

Mechanical Magic

**The Automata
of Brittany Cox**

BY SAMANTHA DE TILLIO



Cox diagnosing a Bontems singing bird clock (c. 1880) in the Memoria Technica studio, Seattle, Washington, 2018. Courtesy: Brittany N. Cox
Photo: Ben Lindbloom



Brittany Cox is an antiquarian horologist, a sort of seventeenth-century mechanic. She specializes in complicated clocks, watches, and objects that include an additional element of function: music, repeating mechanisms, automata, or mechanical magic. She inhabits a world of forms and materials outside of our contemporary lives for the most part. Cox is one of a handful of people in the world with her particular skill set. In fact, she may be the only person in the US with her exact conservation, engineering, and artistic qualifications. Few hand skills and processes are more specialized than the type of complex horology that she is working tirelessly to keep alive.

Maker unknown, possibly
Piguet & Capt.
*Singing Bird Box with
Musical Box and Watch*,
c. 1820; restoration and
horological conservation
2014 by Brittany Cox
varicolored gold, diamond,
split pearls, enamel, brass,
steel, zephyr, bird feather
Photo by and courtesy
Brittany N. Cox



Cox's interest in mechanical objects began as a young child. She was given a music box with a pirouetting ballerina, a familiar object to many young girls—although most likely don't think of it as what it is: a simple automaton. This gift spurred a collection of treasured music boxes and musical snow globes, the latter of which she deconstructed in order to harvest the mechanisms inside. An unstable childhood led her to appreciate the rules that govern such mechanical objects, seemingly organic yet scientific in invention. Her youthful tinkering sparked a love of handwork, and she spent her first professional years as a jeweler. A universal sense of curiosity subsequently led to a bachelor's degree in philosophy from the University of Texas at San Antonio, where she focused in metaphysics and epistemology.¹

First formally introduced to automata during her undergraduate studies, Cox became enamored with the seventeenth-century use of machines to explore philosophical questions about the essence of humanity and the origin of consciousness. During this period, the theory of dualism—which argued the separation of the mind and body—prevailed. Although ancient in origin, dualism was developed into its modern form by the French philosopher, mathematician, and scientist René Descartes (1596–1650), whose work has been popularly distilled to the adage, “I think, therefore I am.”² This theory of separation led him to the conclusion that, in a way, humans and animals are automata animated intellectually by God, the omnipotent divine mechanic.³ An innate human drive to replicate life, combined with contemporary theories about the mechanical nature of the human body, led to inventions such as *The Flute Player* (1737) by French inventor and artist Jacques de Vaucanson (1709–1782), a life-size shepherd that played the flute and had a repertoire of twelve songs. *The Flute Player* was animated by a bellows system that inflated and deflated its lungs, pushing air across the instrument through articulated lips, and used articulated fingers to achieve the correct notes, thus replicating the mechanical functions of a human body step by step.⁴

Enamored with the history and theory of these objects, Cox went on to earn a Watchmaker of the 21st Century Certification, a Swiss American Watchmakers Training Alliance Certification, and a Watchmakers of Switzerland Training and Education

Programme Certification from the Watch Technology Institute in Seattle. She subsequently received a Conservation and Restoration of Clocks Diploma, Conservation of Clocks Post-Graduate Diploma, and a master's in Museum Studies from West Dean College at the University of Sussex in the United Kingdom. While studying watchmaking, she learned micromachining, fine finishing, and mechanical systems, and developed the intricate handwork needed for more complex mechanisms. She then studied clockmaking, which the artist describes as a much more robust mechanical form, and learned how to machine larger objects, cut gears, and replicate historic bench practice.⁵ At West Dean, she learned a plethora of additional craft techniques, including leatherworking, blacksmithing, woodworking, gilding, papier-mâché, and organ building, all in the service of the complex objects she wanted to conserve and create. Most notably, she studied with horologist Matthew Reed, who at the time was engaged in the conservation of *The Silver Swan*, an "intricate automaton made in 1773 that twists its neck to preen its feathers, dips its head into a river of glass rods and catches a silver fish in its beak."⁶

Mechanical objects have been used for centuries; they are referenced in texts from antiquity,⁷ and survive from the medieval period. Despite this long and complex history, automata are most readily associated with the eighteenth and nineteenth centuries.⁸ This is Cox's favorite period of automata innovation because "complex cams," a mechanism that allows for more realistic movements, were first introduced, as well as the earliest singing bird boxes, which utilized miniature pipe organs and later slide whistles and bellows systems to create musical effects.⁹

Cox's own portfolio is extensive. Her work is conservation-focused; her clients are primarily private collectors and range from those who have that one special heirloom to collectors who specialize in stage magic, mechanical music, or small clocks. She also creates mechanical tricks for magicians, either restoring antique tricks or making new ones. Finally, she does some work for museums, although this makes up the smallest portion of her practice because, as Cox observes, there is a lack of attention to the conservation of these objects in the United States. She endeavors to make the traditions of automata and guilloché (a decorative



Victory Bird, restoration and horological conservation 2017 by Brittany Cox
feathers, leather, brass, steel, wood
8 × 6 × 4 in.
Photo by and courtesy Brittany N. Cox



Cox feathering a bird with new beak and tail for a c. 1920 Griesbaum singing bird box, 2016.
Photo by and courtesy Brittany N. Cox



It's worth remembering that automata have always explored the notion of what makes us human.

technique in which a precise, intricate, and repetitive pattern is mechanically engraved via engine turning) accessible to a wider audience, so in addition to her conservation and studio

practice, she makes small spinning tops and guilloché coloring books to engage a casual and first-time audience.¹⁰

Cox's past projects include *Victory Bird* (2017), an antique singing bird in a cage originally made by Bontems in 1880, which Cox received sans bird. She restored the mechanism and created a new bird comprised internally of steel wires and a gearing system, including a cam that dictates the rotation of the head and movements of the beak and tail.¹¹ Cox used bellows for lungs and a slide whistle for the bird's voice.¹² She then hand trimmed, shaped, and individually applied more than 100 feathers to the leather-wrapped brass body of the bird.¹³ For *God Save the King* (2010), a musical sailing ship from the early nineteenth century, Cox identified an incorrectly

pinned barrel that failed to interact with its comb, thus rendering the small ship silent. She created a new barrel and conserved the mechanism, restoring the object's music, then regilded the ship, made wire rigging for the masts, and created a case for the piece from sterling silver and shagreen.¹⁴ In 2012, Cox developed a smoking machine in order to test various bellows constructions made from wood, brass, steel, and three different types of covering materials. Each was tested for strength, durability, and the robustness of smoke produced. With the findings, she was able to restore a nineteenth-century smoking automaton by rebuilding the bellows system, in addition to repairing its badly damaged body.¹⁵

On any given day, Cox may be working on a number of horological projects in her 1,000-square-foot combination workshop, studio, and library. It is truly a job where no two days are alike. She's currently in the diagnostic and disassembly stage of a conservation project featuring a singing bird box with watch, and in the process of making a new work called *Bird Song*, a cabinet of flora containing singing birds. Cox is writing the music herself and will build a machine that can cut the song cams in order to generate her composition.¹⁶

Because of the age of the objects she works on, there are numerous technical challenges, as well as ample opportunity for creative problemsolving. For example, Cox may need to replace jewels and precious stones, and in order to preserve the aesthetic and period integrity of the object, she needs an exact match. A contemporary replacement would not have been made the same way, so it may take months or years to find the exact material to complete the project. The same can be said for springs and gears. The inherent inconsistencies found in period steel and in handcrafted springs are challenging to replicate with contemporary equipment and metals. Even the slightest change in a replacement spring can alter the distribution of power in the mechanism and affect the music or movement of a work. As a result, Cox often makes her own tools—gauges, levers, punches—based on the project's needs. The frustration inherent in constant problemsolving makes moments like the first time Cox heard *Victory Bird* sing all the more wondrous, marveling both at the tiny mechanical object and her own ability to bring it back to life.

Cox has worked on numerous projects in which a large portion of the object had

Above:
God Save the King,
restoration 2012 by
Brittany Cox
sterling silver, brass,
steel, acrylic, shagreen,
isinglass, gold, wood
2 1/2 × 1 1/2 × 1 in.
Photo by and courtesy
Brittany N. Cox

been lost and she had to remake much of it herself. She does a significant amount of original guilloche, and in fact, her workshop is the only place in the US (and until last year, the world) that teaches the skill. Despite even this high level of artistic intervention, until recently Cox hasn't been able to devote much time to making her own automata. She manages her conservation workshop Memoria Technica (founded in 2012), and is busy with numerous commissions, lectures, and teaching. However, in 2018 Cox created *Cochlea (Snail)*, her first automaton from concept to finishing, an opportunity the artist affords to her status as one of sixteen inaugural finalists of the Museum of Arts and Design's (MAD) Burke Prize, and her inclusion in the associated exhibition *The Burke Prize 2018: The Future of Craft*.¹⁷

Cochlea provided Cox with the opportunity to combine her vast interests in mechanical objects, philosophy, sacred geometry, and material culture. It is inspired by medieval bestiary (illustrated volumes that referenced the symbolic language of animals in Western Christian art and literature) and manuscript illumination (elaborate illustrations in the margins of religious texts). Scribes used these illustrations to reinforce moralizing messages and to parody the indignities and absurdities of their world. The snail was a popular motif at the turn of the fourteenth century, often pictured in combat with a knight. According to popular interpretation, the snail variously symbolizes a mockery of human cowardice; class struggles between the ruling elite and the peasantry; anti-foreign slurs against the Germanic Lombards, whose kingdom was conquered by the Frankish king Charlemagne in 774 AD; and the Virgin Mary and the Resurrection. The rendering of the snail with rabbitlike features further symbolizes spiritual rebirth, but also lust and sexuality, emphasizing the dual nature of humanity.¹⁸ Cox enlivens the marginal snail imagery in her mechanized artwork, which moves in the pattern of an infinity symbol—a nod to the snail's association with the Resurrection.

The snail also became associated with sacred geometry (the existence of harmonious geometric proportions in nature established by the perfection of God) because of the manifestation of the golden mean—philosophically, the middle point between two extremes—in its shell, resulting in a perfect mathematical ratio and spiral. The golden mean has been used

for centuries in art and architecture, and is central to ornamental wood turning and guilloche, techniques used by Cox in the snail's shell and on the wooden base. The medieval snail communicated messages central to spirituality at a time when people were increasingly curious about the origins of our universe and the fundamental role of humans' existence in it.

It's worth remembering that automata have always explored the notion of what makes us human. From the hydraulic-powered automata documented in antiquity, to medieval religious devotional objects, to fanciful amusements of the eighteenth and nineteenth centuries, these objects chart the course of human innovation. The questions they present are perhaps more relevant now than ever. In a period when artificial intelligence is becoming increasingly quotidian, philosophies of consciousness are expanding to consider the future of humanity in an age when technology's intelligence surpasses our own. These are the questions at the center of Cox's practice. As she gives life to her own mechanized creatures, Cox and her precursors to modern robotics have much to offer our contemporary world.

Brittany Cox
Mineral Stands, 2016
 turned box wood, black
 wood, cocobolo; guilloche
 on brass, steel, quartz,
 pyrite, bismuth
 Photo by and courtesy
 Brittany N. Cox





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Samantha De Tillio is a curator, art historian, and writer of modern and contemporary craft, and is currently Assistant Curator at the Museum of Arts and Design. Her research focuses on illuminating feminist histories, and critically expanding the art-historical canon to include women and people of color through exhibitions, programs, and acquisitions. Her current work is focused on the groundbreaking fiber sculpture of Dorian Zachai (1932–2015).



Brittany Cox

Cochlea (Snail), 2018

brass, steel, sterling silver, shagreen, cocobolo

Snail: 2 1/4 x 4 x 2 1/2 in.,

Base: 1 1/2 x 4 3/4 x 4 3/4 in.

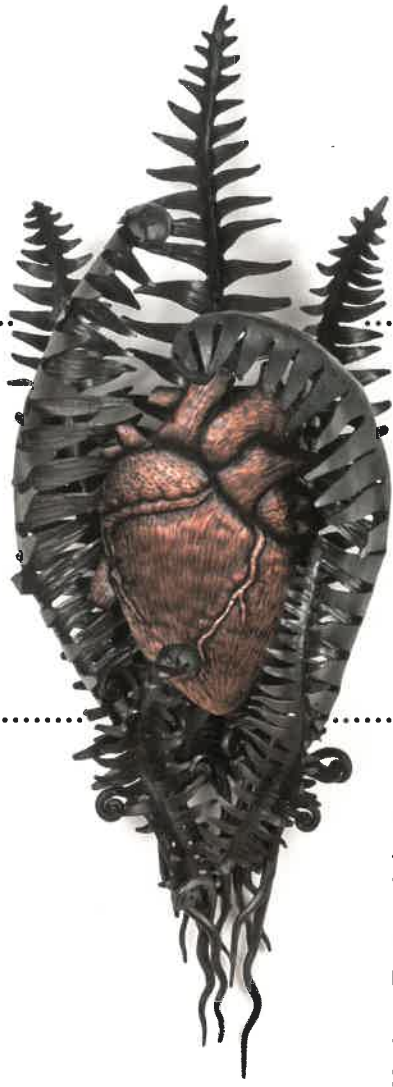
Photo by and courtesy Brittany N. Cox

1 Conversation with the author, November 27, 2018. / 2 Versions of dualism can be traced back to Plato and Aristotle, as well as the early Sankhya and Yoga schools of Hindu philosophy. Anthony Gottlieb, "Think Again, What did Descartes really know?" *The New Yorker* (November 20, 2006), <https://www.newyorker.com/magazine/2006/11/20/think-again-2>, Christopher A. Pallis, "Death," *Encyclopaedia Britannica* (July 19, 2018), <https://www.britannica.com/science/death/Descartes-the-pineal-soul-and-brain-stem-death>, "Dualism," *The Basics of Philosophy*, accessed December 11, 2018, https://www.philosophybasics.com/branch_dualism.html, and Richard A. Watson, "Cartesianism," *Encyclopaedia Britannica* (February 09, 2016), <https://www.britannica.com/topic/Cartesianism>. / 3 Jessica Riskin, "Machines in the Garden," *Republics of Letters: A Journal for the Study of Knowledge, Politics, and the Arts* 1, no. 2 (April 30, 2010): 16, <http://rofl.stanford.edu/node/59>. / 4 Conversation with the author, November 27, 2018; Kat Eschner, "This Eighteenth-Century Robot Actually Used Breathing to Play the Flute," *Smithsonian*, February 24, 2017, <https://www.smithsonianmag.com/smart-news/eighteenth-century-robot-actually-used-breathing-play-flute-180962214/>; and Jessica Riskin, "The Defecating Duck, Or, the Ambiguous Origins of Artificial Life," *Critical Inquiry* 29, no. 4 (2003): 599–633. doi: 10.1086/377722. / 5 Conversation with the author, November 27, 2018. / 6 Victoria Turk, "Science Museum's Robots: Who is really pulling the strings?" *New Scientist* (February 13, 2017), <https://www.newscientist.com/article/2121092-science-museums-robots-who-is-really-pulling-the-strings/>. The tour de force, which is in the collection of the Bowes Museum in Durham, United Kingdom, was created by London showman and dealer James Cox (1723–1800) and clockmaker, musical-instrument maker, inventor, and showman John Joseph Merlin (1735–1803), and was exhibited to acclaim at the 1867 Paris International Exhibition and later memorialized in American novelist Mark Twain's (1835–1910) book *The Innocents Abroad*. "The Silver Swan," The Bowes Museum, accessed December 11, 2018, <https://www.thebowesmuseum.org.uk/Collections/Explore-The-Collection/The-Silver-Swan>. / 7 Notably, the Catholic Church was a patron of the automatic arts and sponsored the printing of ancient texts on mechanical and hydraulic automata. Churches throughout Europe commissioned automata depicting Heaven, angels, and crucified Christs, as well as Hell and all manner of demons, used to invoke religious commitment in their parishioners. Outside of religious theatrics, automata were popular amusements among wealthy estate owners, often showcasing bawdy senses of humor and performing parlor tricks and pranks, such as so called "waterworks" automata that might spray unsuspecting guests with water. Jessica Riskin, "Machines in the Garden," *Republics of Letters: A Journal for the Study of Knowledge, Politics, and the Arts* 1, no. 2 (April 30, 2010): 23–24, <http://rofl.stanford.edu/node/59>. / 8 This association was popularized by *The Invention of Hugo Cabret* (2007, and its 2011 movie adaptation) by American author Brian Selznick (b. 1966), which drew inspiration from the true story of French illusionist and filmmaker Georges Méliès (1861–1938) who led many technical developments in cinema, most notably special effects, which included the use of automata. Brian Selznick, "Automata," *The Invention of Hugo Cabret*, accessed December 11, 2018, https://www.theinventionofhugocabret.com/about_hugo_auto.htm. / 9 Arguably the first recorded music was created when German composer George Frideric Handel (1685–1759) produced music for a number of clocks by horologist Charles Clay (1695–1740). And while Handel adapted arias from his extant compositions, the greater dexterity and speed of the mechanism (a pinned barrel) provided the possibility of a wider variety of compositional options. Jonathan Lennie, "The Triumph of Music Over Time: Handel and Charles Clay's Musical Clocks," *TimeOut*, last modified November 4, 2013, <https://www.timeout.com/london/things-to-do/the-triumph-of-music-over-time-handel-and-charles-clays-musical-clocks>; "The Triumph of Music Over Time: Handel and Charles Clay's Musical Clocks," Handel & Hendrix in London, last modified September 24, 2015, <https://handelhendrix.org/podcast/the-triumph-of-music-over-time-handel-and-charles-clays-musical-clocks/>; and William Barclay Squire, "Handel's Clock Music," *The Musical Quarterly* 5, no. 4 (1919): 539–40, <http://www.jstor.org/stable/738126.539-40>. / 10 Email to author, January 9, 2019. / 11 Brittany Cox, Burke Prize submission materials, January 2018, and Gabriel Spitzer, "Seattle Horologist Masters Clockwork To Make Time Travel And Stand Still," *knkx*, last modified August 28, 2015, <https://www.knkx.org/post/seattle-horologist-masters-clockwork-make-time-travel-and-stand-still>. / 12 Brittany Cox, Burke Prize submission materials, January 2018. / 13 Brittany Cox, Burke Prize submission materials, January 2018. This project led to her master's thesis titled "A Preliminary Investigation into Materials used for Bellows Coverings in Smoking Automata." "Brittany Nicole Cox CV," *Memoria Technica*, accessed December 11, 2018, <https://mechanicalcurios.com/brittany-cox-cv/>. / 14 Email to the author, January 3, 2019. / 15 The Burke Prize is an annual juried award that reinforces the Museum of Arts and Design's (MAD's) commitment to celebrating the next generation of artists working in and advancing the disciplines that shaped the American studio craft movement. The 2018 award was juried by Michael Radyk, Director of Education of the American Craft Council, Editor-in-Chief of *American Craft Inquiry*, and artist; Jenni Sorkin, Associate Professor, History of Art and Architecture, University of California, Santa Barbara; and Namita Gupta Wiggers, Director of the Master of Arts in Critical and Historical Craft Studies at Warren Wilson College, and Director and co-founder of the Critical Craft Forum. This exhibition was co-curated by the author, who is a curator at MAD. However, she was not part of the jury who selected the winner or finalists. "Burke Prize," Museum of Arts and Design accessed January 2, 2019, <https://madmuseum.org/content/burke-prize>, and "The Burke Prize 2018: The Future of Craft Part 2," Museum of Arts and Design, accessed January 2, 2019, <https://madmuseum.org/exhibition/burke-prize-2018>. / 16 Lillian M. C. Randall, "The Snail in Gothic Marginal Warfare," *Speculum* 37, no. 3 (1962): 358–67, <https://www.jstor.org/stable/2852357>, and Phil Edwards, "This video explains why knights in medieval art fought snails," *Vox*, accessed September 2018, https://www.youtube.com/watch?time_continue=271&v=6ISOKXtYs.

METAL

SMITH

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Meta-Formation:
Twenty-
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Blacksmithing,
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