

## DETRITUS & ART / A personal point of view on Environment and Art by Rainer Stegmann

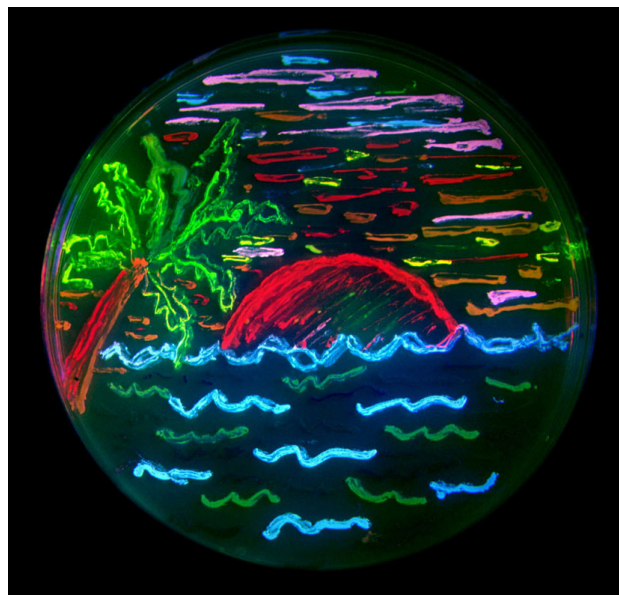
Recently I came across Bacterial Art also called Microbial Art. I had never heard about it before. To get an idea what it is I asked "Big Brother" Chat AI GPT and I got an excellent answer. I present some excerpts:

*"Ah, bacterial art a fascinating and creative intersection of science and art! Artists harness the natural abilities of bacteria to grow and form intricate patterns. They carefully manipulate the growth conditions, such as temperature, nutrients, and agar medium, to guide the bacteria's growth and create desired shapes and colors. The result is a mesmerizing display of living art. One popular technique in bacterial art is called "bacterial painting." Artists use a sterile brush or other tools to apply different strains of bacteria onto a solid surface, such as agar on a petri dish. As the bacteria grow and spread, they create vibrant and intricate patterns (Example No. 1). Another technique involves using genetically modified bacteria that produce pigments or fluorescent proteins (Example No. 2). Bacterial art not only showcases the aesthetic beauty of microorganisms but also raises awareness about the importance of bacteria in our lives".* It is a bit frightening this Chat AI GPT, thinking about the amazing potentials; but the text must be checked for errors.

I like the analogy that agar plates may be the canvas of the "painter", while the specific bacteria and yeasts rep-



**EXAMPLE 1** / Art work from the series Seascapes (courtesy of Dr. Mehmet Berkmen) [www.bacterialart.com](http://www.bacterialart.com)



**EXAMPLE 2** / Artwork by Nathan Shaner, photography by Paul Steinbach, created in the lab of Roger Tsien in 2006. CC BY-SA (from Wikipedia)

resent the paint. The art work can be sealed -after their sufficient incubation- with epoxy. The bacteria, yeast, or fungi are chosen for their natural colours as *Bacillus subtilis* (cream to brown), *Chromobacterium violaceum* (violet)" and others (based on Wikipedia).

A very active group in this field is chaired by Dr. Mehmet Berkmen. Together with the local artist Maria Peñil Cobo, the Berkmen Lab has the mission to bridge the gap between Arts and Sciences, and between Humans and Microbes. The Berkmen Lab has engaged local schools in STEAM events, organized workshops at universities, presented their work in international conferences and presented their work in galleries. (modified from <https://international.neb.com/research-labs/berkmen-lab/research-projects/bacterial-art>). Dr. Berkmen and I realized that we both have the same motivation using art to make disciplines more visible and enjoy their beauty. He gave us permission to publish this beautiful artwork No.1 from the series "Seascapes" on our page. For those of you getting more interested in this art direction should visit beyond others the website <https://www.bacterialart.com>.

I found another example of Bacterial Art on Wikipedia: Beach scene with bacterial strains expressing different kinds of fluorescent proteins, from the laboratory of the Nobel Prize-winning biochemist Roger Tsien (Example 2).

Now we come to the obvious connection of bacterial art and waste management (WM). Biological waste treatment is one of the pillars of WM. Bacteria operate the biological degradation of organics during composting and the acidification and acetogenesis under anaerobic conditions; they are also active in biofilters, landfills, during biological contaminated soil treatment and other WM areas. Bacteria are not visible during practical application in biological plants; i.e., for non- biologists there is a re-strained relationship to the specific bacteria. I think, through the representation of bacterial art more in-terest for the microbiology of bacteria may be raised. Engineers use biological processes in WM all the time and can control the processes very well without decent knowledge about the specific bacteria in-volved. So, why should we know more about them. I think for the further improvement of the biological processes in WM and the extension of their application (e.g., microbiological production of specific organic acids and hydrogen) the engineers have to cooperate with the microbiologist. But this is only successful when there is a basic microbio-logical knowledge so that both disciplines can communicate with

each other. I see also potentials in biological waste treatment by developing gene manipulated bacteria. Interesting for our field would be a faster biological methane oxidation in biofilters, and may be designed specialized bacteria for the deg-radation of halogenated multi- ring aromates that are not supplanted by the existing microorganism. Well, there are more potentials we can think of, but we have to make sure that we do no not open Pandora´s box.

Let us admire the amazing creativity of the bacterial art artists and enjoy the beauty of their creations. May be some of us get inspired for new activities.

*In the next issue I will present a sculpture by Umberto Boccioni (1882-1916) "Dynamism of a Speeding Horse + Houses". Boccioni was an Italian painter and sculptor. He was a representative of the movement Futurism.*

