sculpture
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Oliver Laric, *Metamorphosis*, 2021. Sculpture generated from 3D computer, installation in Middelkerke, Netherlands. Photo: Wikimedia Commons

Beyond the Art/Science Duality: A Conversation with Ellen K. Levy

December 8, 2022 by Joyce Beckenstein

Ellen K. Levy, curator, scholar, and artist, directs her boundless curiosity through complex realms of science and technology. Where, she wonders, do the patterns and structures hidden within the natural world intersect with artistic creation? *D'Arcy Wentworth Thompson's Generative Influences in Art, Design, and Architecture: From Forces to Forms* (Bloomsbury Press, 2021), which she co-edited with Charissa Terranova, investigates the ideas of a zoologist and philosopher whose writings anticipated our understanding of human growth and evolution. This anthology cuts a clear path to "From Forces to Forms," a multimedia exhibition that Levy curated earlier this year at Pratt Manhattan Gallery, featuring 19 artists who draw on the patterns, forces, and structures within nature to inform their work.

Here, Levy discusses a variety of intersections between art and science, explaining how bio/eco/crypto technologies can provide artists with new insights, media, and methodologies. The works that she describes not only prompt us to reconsider the nature of the art object and the art process, they also reveal how art/science collaborations have impacted social/political revolutions; how they have encouraged activist environmental art projects; and how, going forward, contemporary art is likely to be (re)defined.

Joyce Beckenstein: "From Forces to Forms" emphasized the science of natural phenomena. Why did you choose this subject for a school of design?
Ellen Levy: I chose it for several reasons. It's important to realize that our understanding of nature and our ideas about design have changed over time. Design today is very much an interdisciplinary field, often pursued by engineers, artists, and designers who are informed about technologies that didn't exist before, such as crystallography and biomechanics. Contemporary design also intersects with behavior, especially in the field of eco art, where artists work with communities to try to foster sustainable practices. Many schools, including MIT, Carnegie Mellon, and Pratt Institute, have science and technology-related courses with which they expect students to be current.

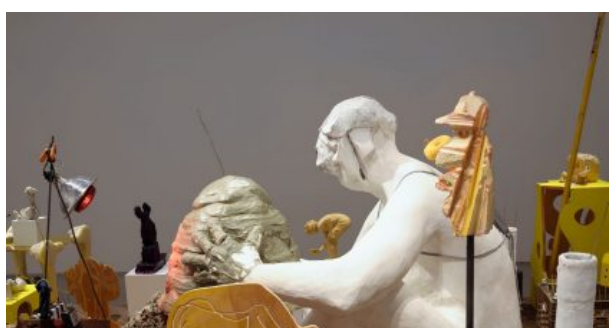
Tauba Auerbach, *Altar/Engine*, 2015. 3D-printed nylon and plastic on table of aluminum, wood, and paint, 126 elements, 18 x 18 x 10 in. to .63 x 1 x 2 in. each; table: 15 x 108 x 108 in. Photo: Steven Probert, Courtesy Paula Cooper Gallery, New York

JB: The intersection of science/technology and art is not new. Can you trace some of this history for us?
EL: Most students, particularly those drawn to art and science, have traditionally been intrigued by the structure and functioning of objects in the natural world—honeycombs, seashells, spider webs, and chicken bones. Many design teachers still draw attention to these forms. By the early 20th century, the complex implications of advanced sciences and

EDITOR'S CHOICE

Athena LaTocha, The Remains of Winter

Mary Ann Unger: To Shape a Moon from Bone



JB: Who was D'Arcy Wentworth Thompson? Why is he important?

EL: Thompson was a Scottish mathematician and biologist whose 1917 book, *On Growth and Form*, significantly expanded cultural and scientific possibilities. We situated his work within an expanded field of evolution to emphasize the significance of his belief that physical forces acting on forms play a significant role in how organisms evolve. For example, his analysis of principles of morphogenesis was particularly influential on 20th-century culture, especially in the fields of generative art, bioart, and bioarchitecture.

JB: What is morphogenesis?

EL: Morphogenesis, simply put, describes the process by which an embryo develops into a living form; it is the shaping of an organism by embryological processes. In 1917, when Thompson published his book, little was known about the gene; its double helix structure was not worked out until 1953. Thompson, however, was familiar with Darwin's theory of natural selection published in 1859. In a later 1871 text, Darwin identified the force of sexual selection as a significant factor in evolution, a discovery largely ignored during the Victorian era. Thompson also believed that there were forces beyond natural selection that determined development, and he turned to the world of physical forces within nature to explain them. The possibility that many different forces, beyond genetics and natural selection, determine inheritance came out of Thompson's thinking, and scientists today look seriously at these factors.

Nicole Eisenman: Untitled (Show)

Nari Ward: I'll Take You There; A Proclamation

Liz Larner: Don't put it back like it was

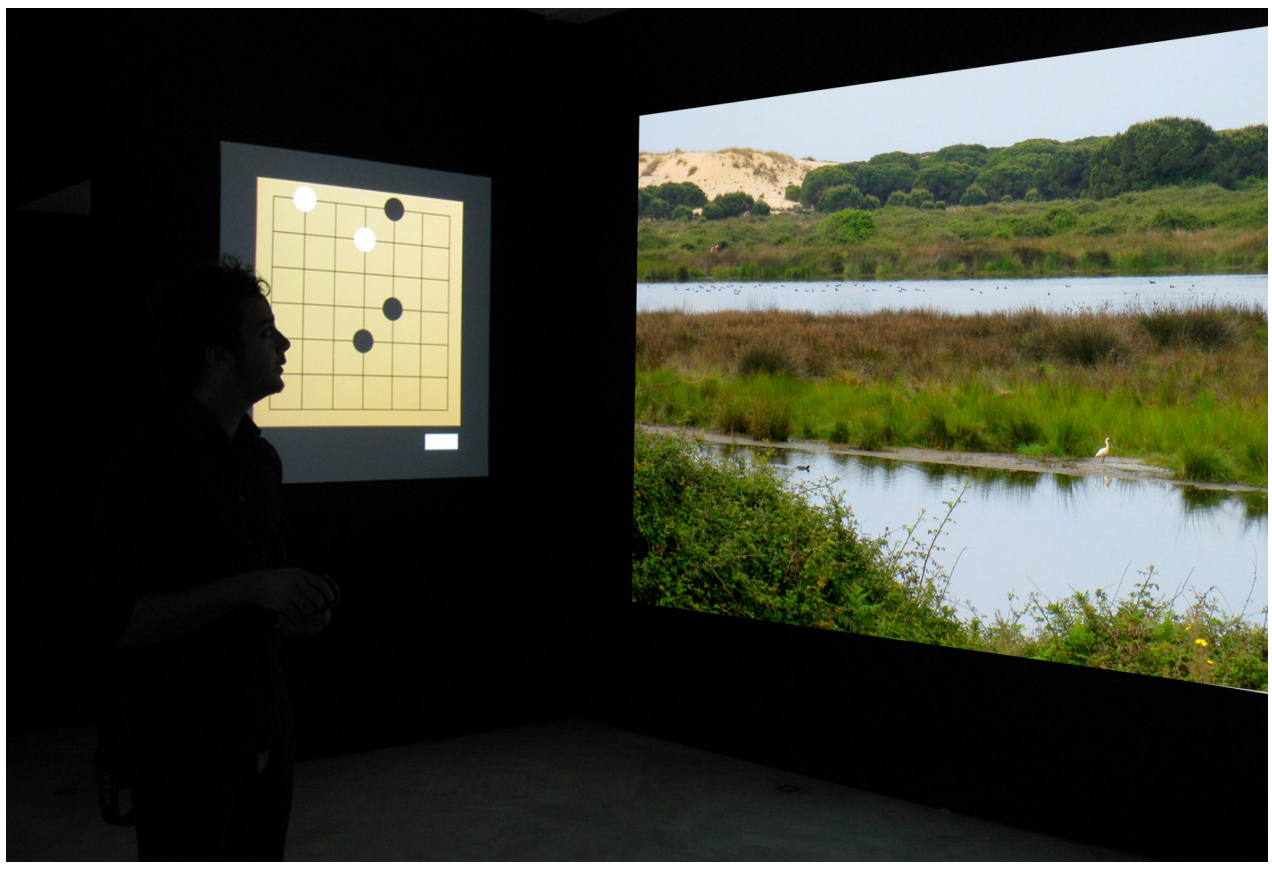
ISSUES

Go to Issue...

Christy Rupp, *The Great Auk*, from the series "Extinct birds previously consumed by Humans," 2008. Welded steel, fast food chicken bones, paper, and mixed media, 32 x 17 x 22 in. Photo: Nick Ghiz

JB: Why was all of this important to artists?
EL: Thompson's writing was inviting and accessible to artists, designers, and architects because it offered them a new approach to building form. Two well-known results were "tensegrity" and the geodesic dome. Tensegrity is a method of stabilizing mountable and demountable structures developed by Buckminster Fuller, as well as by the sculptor Kenneth Snelson. Thompson related his thinking about the forces within the structure of skeletons to the structure of bridges, and this concept was important to Fuller's development of the geodesic dome. These discoveries reinforced the importance of understanding the geometries of the natural world and incorporating them into architecture and design programs.

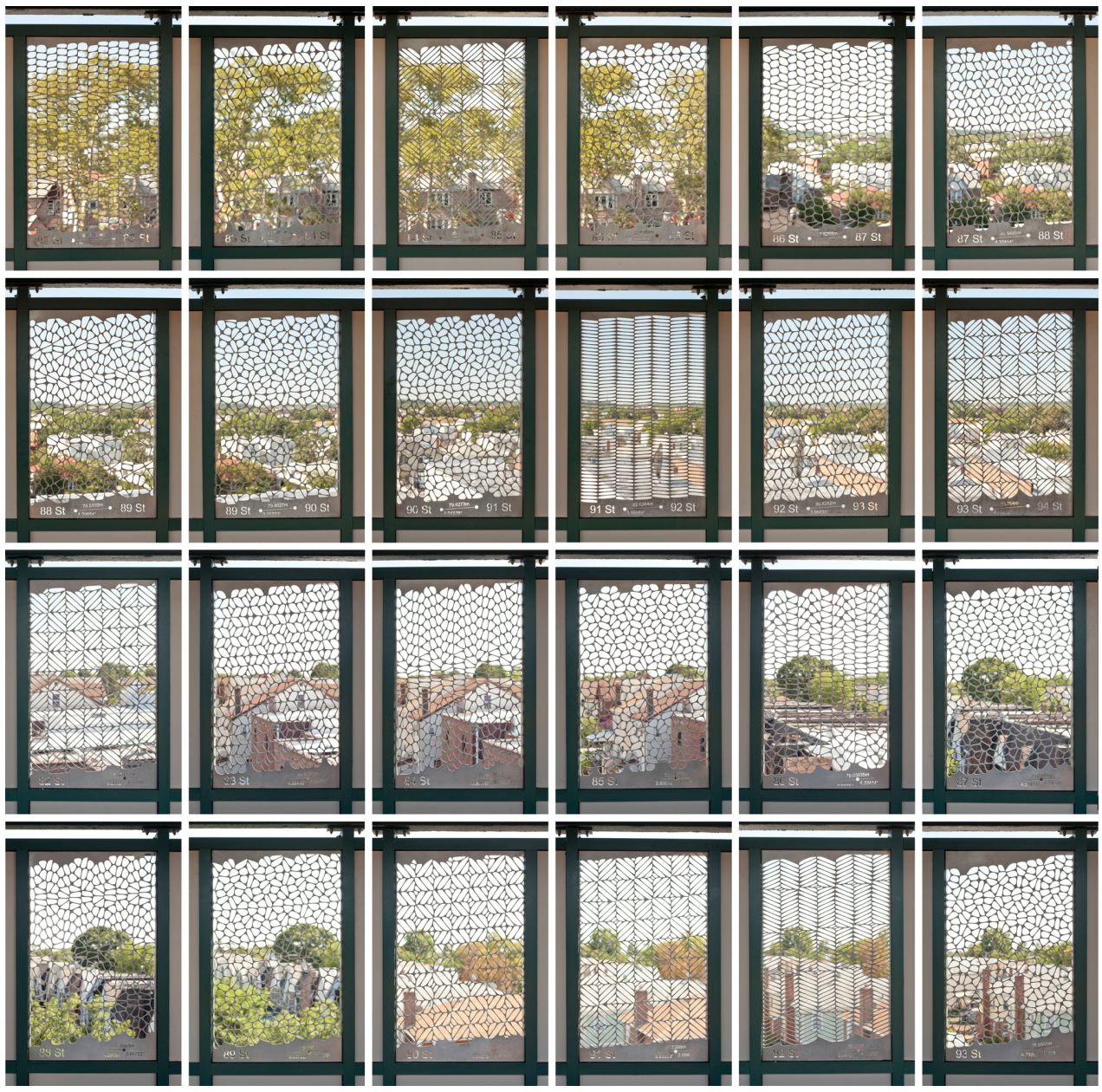
JB: Didn't Thompson's writings also fuel Pop artist Richard Hamilton's fascination with science and technology?
EL: Richard Hamilton was very excited by Thompson's ideas about the relationships between art, science, and technology. In 1951, he curated an exhibition, "Growth and Form," at the Institute of Contemporary Arts in London; in 2014, the exhibition was reconstructed at Tate Modern and the Museo Nacional Centro de Arte Reina Sofía in Madrid. In our anthology, Charissa Terranova traces Thompson's influence on Hamilton's exhibition, describing it as a "design-based expression of scientific concepts" that included projected moving images, microphotographs, specimen displays, and X-rays. Charissa points out that Le Corbusier, in his favorable review of the original show, noted how much the tools of science, instruments of measurement, photography, and cinema could accomplish. In some ways, my 2022 exhibition at Pratt extended this focus because it showed that we continue to have new understandings of the forces in nature, new tools that didn't exist before, and we see how artists are putting them to use to generate new metaphors and experiences.



Lillian Ball, *GO Donaña*, 2008. Multimedia interactive installation with projectors, dimensions variable. Photo: Lillian Ball, Courtesy the artist and Fundacion Biacs

JB: So, how are artists, particularly those steeped in sciences that few non-scientists understand, putting these tools to use as art?
EL: As one example, Haresh Lalvani, a sculptor, architect, and professor of undergraduate architecture at Pratt, explores principles of morphogenesis in his work. In his stainless steel sculpture, *64 60 102* (2012), he applies algorithms and undefined forces (because of patent pending) to flat planes that then self-organize, producing myriad variations of a work.

Metropolitan Transit Authority in New York City, is an example of his innovative practice. This work, consisting of 24 unique laser-cut stainless steel panels, is located at the 88th Street train station in Queens, which serves 12 streets. Twelve panels are installed on the Queens-bound side, 12 on the Manhattan-bound side. Lalvani derived the design of each panel from an algorithm that inputs the GPS coordinates of the streets. The 24 individual designs were selected as specific moments from a continuum of patterns that morph from one to another. This continuous morphing captures the concept of time, a fundamental feature of travel. He has explained that, to his knowledge, "it is the first time procedural pattern-generation was linked to GPS coordinates," something that he says "enables artists to create a distinct design for any location on the planet."



Haresh Lalvani, *MORPHING88*, 2015. 24 laser-cut panels in stainless steel, 48 x 30 x 3 in. each. Installation for MTA Arts & Design. Photo: Bill Kontzias

JB: Who are some of the other artists dealing with morphogenesis?
EL: Oliver Laric's imaginative sculptures resonate with the work of Ernst Haeckel (1834–1919), a zoologist and philosopher whose marvelous etchings and illustrations have long been of interest to artists. Haeckel coined the phrase "ontogeny recapitulates phylogeny." Though it is no longer a scientific belief, the idea implies that an organism's development goes through all the stages of life from which it evolved. Laric's sculpture, *Hundemensch* (2018), incorporates this mythology of creatures as a succession of species. It features a translucent figure with beautifully lacquered layers revealing myriad species—from crustacea to human—within an otherwise representational canine form.

JB: In your 2020 *Woman's Art Journal* article, "Nature: New Contexts, New Art by Women," you discuss how feminism "has changed what nature now means." How so?
EL: Let's begin by recalling the experimental artist Carolee Schneemann, who died in 2019. Her expansive interests included a fascination with what scientists, especially D'Arcy Thompson, were doing. She said, "…this research provides me with permission for melding theoretical prospects into poetics of imagery and materials." I think that was beautifully stated. She was open and encouraging, and she thought interaction with scientists and reading on a very wide scale made her work more profound. She created a broad approach to what art is and what it can be.

Oliver Laric, *Hundemensch*, 2018. Polyurethane and pigment, 20.75 x 20.5 x 22.75 in. Photo: Gunter Lepkowski, Courtesy the artist and Tanya Leighton, Berlin and Los Angeles

JB: Who else would you draw attention to, in terms of artists engaged in feminist-related science, who are changing our ideas about art and art practice?
EL: Feminism offers a framework for understanding nature that may be more directly related to women's lives and experiences. It sometimes focuses on ideas of evolution that have previously been rejected or ignored. Christy Rupp, for example, grapples with the metaphor "we are what we eat" as it relates to future generations. This is not just a metaphor. It accurately describes the biome (e.g., the varied organisms in our guts) and looks at factors involved in inheritance apart from vertical descent, such as regulation of gene expression. Rupp considers how waste and toxic elements in our environment corrupt the accepted way in which organisms function and evolve. *Moby Debris* (2019) is a taxonomic collection of small sculptures that replicate sea creatures. Each of her aquatic-inspired "organisms" is composed of discarded plastic detritus and visually comments on the damage done to species when they consume the glut of inorganic detritus hurled into our food chain.

JB: Artists such as Rupp create imaginative works fueled by their interest in science and technology. Others erase the line between art and science.
EL: I would point to several women artists interested in how nature has been reframed by feminist science. Portuguese artist Marta de Menezes is the artistic director at Ectopia, an

a joint project with Valerie Gonzáles Valerio, *The Origin of Species—Post-Evolution-Maiz* (2018), de Menezes channeled gene-editing data to theoretically re-engineer corn back to its original state. Their joint installation featured evolutionary charts and different kinds of corn on the gallery floor to show how human agricultural intervention has changed corn over thousands of years.

Christy Rupp, *Moby Debris* (detail), 2019. Plastic and welded steel, series of 20, approx. 14 x 10 x 4 in. each. Photo: Christy Rupp

JB: Could you name a few women artists who assume an activist role?
EL: In addition to Rupp, who uses a combination of humor and stealth to dramatize social justice issues, health problems, and environmental degradation, we should mention Victoria Vesna. Her interactive projection installations point to commonalities and empathy felt among all species. *Noise Aquarium*, for example, dramatizes the disquietude animals feel when they are assaulted by huge amounts of noise. One iteration of this work invites viewers to step onto a platform and virtually interact with organisms beautifully projected on a screen. As these virtual marine creatures respond negatively (e.g., withdraw) in response to the sounds of viewers standing on the platform, so do viewers cringe at the commotion caused by sounds of fracking, sonar, and other anthropogenic frequencies they experience through the video. I interpret Vesna's work as an attempt to restore biological homeostasis to communities of animals affected by noise.

Ursula Endlicher, another intriguing artist, draws connections between analog, digital, and virtual worlds, with no firm boundary between them. With humor, she will, for example, translate the "hidden" language of the Web's HTML code into choreographed performances, effectively crossing boundaries between the living and non-living and between the visual and lingual. In her system, a fiddlehead fern might serve as an "@" sign. Her purpose, however, is to demonstrate reciprocity—how coding might affect nature and nature might affect coding. There are two components to her work: the actual field that she cultivates and the computer screen where she has the viewer flesh out all the characteristics affecting that effort. *Field Reversal (and Custom HTML Plant Tags)* (2021) is an example of an installation that addresses reciprocity. In it, she demonstrates how if she changes criteria, such as humidity, on the computer, it will indicate the impact of that change on the environment. She can then decide whether to implement changes within the cultivated field.

Ursula Endlicher, *Input Field Form*, 2018. Drone shot, ChaNorth, Pine Plains, NY. Photo: Lee Day, Courtesy the artist

JB: To what extent do such works provide effective solutions to environmental problems?

EL: Lillian Ball is a wonderful example of the efforts that eco artists are making to restore the environment. But the gains are difficult to evaluate given the immensity of what needs to be done, the fraught political situation, and our continuing dependency on carbon-based fuels. Ball's work involves the active participation of people working on site to remediate wetlands and restore water quality. Her Pratt installation featured three delicately etched glass panels depicting endangered sea life, along with an interactive video game based on the ancient game of Zen Go. Replicating the political strategies involved in making changes to the landscape to restore it to health, Ball's game focuses on behavior and requires players to compromise—no one wins when they don't, and everyone wins when they do.

demonstrate how nature generates new infrastructure in response to shifting environmental conditions, Lamson created an installation replicating geologic forces. For the Pratt exhibition, he contributed *Untitled (After Badwater)* (2021), a scaled-down sculptural combination of peristaltic pumps, timers, and aluminum pipes that, he says, "borrows elements from *Badwater* and *Subterra*, a 2019 project for Socrates Sculpture Park."

Untitled (After Badwater) changes over time as crystallization processes respond to environmental conditions such as humidity. Lamson explains how a "dehumidifier pulls water out of the air and puts it into the work, dissolving magnesium sulfate crystals, allowing this solution to be pumped through the system." He states that the process reveals "a network of non-living things that, while inanimate, continue to exert their 'material agency.'" Returning viewers could observe how the geologic forces that Lamson brought into the gallery developed and evolved in a fascinating way throughout the duration of the exhibition.

William Lamson, *Mineralogy*, 2017. Peristaltic pumps, timers, hose, aluminum piping, aluminum trays, glass, foam, resin, magnesium sulphate, dehumidifier, and water, 9 x 15 x10 ft. Site-specific installation at the Center for Land Use Interpretation, Wendover, Utah. Photo: William Lamson, Courtesy the artist

JB: So, here's the big question: Why is all this art? Many visitors to these science-based exhibitions wonder where the artist's hand connects with the scientist's experiment. Is it still important today to draw such a line, or do you believe this to be a generational evolution in the way we think about and exhibit art? Is this an art historical genre for a bio-technological age?

EL: I agree that a bio-technological emphasis has gradually developed in contemporary art. People today recognize a third culture informed by exciting scientific innovations, and this is a less problematic issue than it has been in years past. And yes, I think it is a generational idea; many people no longer see a divide between art/science worlds, and younger generations tend to consider it old-fashioned to see things otherwise. They've gone beyond that kind of duality. Judging by the success of Tauba Auerbach, whose art practice is grounded in math, science, craft, 3D printing, and the design of musical instruments, there is tremendous interest in the scientific forces determining pattern-making and generative approaches.

JB: Do you think that these changes extend art historical tradition? Are artists working with new materials and technologies using these tools much as our ancestors did when they appropriated a lump of coal to ritualize the hunt by drawing on a cave wall?

EL: I basically would agree with that, though I can't speak to the motivations of prehistoric artists. In *When We Cease to Understand the World*, the wonderfully perceptive

works we've discussed exemplify those ideas. I think that seeing cultural forms at least in part as products of powerful forces operative in nature can beneficially reframe our essential relationship to other species, to nature, and to the environment.