

Truth and Belief

The Butterfly Effect, The Secret Life of Water and other popular myths

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Belief versus Truth

Stephen Colbert defined a new word - ***Truthiness***.

The belief or assertion that a particular statement is true based on the intuition or perceptions of some individual or individuals, without regard to evidence, logic, intellectual examination, or facts.

Colbert states that, "I am no fan of dictionaries or reference books, constantly telling us what is or isn't true".

This is very similar to the ideas that Galileo Galilei wrote in a letter to the Grand Duchess Christina of Tuscany 400 years ago. [1]

But I do not feel obliged to believe that that same God who has endowed us with senses, reason, and intellect has intended to forgo their use.

A number of popular commentators write that we should trust our intuition (without explaining what that may be) rather than relying on what we read. Most of these commentators have written many, many books to tell us that we do not need these books.

Whilst there is not an agreement among psychologists as to a definition of intuition, the unconscious (or subconscious) recognition of previous patterns is frequently a common theme. It is the ability to see things and ideas, often unconsciously, as connected rather than a series of isolated fragments. **Intuition is not the same as doing what feels right.**

Below are some definitions of intuition.

- The unconscious recognition of previous patterns – Carl Jung
- Intuition is nothing but the outcome of earlier intellectual experience – Albert Einstein
- Nothing more and nothing less than recognition – Herbert Simon, Nobel Prize winner, economist, political scientist, cognitive psychologist, computer scientist
- Intuition is the spontaneous knowledge gained through experience – Zen
- Intuition is the ability to see things and ideas as connected rather than a series of isolated fragments
- Knowledge that has come inside

Psychologists tells us that we use 5 criteria to judge if information is true. How we do this depends on whether we use *analytical evaluation* or *fluent evaluation*. Analytical evaluation requires effort to seek additional information to confirm the validity whilst fluent evaluation is more based on what feels right.^[2]

Criteria	Analytical Evaluation	Fluent Evaluation
Social consensus Do others believe it?	Search databases, look for supporting statistics, or poll a group or audience.	Does it feel familiar?
Support Is there much supporting evidence?	Look for corroborating evidence in peer-reviewed scientific articles or news reports, or use one’s own memory.	Is the evidence easy to generate or recall?
Consistency Is it compatible with what I believe?	Recall one’s own general knowledge and assess the match or mismatch with new information.	Does it make me stumble? Is it difficult to process, or does it feel right?
Coherence Does it tell a good story?	Do the elements of the story logically fit together?	Does the story flow smoothly?
Credibility Does it come from a credible source?	Is the source an expert? Does the source have a competing interest?	Does this source seem familiar and trustworthy?

How We Evaluate

Social consensus

If there is consensus among the group of people that we associated with, then this reinforces the idea that our beliefs are correct. If we belong to a group that shares our beliefs, such as a religious, political or Facebook group, we may have only limited view of an alternative.

Support

If there is much evidence to support a view (such as the world is round), people are likely to believe it.

For more complicated ideas, people can find evidence by searching scientific articles in peer-reviewed journals or from their own knowledge of the subject.

But a less rigorous and quicker approach can involve making a judgement on how easy it is to obtain information. For many people this involves an internet search.

Providing many examples to support an idea is *less* effective than having a few. Provide two or three examples at the most to support your idea otherwise it becomes overwhelming.

Consistency

Is the information consistent with existing knowledge? In the absence of knowledge of a particular subject, it is easy to rely on our beliefs or feelings.

We are much more likely to believe something that is consistent with our own beliefs. It can be very difficult for people to change their beliefs.

In *Life, the Universe and Everything* (part of the *Hitchhiker's Guide to the Galaxy* series), Douglas Adams explains our inability to see new information as a result of the *Someone Else's Problem* field. Effrafax of Wug utilised the SEP field to create an invisibility device that

would run for a hundred years on a single torch battery. It relied on people's inability to see anything that they:

- do not want to,
- were not expecting or
- cannot explain

Coherence

Does the evidence form a coherent story? Is the evidence consistent (analytical evaluation)? Or does the the narrative and message appear plausible, fluent and eloquent (fluent evaluation)?

If there are gaps in a story, then people can fill the gaps in unexpected ways.

Credibility

People are more likely to accept an idea if it is from a credible source. This is not very surprising. What can be difficult is judging whether the source is credible or not.

Websites offer a wide range of diverse views. How can we decide which are credible?

Many of our health organisations, such as Cancer Societies, accept a great deal of money from the food industry, which distorts their messages relating to diet.

University researchers also can accept money from food industry.

Most research involves comparing one or more groups of participants with a control group. By manipulating the members of the control group, researchers can manipulate their outcomes.

On study^[3] published in *Nature*, compared a diet containing lean red meat with a diet containing tofu. There was a slight decrease in cholesterol and triglycerides in the tofu-diet group.

However, to minimise the differences in fat intake between the two diets, the researchers added 5 g of butter, 5 g of lard and 8 ml of olive oil to the daily intake of those on the tofu diet.

The researchers noted that, in practice, replacement of meat with tofu would normally be accompanied by a reduction of saturated fats and fats. The addition of the extra fats to the tofu diet is fraudulent.

Suggestions

Repeating an idea three times reinforces the message

It does not matter whether the information comes from different sources or the same source, but once we have heard or seen something three times, then the idea is reinforced and given more credibility.

Do not attack opposing view

Repeating false information is a bad idea. Attacking an opposing view can have the opposite effect. A number of factors contribute to this.

- If a person believes in an idea then attempting to dispel it results in a defensive attitude. It is much less likely for an alternative idea to be considered.
- Repeating an idea three times reinforces the idea, irrespective of the truth.
- If possible, ignore the opposing view and concentrate on the view that you wish to espouse.

Use pictures

Using pictures can have a big impact on the credibility of a story, irrespective of whether the picture actually supports the view or not. Having a picture of a gorilla in a news item about gorillas can reinforce the message even though the



picture does not convey a message to support the story. Shown is a picture of a young Richard – for credibility.

This is unlikely to work for a political, religious or medical story where the message is contradictory to the reader's existing beliefs. If the reader is staunchly conservative then a picture of a liberal politician is likely reinforce the negative response to any liberal message.

Highlight important points

Highlight important points by changing font, **use of bold or italics** or **changing colour to highlight text**.

Poetical devices such as alliteration, rhyming and rhythm

A message is much more powerful if it is easy to remember and is “poetical”.

- No pain, no gain.
- Give me liberty or give me death. – Patrick Henry
- The threefold yoke of ignorance, tyranny and vice, – Simon Bolivar
- I have nothing to offer but blood, toil, tears and sweat. – Winston Churchill
- Does the flap of a butterfly's wings in Brazil set off a tornado in Texas? – Edward Lorez (It is a question – no, it does not.)
- Free at last! Free at last! Thank God Almighty, we are free at last. – Martin Luther King

Grouping items in threes

1. love, hope and charity
2. liberty, equality, fraternity
3. blood, sweat and tears

Make use of white space

Presenting text as in a novel, with pages and pages of words lacks impact.

Use headings, lists or boxes to give impact to your pages.

Tell a story

Whilst ultimately, studies and statistics help determine the credibility of a hypothesis, it is a story – an anecdote, that has a much greater impact.

This is why William Banting, a very overweight English carpenter and undertaker in the mid 1800s, is still an influence one and a half centuries later. In a pamphlet, a *Letter on Corpulence*^[4], Banting describes his experience.

Over a period of 12 months, he lost 46 pounds (21 kg) resulting in a weight of 167 pounds (76 kg). It was a big improvement but not exactly slim. His recipe for achieving this is:

For breakfast, I take four or five ounces of beef, mutton, kidneys, broiled fish, bacon, or cold meat of any kind except pork; a large cup of tea (without milk or sugar), a little biscuit, or one ounce of dry toast.

For dinner. Five or six ounces of any fish except salmon, any meat except pork, any vegetable except potato, one ounce of dry toast, fruit out of a pudding, any kind of poultry or game, and two or three glasses of good claret, sherry, or Madeira – Champagne, Port and Beer forbidden.

For tea. Two or three ounces of fruit, a rusk or two, and a cup of tea without milk or sugar.

For supper. Three or four ounces of meat or fish, similar to dinner, with a glass or two of claret.

For nightcap, if required, A tumbler of grog – (gin, whisky, or brandy, without sugar) or a glass or two of claret or sherry.

According to Banting, this led to a good night's sleep.

Related articles

[Tornadoes, Seagulls, Grasshoppers and the Butterfly Effect](#)
[But we are all individuals](#)

Footnotes

1. Galileo Galilei - Letter to the Grand Duchess Christina (1615)
2. Schwarz, N., Newman, E., & Leach, W. (2016). Making the truth stick & the myths fade: Lessons from cognitive psychology. *Behavioral Science & Policy*, 2(1), 85-95.
3. Ashton, E. & Ball, M. (2000) Effects of soy as tofu vs meat on lipoprotein concentrations. *European Journal of Clinical Nutrition*. 54 (1), 14-19.
4. Banting, W. (1864) *Letter on Corpulence*. Third Edit. London: Harrison, 59 Pall Mall.

Tornadoes, Seagulls and the Butterfly Effect

Edward Lorenz was a mathematician and meteorologist. Whilst his name may not be familiar, you would have heard about the results of his work.

He was born in 1917 in Connecticut, USA. He was by all accounts a brilliant mathematician who was fascinated by astronomy and weather as a child.

During World War II, he obtained his master's degree in meteorology and was posted to Saipan and Okinawa as a weather forecaster with the Air Force.

Whilst he is best known for his work on *Chaos Theory*, he made very valuable contributions to other areas of mathematics including climate theory.



Edward Lorenz 1956

By the 1960s, he had developed a mathematical model for weather forecasting involving 12 parameters such as temperature, pressure, wind speed and direction on a small, "personal" computer. The story of the butterfly effect originated when Lorenz re-entered the data for a weather simulation. When he came back from coffee, he discovered that the results for the first run were completely different from the second run. The results coincided for a time then diverged significantly.

The reason, he discovered, was that he entered the data from a printout that used three decimal places whilst the original data used six decimal places.

One meteorologist, Phil Merilees, remarked that if the model was correct, one flap of a seagull's wings could change the course of weather forever.

Lorenz presented a paper at a meeting of the American Association for the Advancement of Science in December, 1972 in Washington, DC. It was Phil Mears who devised the title - *Does the flap of a butterfly's wings in Brazil set off a tornado in Texas?*. The seagull was transformed into a more poetical butterfly, and he deliberately chose "butterflies" and "Brazil" along with "tornadoes" and "Texas" because of the effect of alliteration. Phil wrote, "I

suppose a seagull in Senegal might have worked as well.” Probably not.

The implication is that “that two states of the system differing initially by a small ‘observational error’ will evolve into two states differing as greatly as randomly chosen states of the system within a finite time interval”.

The title was a question. **The answer is - of course it does not.** If it did we would be creating tornadoes every time we clapped our hands. Lorenz conclusion was that long-term weather forecasting was doomed.

The Butterfly Effect refers to mathematical models of the weather - not to the actual weather.

Lorenz believed that more accurate weather forecasting could be achieved by combining statistical methods with that of mathematical modelling.

In 1898, William Franklin was a professor of physics at Lehigh University, Bethlehem, Pennsylvania. Whilst discussing the problem of the sensitivity of the atmosphere to small perturbations, Franklin wrote,

Long range detailed weather prediction is therefore impossible, and the only detailed prediction which is possible is the inference of the ultimate trend and character of a storm from observations of its early stages; and the accuracy of this prediction is subject to the condition that the flight of a grasshopper in Montana may turn a storm aside from Philadelphia to New York.

The comments regarding seagulls, grasshoppers or butterflies are pointing out the limitations of mathematical modelling when dealing with non-linear systems. A storm in New York or Texas has nothing to do with a grasshopper in Montana or a butterfly in Brazil. The problem of accurate, long-term weather forecasting has been recognised for some time - and seagulls, grasshoppers or butterflies are not part of the problem or solution.

Monarch Butterflies



One of the most spectacular events that we can imagine involves real butterflies. Every autumn in North America, millions, upon millions of monarch butterflies fly from northern United States and southern Canada to winter in a few mountain tops of Sierra Madre Mountains in central Mexico – a journey of 3,000 km.

Next spring, the butterflies fly north. Whilst one generation makes the journey south, it is butterflies three or four generations later that return to their summer home in northern America. In autumn, the great-great grandchildren return to the same mountain-top location in Mexico that their ancestors left the previous year.

No doubt butterflies can help transform our world but it is not because of a beat of a butterfly's wing in the depths of an Amazonian clearing creating havoc in some distant location.

Related articles

[Belief versus Truth](#)

[But we are all individuals](#)

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Anon (1956) Courtesy of the MIT Museum; Wikimedia Commons; courtesy of Jim Fullmer, PhD '79; Kerry Emanuel; MIT News Office photo; Omari Stephens '08/The Tech. *Edward Lorenz 1956*.

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US Forest Service (2018) Monarch Butterfly Migration and Overwintering [online]. Available from: https://www.fs.fed.us/wildflowers/pollinators/Monarch_Butterfly/migration/index.shtml (Accessed 10 March 2018).

The Enlightenment and the Age of Reason

Popular commentators often contend the *The Enlightenment* and *The Age of Reason* was accompanied by a loss of connection with our emotional and intuitive instincts resulting in a purely mechanical view of nature and the universe.

Galileo Galilei (1564-1642) is one of the modern instigators of the “Age of Reason” although similar sentiments can be found in other cultures such as ancient Greece and Islamic civilisations. He believed that knowledge must be found in sensory experience – in observation. However, he was aware that our senses can be deceived. He was a supporter of Nicolaus Copernicus’ (1473-1543) view that the sun was at the centre of the solar system even though each day we see the sun rise in the east and set in the west.^[1]

In January 1610, Galileo discovered the four largest moons of Jupiter. Existing beliefs maintained that all heavenly bodies should circle the earth. This revolutionary observation no longer placed us at the centre of all creation.

It was not until 1616 that having a belief that earth was not centre of all creation was condemned. After this point, it was heretical to defend or even discuss Copernicus’ model of the solar system. In 1633, Galileo was sentenced to house arrest for the rest of his life and the publication of his works were banned.

As Galileo wrote in a letter the Grand Duchess Christina of Tuscany:

But I do not feel obliged to believe that that same God who has endowed us with senses, reason, and intellect has intended us to forego their use.



Rene Descartes^[2] (1596-1650) “provided the basis for seventeenth-century rationalism – a trend towards reason and intellect rather than emotion or imagination”. There is a popular view that reason and intellect cannot coexist with emotion, imagination and passion which clearly is not true..

This was an age where if you swore at a neighbour and something bad happened, you could be in big, big trouble. Given the times, it was very likely that something bad would happen. In Scotland, a village herbalist collecting dew-drenched flowers by the light of the full moon was considered to be a witch, a pagan which could result in being shoved into a barrel with protruding metal spikes, her body ripped to shreds as she was rolled down a hill – surely it is better to suffer momentarily on earth than to spend eternity in hell.

Descartes’ “goal was not to discover a multiplicity of isolated truths. Descartes therefore included in his philosophy metaphysical and physics and natural science. He included anatomy, medicine and morals. [...] According to Descartes, all the sciences are interconnected and must be studied as a single entity.”^[3]

When Descartes was 23, he was camped by the Danube as a non-military participant in the Thirty Years War. On the night of 10th-11th November 1619, he had three powerful dreams that not only changed the direction of his life, but western philosophy and science. 11th November is St. Martin’s day – a day that appears in a number of significant events in Descartes’ life.

Treating people by bleeding was standard medical procedures in Descartes’ time. At the age of 53, Descartes moved to Protestant Sweden to become a tutor to Queen Christina. Five months after his arrival, he became seriously ill with pneumonia. The treatment for all illness at the time was bleeding. Descartes had dissected many animals that he obtained from the local butcher in the Netherlands. (He did not eat meat and very rarely drink wine.) His knowledge of anatomy was extensive for the time and he was aware that bleeding was

dangerous and possible fatal. His view was that “bleeding shortens the days.” He refused the treatment of bleeding – much to the disgust of Queen Christina’s physician. Descartes died after appearing to recover on his preferred treatment of “broth, water and rest”. Queen Christina’s physician “wanted to see Descartes dead” and it is possible that he was involved in Descartes’ death by poisoning. Being a Catholic that had a great deal of influence over the queen generated a great deal of hostility in Christina’s Protestant court. Bleeding was still a valid treatment 140 years later. Mozart was bled at the time of his death in 1791.

Rosicrucians (Brotherhood of the Rosy Cross) arose in the early 17th century in Germany. It was a secret society which wanted to transform all aspects of society – science, mathematics, art, religion and politics through the exploration of esoteric knowledge. This was a time of bitter and bloody wars, primarily driven by divisions in between Catholic and Protestant religions. They believed that all knowledge was interconnected and could not be divided into discrete categories. Geometry, mathematics and alchemy were a foundation of their study.[4]

It is not known if Descartes was a member but he was certainly in contact with members and was deeply influenced by their thoughts. A secret, coded notebook was discovered after Descartes death. It was decoded by the brilliant German mathematician, Gottfried Leibniz. His coded notebook contains alchemy symbols. Descartes desired to combine ancient Greek geometry with mathematics. It is clear that Descartes had discovered the relationship between the vertices, edges and faces of the Platonic regular solids which was later rediscovered by Leonard Euler – that is, the number of faces plus the number of vertices equals the number of edges plus two. Descartes later found this formula worked for any polyhedra – not just the five regular Platonic solids. Descartes believed this discovery was very significant – far beyond the simple geometrical relationship. Why did Descartes think this esoteric knowledge to be kept secret? One reason is that Johannes Kepler linked these regular solids with Copernicus’ cosmology of placing the sun at the centre of creation. Revealing his discovery, would have roused the attention of the Catholic Inquisition – a fate worth avoiding.

Giordano Bruno (1548-1600) was a Dominican friar and mathematician. As well as accepting Copernicus' view that the earth and planets revolved around the sun, he also believed that the sun was simply another star and stars were surrounded by planets and that could be inhabited. He believed that the universe was infinite and did not have a centre. People on other planets could make the same mistake as we do - thinking that they are the centre of all creation. After spending 8 years in prison, Bruno was burnt to death in 1600 for his heretical views.[5]

Marianne William's contention that "Descartes, Galileo and even Darwin viewed the body as a machine with levers that you can use to make adjustments" does not correspond to their beliefs and views. The time of Galileo and Descartes is a alien world - full malevolent spirits, virulent illnesses such as bubonic plague that resulted from divine displeasure and ordinary folk were at the mercy of climate and warring rulers. Religious fervent resulted in bloody religious wars and the church exploited the fears of population to control their subjects. All that Galileo, Descartes and others advocated was an examination of existing knowledge to verify if it really was true.

When there is a discrepancy between our beliefs and reality, often our beliefs take precedence. We cling desperately to what we wish to believe - even in the face of overwhelming evidence to the contrary. Call it logic, common sense or whatever term you wish to use, but we need to be able to subject our beliefs to some scrutiny.

If we take a narrow view of the world when making decisions, it is not necessarily a failure of logic and reasoning. It is a failure to comprehend the interconnectedness of all aspects of life.

Footnotes

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2. Hals, F. (1649) *Portrait of Rene Descartes (1596-1650)*. Photography by André Hatala [e.a.] (1997) *De eeuw van Rembrandt*, Bruxelles: Crédit communal de Belgique, ISBN 2-908388-32-4.
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The Secret Life of Water and Masaru Emoto

Masaru Emoto is a Japanese writer and photographer. He published six books, including *The Secret Life of Water*, that shows consciousness affects the structure of water and ice.

In *The Secret Life of Water*,^[1] Emoto describes his methodology. Emoto takes a sample of water and distributes amongst 50 petri dishes. The water is then frozen following a prescribed procedure. Emoto then assigns a number ranging from 1 to 8 that describes the beauty of the resulting crystal formation. From the 50 petri dishes, Emoto chooses one that he feels best describes the attribute being investigated.

I admit that the selection process is not strictly in accordance with the scientific method, and the whim of the person doing the selecting certainly comes into play. When making the selection for a collection of crystal photographs, it is best if one person chooses all the photographs for consistency, which is why all the photographs in this book were selected by me.

He writes that his procedures are “not in strict accordance with the scientific method”. This is an optimistic assessment. It is simply not a valid way of selecting a representative sample. It is obvious that there is not a representative sample to select. Every sample is unique.

Emoto gives an example of how this works. He collected two samples of water: one from a polluted part of the Honmyo River near where it reaches the Ariake Sea and another from the pristine waters near its source.

Below are the results.

Crystal Type	Pristine Water	Polluted Water
1. Beautiful	2	0
2. Rather beautiful	4	0
3. Hexagonal pattern	0	0
4. Radial pattern	4	2
5. Lattice pattern	8	6
6. Indefinite pattern	29	29
7. Collapsed pattern	3	2
8. No crystal formation	0	11

As Emoto states:

In this case, we chose a beautiful crystal to represent the sample [of pristine water]. Of course, there were only two beautiful crystals in the sample of fifty.

He states the the water has the potential to form beautiful crystals so this is why he chose one of the only two beautiful crystal samples to represent the pristine waters. There were 32 samples that were labelled *Indefinite* or *Collapsed* pattern. He chose an *Indefinite* pattern sample to represent the polluted water. There was the same number of *Indefinite* samples from both the polluted water and the pristine water.

Whilst there is no doubt about Emoto's passion for his subject, by his own admission, "photographing crystals is a subjective science".

Footnotes

1. Emoto, M. (2005) *The Secret Life of Water*. New York: Atria Paperbacks.

Moderation is a Fatal Thing

Everything in moderation is a near unanimous response by health professional, health support organisations and media commentators to solving our health crisis.

The same argument was used in in the 1950s and 1960s to convince people to reduce smoking. After all, you would not want to deprive people of the “solace, relaxation and enjoyment to mankind” that smoking has provided for more than 300 years. These days, doctors do not suggest that people reduce smoking but to stop.¹

One problem is that moderation cannot be defined. One person may consider a hamburger or packet of cigarettes a week as being moderate. This can easily become two hamburgers a week or just one more cigarette. Doing things in moderation does not change a habit. To change a habit requires consistency and commitment over a period of several weeks or months.

The China-Cornell-Oxford project (The China Study) involved 6,500 people in 65 different counties over a period of 20 years. As the counties reduced the percentage of animal-sourced foods from 47% to 0%, the health outcomes improved. In the US, 70% of food is sourced from animals.²

A Taiwanese Buddhist study³ with 4,384 participants compared type 2 diabetes outcomes for lacto-ovo-vegetarians compared with those who avoided meat. The meat-eating group ate only a very small amount of meat.

- Meat intake for females: 50% consumed less than 10 g/day; 25% consumed less than 2 g/day.
- Meat intake for males: 50% consumed less than 20 g/day; 25% consumed less than 7 g/day.
- Fish and meat intake for females: 50% consumed less than 17 g/day; 25% consumed less than 3 g/day
- Fish and meat intake for males: 50% consumed less than 37 g/day; 25% consumed less than 11 g/day.

There were insufficient numbers to divide the vegetarians into subgroups (pesco, lacto-ovo, vegan). There were 69 vegans (no animal products) and there were no cases of diabetes within this group.

One Big Mac, with 2 meat patties, contains 90 g of meat—so the participants were consuming only a very small amount of meat. Three garden peas weigh a gram.

That tiny amount of meat increased the risk of diabetes **4 times** for females and **2 times** for males. Not an endorsement for moderation.

A strong commitment to health has been a part of Seventh-day Adventist's philosophy since its founding in the 1840s. They have been studied extensively since the 1950s. Once again, as the diet becomes more vegetarian, so does their health outcomes. Seventh-day Adventists eating no meat have better health outcomes than those eating meat less than once a week – something that most would consider less than a moderate amount of meat.⁴

The following table compares the BMI and diabetes Odds Ratio for five levels of vegetarian diets for Californian Seventh-day Adventists. Note that the comparisons are with non-vegetarian Seventh-day Adventists who are much healthier than the average American.⁵

Category	%	BMI	Type 2 diabetes Odds ratio (*)
Vegan No red meat, fish, poultry, dairy, eggs	4.2	23.6	0.32
Lacto-ovo vegetarians Vegan with eggs and milk	31.6	25.7	0.43
Pesco-vegetarians Vegan with fish, milk and eggs	11.4	26.3	0.56
Semi-vegetarians Red meat, poultry less than once a week plus fish, milk, and eggs	6.1	27.3	0.69
Non-vegetarians Red meat, poultry more than once a week plus fish, milk, and eggs	46.9	28.8	1

(*) After adjustment for age, sex, ethnicity, education, income, physical activity, television watching, sleep habits and alcohol use.

Much publicity is given to the longevity of the people of Japan and Okinawa (an archipelago that stretches from southern Japan to Taiwan). However, the population with the longest lifespan and the highest levels of health on the planet is the vegan Californian Seventh-day Adventists.

As Professor William Roberts, a pathologist, cardiologist, long-time editor to the American Journal of Cardiology and a real expert in heart disease wrote:⁶

Although we think we are one and act as if we were one, human beings are not natural carnivores. When we kill animals to eat them, they end up killing us because their flesh was never intended for human beings.

Our closest relatives, gorillas, orangutans, bonobos and chimpanzees are all primarily plant-eating animals. Chimpanzees eat by far the most animal-source foods (approximately 5%) which is mostly termites.

Our stomachs, intestines, jaws and hands have evolved to gather and eat plants. Try wrestling a pig to the ground with your bare hands and making a meal out of it.

Given that even moderate or minimal eating of meat is detrimental, there is no benefit in eating meat. Changing any habit can be difficult - and breaking a habit by reducing its consumption is impossible. As Plutarch pointed out, we had to learn to eat the gore and flesh of a dead creature.

A life of moderation is devoid of passion and commitment. As Oscar Wilde wrote, "Moderation is a fatal thing. Nothing succeeds like excess."⁷

Fortunately, whole-food, plant-based diets that are optimal for our health and are also the best for the environment and for the animals we share the earth with.

Footnotes

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How do we know what we know?

Many “facts” have a long history of discovery, with a sometimes bitter and acrimonious debate before a final acceptance.

The study of knowledge even has a name, *Epistemology*, which investigates the “nature, grounds, limits or validity of human knowledge.” [1]

Consider the problems Giordano Bruno and Galileo Galilei had in the late 16th and early 17th centuries for advocating a view of the cosmos that was at odds with the Church’s doctrine that the earth was the centre of all creation.

Or Ignaz Semmelweis, a Hungarian doctor who reduced the mortality rate of mothers giving birth at Vienna General Hospital. In 1847, he was appointed an assistant in obstetrics at the teaching hospital. Women who gave birth that were attended by physicians and medical students had a death rate from infection of 13%–18% which was much higher than the 2% when delivered by midwives. He concluded that this resulted from the handling of corpses during autopsies before visiting the women. By introducing washing of hands with chloride of lime solution that mortality rate was reduced to 2%, After he introduced the washing of instruments the rate was reduced to 1%. [2]

Despite this he was subjected to ridicule and he died at the age of 47 in 1865. Consensus that cleanliness is a good idea is established a generation later with the work of people such as Louis Pasteur and Joseph Lister. Tens of thousands of mothers and their families suffered unnecessarily because of the reluctance to accept new ideas.

In *Life, the Universe and Everything* (part of the *Hitchhiker’s Guide to the Galaxy* series), Douglas Adams explains our inability to take in new information as a result of the *Someone Else’s Problem* field. Effrafax of Wug utilised the SEP field to create an invisibility device that would run for a hundred years on a single torch battery. It relied on people’s inability to see anything that they :

- do not want to,
- were not expecting or
- cannot explain

We obtain our information initially from parents and from interacting with the world around us. We learn that fire is something that should be avoided if we put our hand in it.

As we grow older, we learn from other people, reading, school, television. Observation is not always a reliable guide. It is obvious that the sun and the moon revolve around the earth. We see the sun rise each morning in the east and set at night in the west.

Causality – What does it mean to say an event causes an outcome?

Let's take smoking and lung cancer as an example. What does it mean when it is announced that "smoking causes lung cancer"?

For some people this means "smoking significantly increases the risk of developing lung cancer".

Others (particularly the tobacco companies) insist that it means "smoking always causes lung cancer". Most people can identify with a relative who smoked until she was in her 90s without any signs of cancer so the statement can easily be refuted. Frequently an additional criteria is added – "lung cancer is always caused by smoking". Since other factors play a part in lung cancer then this creates another opportunity to dismiss the "smoking causes lung cancer" argument.

This is the reason why tobacco companies were able to enlist scientists to announce that it has not been proven that smoking causes cancer even though strong evidence existed to link smoking with an increase in lung cancer risk.

The real world does not contain certainty – it is simply not possible to predict outcomes based on preceding events. Life is much more complex and unpredictable to allow for this kind of certainty. We can still make sensible decisions based on an element of uncertainty.

Whilst the statement "smoking does not cause lung cancer" may be strictly true, it is

inadequate to describe the effect that smoking has on lung cancer and overall health.

Taking a strictly reductionist approach to life that is rich, complex and chaotic does not lead to practical decisions.

We can also be trapped in believing that if an event is followed by an outcome then the outcome must be caused by the proceeding event. May be it does – may be it doesn't. These beliefs can become very persuasive and difficult to dislodge even after it has been demonstrated that the two events are completely unrelated.

Studies relating to health and medicine

Observational Studies

Epidemiology is the study of the distribution and causes of health related states and events in a number of populations. An observational or ecological study observes the study groups without intervention.

The studies may be prospective – information is gathered and the study group followed for a number of years to determine if there are correlations between that observed facts and the later outcomes. It is possible that important information regarding the study was not gathered because it was not considered or was too expensive or complicated to gather.

A cross-sectional study looks at a snap-shot of the population at a point of time.

Examples of observational studies that relate to health include:

- Framingham study that showed the risk factors (high blood pressures, cholesterol values, fibrinogen, left ventricular hypertrophy, weight, and cigarette smoking) associated with heart disease.
- Seven Country Study showed that the major cardiovascular risk factors are universal, that diet is important factor in cardiac health and that cardiovascular disease is preventable

and not an inevitable result of aging.

- China-Cornell-Oxford Project examined over 360 different health, lifestyle and nutrition factors and found over 8,000 significant correlations.
 - Work of Sir Richard Doll and Sir Richard Peto that showed the link between smoking and lung cancer.
 - Seventh Day Adventist studies showed significant correlations with health and 5 different categories of animal/vegetarian diets.
-

Sometimes epidemiological studies are considered weak evidence because, whilst they may show associations with different variables, that does not imply causation.

If the correlations can be explained by biological plausible reasons then additional credence for the correlation is warranted. If there is no known explanation, it is possible that it is simply because it has not been discovered yet.

A passionate criticism of *The China Study* was written by Denise Migner, an English major with no experience in epidemiology. She stated that a “highly significant correlation between wheat flour consumption and two cardiovascular diseases” for Tuoli County was omitted from the analysis.

Migner was implying the Colin Campbell deliberately ignored a relationship between wheat consumption and cardiovascular diseases. The Tuoli people are nomadic with a large seasonal variation in diet. At survey time they had a very high meat consumption but ate more vegetables and fruits when they migrate to the valleys. As a result, the data was excluded because it was unrepresentative of their diet as a whole.

It is important to note that the epidemiologist in the China-Cornell-Oxford project was Sir Richard Peto, not Colin Campbell.

Migner also stressed that “none of these correlations (with wheat and heart disease) appear to be tangled with any risk-heightening variables.”

However, there were a number of highly significant confounding correlations which do affect the incidence of heart disease.

- There was a lower consumption of green vegetables,
- they consumed a relatively low intake of monounsaturated fats,
- had a greater body weight and
- had a high level of urea indicating high levels of protein intake.

Colin Campbell's response indicated that there is no known and biologically plausible evidence to support a hypothesis that wheat causes these diseases.

Prospective Interventionist Experiments

Interventionist studies are commonly used to test a new drug, supplement or procedure. Often these are random trials where both the subject and researcher are unaware if the subject is receiving the intervention.

If there is only one variable been changed, the goal is to be able to assert that A causes B.

This type of experiment is often considered the most highly regarded form of study. As a result, it offers greater funding opportunities.

It is almost impossible to have a dietary study where the participants are unaware of changes to the diet. Changes to diet involves the whole family, participants and their families need to be committed to the idea of change and the reasons for them.

One concern that is frequently overlooked with random, clinical trials are the ethical issues. It is possible that a person could be significantly disadvantaged by being randomly assigned to a particular group in the study.

Case-Control Study

A retrospective study looks back to determine if events in the past have an impact on the

current state of the population. This is more beneficial if you are seeking to determine the cause of a relatively rare event. It is impractical to wait for a long time to hope for an outcome that occurs infrequently.

It can be difficult (or impossible) to ensure that the recall of past events are accurate. How can we accurately recall what we ate or how long we spent in the sun without a hat 10, 20 or 40 years ago?

The *Case* cohort (the group of people who have the condition that is being studied) is matched and then compared with a *Control* group. This a group that is similar to the *Case* group but does not have the condition that is being studied.

It may be difficult to adequately match the two groups. How do we know which characteristics are important to be matched for the study?

How Truth may be Misrepresented

Cherry Picking

When data is being gathered, it is important to validate the legitimacy of the data. Some data should be ignored because it is not valid. However, it may be tempting for researchers to ignore data, either deliberately or inadvertently, which does not fit their preconceived notions.

For example, Ancel Keys did not include data from northern Europe in his *Atherosclerosis: a problem in newer public health* [3] paper of 1952. This was ignored because of the changes in diet during the Second World War. Death rate from heart disease fell in Northern Europe during the Second World War. Mexico was excluded because of the lack of a death certificate system. Untrained personnel were completing death certificates in Ceylon.

Another example is to selectively quote material from a journal article. Sometimes the referenced article's conclusion is actually opposed to that reported in the original article.

Funding

It is important to determine the funding source of the study and the associations of the authors of the study. Researchers may be reluctant to find adverse findings against the organisations which are funding the study.

Clair Patterson was a geologist who determined the age of the earth by studying the rate of decay of uranium into lead. He discovered the amount of lead in the atmosphere was much greater than it should be. It is largely through his efforts that legislation was enacted to remove lead from our environment. This was bitterly opposed by industry which actively fought against the removal of lead from products.

It is easier to have papers published that report positive results rather than negative results. Journals receive income from reprints of articles. A paper that supports the use of a drug may generate thousands of dollars in income.

Researcher's Beliefs

In 1954, the Tobacco Industry Research Committee published a document *A Frank Statement to Cigarette Smokers*. It stated:

For more than 300 years tobacco has given solace, relaxation, and enjoyment to mankind. At one time or another during those years critics have held it responsible for practically every disease of the human body. One by one these charges have been abandoned for lack of evidence.

If your doctor or medical research was a smoker back in the 1960s when 60% of the population smoked then it would be difficult for a patient to find support to give up smoking.

The habits and beliefs of researchers has an impact on how their research studies are designed. Why look for evidence for the impact of smoking when you enjoy a cigarette after dinner? A researcher is less likely to find a problem with saturated fats if they like bacon and

eggs or coconut oil. How can infection be prevented from spreading by washing hands if infection is caused by bad air (or miasma) as was the common belief for many centuries?

Sir Ronald Fisher was one of the founders and giants of statistical science. Yet in the late 1950s, he wrote passionately and extensively to dispel the myths that smoking was harmful. The fact that he was a smoker most likely had a great deal of influence on his views. He wrote in 1958, that:

Unfortunately, considerable propaganda is now being developed to convince the public that cigarette smoking is dangerous, and it is perhaps natural that efforts should be made to discredit evidence which suggests a different view.^[4]

Animosity

Another possible guide to the presence of fallacious arguments is when a writer stops debating the issues and the writings become embroiled with personal attacks and generalisations.

One side may ask for clarification of a statement. Instead of a response to the query, statements such as “it is now accepted” and “it is now commonly understood” appear.

Clair Patterson (advocate for removal of lead from the environment) and Ignaz Semmelweis were subjected to vicious personal attacks.

Cultural Myths and Paradigms

Cultural viewpoints are frequently accepted without much consideration. They are so much a part of our lives that it is difficult to see that they may not be true. The definition of concepts can colour our views.

The *French Paradox* is widely quoted as evidence that saturated fats and heart disease link is, if not invalid, is somewhat dubious. According to a paper in *The Dialogues of Medicine-*

Vol 13 No 3 2008 [5], the French paradox is indeed a myth.

The clear conclusion, driven by the facts as summarized by Pierre Ducimetière, is that the rates of CHD are not so low in France, animal fat intake is not so high, and the diet-heart concept is not so unique that the existence of a “French paradox” can be sustained, except for satisfying cultural fantasy or for wine enthusiasm and marketing. Thus, the real paradox is why the French paradox continues to exist as a concept, when it should be replaced by the less mystifying view, namely, “the more Mediterranean, the better”.

The *Butterfly Effect* refers to the concept that small changes can have a large impact on the final result. It is often quoted as “a flap of a butterfly’s wings in Brazil will set off a tornado in Texas”.

Edward Lorenz was a mathematician and meteorologist. In 1961, he was examining the results of his weather forecasting model which took in to account changes in temperature, pressure, wind speed and direction. He re-entered the data, to run the results again, leaving out the last 3 decimal digits. The results were consistent with the first run for some period then they diverged substantially.

One meteorologist friend, Phil Mears, remarked that “if the model is correct, one flap of a seagull’s wings could change the course of weather forever.”

In 1972, Lorenz presented a talk *Does the flap of a butterfly’s wings in Brazil set off a tornado in Texas?* It was a question. The answer is – of course it does not. Lorenz conclusion was that long-term weather forecasting was doomed.

The question became a statement known as the *Butterfly Effect*. Yes, a small single decision may have a big on our lives but not because of the actions of a single butterfly.

Why is “Left” and “Right” reversed in a mirror and “Top” and “Bottom” is not? This is most obvious when we look at writing in a mirror. **W**, **M**, **V** and **A** are the same shape when viewed in a mirror. However, the letter **E** becomes **Ǝ** - left and right is reversed, but not the top and bottom.

It is because of our definition of left and right is different from our definition of top and bottom. Walk around the opposite side of a tree then the left side becomes right. Our view of the world is dependent upon our definition of these 4 concepts.

Truth and Significance

Even if a fact is true, it does not necessarily mean that it is significant when taken in context.

Ranexa [6] was studied in patients with chronic angina who still had symptoms despite being treated with other angina drugs. Patients taking Ranexa experienced a reduction of 22% of angina pain. It does sound impressive.

565 patients who were experiencing about 4.5 episodes of angina a week were randomly assigned to take either Ranexa or a placebo for six weeks.

Patients receiving Ranexa had a reduction in angina of about one episode per week, compared with those in the placebo group.

A reduction from 4.5 episodes a week to 3.5 episodes a week is not going to change the quality of life, especially given that common side effects included dizziness, headache, constipation, and nausea.

When examining the validity of a statement, all relevant information needs to be taken into account including the relative and absolute changes to the data. The impact of an intervention, both short-term and long-term needs to be considered.

It is not easy to determine the difference between a fact and an opinion. Our own biases and world-view may conflict with new information that we receive.

It is difficult for us to change our strongly held views – this is equally true for researchers as well as those who are reading their works.

Footnotes

1. Webster Comprehensive Dictionary (1984) Chicago: J. G. Ferguson Publishing Company
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5. Tunstall-Pedoe, H. (2008) The French Paradox: Fact or Fiction? *Dialogues in Cardiovascular Medicine*. 13 (3)
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Many Points of View Regarding Nutrition

Looking at Isolated Facts instead of the Whole

There are a number of factors that are associated with heart disease, such as [1]

- Lipid levels (cholesterol, LDL cholesterol, HDL cholesterol, triglycerides, Lipoprotein(a))
- Blood pressure
- Thrombotic tendency
- Cardiac rhythm
- Endothelial function
- Systemic inflammation
- Insulin sensitivity
- Oxidative stress
- Homocysteine level

There can be a tendency for researchers and commentators to become attached to one particular area and not be able to see the relationship and interconnectedness with the different aspects of the same disease.

Also, much research is focused on individual components of nutrition, such as individual minerals, vitamins, or components such as fats or saturated fats.

Once again, researchers can become attached to one particular element of nutrition. We search for the magic supplement or the one miraculous cure.

Nutrition is the result of endless number of components in food. Health is the result of the relationship between all that we eat (and absorb during digestion), our relationships with others, the community that we live in and the world that we inhabit.

Looking at individual components of food in isolation can never give a complete picture.

Normal is not Necessarily Healthy

One difficulty in accepting the role of cholesterol in heart disease is that the “normal” ranges

in Western countries are unhealthy. It is also normal to die from heart disease. 31% of Australians (that is, 45,600 people) died from cardiovascular diseases in 2011.

In the 1940s, in the USA, 95% of the population had values below 7.2 mmol/L.[2]

Most heart attacks were occurring in people with cholesterol levels below 7.2 mmol/l. It is understandable that the majority of doctors did not consider blood cholesterol relevant to heart disease when most heart attacks occur in people below this level – “normal” does not mean healthy.

According to the Mayo Clinic, cholesterol should be below 200 mg/dL (5.2 mmol/L).

However,

- Dr Bill Roberts (previous long-time editor of the medical journal *Cardiology*)
- Dr Bill Castelli (former director of the Framingham Heart Study)
- Dr Caldwell Esselstyn (former surgeon at the Cleveland Clinic)

have stated that they have never seen a heart disease fatality when cholesterol levels are below 150 mg/dL (3.9 mmol/L).

Autopsies of 300 male soldiers killed in action in Korea showed 77.3% of the soldiers had gross evidence of heart problems. The average age was 22 years, fit and active and had not been diagnosed with heart problems.

Food and Health is Big Business

The Food and Nutrition Board (FNB) of the National Academy of Sciences, has the responsibility every five years to review the nutritional requirements and make recommendations.[3] This is a large (900 page) report.

In their report, published in 2002, it stated:

To meet the body's daily energy and nutritional needs while minimizing risk for chronic disease, adults should get 45% to 65% of their calories from carbohydrates, 20% to 35% from fat and 10% to 35% from protein....Added sugars should comprise no more than 25% of total calories consumed.... added sugars are those incorporated into foods and beverages during production [and] major sources include candy, soft drinks, fruit drinks, pastries and other sweets.

Recommendations for fat and protein are not based on any scientific evidence and are far above healthy guidelines.

Below is a list of corporate sponsors of the FNB report:

- M&M Mars
- The Dannon Institute, a leading dairy-based consortium
- International Life Sciences Institute, which is a group of fifty food, supplement and drug companies
- Coca-Cola
- Taco Bell
- Burger King
- Nestle
- Pfizer
- Roche Vitamins

The chairman of the FNB has been an important consultant to several major dairy-related companies (National Dairy Council, Mead Johnson Nutritionals, which is a major seller of dairy-based products, Nestle Company and a Dannon yogurt affiliate)

He was the chairman of the Dietary Guidelines Committee that establishes the Food Guide Pyramid and sets national nutrition policy affecting the National School Lunch and Breakfast programs, the Food Stamp Program and the Women, Infants and Children Supplemental Feeding Program.

The Physician's Committee for Responsible Medicine obtained a court ruling that ordered the committee members to reveal their industry associations. Six of the eleven committee members had links to the dairy industry.

Distrust of Authorities

A number of popular books contend that we have been lied to about our health by the medical authorities. This program stated that the medical authorities have lied to us for decades regarding the role of saturated fats and cholesterol in heart disease.

Books such as *The Great Cholesterol Myth* by Jonny Bowden (Naturopath) and Dr Stephen Sinatra (Cardiologist) claimed that researchers manipulated results to falsely accuse cholesterol and saturated fats in the cause of heart disease.

Whilst there is much to be wary of in interpreting medical research results, we need to be equally careful in examining such claims.

Where is the evidence that:

- Ancel Keys "cherry-picked" those 7 countries (Italy, Greece, the Netherlands, Finland, Yugoslavia, Japan and the United States) because they fitted his hypothesis that saturated fat caused heart disease.
- It's well known that cholesterol helps fight infections – it helps knock out toxins from harmful bacteria. . . . So a low cholesterol may leave you with an increased risk of infection.
- And lowering the cholesterol especially in older people, who tend to have low cholesterol anyway, risks depression and lower vitamin D
- So the best advice would be to forget about saturated and unsaturated fats, and instead think about whether the fat or oil is from a healthy source.
- Lowering cholesterol does not reduce the death rate, as people with low cholesterol die of other causes like cancer.
- When inflammation occurs in our blood vessels, cholesterol rushes to the scene to smooth over the patch of inflammation. It collects around the patch and forms a plaque. So cholesterol is in fact trying to help fix the problem not causing it.

- Cholesterol is the mother hormone from which all the other hormones are made. This process may be blocked by lack of the right nutrients such as B vitamins, zinc and magnesium. The cholesterol then backs up as it cannot convert into the right hormones. This results in a combination of high cholesterol and low sex hormones leading to low libido, fatigue and hormone imbalances.

Conflicting Evidence

There is a lot of conflicting evidence in books, websites, the media and research papers.

We are told to follow a Palaeolithic diet, low-carbohydrate diet, low-fat diet, avoid saturated fats and trans-fats, avoid the sun, eat dairy to obtain calcium and prevent osteoporosis.

What do we believe?

Often when we are confronted with conflicting evidence, we simply believe what we want to believe and continue to doing what we have always done.

Misleading evidence from clinical trials can result from inappropriate comparisons between the sampled populations.

Too frequently, the control group and the intervention group in a trial are both eating a very similar and unhealthy version of a high fat, high protein diet.

So it is not really surprising that the minor changes made in the intervention group show little change to the control group.

Another complication is that a randomise trial is often considered to be the best way to test a hypothesis. It is challenging to divide people into two groups without the individuals knowing that they are in the control group or the intervention group. If people in the trial are not committed to making the big dietary changes to improve their health then it is unlikely that they will have a high compliance rate for their dietary regime.

Instead of using randomised trials, researchers can look at populations that are already

committed to a certain lifestyle. The Seventh Day Adventists studies have provided valuable information in relation to diet.

Some popular authors give a long list of reference papers to support their conclusions. Upon reading the cited papers, it is not uncommon to find that the author has completely misinterpreted or simply lied about the material.

The Whole-Food Plant-Based Diet is Inconceivable

In 1985, the Nobel Prize in Medicine was awarded to Michael Brown and Joseph Goldstein “for their discoveries concerning the regulation of cholesterol metabolism.” They wrote^[4]

If the LDL-receptor hypothesis is correct, the human receptor system is designed to function in the presence of an exceedingly low LDL level. The kind of diet necessary to maintain such a level would be markedly different.

It would call for the total elimination of dairy products as well as eggs, and for a severely limited intake of meat and other sources of saturated fats.

They also state that “such extreme dietary change is not warranted for the entire population” because of the “severe social and economic consequences”.

Perhaps the extreme social and economic consequences of *not* implementing that diet far outweigh the consequences of continuing to farm and feed ourselves in our habitual manner.

To be fair, this was written in 1984.

More recently, in 2006 Dr Brown said to *Academy of Achievement* participants,

The real news is that we shouldn't really need these drugs, that for those of us who have normal genes, the reason why our blood is being filled up with

cholesterol is because we are basically eating too much cholesterol and too much animal fat. And if you look at populations where the diet is lower in cholesterol and fat, they don't need these statin drugs. They have low cholesterols in their blood and they have twenty times lower rate of heart attacks than we do in the United States.

Inevitable Consequence Of Aging

In the early part of the 20th century, the prevailing belief was the heart disease was inevitable.

In the 1940s, students were told that atherosclerosis was an inevitable accompaniment of aging. It was a “degenerative disease about which nothing could be done and that was that”.^[5]

Even today, this view is still held by some, including some cardiologists.

According to Dr Ernest Curtis, a cardiologist from California,^[6] “Everybody has atherosclerosis to one degree or another. It is simply a biological fact of aging.”

Below is different point of view.

All males who are 65 and all females who are 70 who have been exposed to the traditional Western diet have cardiovascular disease and should be treated as such.

Professor Lew Kuller, University of Pittsburg School of Public Health

Footnotes

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But We are All Individuals

This is a frequent response to the suggestion that dietary and lifestyle changes will be beneficial to a person's well being.

"But we are all individuals. Just because it may be good for some people, it does not mean it will be good for me. I will continue to do whatever I feel is right."

Yes, we are all individuals with different beliefs, habits, preferences and experiences. However, when it comes to nutrition, we are pretty much the same - allergies being one significant difference. The real question is - "Why is there a need to be special and different?"

Loving and respecting your body - the only one that we will ever have, means being committed to learning how to best look after ourselves. It is not something that we innately know and understand.

Habits can be difficult to change. The good news is that we did learn the old habits and we can easily (well, may be not quite that easily) replace the old habit with a new, more beneficial habit. It takes some time to cultivate a new habit to ensure that the new habit becomes an established habit.

Yes, it may be comforting to sip a hot cup of coffee on waking or drink a warm glass of milk before going to bed.

Dairy contains casein. Casomorphins derived from casein are protein fragments (polypeptides) that are found in the blood after digesting dairy. Both meat and dairy are comfort foods - not foods that are in our best interest or in the best interest of the animals that provided these foods.

If poor nutrition is the basis of the majority of our health problems, then the only solution is great nutrition. This means taking the time to discover what is great nutrition for us all.

It is not a matter of eating whatever you feel like as an individual. It is about following the rules for being human - which apply to all.

Additional reading

[Belief versus Truth](#)

[Tornadoes, Seagulls, Grasshoppers and the Butterfly Effect](#)

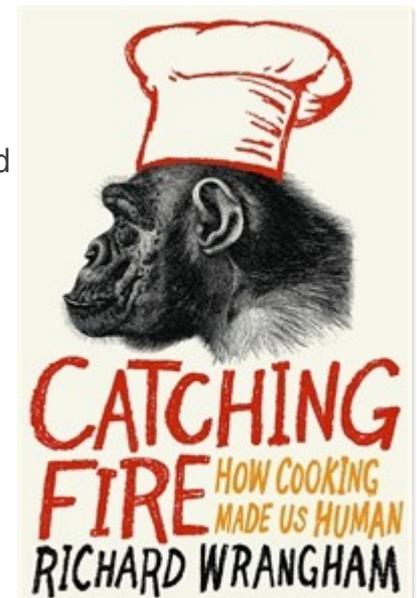
How Cooking Changed Us

How Cooking Made Us Human

Richard Wrangham is a Professor of Biological Anthropology at Harvard University. He is also the curator of Primate Behavioral Biology at the Peabody Museum in Cambridge, Massachusetts and a director of the Kibale Chimpanzee Project in Uganda.

Wrangham began his career at Gombe Stream National Park in Tanzania as a member of Jane Goodall's chimpanzee research team.

The standard view of evolution is that by eating meat, humans were able to evolve the larger brains that distinguish us from other primates. Wrangham's view is that cooking food is a fundamental activity that transformed humans and our society. [1] He is not the first to propose this view but has developed the concept.



Catching Fire by Richard Wrangham

Cooking increased the value of our food. It changed our bodies, our brains, our use of time and our social relationships.

Australopithecines are human ancestors that walked upright, unlike chimpanzees or gorillas. They were at home in trees, about the same size as chimpanzees, similar digestive systems to other apes and a brain size very slightly larger than chimpanzees.

Sharp stone tools were found in Ethiopian rock that were created by our australopithecine ancestors 2.6 million years ago. These tools allowed them to dissect meat much more effectively than other primates.

By 2.3 million years ago, a new species had emerged. Habilines are the link between apes and humans. They were discovered by Jonathan Leakey in 1960 at Olduvai Gorge in Tanzania. They are about the same size as chimpanzees and australopithecines with twice

the brain size. They had plenty of hair and were good at climbing trees.

Between 1.9 and 1.8 million years ago, a habiline species evolved into *Homo erectus* who could walk and run as we do.

According to Wrangham, the standard view that the eating of meat led to *Homo erectus* does not take into account the two stage development from australopithecines to habilines then habilines to *Homo erectus*.

Chimpanzees obtain about 5% of their energy from animal sources. Most is from insects such as termites. A tribe may capture a small monkey. However, this is opportunistic and months can pass without chimpanzees consuming meat.

Eating meat can account for the first transformation from australopithecines to habilines but not the second from habilines. Cooking appears to be the force behind out transformation into *Homo erectus*.

MYA	Species	Events
0.2	<i>Homo sapiens</i>	Modern humans
1.8	<i>Homo erectus</i>	Use of fire and cooking, change to society with man-woman pairs and sharing of food with partner. Similar appearance to humans, with large change to anatomy. Smaller digestive system, mouth and jaw, loss of hair. Food more energy dense, softer and easier to digest, less astringent and sweeter. Much less chewing time. Cooking destroys bacteria.
2.3	<i>Homo habilis</i>	Tool makers and meat eaters
3-6	<i>Australopithecus</i> sp	Ape-like <i>Australopithecus</i> . Lucy was an <i>A. afarensis</i> that lived in Ethiopia 3.2 mya.

All human societies depend upon cooking for survival. Inuit consume more raw meat than any other society but their main meal of the day is a cooked evening meal.

Advantages of Cooking

Cooking has a big impact on food. It

- improves the taste of foods
- removes toxins
- makes food softer and easier to digest
- increases the nutritional value of food
- reduces spoilage
- increases the amount of energy obtained from food

The Giessen Raw Food study [2] is the most comprehensive study relating to raw food consumption. It was conducted by nutritionist Corinna Koebnick and colleagues from the Institute of Nutritional Sciences at University of Giessen in Germany.

The objective was to determine the “nutrition and health habits of people following raw food diets in Germany”.

The participants in the study were categorised as omnivores (all food groups), vegetarian (exclusion of meat, fish, sea foods and their products) or vegan (vegetarian with the exclusion of dairy products and eggs). The 513 participants ate 70 to 100% of their diet raw. Some items were lightly heated.

The conclusion was that “a strict raw food diet cannot guarantee an adequate energy supply.” Mild heating, blending, grinding, and sprouting were used which reduces the particle size and leads to an increase in energy produced. About 30% of the energy consumption came from added oils and the participants were still under nourished.

Our Digestive Systems

The amount of energy required to process a raw food diet is much greater than a diet of cooked food. All animals grow quicker on a diet of cooked food.

Compared with other apes humans have a relatively small digestive system. Our mouths, jaws, teeth, stomachs and colons are relatively small. Wrangham believes that these changes are better explained as an adaptation to cooking food than to eating meat.

The mouths of apes are much larger. Chimpanzees spend 5 – 6 hours a day chewing their food. They also eat food with apparent relish that we find extremely distasteful.

Our jaw muscles are much weaker than apes. Given that cooked food is much softer, we do not need strong muscles to chew hard raw food. Similarly, our teeth are the smallest of the primates.

Our stomachs are comparatively very small. Since cooking increases the amount of energy available in the food, our stomachs do not need to be very big. The great apes eat about twice as much food, by weight, as we do.

The small intestine is the main organ of digestion and absorption of nutrients. It is only slightly smaller than expected in comparison to other apes. The large intestine, however, is comparatively quite small. This is where fermentation of plant fibre takes place. Because of cooking, this process is of less importance to humans than other apes.

The reduction in size of our digestive system reduces the energy cost of digestion.

A frequent question is “what is the natural diet of humans?” This question ignores the fact that evolutionary changes are affected by behaviour. Giraffes have evolved with long necks because males fight for breeding rights using the necks as weapons. The long necks are actually an inconvenience when it comes to feeding. [3]

It is easy to argue that cooking food is not natural – after all no other species cooks their food. (Although chimpanzees are known to hunt for nuts that have been cooked in bush

fires.) However, since cooking became the norm in human societies, our bodies quickly adapted to the new circumstances.

Other species of animals maintain body temperature by having hair or fur. Since fire allows us to maintain body heat without hair gives other advantages. We can remain active for much longer and travel much further, especially during the heat of the day. Also, naked humans have less parasites. Monkeys spend a lot of time grooming to remove parasites which has the added benefit of cementing social bonds.

Feeding strategies of animals have a profound effect on the social structures of the group.

Apes spend 5 – 6 hours a day chewing food. Wrangham argues that cooking substantially reduces the time required for chewing which led to the sexual division of labour. Since we no longer need to spend hours a day chewing, women in subsistence societies collect and prepare food whilst men hunt or engage in other activities – either productive or unproductive. Whilst the activities vary in different societies, women and men make different and complimentary contributions to the group.

This practice results in the sharing of food within the family group. Meat is frequently shared within the entire community. Other apes do not share food that has been gathered.

Women tend to provide the staple foods. Obtaining food from hunting is less reliable.

Richard Wrangham's book is a fascinating account of how cooking food changed us and our society to become an essential part of our lives.

Footnotes

1. Wrangham, R. (2008) *Catching Fire: How Cooking Made Us Human*. Basic Books.
2. Institute for Nutritional Sciences (n.d.) Giessen Raw Food Study — Institute of Nutritional

Sciences [online]. Available from:

<https://www.uni-giessen.de/faculties/f09/institutes/institute-for-nutritional-sciences/units/nutrec/research/epidemiological-studies-on-populations-with-different-regimens/giessen-raw-food-study> (Accessed 15 March 2016).

3. Simmons, R. E. & Altweg, R. (2010) Necks-for-sex or competing browsers? A critique of ideas on the evolution of giraffe. *Journal of Zoology*. 282 (1), 6–12.

Taiwanese Buddhist Study

Everything in moderation is a near unanimous response by health professional, health support organisations and media commentators to solving our health crisis.

A Taiwanese Buddhist study ¹ with 4,384 participants compared type 2 diabetes outcomes for lacto-ovo-vegetarians compared with those who consumed meat. The meat-eating group ate only a very small amount of meat.

- Meat intake for females: 50% consumed less than 10 g/day; 25% consumed less than 2 g/day.
- Meat intake for males: 50% consumed less than 20 g/day; 25% consumed less than 7 g/day.
- Fish and meat intake for females: 50% consumed less than 17 g/day; 25% consumed less than 3 g/day
- Fish and meat intake for males: 50% consumed less than 37 g/day; 25% consumed less than 11 g/day.

There were insufficient numbers to divide the vegetarians into subgroups (pesco, lacto-ovo, vegan). There were 69 vegans (no animal products) and there were no cases of diabetes within this group.

One Big Mac, with 2 meat patties, contains 90 g of meat—so the participants were consuming only a very small amount of meat. Three garden peas weigh a gram.

That minute amount of meat increased the risk of diabetes 4 times for females and 2 times for males. Not an endorsement for moderation.

Category	Pre-menopausal women		Menopausal women		Men	
	Vegetarian	Omnivore	Vegetarian	Omnivore	Vegetarian	Omnivore
Diet type						
Diabetes %	0.6	2.3	2.8	10	4.3	8.1
Impaired Fasting Glucose %	5.8	9.0	14	18	12	17

For those interested, the *p-values* for the diabetes outcomes for pre-menopausal, menopausal and men cohorts were 0.0006, <0.0001 and 0.0014 respectively.

Category	Pre-menopausal women				Menopausal women				Men			
	Lacto-ova-vegetarian		Omnivore		Lacto-ova-vegetarian		Omnivore		Lacto-ova-vegetarian		Omnivore	
Measure	Median	25%	Median	25%	Median	25%	Median	25%	Median	25%	Median	25%
Fish (g)	0	0	5	1	0	0	7	2	0	0	15	4
Fresh meat (g)	0	0	11	2	0	0	7	1	0	0	20	7
Processed meat (g)	0	0	1	0	0	0	1	0	0	0	2	0
Eggs (g)	16	6	24	9	7	2	16	6	15	4	18	8
Dairy (g)	34	4	41	9	36	2	50	1	46	1	46	1
Soy (g)	96	53	68	30	88	41	52	23	104	53	63	27

[Show more](#)

[Show less](#)

Footnotes

1. Chiu, T. H. T. et al. (2014) Taiwanese Vegetarians and Omnivores: Dietary Composition, Prevalence of Diabetes and IFG Marià Alemany (ed.). PLoS ONE. 9 (2), e88547.

Quotes Relating to Health

You ask of me then for what reason it was that Pythagoras abstained from eating of flesh. I for my part do much admire in what humor, with what soul or reason, the first man with his mouth touched slaughter, and reached to his lips the flesh of a dead animal, and having set before people courses of ghastly corpses and ghosts, could give those parts the names of meat and victuals, that but a little before lowed, cried, moved, and saw; how his sight could endure the blood of slaughtered, flayed, and mangled bodies; how his smell could bear their scent; and how the very nastiness happened not to offend the taste, while it chewed the sores of others, and participated of the saps and juices of deadly wounds.

But we are nothing put out of countenance, either by the beauteous gayety of the colors, or by the charmingness of the musical voices, or by the rare sagacity of the intellects, or by the cleanliness and neatness of diet, or by the rare discretion and prudence of these poor unfortunate animals; but for the sake of some little mouthful of flesh, we deprive a soul of the sun and light, and of that proportion of life and time it had been born into the world to enjoy.[1]

Plutarch 46 - 120 CE

By having a reverence for life, we enter into a spiritual relation with the world. By practicing reverence for life we become good, deep, and alive.

By respect for life, we become religious in a way that is elementary, profound and alive.

Compassion, in which all ethics must take root, can only attain its full breadth and depth if it embraces all living creatures and does not limit itself to mankind.

If a man loses his reverence for any part of life, he will lose his reverence for all of life.

Until he extends the circle of his compassion to all living things, man will not himself find peace.

Albert Schweitzer, French philosopher, physician, priest and musician - The Nobel Peace Prize 1952

Whenever people say “We mustn’t be sentimental”, you can take it they are about to do something cruel. And if they add “We must be realistic”, they mean they are going to make money out of it.

Brigid Brophy (1929-1995)

There is no fundamental difference between man and the higher animals in their mental faculties.... The lower animals, like man, manifestly feel pleasure and pain, happiness, and misery.

Charles Darwin, naturalist and author (1809-1882)

A man can live and be healthy without killing animals for food; therefore, if he eats meat, he participates in taking animal life merely for the sake of his appetite. And to act so is immoral.

Leo Tolstoy, Russian novelist (1828-1910)

The beef industry has contributed to more American deaths than all the wars of this century, all natural disasters, and all automobile accidents combined. If beef is your idea of real food for real people, you'd better live real close to a real good hospital.

Neal D. Barnard, MD, President, Physicians Committee for Responsible Medicine

About 2,000 pounds of grains must be supplied to livestock in order to produce enough meat and other livestock products to support a person for a year, whereas 400 pounds of grain eaten directly will support a person for a year. Thus, a given quantity of grain eaten directly will feed 5 times as many people as it will if it is eaten indirectly by humans in the form of livestock products.

M.E. Ensminger, PhD

A human being is a part of the whole, called by us the Universe, a part limited in time and space. He experiences himself, his thoughts and feelings, as something separate from the rest - a kind of optical delusion of his consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest to us. Our task must be to free ourselves from this prison by widening our circle of compassion to embrace all living creatures and the whole of nature in its beauty. Nobody is able to achieve this completely, but the striving for such achievement is in itself a part of the liberation and a foundation for inner security.

Albert Einstein (1879-1955)

What is the meaning of human life, or, for that matter, of the life of any creature? To know an answer to this question means to be religious. You ask: Does it make any sense, then, to pose this question? I answer: The man who regards his own life and that of his fellow creatures as meaningless is not merely unhappy but hardly fit for life.

Albert Einstein (1879-1955) Mein Weltbild, Amsterdam: Querido Verlag, 1934.

So I am living without fats, without meat, without fish, but am feeling quite well this way. It always seems to me that man was not born to be a carnivore.

Albert Einstein, in a letter to Hans Muehsam, dated March 30, 1954

When a human being kills an animal for food, he is neglecting his own hunger for justice. Man prays for mercy, but is unwilling to extend it to others. Why then should man expect mercy from God? It is unfair to expect something that you are not willing to give.

Isaac Bashevis Singer, writer and Nobel laureate (1902-1991)

A dead cow or sheep lying in the pasture is recognized as carrion. The same sort of carcass dressed and hung up in a butcher's stall passes as food.

J. H. Kellogg, American physician (1852-1943)

It ill becomes us to invoke in our daily prayers the blessings of God, the Compassionate, if we in turn will not practice elementary compassion towards our fellow creatures.

Violence begins with the fork.

The greatness of a nation and its moral progress can be judged by the way its animals are treated.

Mohandas K. Gandhi (1869-1948)

There is nothing more frightful than ignorance in action.

Johann Wolfgang von Goethe, German writer (1749-1832)

The conventional view serves to protect us from the painful job of thinking.

John Kenneth Galbraith, Canadian-American economist (1908-2006)

Some people think the plant-based, whole-foods diet is extreme. Half a million people a year will have their chests opened up and a vein taken from their leg and sewn onto their coronary artery. Some people would call that extreme.

Dr. Caldwell Esselstyn US Surgeon and plant-based diet advocate since 1984

It is not your right — based on YOUR traditions, YOUR customs and YOUR habits — to deny animals THEIR freedom so you can harm them, enslave them and kill them. That's not what rights are about. That's injustice.

Gary Yourofsky

You have to make a conscious decision to change [eating habits] for your own well-being, that of your family and your country.

Bill Clinton

I decided to pick the diet that I thought would maximize my chances of long-term survival.

Al Gore

I choose not to make a graveyard of my body for the rotting corpses of dead animals.

George Bernard Shaw (1856-1950)

A mind of the calibre of mine cannot derive its nutriment from cows.

George Bernard Shaw, The Star, Apr. 5, 1890

We consume the carcasses of creatures of like appetites, passions and organs with our own, and fill the slaughterhouses daily with screams of pain and fear.

Robert Louis Stevenson (1850-1894)

One farmer says to me, 'You cannot live on vegetable food solely, for it furnishes nothing to make the bones with;' and so he religiously devotes a part of his day to supplying himself with the raw material of bones; walking all the while he talks behind his oxen, which, with vegetable-made bones, jerk him and his lumbering plow along in spite of every obstacle.

Henry David Thoreau, author of Walden: Or Life in the Woods (1817-1862)

As long as men massacre animals, they will kill each other. Indeed, he who sows the seeds of murder and pain cannot reap the joy of love.

Pythagoras (570 BC-495 BC)

The greatest wealth is health.

Publius Vergilius Maro (Virgil) - Roman Poet (70 BC-19 BC)

Life expectancy would grow by leaps and bounds if green vegetables smelled as good as bacon.

Doug Larson

Health is not simply the absence of sickness.

Hannah Green (1927-1996)

The best doctor gives you the least medicine.

Benjamin Franklin (1706-1790)

But I do not feel obliged to believe that that same God who has endowed us with senses, reason, and intellect has intended us to forego their use and by some other means to give us knowledge which we can attain by them. He would not require us to deny sense and reason in physical matters which are set before our eyes and minds by direct experience or necessary demonstrations.

Letter to the Grand Duchess Christina of Tuscany (1615)

Galileo Galilei (1564-1642)

Footnotes

1. Plutarch (1878) *Plutarch's Morals*. Vol. V. Little, Brown, and Company. [online]. Available from: <http://oll.libertyfund.org/titles/1215>.