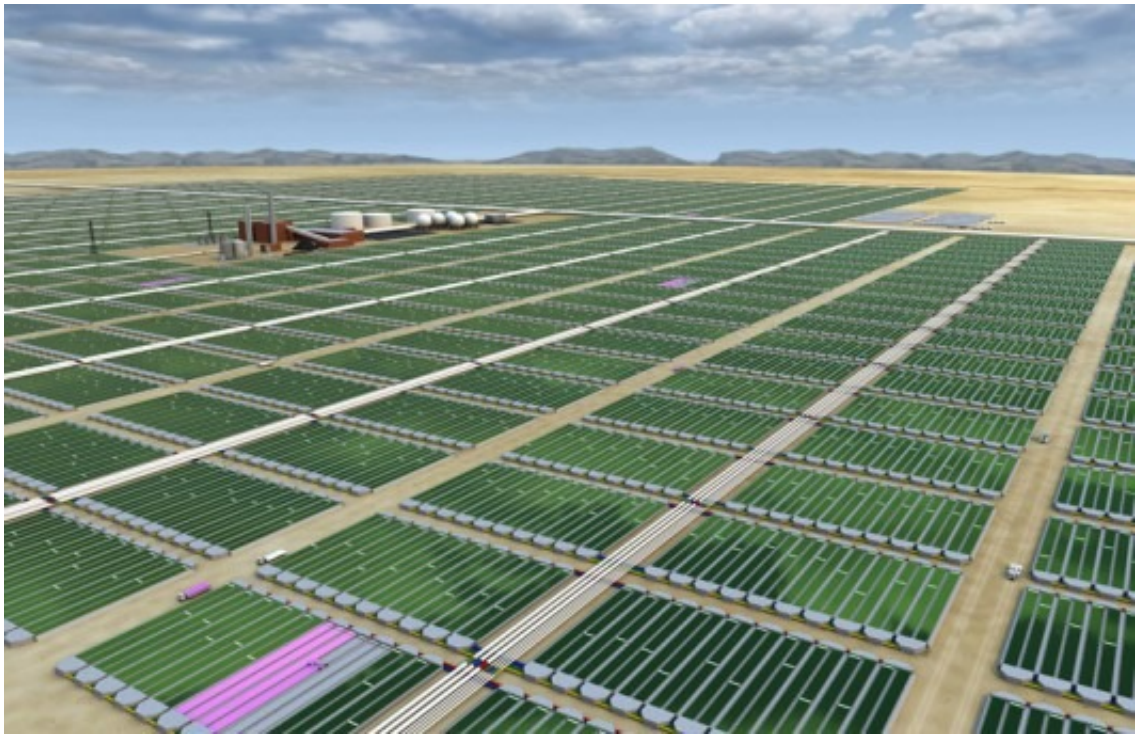


Little Green Cows

The world is alight with algae fever.

In this age of deep ecological design aspirations, the range of speculative design projects based on algae technology is growing. Algae are imagined to provide a whole range of solutions, from energy-producing architectural towers, to lights, burgers, skin care products, animal feed, drug factories and bioplastics. It finally appears that the world is turning green. Literally.

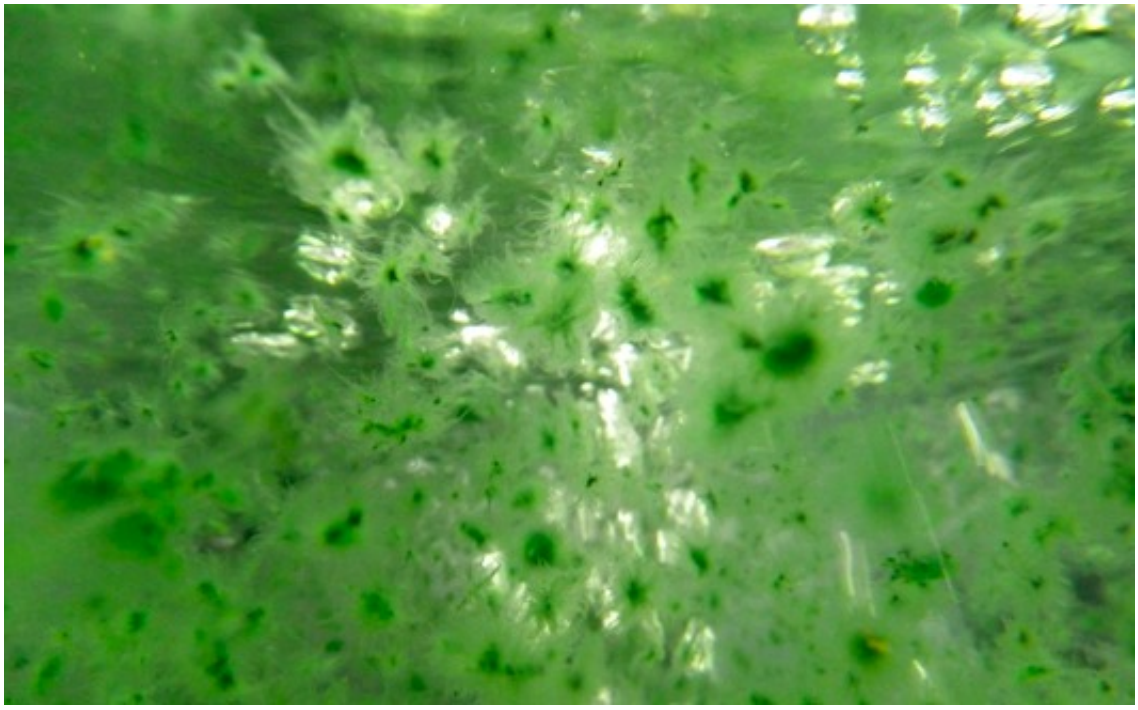
Algae, simple photosynthetic plants that live in water, are among some of the oldest living organisms on earth. Most species can only be seen with a microscope, but others can form dense mats of vegetation or large underwater forests. During the Archean period, between 3.9 and 3.5 billion years ago, blue-green algae* set the preconditions for modern life by changing the earth's atmosphere, which was choked with poisonous gases, and turning it into an oxygen-rich environment. Their modern-day descendants can use a range of pigments to harvest specific wavelengths of light to form solid plant matter, or 'biomass', by using sunlight and carbon dioxide to produce fuel, water and oxygen.

Indeed, the ability of algae to fix carbon is such that they've become the technology of choice for carbon capture. We already know that they can make a large-scale impact. In fact, algae are so relentless, work so quickly and on such a scale that up until this

moment in time they've been regarded in an extremely negative manner. Algae have been called by many names, most of them not at all complementary: Weeds, blight, bloom, deadly foam and literally, the scum of the earth. Despite their current reprieve as a possible solution to escalating carbon dioxide levels, there are still more products on the market designed to kill algae than ways to fruitfully use them.

Designing with algae is an opportunity to creatively engage their technological potential in new ways, since they are not machines. Yet the modern synthetic biology industry, which takes a rational design and engineering approach to living systems, exists within an industrial framework. The model for the production process is the brewing industry. In a brewery, a living system, yeast, is introduced into a mechanical container where it performs the function of a tiny 'machine' that makes alcohol using natural raw ingredients. The container walls have no connection to the outside environment, so the yeast is ecologically 'imprisoned' and disconnected from nature. The process is also invisible to observers and the final product is assessed as a commodity rated purely in economic terms as a manufactured 'product'. Its value is rated in comparison to the equivalent of a barrel of crude oil. It is not sold according to any other benefits of the process that relate to human experience.

This is a huge missed opportunity for synthetic biology to reach new customers and audiences. Biological systems do not just make useful products, but also offer significant environmental and people-centered benefits, which are neglected in the industrial approach. For example, algae bioreactors that use sunlight to fix carbon dioxide for the production of biofuels, which range from alcohol to oils, can also be designed as social experiences. IBA Hamburg promises the reality of a more integrated ecological design solution in its amazing new building facades for novel housing types.



ALGAE DRIFT IN THE INTERIOR OF A BIOREACTOR. PHOTO BY AUTHOR.

So, rather than thinking of the algae as being 'machines' we could perhaps think of them as being 'little green cows'. Imagine the algae bioreactors, which are simply aquariums, as a field in which oil-producing algae can graze on sunlight and carbon dioxide. These algae are circulated around the tank so that they have plenty to eat. They are eventually moved into a milking shed in the form of a copper pipe, which gives the little green cows a tiny shock as they pass through, in a process called 'cracking'. Absolutely no cows are hurt in the process, and by the end of a week a window-sized bioreactor will have produced a buttery layer of biofuel, which floats to the top of the collecting vessel like cream in a bottle of milk. The protein-rich waste can be recycled into soil fertilizer, or compressed into bricks for building with.

Many of the design issues raised in algae-based solutions prompt ecological thinking and approaches that are more frequently associated with creating ponds, gardens, farming and parks than making gadgets. So, thinking beyond the machine metaphor creates new ways of experiencing technology, and invites biology into our living spaces, which brings added benefits. Life is more robust, more adaptable and more surprising than machines can ever be. Uniquely, it also has the capacity to deal with 'the unknown' – something that simply cannot be modeled and programmed into mechanical systems. Consequently, when we view biology as being qualitatively different from machines, science and design are presented with new opportunities in ways of making and working with biology. Next nature explores this creative interface between biology, technology and humans, and inspires design solutions that are greater than the sum of their parts – which really is a lot more delightful than watching the inner workings of an oil refinery.

Image via Celcias.

* Once considered true algae, blue-green algae, or cyanobacteria, are now classified as bacteria.

Rachel Armstrong on 21/03/12
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