The Hen that Laid a Tofu Egg

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Abstract: A new category of plant-based, 'free-from' foods has created a multi-billion-dollar food industry – food, free from animals in known forms and familiar textures made not entirely from plants, instead defined by a lack of any animal part.

This paper aims to present the moments of transformation, the Eureka! in these kitchen trials. Investigating the inspirations, the serendipity and the creative process in designing these replacement and alternative foods reveals that the imagination lies in the contributions of many stakeholders. The quest for Godliness, health, animal-free protein sources, and meaty tastes have driven the dietary concerns of people with religious, health or environmental ideologies. Imagination in the animal-free kitchen has created a new culinary vocabulary of many modern-day foods and a particular modernist cuisine, marrying chemistry, technology, and creativity to create unprecedented gastronomic experiences.

The millennial pastorals are pushing a new wave of imagined foods as innovators, creators, and consumers of plant-based foods driven by new ethics, sustainability, and wellness ideologies. Food has never been imagined so widely or ever so much in history. Many generations have pioneered new ideas for 'animal-free' food – the singular culinary pursuit of western ideologies of vegetarianism[1] and veganism.[2] One of the most peculiar, creative and imaginative trends for good or worse is the rise of plant-based substitutes for animal products.

With copious help from big science and most probably produced in a plant, these plant-based foods are catalysed by one ingredient – Imagination.

Imagination Is Key to Culinary Mimicry.

A completely new set of ingredients, many of which do not always belong to the conventional pantry, mimic eggs, honey, meat and milk products for a complete sensorial experience – in appearance, aroma, taste and texture. A deep dive into didactic sources- going beyond cookbooks, recipes and historic food trends to patents, war, theological discourses on diets and the protein race shows the rise of the vegan mindset from a fringe movement to the billion-dollar mainstream industry it has become.

Since Nuttose, the first meat analogue developed in 1896, most animal-free meat products have followed roughly the same formula.[3] They usually contain a carbohydrate base, assorted proteins, fats, sugars, a source of fibre, antioxidants, emulsifiers, vitamins, minerals to meet nutritional guidelines, colouring agents to render them appealingly

authentic and preservatives. Added probiotics, digestibility enhancers, and enzymes can claim health benefits. Nevertheless, how do we imagine that combining them will lead to a remarkably familiar product? What were the key moments inspiring the creators and what questions did pioneers ask that led to creating these animal-free analogues?

Many Roads Lead to Rome – Decoding the Creative Process

Imagination and innovation lie in three distinct areas – the food lab, the food narrative driven by the market and the food ideologies that have shaped our approaches to dietary ethics and sustainability. The questions posed by actors in these areas spark the nature of their imagination and define their idea's impact.

Chefs and cooks are informed by their practice and borrow from each other's kitchen experiences – They seem to ask, '*What if...?*'

On the other hand, scientists were very imaginative in the food lab, often starting with *'How might we...?'*

The events that led to the discovery of aquafaba, a popular plant-based egg white replacement, are a great example.

In asking, '*How might we create a plant-based meringue?',* scientists Kent Kirshenbaum and Alizee Guegan explored the use of saponins in 2011 to primarily address vegan needs. Meringue is prepared from a mixture of saponin, sugar or sugar substitute, and water as a self-sustaining, baked product.[4]

Asking, *'What if a vegetable foam could be whipped like egg whites?'* led, vegan blogger Joël Roessel discover through a systematic investigation into vegetable foams in 2014, that liquid from red kidney beans and palm hearts can be whipped into a foam similar to flax mucilage.[5] Joël built on two important previous developments – Miyoko Schinner's experiments with flax mucilage to replace egg white that she shared on her blog[6] and Kirshenbaum and Guegan's patent from 2013.

Cookbooks and bloggers have established that whole eggs can be replaced with chia seeds, psyllium husk, bananas, apple sauce, prunes, pumpkin, flax, nuts, and garbanzos in recipes.[7] These work well in recipes that call for whole eggs, but a similar whole-food approach to replacing egg white in recipes like meringues had been impossible.[8] Commercially available egg and egg-white replacers for home cooks like Orgran, Ener-G, Bob's Red Mill contain processed starches, gluten, and concentrated soy proteins with varying degrees of textural and taste acceptance. However, the quest to find a plant-based replacement for egg whites had started on a chat forum seven years before Joel.[9]

Joel posted updates on the bean liquid-based experiments on his blog. Meanwhile, Goose Wohlt, a software engineer in the US, experimented with existing meringue techniques based on hydrocolloids to replicate egg whites. Inspired by a French video coercing the soaking liquid in canned chickpea to a mousse,[10] Wohlt whipped a stable meringue and

concluded that soaking liquid *by itself* can act as a direct egg white replacer.[11] Goose created a virtual space for the experiment on Facebook and called it *aqua faba*, Latin for bean water.

The intense focus on novelty to create a plant-based meringue played out in the public sphere fuelled iteration in a participatory design process. Genuine novelty arose from the everyday interactions in the kitchen with cosmopolitan ingredients, techniques and ideas, and not from a scientist or star chef.

Recently, I prepared *batasha*, a traditional Indian sweetmeat that is very popular throughout the Indo-Gangetic plain. Traditionally, the soaking liquid of *aritha* (Sapindus mukorossi) is added to sugar syrup to achieve a light, 'brittle', or 'crunchy' texture.[12] Well-made *batasha* looks, feels and tastes like a meringue, easily achieved without eggs. In a moment of epiphany, I realized that Kirshenbaum and Guegan had inadvertently patented an old, popular Indian sweetmeat. Their patent acknowledged that their heat-stable meringue took reference from a Middle eastern dessert topping, *Natef,* prepared from saponin-containing. However, *natef* unlike *batasha*, is not heat stable.

Unlocking creative potential in learning from the past as a springboard for the future is crucial- like the potential of plant extracts trapped in unavailable (unrecorded, oral traditions) or inaccessible (due to language barriers) traditional knowledge systems: surely challenging inspiration and appropriation.

Who Were these Skeuomorphic Foods Created for?

Ideology and Markets in the Food Lab

Unlike in ethnically vegetarian groups, the ideas of a 'free-from animal source' diet link to strong ideologies that have stemmed from carnivorous societies as a sort of rebel and refuge. The western ideology of animal-free foods first emerged as 'vegetarianism' in Victorian Britain. Believers of better health through a plant-based diet or non-violence to animals followed a diet against the grain of their meat-eating cohort. Meat and dairy were considered essential to strength, vigor, and an aspirational diet, so early vegetarians used hygiene and poor animal husbandry to incite doubt.[13] The dietary ideology was interested not in creating genuinely original food but in changing the ingredients used to prepare the dishes people already ate executed in new ways. The most critical factor for converting and staying on a diet seemed to be a struggle between psychological and social factors. Entirely new products would take much effort to educate and explain. Skeuomorphism remains essential to become meaningful to adoption and commerce.

In 1843, a Liverpool native wrote to the Editor of *New Age: Concordium Gazette and Temperance Advocate*, 'Quite convinced of the correctness of the principle in every variety of view, I am yet at a loss for substitutes for animal food – for tea, coffee, butter, eggs, milk, & cheese, necessarily precluded by the principles of abstinence from all animal food.

The experience of those practically acquainted with this subject, would be of essential service to novices in these matters, who find nothing so perplexing or so difficult as the change of their daily habits in these respects'.[14] It was essential to substitute meat in easy to replace, cost-effective ways in known preparations. With no precedence of a meat-free diet, much of the early literature addressed nutrition, protein intake, general wellbeing and hygiene concerns in farms. They introduced readers to new colonial ingredients, described ethnically vegetarian cultures to instill confidence, discussed meat substitution in recipes to encourage a new culture of preparing such foods. By 1896, the *Lancet* reported on the food served at the London Vegetarian Society's press conference: 'various dishes were composed entirely of vegetables and fruit, but such things as macaroni cutlet and dishes prepared a la Francaise, a la Normandy, ... bore some resemblance to the food eaten by the ordinary "corpse" eater.'[15]

Imagination Can Stretch only as far as People Are Willing to Eat It.

For people shifting to a plant-based diet, the journey starts with a few simple questions. Can we still have milk? Am I getting enough proteins? How can I feel the satisfaction of meat? These consumer driven questions forced scientists and the industry to create dietary 'essentials' with new techniques and ingredients.

Novelty in Reimagining the Archaic

To understand the creative process behind creating the plant-based food alternatives one needs to delve a bit into how satisfying these different pursuits became drivers for new food industries:

- The pursuit of Godliness for the ethnic and ethical
- The pursuit of plant-based fat & protein for the health-conscious
- The pursuit of the meaty taste and experience for the carbon-conscious

The Pursuit of Godliness for the Ethnically and Ethically Vegans

Religious ideologies use culinary doctrines for community building. Exclusion and inclusion are fundamental to this mechanism.

In India, where vegetarianism has a reasonably significant acknowledgement, there are two different culinary approaches: plant-based diets rooted in theology and non-violence are the ethnic identity and the other that offers plant-based meat analogues for people who periodically abstain from meat. Among most Brahmin communities from the subcontinent, vegetarianism has lasted many generations, and there may be a complete loss of memory of meat-eating if it ever was practiced amongst them.[16] Strong kinship supported by a highly evolved culinary ecosystem allows for a shared culture and culinary identity.

Many mock-meat dishes have evolved for periods of religious abstinence or as vegetarian options in convivial gatherings. In east Maharashtra, *maaswadi* is a snack made to look

like bone, an outer covering of chickpea flour, and the 'marrow' mimicked with spices and lichen. Naatukottai Chettiars of South India have used banana flowers to replace spiny loach (*Lepidocephalus thermalis*) in *aayira meen kuzhambu*. A paste of black-eyed peas is steamed in the shape of a fish on a banana leaf and added to *meen kulambu* curry to replace mackerel. The Jain community follows a more rigorous approach to non-violence that includes avoiding root vegetables to preserve microbial life forms. Thus, different types of bananas replaced starchy tubers, and asafetida satiates the need for alliums. Today, *paneer* and soya chunks have become the de facto replacement for meat in many curries.

The kosher dairy laws forbid the consumption of dairy and meat in the same meal. Judaism advocates serving *pareve* foods – those made without milk, meat or their derivatives and upholds the dietary laws. Pareve foods are not vegan, for it allows the inclusion of fish. While the laws of *marit ayin* forbid eating a *pareve* food that appears like dairy is served with meat or vice versa, with the wide commercial availability of such pareve imitations of both dairy and meat foods, today this is permitted. Since the demand for foods free of dairy or meat among kosher-keeping Jews is high, the dilemma led David Mintz, an Orthodox Jew, to start his famous line of soy-based dairy-free alternatives, Tofutti, in 1981. Tofutti has found a vast following among vegans as the diet continues to grow in popularity.

The modern ideology of animal-free diets gained momentum with the Seventh Day Adventists who rose from the ashes of the Millarite Movement after the 'The Great Disappointment' Shaped by her visions of Ellen G. White, one of the founders of the Seventh-day Adventists, the Church called for health reforms. The Church became actively involved in vegetarianism by 1863 and, three years later, opened the Western Health Reform Institute in Battle Creek, later known as the Sanitarium. In 1892, Ellen White wrote to General Conference President O. A. Olsen concerning her need for a new cook: 'Give me an experienced cook, who has some inventive powers, to prepare simple dishes healthfully, and that will not disgust the appetite. I am in earnest in this matter.'[17]

In a parallel development, vegetarianism evolved as an idea, gaining a foothold in 1842 with the Manchester Vegetarian Society (UK). The idea of eating a plant-based diet was also growing to be less alien as colonial life exposed the western world to new ingredients, cultures and markets.

The Church pioneered the efforts by directly owning institutions and factories like Battle Creek Sanitarium (USA), Nutana (DK) and Sanitarium Food Company (AU) or Adventists invested in their ventures seeing the market potential for plant-based analogues, enabling vegetarian reforms go mainstream. John Kellogg's (an Adventist) vegetarian ideologies set the commercial stage for new foods and new ideas beyond the Church's fold. He cooked out the preaching in the kitchen of the Battle Creek Sanitarium and established The Sanitarium Food Company to commercialize these products that include cornflakes, granola, nut and peanut butter (Kellogg's patent), spurring competition and patent wars.

In the 1930s, Rastalogy evolved in Jamaica as a calm, peaceful way of life with a dietary focus on cruelty-free eating called *ital* – from vital with an approach to natural foods discouraging meat substitutes. Interestingly, religious restrictions have forced people to make an alternate preparation in the historical context instead of 'substitution or mimicry'.[18] One exception might be the use of tofu as a meat substitute by Buddhists in Taiwan. Vegetarianism became prevalent among Chinese Buddhists in the 6th century when Emperor Wu urged monastics to stop eating meat. 'Faux meat' emerged as a culinary type catering to visitors to the monasteries between 10th to 13th century. Soy, native to the region, forms the base of this cuisine subculture and nuns who cook at the monastery have a deep understanding of it as a material. With limited technology, imagination has fired the flavors in bland tofu or seitan – from beef to pork and eel, monastic cooking can fake it all.

FIGURE 1. *Maaswadi*, a mock bone snack.

FIGURE 2. *Ayira meen kuzhambu* uses banana flower to mimic Indian spiny loach and *Meen kuzhambu* uses black-eyed beans to mimic mackerel.

The Pursuit of Plant-Based Fat and Protein for the Health-Conscious Vegans

John Kellogg developed 'Nuttose' in 1896,[19] for the Sanitarium's patients suffering from intolerance to starch, a condition he describes as 'amylaceous dispepsia'. In Nuttose, he found the perfect cognate for meat protein. Nuttose was inspired by tofu making – dried soybeans are soaked crushed, boiled and separated into solid pulp (*okara*) and soy 'milk'. Added salt coagulants separate curds to make tofu. Kellogg soaked and ground peanuts into a paste before processing it with coagulant salts and shaping it in cans. The cans were steamed for 3-4 hours to 'set' the meat before using it.

Kellogg wrote of Nuttose:

> For many years we dreamed of such a product, but had little hope of ever seeing the thing accomplished. A discovery, almost accidental, made some years ago, put us in the possession of the key to the situation, and long-continued experimental effort gradually perfected the method, until at last we have really mastered the art of meat making, and can compete with nature soy successfully as to be able to produce not only the real thing, but a better thing that the natural product.[20]

Kellogg declared it the 'perfect substitute for flesh food,' and said it resembled 'cold roast mutton'. Kellogg did not patent Nuttose. But, his patent for peanut butter (1895), Protose (1907)[21] and other literary sources show a familiarity and frenzy for nuts had set in.[22] Many nut-based mock meat products flooded the market owing to the Sanitarium's wild popularity. Grains, fruits and nuts find repeated mention in Ellen White's writings too-[23] -she writes of its rising popularity but is quick to warn of excessive consumption. [24] Nuts have since been the primary 'healthy' choice in replacing animal-based products.

Later that year Kellogg would famously say, 'Nuts are unquestionably the vegetable analogue of meat and other animal foods.'[25] Protose became the first commercially available meat substitute that was on the market until 2000.

Soy-based products were also one of the early alternatives for plant proteins. Soy is very versatile, suited to diverse regions and very attractive to farmers and the industry. Soy first arrived as tofu and later fermented tofu in the Western world, imported mainly by Asians in 1878.[26] The pioneering work of Li yu-Ying, who arrived in Paris in 1903 brought Western food semantics to this Asian ingredient. Soy-based Roquefort, parmesan, gruyere, kefir & yoghurt consciously mimicked to the tastes of France with suitable ferments were patented. In 1908, he established the world's first soy dairy, the Tofu Manufacturing Co. Li served vegetarian ham (*jambon végétal)*, soy cheese (*fromage de Soya*), soy preserves, soy bread etc. at the annual lunch of France's national *Société d'Acclimatation* in 1911, keeping with its tradition of introducing new foods from little-known plants. [27]

The growing discomfort among western vegetarians about inhumane emotions in using animal by-products like milk and eggs led Donald Watson to start the 'veganism' movement in 1944, defining their people as those who avoided milk and other animal products like leather, eggs, and honey. The search for an alternative to milk and meat only intensified. Early vegans were committed to generating knowledge and sharing best practices in the Vegan Magazine, published quarterly since 1944. Lively discussions of new ingredients to understand their potential as 'replacements' [nuts for meats regained popularity], taste enhancers [e.g. widespread use of nutritional yeast[28], miso], new options for coagulants and binders, probiotics [Rejuvelac[29], kombuchas etc.] were all shared forming a culture of collective 'vegan practice'.

The Pursuit of the Meaty Taste and Experience for the Carbon-Conscious Vegan

Historically, after soy products supplanted peanut/wheat gluten blends, simulating the 'chewiness' of meat became the next technical frontier in 'meat-like' challenge. Robert Boyer patented a method to make imitation meat, summarizing the problem in his patent of 1954, 'The stumbling block up to this point has been in the reproduction of the texture and appearance of natural meat, the texture of course involving a factor of 'chewiness'. Wheat gluten offers a certain amount of 'chewiness,' but they do not duplicate the fibrous character of meat and the satisfaction derived from the mastication of meat. [30]

'What makes meat taste like meat?'

Pat Brown of Impossible foods says of his moment of epiphany, 'Humans have been eating meat from animals since we were living in caves. So, I was shocked to discover how little we knew about how and why we crave meat. Our team spent five years studying meat at the molecular level and were able to make fundamental discoveries before launching a product. Our archive of knowledge on this subject is one of the company's biggest assets.'[31] Seven out of Impossible foods' fourteen patents address the meat-like taste components.

A new category of lab-reared, plant-based meat alternatives is on the rise that can be defined only by their lack of animal origin components. The Impossible approach takes a gene encoded with the characteristics of heme, a hemoglobin-like compound found in lentils and soybean and transfers it onto the common yeast, *S. cerevisiae*. It is a powerful vehicle for flavours and characteristics suited for large scale replication and production of leghemoglobin. Relocating the mouthfeel of muscle, the texture of meat has been another area of intensive competition.

Imagination in the Blogger Kitchens

Plant-based eating found its millennial readership in food blogs, and the influence of vegan food bloggers as recipe developers has spurred a new food culture. They echo a sentiment of personal health and discovering 'cleaner eating'. Over a decade, this rhetoric has given way to eating the 'vegan way'. Plant-based food from hyper-local traditional kitchens inspire their modern renditions often questioning the meaning of food within its geography. Sarah Britton set a frenzy for chickpea tofu inspired by Burmese Shan tofu.[32] Her recipe for nut bread became one of the biggest trends to change the way home bakers made bread, introducing nuts to replace grains in bread. The nut and seed bread echoes Florence George's nut roast[33] and many of the Battle Creek-era recipes but fit right in with today's needs of high protein, gluten-free foods. Food bloggers of the last decade have borrowed heavily from the vegetarian and vegan literature of the last century, in part appropriating the efforts of many generations of pioneers – the Seventh Day Adventists, the early vegetarians in England, the vegans of the '50s and the Hippies of the 60s and '70s. Nevertheless, their contribution to the visual appeal of food through digital photography and social media is the most powerful, bringing plant-based foods from a fringe culture to mainstream consumption.

New Frontiers in plant-based foods

Imagination sparked by new questions

An essential part of food science today is that most ingredients are broken down to functional building blocks- starch, fiber and protein often using a process called fractionation. Each plant-based ingredient can thus be a catalogue of derivatives and isolated compounds that

have physical and chemical properties distinct from the whole. These isolated parts are then selectively picked to fill in for the formula of a plant-based analogue.[34]
Scientists are also asking, 'What if we could...'

Could we just change the process and not the food?

What if one could make 'animal-based' more efficient?

Eric Östman set out to make a vegan-copy of cheese for the booming vegan industry. Observing traditional cheesemakers, Eric stumbled upon a conversation on casein with a cheesemaker. 'If you could give me a bag of casein, it would help small farmers like us compete with giant cooperatives. Just give me a bag of casein!' This sparked a new approach, and Eric changed course to a super-efficient cheese. Synthesizing dairy protein by fermentation, Eric's casein is structurally identical to milk casein, just animal-free and its addition increases cheese yield by 50%. Eric is not alone. Hours after the idea hit him; he realized ReMilk, PerfectDay and many others across the globe are pursuing it. With a valuable intermediary product, Eric and his competitors have markets beyond food.[35]

Imaginative Code for AI can still keep additives 'plant-based'

Companies such as Brightseed Bio, The Live Green and NotCo are actively scanning the plant kingdom to identify bioactive compounds identical to synthetic additives that have defined alternative foods from its start Using AI, their algorithms can scan thousands of plant-based compounds based on threshold values and qualitative terms to identify potential replacements. I dug deeper to understand how the algorithm worked. Notco 'plant-based' whole milk using its AI has these ingredients:

> Water, Pea Protein, Contains less than 2% of: Chicory Root Fiber, Sugar, Pineapple Juice Concentrate, Coconut Oil, Sunflower Oil, Virgin Coconut Oil, Cabbage Juice Concentrate, Natural Flavors, Salt, Gum Acacia, Gellan Gum, Calcium Carbonate, Monocalcium Phosphate, Dipotassium Phosphate, Vitamin B12, Vitamin D2. Contains coconut.

An array of flavour compounds mimics the taste of whole milk. The programmatic output feeds kitchen experiments that tweak the final recipe to taste. The method allows for exploration of untapped plant isolates.

Oatly, today's leading plant-based milk, lists its ingredients as:

> Oat base (water, oats 10%), rapeseed oil, calcium carbonate, calcium phosphates, iodised salt, vitamins (D2, riboflavin, B12). Free from lactose, milk protein and soy.

Oatly uses diverse salts for the enzymatic action required for fluidity.

A comparison between the tastes of Oatly and Notco frames the dilemma of our time: Are we seeking plant-based alternatives or replacements?

Conclusion

The rigorous journey to find analogues to animal-derived foods has food science, novel processes, production techniques and unusual combinations of ingredients that do not belong to the conventional kitchen. Ideologies from religion, personal health to climate change have driven this thirst for substitution. However, one essential, secret ingredient is the *incredible imagination* of the unseen influencers who conjure up these seemingly impossible recipes or formulas to fulfil the need for ideological substitution. It is also worth noting that these creative processes are predominantly preoccupied with matching known concepts in animal-based derivatives, including taste, texture, aroma and cooking process. Difficulty in mass appeal or presumption of being assertively weird, hampers imagination into unknown frontiers of unique foods with new forms, tastes and feel.

These imaginative foods follow a pattern that consists of

(A) finding innovative substitutes for protein, fats, fibres, and binding agents – driven by the need for systematically scanning for scalable yet novel feedstock.

(B) innovative deconstruction and re-combination of supplemented material by proprietary process or novel catalyst ingredients – driven by the need to mimic known tastes, mouthfeel and form.

(C) Imaginative conceptual packaging of the outcome as a valid food for mass appeal – driven by the need to gain ideological acceptance often with the end goal of marketability and commercial success.

These are not apparently discreet and have significant overlaps, but the general notion seems to hold true to most of the cases I have investigated. Temporal variance in ingredient availability, technology to synthesize a subcomponent and skills of the people driving the process i.e. food scientist's vs marketing guru – emphasize which aspect of the process gains importance.

It is also worth noting that the quest for imaginative synthesized food seems irrelevant to ethnically multi-generational vegetarians or vegans who have evolved a repertoire of culinary skills that simply avoid animal-based produce in their diet, thus have no need for mimicry. While the war years positively influenced the sale of meat alternatives, imaginative skeuomorphic foods didn't continue in the post war era.

The unsettling truth about these impossible foods is the drive to consume a 'guilt-free' diet that allows us to take pleasure in eating things, and in quantities that we would never want to eat otherwise. Food is a unique creative offering in that it needs to be eaten by people. It has an emotional and psychological need far beyond its function. The development of new animal-free and plant-based foods will remain a tussle between retro-vation and innovation. The unending, vivid, chemical diversity of this culinary mimicry shows that food, like the mouth, is a victim of preadaptation.

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Notes

1. The expression *vegetarian* first appeared in the April 1842 issue of *The Healthian* magazine. There is etymological disagreement on whether the English word *vegetarian* comes from *vegetable*, or from the Latin *vegetus* (strong, vigorous).
2. Donald Watson, 'The Vegan News', November 1944. Issue 1, p.02.
3. <?> John Harvey Kellogg. 1896. Nuttose: A new food for brain and muscle building. *Good Health*, July 1896, p.195-96. First instance the term 'substitute for flesh!' refers to a meat alternative.
4. K. Kirshenbaum, A. Guegan.'Meringue Composition And Methods Of Preparation' WO 2013/022750 A9, Feb., 13, 2013. (Patent filed on August 2011) (PCT)
5. Joël Roessel, 'Mousses végétales' <http://www.revolutionvegetale.com/en/> [accessed 13 March 2021]
6. Miyoko Schinner,<https://www.artisanveganlife.com/intensely-baking/> [accessed 11 April 2021]
7. On March 2, 2011, she wrote, 'I think the star of the week was my flaxseed meringue, which is an omega-3 packed mound of white fluff that can be folded into mousses and terrines and piled on top of pies, just like the stuff made from egg whites. This is just plain fun and amazing, sort of like a science experiment. Basically, flaxseeds are simmered for 20 – 30 minutes, strained, and the resulting goop chilled. Afterwards, it whips up just like meringue.'
8. Many cookbooks discuss such alternatives: Fay K Henderson, *Vegan Recipes* (H.H Greaves, 1946), 'The Golden Rule Cookbook: Six Hundred Recipes for Meatless Dishes (Brown Little, 1912), Ella Kellogg, *Science in the Kitchen* (Health Publishing Company, 1892), Amanda Lambert, *Guide for Nut* (J. Lambert & Co, 1899)
9. Abu-Ghoush et ah, '*Comparative Study of Egg White Protein and Egg Alternatives Used in Angel Food Cake Systems, Journal of Food Processing and Preservation*', 34 (2010), 411-425.
10. http://aquafaba.com/history.html
11. Le Défi FUDA – BONUS #1 Mission Pois Chiches <https://www.youtube.com/watch?v=aIlp_FUINZI&ab_channel=ONGFUDA> [accessed 12 April, 2021]
12. An archive of the Facebook conversation between Joel, Goose, aquafaba users and other vegans reveals the development of aquafaba- <https://www.facebook.com/groups/VeganMeringue/permalink/3830041052205 95/.>
13. Modern day recipes listed online on various blogs and in cookbooks use soda bicarbonate to create the foamy structure.
14. Sinclair, Upton. 1906. *The Jungle* (New York, NY: Doubleday, Page & Co.)
15. John Davis, '*Extracts from some journals 1842-48 – the earliest known uses of the word 'vegetarian'*, International Vegetarian Union <https://ivu.org/history/vegetarian.html>. [accessed on 3 April, 2021]
16. William Shurtleff, Akiko Aoyagi, '*History of Meat Alternatives (965 CE to 2014): Extensively Annotated* Bibliography and Sourcebook' Soy Info Center, 2014, p.36 'This is the earliest English language document that mentions a meat alternative in the form of a 'cutlet''
17. Among the Saraswat Goud Brahmins, Kashmiri Pandits and Brahmins of Bengal and Orissa, meat eating is accepted.
18. https://whiteestate.org/legacy/issues-vegetarian-html/
19. The national meat bans in Japan imposed gradually (AD 675 – AD 872) still allowed fish..
20. John H. Kellogg, 'A doctor's chats with his patients: A new food for diabetes.' *Good Health,* 1896, p.248.
21. By 1896, seitan, tofu and casein based mock meats had been explored.
22. John H. Kellogg, 'Healthful Living: An Account of the Battle Creek Diet System' (Kellogg Food Company,1908). *p.*44. p 45
23. John Kellogg, 'Food Product' US Patent No. 869371, Oct. 29, 1907.

24. Ellen G. Smith, *'The Fat of the Land and How to Live on It',* (1896). p.132 'Brazil nut meats eaten with beans are an excellent substitute for pork.' Also p.144
25. Ellen White, '*Counsels for Diet and Foods*', Review & Herald Publishing, 1938), p. 92 'In grains, fruits, vegetables, and nuts are to be found all the food elements that we need 'The grains, with fruits, nuts, and vegetables, contain all the nutritive properties necessary to make good blood.'
26. Ellen White, '*The Ministry of Healing*', (Washington: Review & Hearald Publisihing Assn., 1905), p. 298.
27. The first use of the word 'analogue' for meat-alternatives.
28. Doufu-ru (Fermented tofu) was first made in the Western world in San Francisco by Wo Sing & Co., which also made regular tofu (Wells Fargo & Co.) in 1878.
29. Shurtleff, William, and Akiko Aoyagi. 2015. *History of Soybeans and Soyfoods in France (1665-2015)* (Soyinfo Center)
30. 'In 1919, Li is granted patents for the world's first vegetable milk and its derivatives (British Patents No. 30,275 and 30,351) and two French patents, No. 424,124 concerning soy flour and its derivatives, and No. 424,125 concerning soy food products and condiments. The former is packed with original ideas, including various French-style cheeses and the world's first industrial soy protein isolate, Sojalithe.'
31. <?> *The Farm : Yay Soybeans! How You Can Eat Better for Less and Help Feed the World*. 1974. (Tennessee: The Book Publishing Co)
32. Rejuvelac is a kind of grain water that was invented and promoted by Ann Wigmore in the 1980s
33. Robert Boyer, Harold Saewert. 1953. 'Method of Preparing Imitation Meat Products,' *US Patent*. First use of term *synthetic meat*. Boyer employed textile manufacturing techniques and adapted them to produce, elongate and spin vegetable protein fibers later applied by General Mills to make Bac-O in December 1965.
34. Allen, Mary. 2018. 'Impossible Foods : The Flavour of Meat,' *gfi.org* <https://tinyurl.com/5f69nu7w> [accessed 21 April 2021]
35. Britton, Sarah. 2014. ''Genious Chickpea Tofu,'' *My New Roots* <https://www Mynewroots Org/site/2014/04/genius-Chickpea-Tofu/> [accessed 29 May 2021]
36. George, Florence A. 1908. *Vegetarian Cookery* (E. Arnold)
37. Protein+fibre+texturizer+ emulsifier+binder+probiotic+enzyme+protection.
38. Interview. Ostman, Eric. 2021.