

Other Selves: An Artistic Study of the Human Microbiome

Joana Ricou

Abstract

We are made of many parts and many types of parts. Many of these are alive, and as the study of the human microbiome has recently revealed, most are not human. I explore the microbiome as an artistic medium and the questions it raises about identity, since the microbiome blurs the boundary between organism and environment, figure and ground. I cultivated my microbiome and others inhabiting my environment to create living paints with which to make an unusual self portrait: an otherself portrait. In the process, I arrived at a series of otherself landscapes, discovering the body as a world, multiple and dynamic.

Background

Comparing the concepts of identity in art and biology yields some insights about how our understanding of ourselves evolved. In art history, we can observe the progression from a concern with stylized forms and ideas, to a true depiction of reality, to an exploration of the metaphorical and subjective. Meanwhile, identity as defined in biology mostly limited itself to polemic, taxonomic descriptions of the human species¹ until the 20th century, when it exploded to the forefront of the conversation with the discovery of DNA and the uniqueness of the genetic fingerprint.

More recently, several discoveries in biology, such as the microbiome, have fundamentally challenged our notions of identity. Researchers determined that not only are nonhuman organisms essential to our health, but nonhuman cells outnumber human cells 10:1, and nonhuman genes outnumber human DNA

150:i.² Science now proposes that we consider the human being not as a single organism, but as a diverse ecosystem.

I am interested in the way that biology defines and redefines boundaries in the human body, and I use these discontinuities as starting points to phrase questions about identity. I was intrigued by the idea that there is a nonhuman part to each of our many parts, most parts. And since our microbiome stems from our environment—the air we breathe, the food we eat, the objects we touch—it connects us to our environment directly and blurs the most fundamental boundary of individual identity: skin.

The Microbiome as an Artistic Medium

I consulted with scientists to determine a protocol to cultivate microbes commonly found on the surface of the human body and in an urban environment. Using Q-tips, I collected samples of my microbiome, swabbing only external surfaces of my body (face, scalp, and hands) and my environment (air, table, and floor). The collection was done under semisterile conditions, and each sample was plated in a petri dish with LB agar and potato dextrose, then incubated at near body temperature.

I used the standard crosshatching pattern for plating so the initial petri dishes didn't differ visually from common scientific sampling of bacteria. To the untrained eye, the diversity of the microbes grown was exciting: there were a variety of colors, ranging from whites to yellows to reddish orange, and a variety of textures, many bacteria and some fungi. I had hoped that samples grown from different parts of the body would look different, since our microbiome is thought to vary by nook and cranny, but they were not recognizably different. Consulting with experts, I learned that the environment of the human body is truly unique and the *in vitro* conditions cannot match its richness. My own inexperience may have limited the diversity; for example, the temperature of incubation was likely too high because the cultures were taken from the surface of the body, which has a slightly lower temperature than the interior (body temperature). In effect, I had selected for a hardy few. I digitally combined all the human samples in one image, virtually integrating organisms that couldn't tolerate each other *in vitro* and creating a more complete portrait.

Whereas there was no significant difference between the different human microbiome plates, there was almost no overlap between the human and environmental samples. This was disappointing, since I had hoped to see the similarity, the blurring between organism and environment. Comparing a combined image of all human- with all nonhuman-derived microbes, the two works have a distinct cosmic feel: individual dots and tendrils float in the environment, the petri dish

boundary creating a planetlike shape and emphasizing the loss of connection between the two.

Individual bacterial colonies and samples of different fungi were carefully picked off each plate and grown separately, in liquid LB agar, with agitation, at body temperature. These conditions allowed for rapid growth and the creation of a palette of living colors.

An Unusual Self-Portrait

The cultures were used as common paints, as I painted two compositions on a series of petri dishes using traditional brushes (Figure 5-1). The petri dishes contained LB agar. One composition was a self portrait, a bust. Cultures from the forehead or chin were used to paint those areas of the face; cultures from the environment were used for the background. The second composition was symbolic, a filled circle surrounded by a ring, symbolizing the person and the environment, respectively. In this case, human paints were mixed in the center, and environmental paints were used in the ring.



Figure 5-1. Creating a palette of living colors. The “paints” included bacteria and fungi derived from the collected microbiomes of myself and my environment.

Over three days, all of the plates in this experiment revealed a similar result: a milky white, homogeneous substance, likely due to the artificial decisions made about the growth conditions. The resulting work was an unusual self portrait (Figure 5-2), an otherself portrait, which had an interesting mix of markmaking between those made by hand with brushes and the textures and forms created by the microbes. Between the two, the outline of an individual remains barely discernible, effectively blurring the boundary between the figure and the ground.

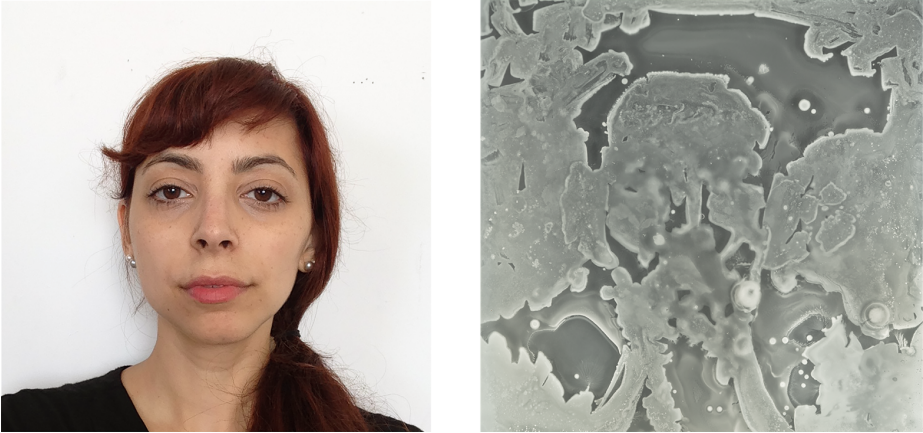


Figure 5-2. Joana Ricou, *Me and My Other Selves*, inkjet, each 22 × 22 in., 2014.

Over three days, all of the plates in this experiment revealed a similar result: a milky white, homogeneous substance likely due to the artificial decisions done about the growth conditions. The resulting work was an unusual selfportrait (Fig. 2), an otherself portrait, which had an interesting mix of markmaking between those made by hand with brushes and the textures and forms created by the microbes. Between the two, the outline of an individual remains barely discernible, effectively blurring the boundary between the figure and the ground.

Exploring the portrait at a higher resolution revealed a new layer of detail. With the aid of photographer Raúl Valverde, I discovered that the seemingly homogeneous biofilm had a surprising variety of shapes and textures. Beautiful and delicate borders arose from complex interactions stemming from physical, chemical, and biological tensions created by the microbiome.

At this degree of magnification, the imagery became topographical, and the reference framework switched from portraiture to landscape representation (Figure 5-3). Searching for a portrait of my other selves, I feel that I discovered a selfhood as a world.

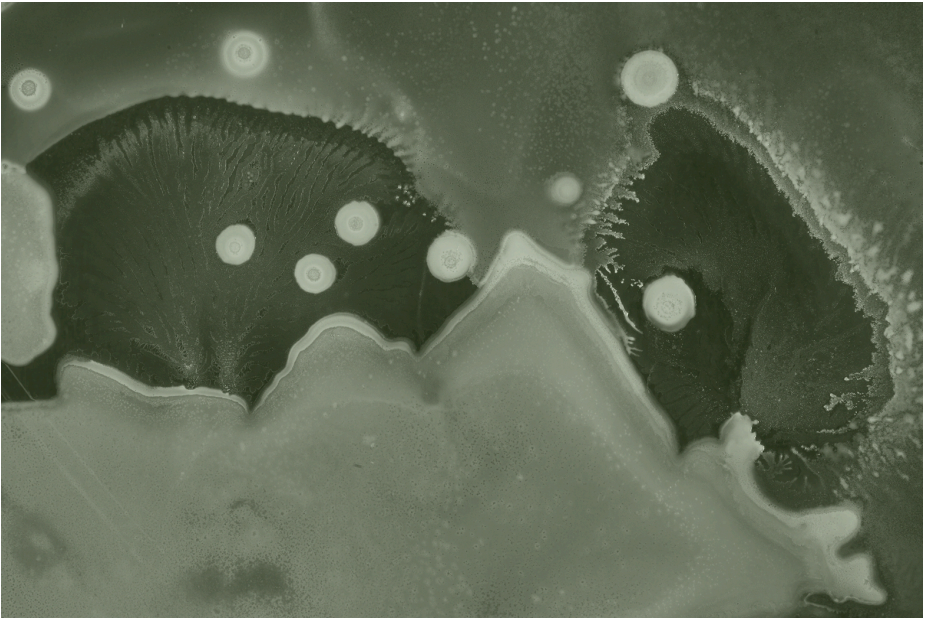


Figure 5-3. Joana Ricou, *Other Landscapes (Microbiome) no.1*, 35 × 55 in., 2014 (photographer: Raúl Valverde).

Conclusions and Next Steps

I started this project looking for a connection between the body and the world and felt that I arrived more at a discovery of the body as a world. Continuing to discuss these results, I learned that a significant part of our microbiome comes not from our world but from our mothers (from vaginal delivery). I am expanding the project now to include how the microbiome blurs not just the boundary between the organism and the environment and but also between generations. From a technical perspective, the microbiome is surprising in many ways: control has to be shared with a living medium but, like with any other medium, manipulating the conditions of its use seems to lead to interesting results.

Biology has uncovered the body as multiple, dynamic, and transient, and the microbiome is only one of the latest research areas to embody these themes. I believe that an artistic exploration of our biology is not only fun but essential, not necessarily for helping us understand what our biology is or what it does, but what it means. Playing with portraiture and apparently landscape, we can explore and incorporate these changing ideas into the changing image we somehow insist on recognizing every day in the mirror.

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References and Notes

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2. B. Zhu, X. Wang, and L. Li, "Human gut microbiome: the second genome of human body," *Protein Cell*, no. 8 (2010): 718-725.
3. David A. Relman, "Learning about who we are," *Nature* 486, no. 7402 (2012): 194-195.

Joana Ricou works at the intersection of art and science as an artist and as a creative consultant in education. She has collaborated and exhibited at galleries, museums, and universities including the Andy Warhol Museum, Carnegie Science Center, New York Hall of Science, Harvard University, and Children's Museum of Pittsburgh, among others. Joana has a Bachelor of Science and Arts from Carnegie Mellon University (2004) and an MS in Multimedia Arts from Duquesne University (2009).