Why Paint a Bird? Why Do Anything at All?

Kartik Chandra (2026)

It took me four years to paint like Raphael, but a lifetime to paint like a child. —Pablo Picasso

If you were wondering what drove me to do it — to sneak into the MIT Department of Brain & Cognitive Sciences with a hammer the night before winter break — to hang up the paintings covertly in the hallway outside my PhD advisor's door — and before that, to spend a small fortune at BLICK Art Materials, and to sacrifice many hundreds of hours of my time on making those paintings, which frankly didn't even turn out that great in the end, and the making of which left an unfortunate pink stain on my beloved winter sweater — if what you really wanted to know was why I did any of it at all, knee-deep in the middle of my PhD, when I should have been concerned with my dissertation research — then you would be asking a question that has puzzled me for almost ten years, now.

In my opinion, the question — or rather, the Question behind the question — was posed most thoughtfully by the American poet Richard Siken in his poem "The Language of the Birds." The poem goes like this: *"A man saw a bird and wanted to paint it. The problem, if there was one, was simply a problem with the question. Why paint a bird? Why do anything at all? Not how, because hows are easy—series or sequence, one foot after the other—but existentially why bother, what does it solve?"* The reason Siken's Question has haunted my mind for so much of my adult life is that its answer seems so tantalizingly close. Why *do* human beings make pictures? In some ways the answer is obvious: sometimes we draw to communicate an experience, or idea, or emotion trapped inside us that language alone cannot express; sometimes we draw to preserve an aesthetic experience, or to create a new one from whole cloth; and sometimes we draw to reason about the world through diagrams and maps, externalizing and spatializing thoughts that would not fit in our minds alone. This tripartite schema of why-we-draw is what I was taught in my undergraduate courses in art history, and I agree, for the most part, that all of this is true.

But from time to time I have an artistic encounter that defies this type of explanation, an act of image-making that appears irrational and inexplicable on the face of it, and that calls into question this entire account of why-we-draw. The paintings I made and installed at MIT were one crazed first-person instance of this (more on them, shortly). But there are other cases, more ordinary in scope, cases that in their everydayness are somehow even more mysterious to me.

I am thinking, for example, of my dear friend Michael and his son Euclid. When I first met Euclid—yes, that really is his name—he was just shy of a year old. One lazy Sunday afternoon Michael and I sat on his living-room couch and watched Euclid munch on a crayon when, suddenly, he took the crayon out of his mouth and began scribbling haphazardly with it.

I sat up and peered skeptically at his scribbles. A little child drawing is hardly an unusual sight, but with the Question on my mind, I couldn't help but stare. What *was* going on here? What was driving little Euclid to draw? Neither Michael nor I had encouraged Euclid to put crayon to paper; he had chosen this activity of his own accord. But why? I found myself hard-pressed to answer. The usual art-historical explanations failed me. I do not, for example, think that Euclid was drawing to communicate an experience, idea or emotion to us — in fact, he was completely absorbed in his activity and had no interest at all in showing us his work. Similarly, I find it hard to believe that Euclid was drawing a diagram or map for the purpose of solving a problem (what problem could he possibly be solving?). And surely Euclid wasn't in it for the aesthetics, either — this is, after all, a baby we are talking about, one who at the time could not even speak or walk. And yet: there he was, little Euclid, drawing stray crayon marks on his piece of paper with the focused intensity of the fiercest adult draughtsman. I was stumped.

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One way out of this jam would be to quibble with the question itself. You might, for example, complain that "drawing" is simply not the correct word for Euclid's actions that Sunday afternoon. Perhaps Euclid just liked the tactile feeling of pushing a bar of wax against paper. He certainly wouldn't be the first member of his species to enjoy rubbing a thing against another thing. But if that were the case, then Euclid wouldn't exactly be engaged in "drawing"; he would be engaged in "rubbing," only incidentally making marks on paper, the way a skier only incidentally leaves marks on fresh snow. And if Euclid wasn't "drawing," then there is nothing left to explain — problem, solved.

As it turns out, this hypothesis has been tested scientifically. And this test, I think, is the first foothold we have on which to make real progress on the problem of Euclid. In 1968, the cognitive scientists James Gibson and Patricia Yonas conducted a series of experiments on what they called the "fundamental graphic act": putting pen to paper and making a mark. The experiment was gorgeous in its simplicity. First, they handed 15-month-old children styluses that either left marks on paper, or were inert (like a dried-out marker). Then, they measured how long those children scribbled with their styluses. They found that the children whose styluses left marks spent 50% longer scribbling than children whose styluses were inert. From this, Gibson and Yonas concluded that children do not merely scribble for the tactile feedback of pen against paper. The marks left by the pen on the paper — the intervention on their own visual experience

— matters to them. They wrote: “The act of scribbling… is not at the outset an act of communication or a social act. It seems to be an act with the sole purpose of producing a new source of optical stimulation that can be looked at by its producer.”

A baby in a crib, with a mobile tied to his foot (Rovee-Collier, 1979)

Perhaps we shouldn’t be so surprised by this finding. If there is anything we know about children, it is that they enjoy intervening on their experience of the world. Consider for example a classic 1979 experiment by Carolyn Rovee-Collier, which took place in the cribs of infants as young as 3 months old. She attached a mobile to each infant’s crib, and then, with a ribbon, connected the mobile to the infant’s foot. When the infant kicked, the mobile moved and made a sound. Infants smiled and cooed when this happened — and critically, they smiled and cooed a lot more than if the mobile was detached from the ribbon and moved independently by an adult. From this, Rovee-Collier concluded that the infants cared more about their *ability* to make the mobile move, than the mobile’s motion itself. She wrote: “The control which the infants have gained over the consequences of their own actions seems to have become the reward, rather than the specific consequences per se.”

Why, then, might infants and children be so driven to intervene on their own experience? The developmental cognitive scientist Alison Gopnik thinks the answer is right under our noses: children care about interventions for the same reason that we scientists care about interventions, namely, that interventions let us learn about the causal structure of the world around us. As every scientist knows, “correlational” evidence gained through passive observation can be suggestive, but it is rarely conclusive. To really claim to understand *why* something happens, you must test your hypothesis by actively making an intervention on the system you are studying. That is what we call an "experiment." Gopnik argues that children know this logic intuitively. On her account, we should think of children as little scientists — or, in her words, scientists as really big children — who are constantly engaged in experiments that help them understand how the world works. The drive for intervention derives from a drive for learning.

Where, then, does that leave Euclid and his scribbling? If you believe Gibson and Yonas, that Euclid really did care about the marks he was making — and if you believe Rovee-Collier, that Euclid was motivated by the ability to intervene on his visual experience — and if you believe Gopnik, that interventions are a way of learning about the system that is intervened upon — then I think you cannot escape the conclusion that Euclid was drawing in order to learn about his own visual system.

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This is, by all accounts, an absurd conclusion to have reached. What I am proposing is that Euclid, less than a year old, was performing a kind of visual neuroscience when he took the crayon out of his mouth and pushed it against the paper in front of him. I understand how far-fetched this theory sounds. But hear me out. To make a mark on paper is, in a very literal sense, to directly stimulate your brain: that mark you make is projected onto your eye's retina, which is made up of neurons, and which, arguably, should be thought of as a patch of exposed neural tissue. Of course, nearly *anything* we do in the physical world is in some sense an "intervention on visual experience" — for example, the act of turning your head changes everything you see. But what a blunt instrument that is! Drawing is special because, by its very nature, it is targeted and precise. A crayon mark intervenes at the level of individual photoreceptors on the retina, letting you make the sharp, carefully-controlled stimulations you need in order to meaningfully test a hypothesis. In this way, a crayon can be a scientific probe. Making a mark and looking at it is not very different from jamming an electrode in the back of a mouse's skull. It is a targeted intervention on a brain. It is an experiment. It is neuroscience.

Peeter (ca. 1625). *Still Life with Cheeses, Artichoke, and Cherries*. Highlights on the cherries give create the illusion of shininess.

I am not the first person to have thought along these lines. In a 2005 article in *Nature*, the vision scientist Patrick Cavanaugh argued that all visual artists are, in a way, lay neuroscientists. He writes: "Artists act as research neuroscientists or as visual hackers, and we can learn a great deal from tracing their discoveries. … Art in this sense is a type of found science—science we can do simply by looking." For example, when a painter tinkers with highlights to determine what exactly it takes to make a cherry look shiny, or tinkers with lines to work out what makes a courtyard look three-dimensional, what that painter is doing is reverse-engineering the subtle cues that the mammalian visual system uses to determine the texture and depth of objects in the world. In this way, the painter and the vision scientist are both engaged in the project of determining why things look the way they do.

Perugino (1481), *Christ Giving the Keys to Saint Peter*. Converging lines in the courtyard create the illusion of depth.

I have come to believe, then, that drawing really is a way in which we learn about our visual systems — whether at the timescale of the lifetime of an individual, from infancy to adulthood, or at the timescale of a civilization, from the Renaissance invention of coherent geometric perspective to the Escherian discovery that perspective need not be coherent at all. And I have come to believe that in addition to communication, problem-solving, and aesthetic pleasure, we also draw in order to learn about our own vision.

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Around the time I visited Euclid at Michael's house, I received an invitation to give a talk at a major computer graphics conference. I was to speak about my thoughts on the intersection of visual art and psychology. I decided that I would talk about my theory of why babies draw.

But theorizing on a dear friend's couch is one thing; making an argument to a roomful of skeptical scientists is another entirely. I realized that if I were to do this in earnest, I would have to learn quite a lot more about babies. So that spring, I convinced a Harvard professor to let me sit in on her undergraduate course on developmental psychology.

The course conveniently began with a unit on vision: what we know about the early visual experience of babies. For example, I learned about Eleanor Gibson and Richard Walk's classic "visual cliff" experiments, which established that infants have depth perception by testing whether they would be willing to crawl off a ledge (they were not). On the other hand, subsequent experiments showed that babies do not start off with the ability to see depth through *stereopsis*, the technique of combining the perspectives of two eyes. By strapping 3D glasses onto babies' faces, developmental cognitive scientists have heroically determined that stereopsis develops over time. The infants who perceive depth must be doing so by means other than stereopsis.

One particularly remarkable source of knowledge about early visual experience comes, not from babies, but from adults who see for the first time. Pawan Sinha, a professor at MIT, works with people in India who suffer from treatable cataracts. His foundation offers free surgery, on a humanitarian basis, and in addition recruits some of these patients for scientific study. By this method, Sinha was able to resolve a 200-year-old question, first posed to John Locke by the philosopher William Molyneux. Molyneux's question is this: Consider a person who has never seen before, but has learned to distinguish spheres from cubes by touch. If this person were somehow granted the ability to see, would they be able to tell from sight alone which object was which? The essence of Molyneux's question is about nature and nurture. Is "how to see" innate, built-in knowledge, or do we have to learn to see from experience? Great thinkers have argued in both directions since antiquity, but only recently, through Sinha's work with cataract patients, do we have empirical data to bring to bear on the question. If you are curious about the answer, I direct you to Sinha's 2011 article in *Nature Neuroscience*.

These lessons at Harvard were fascinating, but as the semester passed I couldn't shake this gnawing feeling that these lessons were not what I was looking for. My claim was not that drawing helps children *gain* the ability to see; it was that drawing helps children *understand* their existing ability to see. How could I learn about the causal role drawing plays in understanding visual experience? Well, when you put it that way, the answer was staring me in the face… Haven't we been saying this whole time that causal knowledge comes from intervention?

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It was time for an experiment — or, rather, a meta-experiment, an experiment in experimentation. I decided to paint something and see what I learned. I applied for a grant from the Council for the Arts at MIT and received a modest sum to make a series of six paintings, acrylic on wood panel, depicting classic experiments in developmental cognitive science.

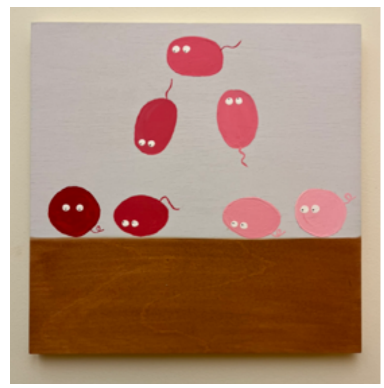
I did not mention on the application that, despite my many years of education in art history, optics, computer graphics, and vision science, I had no training in painting. I didn't even own a brush. In fact, that was part of the point of the experiment. I am no longer a child by age, but at least in the discipline of painting, I am on par with a child. (You will see on the next page just how childish the finished paintings looked.) For the sake of the meta-experiment, I would be painting as a child, an amateur, without seeking out any books, tutorials, or training. Then I would reflect and see what, if anything, I learned, by myself, about myself, by painting.

Things started off according to plan. About a week after I applied, I was informed that I had been awarded the grant. I stopped at BLICK Art Materials on my way home from lab and spent it all the same day. In hindsight, it must have been at that art supply store that I first had the inkling that I was in way over my head — the overwhelming variety of brushes and paints on offer, and the haphazard and uninformed way in which I chose them, were the first clues. The employee at the checkout desk raised an eyebrow when I handed him my basket. And indeed, when I finally sat down that weekend with my new brushes and my new paints, I discovered to my horror that I *was* in over my head. Painting is *nothing* like drawing with a pencil. It turns out that paint is colored goo, and painting involves carefully spreading the goo on a surface to make it look like something else entirely. It is foremost an exercise in applied fluid dynamics, and the fluid dynamics of goo simply defied my intuition. I quickly gave up on making outlines of my planned shapes: I couldn't get the lines to be thin enough, and the smallest misstep would ruin the entire painting. Each stroke was a gamble in this finicky, cursed medium. I began to get stressed out about the entire project.

But as I tinkered more and more with my paintings, I discovered that the power of the stroke cuts both ways. Goo can produce stunningly complex visual effects with very simple techniques. For example, one afternoon by chance I discovered that I could make flower petals by loading two bright colors onto my brush and painting just a single stroke, letting the colors blend along the way. No amount of careful shaping and detailing could have produced such a convincing flower petal.

In fact, over the next few weeks, I discovered again and again that it was the subtlest and simplest strokes that made the biggest differences in my pictures. I discovered that you can make a surface look shiny by giving it the slightest white marks in the right places. I discovered that you can give animals a sense of intentionality by careful placement of small black dots — pupils — in their eyes. I discovered that you can create the illusion of transparent glass by painting the glass a subtly lighter shade than the background it occludes. These strokes feel magical or alchemical in their simplicity, as if with the gentle wave of a

A few white marks transform these yellow animal figures from stick figures into shiny latex balloons.



Careful positioning of the little black dots (pupils) is essential to create the impression of animacy.

Subtle variation in lightness gives this beaker the illusion of transparency. Notice also the white highlights on the marbles, a lesson learned from a previous painting.

wand I can transmute dry to wet, rough to smooth, opaque to transparent, dead to alive.

In hindsight, of course, I can marshal my academic knowledge of optics and vision science to explain all of these effects. The small white marks create what we call "specular highlights," which the visual system uses to infer shininess. We are evolutionarily attuned to pupils because they reveal gaze direction, which is critical for social cognition (in fact, some scientists argue that the "whites of our eyes" evolved to be bright, high-contrast white precisely to make it easier for our social partners to track our pupils). Everyday transparent materials transmit light from behind them, but with some absorption, leading to a subtly different shade, a phenomenon that the human visual system is highly responsive to.

I knew all of these facts in the abstract, but it was only through painting that I came to seriously understand and appreciate the degree of sensitivity that my visual system has to specular highlights, pupil placement, and shading, and the powerful role they play in creating percepts of gloss, animacy, and transparency. I had gone twenty-six years being alive and sighted, nearly a decade of which I spent receiving formal education on optics and vision science, without knowing this about myself. So when I refer to these findings as "discoveries," I really do mean it — I think these findings are bite-sized scientific discoveries, conceptually no less than the discovery that magnets induce electrical currents in wires, or that certain molds have antibacterial properties. Indeed, just as grown-up scientific discoveries tend to beget engineering applications, so too do my bite-sized ones: as I made progress on the paintings, I found myself applying my visual discoveries to engineer new visual experiences. For example, you can see in the third image above how I used my newfound knowledge of specular highlights to create the impression of shininess in the marbles in the glass beaker.

I was satisfied with the experiment. I prepped my talk. After watching the first dry run, my PhD advisor paused for an uncomfortably long time, and then said I should perhaps read what Aristotle had to say on this matter. Aristotle? The… neuroscientist? I looked back at him skeptically, but later in the day I did check out a copy of *Metaphysics* from the library and take a look. Aristotle writes: "All people yearn to know. That is why we take pleasure in our senses … But to sense alone is to know *what* things look like. To make art is to know *why*." Thus emboldened, I delivered my talk at the conference.

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The paintings went up this winter. In the dead of night, two of my colleagues helped me mount them on a patch of wall near our office in the Department of Brain & Cognitive Sciences. I swore them to secrecy; I let the lab discover the surprise in the new year.

When I shuffle past those paintings, I think about what I learned about myself this winter — about specular highlights, about gaze tracking, about the perception of refraction, yes, but more abstractly about this mysterious drive I have to understand who or what I am, a drive that I think is essential to what it means to be a human being. I think about Euclid, and his crayon, and all the marvelous things he will go on to discover about his eyes and his mind and his body through childhood and into adulthood. I think about the developmental cognitive scientists whose work I studied and memorialized in my paintings, and I wonder about the extraordinary lengths they are willing to go to for these precious scraps of knowledge about what babies know and how children learn. I think about the desperation with which they have dedicated their careers and their lives to resolving these questions. And then I think about myself, perched on the precipice between child and scientist, being educated in the discipline of thinking about myself.

Why paint a bird? Why do anything at all? I have come to believe that we are all born strangers to ourselves; that all humans are engaged in the grand lifelong project of discovering what kind of thing they are. On crisp winter mornings I stare at the back of my hand, curling and uncurling my fingers as if they are alien to me, puppet-hands on puppet-strings held tight by my mind. To be human is to learn what it means to be human, by experiencing and observing, by intervening and experimenting, by being and doing and thinking and feeling and making. Which means: knowing oneself is a science and an art — perhaps even *the* science and *the* art. Which means: every painting is, in its own way, the trace of an experiment, a scientific report that is its own figure, stimulus, and data. Which means: I submit this, to you now, for peer review.

The six paintings, as they hang in the MIT Department of Brain & Cognitive Sciences. The paintings depict, in stylized form, classic experiments that teach us about babies' knowledge of (from left to right) objects and their forms, agents and their social relationships, and geometry and number.