England became the centre of the world sugar trade in the 16th century, and in some ways still is.

Globalisation and transnational corporations have a history of half a millennium. The fact that consumption of sugar in Britain rocketed from an annual average in pounds weight of 4 in 1700, to 18 in 1800, to almost saturation point of 90 in 1900 – where in various forms it has stuck ever since except during the two world wars – is a side issue. The public health problem is one part of a far greater phenomenon. This is the seizure of production, distribution and consumption of sugar, and of other edible products, and of global trade in all commodities, by corporations in the global North that ravage and plunder vulnerable countries in the global South. This in effect is what William Blake depicts in his beguiling, disturbing engraving.

Sidney Mintz was an anthropologist whose fieldwork was done in the sugar cane plantations of Puerto Rico and in Jamaica and Haiti from the late 1940s and throughout the 1950s. His decision to examine the politics and economics of sugar, and the relationships between owners, workers, industry, politicians, and consumers, combines with the wisdom of his thought and beauty of his writing, make *Sweetness and Power* a kind of miracle. It is one of the books that explain the editorial policy of *World Nutrition – and of Nourish, to come.*

If you have not done so, do please read, mark and inwardly digest *Sweetness and Power*. Two introductions are offered above as pdfs – a summary of review, and a brilliant report by Ian Jack in *The Guardian* of a 2007 lecture Sidney Mintz gave in London.

Evolution. Lamarck. Darwin
The gene genie is out of the bottle



Jean-Baptiste Lamarck, (1744-1829, left) said that evolution includes inheritance of characteristics from one generation to the next. Darwinists such as Herbert Spencer (1820-1903, right) claimed this was nonsense and that evolution is caused by natural selection of random mutations. Charles Darwin (1809-1882, centre) came to believe in inheritance of characteristics. Epigenetic science is proving that he was right and that Lamarck, still mocked by neo-Darwinists, was right all along

Ever since I was a boy I have been unable to get my head round the conventional Darwinist theory that evolution comes about by natural selection of random mutations. Expressed more concretely, this means that of the multitude of mutations that occur by chance, some are advantageous, and that the human, animal or other living thing with such a mutation and its descendants will displace those without the mutation – hence 'the survival of the fittest'. Put simply now, I can see that this is a partial explanation, but I do not believe it is the whole reason. Nor do many others.

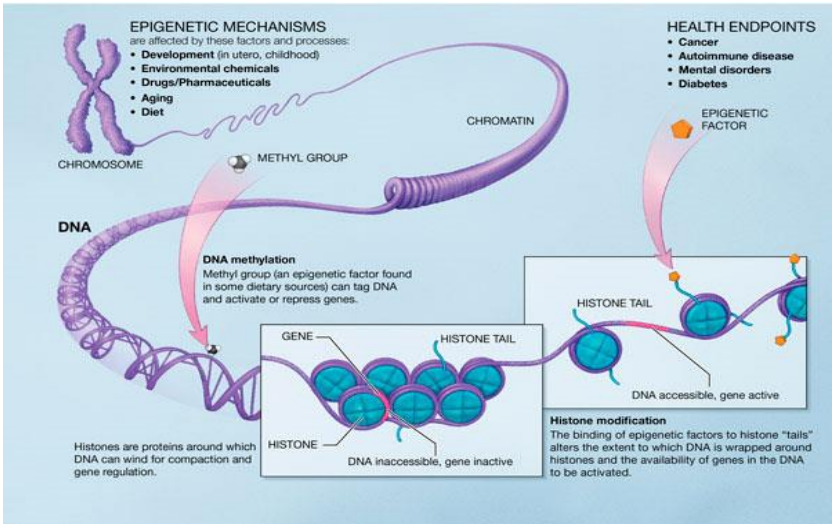
Box 1

The inheritance of disgust - mice

From a report by Helen Thomson in The Guardian, August 2015

Researchers have shown that certain fears might be inherited through generations, at least in animals. As published in *Nature Neuroscience*, Brian Dias and Kerry Ressler of Emory University School of Medicine trained male mice to fear the smell of cherry blossom by pairing the smell with a small electric shock. Eventually the mice shuddered at the smell even when it was delivered on its own.

Despite never having encountered the smell of cherry blossom, the offspring of these mice had the same fearful response to the smell - shuddering when they came in contact with it. So too did some of their own offspring. On the other hand, offspring of mice that had been conditioned to fear another smell, or mice who'd had no such conditioning, had no fear of cherry blossom. The fearful mice produced sperm that had fewer epigenetic tags on the gene responsible for producing receptors that sense cherry blossom. The pups themselves had an increased number of cherry blossom smell receptors in their brain. How this led to them associating the smell with fear is still a mystery.



An awesome expression of epigenetic mechanisms. The Wikipedia entry states 'More than 100 cases of transgenerational epigenetic inheritance phenomena have been reported in a wide range of organisms, including prokaryotes, plants, and animals'. And humans? See below, and Box 2

Here are three reasons why (and see Boxes 1 and 2, above and below). First, Darwinists I have met or read who espouse this theory do so with a curious passion, I guess because it is crucial to a general ideology that evolution is by chance, not design (divine or otherwise). Second, I am not a naturalist, while having a rough idea of Gregor Mendel's system of inheritance, but any animal breeder surely knows that physical and other characteristics are passed on 'in the blood' to successive generations. Third, Charles Darwin (1809-1882) himself in large part came to agree with his predecessor Jean-Baptiste Lamarck (1744-1829) whose theory of hereditable characteristics has been brutally rubbished by Darwinists like Herbert Spencer (1820-1903), and neo-Darwinists like Richard Dawkins.

More recently, a fourth reason has impressed me. I am also not a biologist, but the relatively new science of epigenetics, which has *an excellent Wikipedia* entry including the beautiful visual above, clearly implies that characteristics can be and are inherited. The only issue surely is to what extent and over how many generations. This seems to have been demonstrated by various experiments on animals, like the one summarised in Box 1, above. *A magisterial review* coauthored by Eva Jablonka of Tel Aviv University *(interviewed here)* states that epigenetic studies imply a reconciliation of Lamarck with Darwin (as Charles Darwin himself did) and that

> Heredity is a fundamental property of living organisms. It is therefore not surprising that, in the beginning of the last century, the rediscovery of Mendel's laws, and the chromosomal mechanisms underlying them, led to profound changes in all branches of biology. Today, at the dawn of the 21st century, another aspect of heredity –epigenetic inheritance and the epigenetic control mechanisms underlying it – is being unravelled. Like the early 20th-century discoveries, it too is driving a great expansion and transformation in our understanding of biology.

Box 2

The inheritance of fear – men and women

From a report by Helen Thomson in The Guardian, August 2015

Genetic changes stemming from the trauma suffered by Holocaust survivors are capable of being passed on to their children, the clearest sign yet that one person's life experience can affect subsequent generations. A study at Mount Sinai Hospital in New York led by Rachel Yehuda, published in *Biological Psychiatry*, investigated 32 Jewish men and women who had either been interned in a Nazi concentration camp, witnessed or experienced torture, or who had to hide during the second world war.

They also analysed the genes of their children, who are known to have increased likelihood of stress disorders, and compared the results with Jewish families who were living outside Europe during the war. 'The gene changes in the children could only be attributed to Holocaust exposure in the parents', said Rachel Yehuda. Her team's work is the clearest example in humans of the transmission of trauma to a child by way of what is called 'epigenetic inheritance' – the idea that environmental influences such as smoking, diet and stress can affect the genes of your children and possibly even grandchildren.

Scientific convention states that genes contained in DNA are the only way to transmit biological information between generations. However, our genes are modified by the environment all the time, through chemical tags that attach themselves to our DNA, switching genes on and off. Some of these tags might be passed through generations, meaning our environment could have an impact on our children's health.

Transmission of trauma

The team was specifically interested in one region of a gene associated with the regulation of stress hormones. Said Rachel Yehuda, 'If there's a transmitted effect of trauma, it would be in a gene that shapes the way we cope with our environment.' They found epigenetic tags on the very same part of this gene in both the Holocaust survivors and their offspring. The same correlation was not found in any of the control group and their children. Through further analysis, the team ruled out the possibility that the changes were a result of trauma that the children had experienced themselves.

'To our knowledge, this is the first demonstration of transmission of pre-conception stress effects resulting in epigenetic changes in both the exposed parents and their offspring in humans,' said Rachel Yehuda. 'It's a lot to wrap our heads around. It's an opportunity to learn how we adapt to our environment and might pass on environmental resilience.'

So much for mice – and bacteria, whose speed of adaptation to resist antibiotics surely has to involve intergenerational transmission. What about men, and women and children? There too, there is good evidence, specifically of the transmission of strong emotions. See Box 2, above. If significant and replicated, a substantial amount of received wisdom transmitted by Darwinists past and present should be tossed in the trash. For instance, it means that 'all people are born equal' with a 'clean slate' and that progress in life is all about upbringing and education, is not true. The race is to the children of parents and their parents who were swift – an idea hated by egalitarians as having a smack of eugenics. And… the implications are endless…

Physical activity. Resistance training

Working out working out



Trainers, workers and owners at RH Fitness, my local academia. Standing, Márcio, Humberto; Aline and Luiz (the bosses); Pamela. Kneeling, Andre and Malcom. They are all very nice people

After the 28-day water-only fast I undertook last summer, I was in a sad state that signalled the start of starvation. My limbs – arms and shoulders most of all – were scrawny, and my muscles were wasted, and I looked like I had been bedridden. Very foolishly, I (my mind) had trained me (my body) to respond as if I no longer needed to be active, so my body consumed my lean tissue as well as my fat.

So then belatedly I did what I should have done all along throughout the fast – get and keep moving, systematically. So I signed up at RH Fitness, my local *academia* (as gyms are called here in Brazil) and began to work out for an hour every day in the *musculação* rooms, using the Nautilus fixed-weights resistance machines some of which you can glimpse in the picture above.

These test, train and strengthen specific muscle groups, with different machines all looking a bit like instruments of torture, using graded weights that begin at little-old-lady level of difficulty, through ten to fifteen 7 kilogram – 15 pound stages to muscleman (or gym trainer) level. To my horror, at first anything above little-old-gentleman was a struggle. But now after four months of daily visits I am on stage 3 (arms) to stage 5 (guts) to stage 6 (legs), for a total per visit usually of 1,000 reps (repetitions), 100 each on ten machines, and I get to a higher stage on at least one machine every visit, completing the whole circuit usually a bit faster. Speed of punch! as Mike Welton, my coach at Debenham's gym in London declaimed, in my running days. (Later – arms are up to stage 4, guts 6, legs 8. Ooof!) Yes, I will survive.

Legend of the snowfall

People who first meet me at this time of my life are intrigued to learn that when I was based in London in the 1980s I ran nine marathons (PB 03.28.35) in New York, London and elsewhere with the badges to prove this, and skiied another in the Engadine. Plus I created and trained teams of initially sedentary citizens to run long-distance including marathons, and I founded the Serpentine Running Club, now 2,000 strong. Throughout the decade I wrote a monthly column for *Running* magazine, also wrote the popular book *Fat to Fit*, and worked out on resistance machines as well as running long distances in training and races.

My favourite true tale is of cycling on my 15-speed racer one January before dawn from home in Notting Dale through a thick fall of new snow to Gunnersbury Park to a regular date for a run with my training partner Russell. He opened his door in his pyjamas, having seen the snow dump before he went to bed, and asked me what the hell I was doing. 'Russell' I said, 'this we will boast about to our grandchildren'. So he changed, muttered some Zen and entered the Zone, and we ran in t-shirts, shorts and trainers 12.5 miles in the glittering dawn through the streets to Kew, along the Thames towpath to Richmond, round Richmond Park, all the time making fresh footprints in the crisp snow, close enough to a half-marathon. Then back again, now waving gaily to horrified huddled commuters on Kew High Street, to a hearty breakfast, and then I cycled to Grays Inn Road and *The Sunday Times* where I then worked, arriving earlier than my colleagues. Speed of punch!

The general theme of my *Running* column was 'if I can do it, anybody can', but I also learned, from observing training effects in my body, from practicing *The Inner Game* of sports, and also from exercise physiology textbooks. The reason I mention all this now, is that my *academia* sessions have awakened and alerted my muscle (and sinew) memory, as only renewed sustained physical activity can do. The intelligence enabled by the brain is of only one type. Bodies learn and are intelligent, and we know this for sure, in our minds, hearts and souls, when we are constantly physically active.

My take on fitness and fatness

So I return here to two inter-related themes I discovered and insisted upon when I was a citizen runner. One is that the range of benefits of physical fitness are usually overlooked or underestimated. Two is that body weight, whether or not expressed in terms of body mass index (BMI) is for most able-bodied people who are not emaciated or obese, a poor guide to general states of health. In making these assertions I am tip-toeing through minefields. The most conspicuous champions of exercise are the Coca-Cola corporation and their hired hands, plus politicians who cosset transnationals, and almost all professionals use BMI as a key gauge of health. Yes of course what you habitually eat is crucial in states of health, including your chances of becoming malnourished, or over-fat or obese, or of suffering from a number of various disorder and disabilities, and serious diseases. But regular

sustained physical activity, vigorous within your capacity, is also crucial. Its impact on vital signs such as blood pressure and blood chemistry is rock-solid conclusive. As well as protecting the cardiovascular system, activity also improves metabolism, digestion and excretion, and strengthens muscles, connective tissue and bones. You become more erect and flexible and physically more competent at work, home and play. None of these effects is immediate. The neglected body takes time to adjust, and the training effect is not felt gradually but in steps. Plus of course anybody who has been sedentary for many years is not about to hoist free weights, run five miles, or play in a volleyball team, on day one or month one of daily physical activity.

There is more. Being and staying physically fit also naturally amplifies memory, the senses, and the sure sense of being-in-the-world. My *academia* workouts enable me now not merely to recall the facts of my long run in new snow, but also to see, scent and in other ways evoke the sensations, perceptions and emotions of that whole early morning and my best memory of my comrade Russell. They make me more alive. Such qualitative phenomena are unknown to sedentary experts who think that what cannot be measured is meaningless or an illusion, and so do not like to be asked 'What is life?'

Other benefits of sustained physical fitness can be measured, but are poorly understood. The estimable nutrition professor John Yudkin, in one of his popular books, wrote that 'to dispose of a single cheese sandwich you would have to play squash for an hour'. His colleague at what is now King's College London, Derek Miller, said that to get rid of the energy content of a hearty meal it would be necessary to walk up and down Ben Nevis, Britain's highest mountain.

The implication of these measurements of energy in from food and out from activity, was – forget exercise. Such mistaken claims are still made by experts who say that weight control and reduction is all about eating less or better. In fact, physical activity uses energy during the activity itself, when measurements are made, and also after the activity is completed. The more regular and vigorous is the activity, the greater is the effect. Anybody who becomes and stays fit has revved up their metabolism 168 hours a week. John Yudkin and Derek Miller's calculations can be tossed in the trash.

The trouble with body mass indices

Here is why I am not a big fan of gauging body fatness by means of body mass index (BMI). Wild animals and birds are lean, while animals and birds bred to be eaten are fat, and the quality of lean tissue depends on duration and intensity of activity. Much of the muscle of physically fit animals is red, whereas more of the muscle of penned animals – what remains – is white. Red muscle is metabolically more active. The body composition of animals that are inactive degenerates in many ways. The proportion and amount of fat increases, and red muscle is lost while white muscle relatively increases, and flesh becomes marbled with fat. The general effect is that the animals become flabby. Anybody who has carved a wild bird that flew in its life, and

who has also pulled apart a battery-raised bird, knows this. In such respects humans are no different from animals and birds. There is no need personally to dissect the corpses of active fit and sedentary fat people to get this point.

Body mass indices can only be a rough and ready way to assess degree of body fatness. Calculations of degrees of population body fatness are made by measuring the height and weight of a representative sample of people, from which their average BMI is calculated, and extrapolating this to larger populations – of countries, for example. That's how data of prevalence and trends of obesity are derived. It is easy to measure height and weight. But BMI does not measure body fat. It is reasonably reliable only if the populations measured are or remain all at the same level of physical activity – or in these times, sedentary to the same degree.

True, in general the heavier people of the same height are, the fatter they are. But it is not true that light people are almost always lean. Sedentary people who reduce weight by sporadic or constant low-energy dieting regimes, as a high percentage of women do, may become lighter, but also flabby and so increasingly unable to be physically active. Plus – killer point coming – any reduced weight is in large part because body fat is relatively light, whereas muscle, being three-quarters water, is relatively heavy.

Likewise, many if not most lean people whose physical fitness comes from constant manual labour, or from habitually working out in gyms, will by the BMI method measure out as overweight, and some will apparently be obese! This well-known fact is typically discounted by experts who rely on BMI, on the grounds that these days, few people are physically fit. This is no doubt true, but to discount very fit people and to place them in an 'outlier' statistical category, is to send out a horrible public health message. Here ends the first lessons hot from my *academia*.

Status

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