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## IMAGINE THIS . . .

**Abstract.** These days, creativity is a hot commodity, the magic ingredient that separates excellence from competence in every field of human endeavor. Yet there is little agreement on what it is, especially in education, where Jean Piaget's critique of imagination remains influential. I outline the basis for a naturalized conception of creativity rooted in evolutionary processes that are enhanced by and in turn amplify individual and group creativity, and propose that replacing Piaget's polarization of imagination and realistic thinking with Lev Vygotsky's integration of those mental processes is necessary to meet the aim of educating for creativity. The role of imagination in counterfactual thinking is explored and improvisation posited as a paradigmatic manifestation of both creative process and product.

I HAD A SINGLE conversation with Denis Dutton. It lasted no more than five minutes and would have passed from Denis's mind in seconds as he moved through a room in which most people wanted his ear. The occasion was an event to celebrate the publishing of Brian Boyd's *On the Origin of Stories: Evolution, Cognition, and Fiction*.<sup>1</sup> Brian introduced us by strongly recommending *The Art Instinct*<sup>2</sup> to me and telling Denis I was working on human creativity in ways he might find interesting. As Denis disappeared into the crowd, I was left with two impressions that have not dimmed: (1) Denis Dutton really was interested in my thoughts on creativity, and (2) he agreed that aesthetic responses to creative processes and products are overrepresented in the philosophical literature relative to analysis of what happens when creators create. The comments that passed between us anticipated Berys Gaut's observation a year later

that “there is a wide range of philosophically interesting questions that can be raised about creativity, questions that go considerably beyond its role in aesthetics.”<sup>3</sup>

I want to naturalize human creativity. I want to understand it at every level, from the tiny sparks of pretend play in early childhood, to the most extraordinary insights, creations, and inventions human beings produce. I believe creativity of the kind we attribute to people like Jane Austen, Pablo Picasso, and Albert Einstein is rooted in the fundamental creativity all human beings share, and that the application of philosophy’s broad license and sophisticated analytical tools to the wealth of research in cognitive science and childhood development can yield a complete explanation capable of improving our ability to identify and even enhance human creativity.

The natural foundation of this enterprise is the study of human evolution. Denis Dutton presents an evolutionary approach to beauty and pleasure in *The Art Instinct*, and Brian Boyd offers a comprehensive theory of the relationship between storytelling and the evolution of the human mind in *On the Origin of Stories*. Five minutes with Denis at Brian’s book launch more than four years ago confirmed in my mind the importance of a naturalized, “bottom up” understanding of creativity that can stand alongside and inform theories derived from aesthetic analysis. It is therefore fitting to outline the general shape of my work in a journal Denis Dutton edited and an issue dedicated to his impact as a philosopher and a teacher.

## I

“Every child is an artist. The problem is how to remain an artist once we grow up.”

—Attributed to Pablo Picasso

“I am enough of the artist to draw freely upon my imagination. Imagination is more important than knowledge.”

—Albert Einstein<sup>4</sup>

All human beings can have conscious mental experiences independent of contemporaneous physical sensation, and they are able to conceive of and bring into existence ideas, images, and objects in forms that did not previously exist. In other words, all human beings are capable

of imagining and creating, capacities that are fundamental to human mentation and mutually interdependent. Imagination indeed has been described as “the vehicle of active creativity.”<sup>5</sup> Use of the imagination is pronounced in normal childhood play, particularly through pretense or make-believe, and central to human learning and development. Adult artists generate concepts, events, and objects, and exhibit creativity through their art-making processes and products, and scientific discovery and science-based understanding depend on the interplay between imagination and knowledge.<sup>6</sup>

Early Western philosophers afforded imagination a central role in human mental processes, initially holding it to be involved in making sensory perception available to the mind for contemplation and manipulation, and later adding generative powers associated with creativity. In the first half of the twentieth century, several philosophers—most notably Jean-Paul Sartre, Gilbert Ryle, and Ludwig Wittgenstein—challenged the “illusion of immanence” (Sartre’s phrase) implicit in the traditional formulation. The concern is that imagining so conceived involves entirely internal “perceiving,” such that a mental entity is contemplated as if it existed physically in the mind. There’s an inherent regress flaw: what’s doing the perceiving inside imagination, and what’s inside that, and so on? As strong challenges of this kind to the traditional understanding of imagination accumulated, it atrophied as a subject of serious investigation, especially in the context of analytical philosophy.

Over the last two decades, advances in cognitive science and evolutionary theory have largely rehabilitated the imagination as a legitimate component of the human mind, with the result that a naturalized understanding of imagination and the importance of its role in creativity are now widely accepted:

Imagination appears fundamental to the mental apparatus that differentiates humans, in degree if not in kind, from other species. It is this that enables humans to operate flexibly and effectively in complex social groupings, to contemplate intricate plans for possible (and impossible) future action, and to envisage the consequences without enacting them. It is this that enables humans to conceive of works of art, literature, poetry, and music, to appreciate these cultural “products,” and also to make discoveries and innovations in scientific and technological fields.<sup>7</sup>

Here are some coordinates for a map of creativity:

- Human evolution has been enhanced by, and has in turn amplified, individual and group creativity. Humans are the most creative animals, and their success as a species depends significantly on that creativity.
- A primary vehicle for human creativity is imagining, which is a mental process used to generate novel concepts and explore myriad possibilities that do not depend directly or entirely on prior experience or contemporaneous sensory input, though both may be incorporated.
- Counterfactual thinking and inferences about causation draw on and extend human imagination.
- From a very early age, children who develop normally use imagination to negotiate their physical and social environments. Their development as individuals and as social creatures is to some degree dependent on the increasing complexity and sophistication of their ability to imagine.
- Before they are three years old, normally developing children spontaneously pretend and make believe, and they recognize make-believe situations and characterizations that are generated by others.
- Improvisation is both an enactment and a product of creative processes.
- Collaborative creativity is an emergent phenomenon that can yield outcomes not limited to the sum of the contributing individual creative inputs, and is founded in the “synergy between organized learning environments and individual cognitive adaptations.”<sup>8</sup>

## II

Young humans learn by doing in contexts that involve both direct interaction with their physical environment and access to information mediated by their parents, peers, and wider social world. They observe more experienced conspecifics using their accumulated knowledge and acquired skills. The novice draws on what she sees and responds through trial and error to the novelty she encounters in her environment. Eventually, language allows for this information to be organized by those with expertise, and becomes a conduit for deeper investigations.

Learning of this kind is incremental, can support “high-fidelity, high-bandwidth knowledge flow” (*EA*, p. 36), and facilitates the active participation of the student. It does not require explicit, institutionalized instruction, but is compatible with it. While there remain some traditional societies in which implicit, apprentice learning dominates, wherever education is institutionalized, the prevailing pedagogy separates implicit and explicit learning, usually with a heavy emphasis on the latter. The result is a de-emphasis of the very basis on which human learning has evolved, and this is compounded by a flawed concept of childhood imagination that dominates educational theory in the West.

Sigmund Freud and Jean Piaget saw imaginative thinking as distinct from and opposite to realistic thinking. Piaget codifies the imagination as leading to “satisfaction and not to objectivity,”<sup>9</sup> and includes it in the bundle of childish thought that is egocentric and must be replaced by realistic adult thought through the process of maturation. This polarity is at the root of the assumption that the greater the difference between imaginative behavior and reality, the more “creative” that behavior is, which in turn feeds the separation of art (thought to be distanced from reality and therefore more creative) and science (putatively reality oriented and therefore less creative). “Science *is* an art, the result of humans together and separately thinking imaginatively about their world.”<sup>10</sup>

Developmental psychologist Lev Vygotsky<sup>11</sup> believed that imagination is an active part of the making of meaning and cannot be understood in binary opposition to realistic thinking. His analysis of the role of imagination in human mentation supports an overdue reintegration of imaginative and realistic thinking in theories of both the mind and creativity: “Imagination is as necessary in geometry as it is in poetry. . . . Everything that is connected with interpretation and construction of something new, requires the indispensable participation of imagination. . . . Absolutely everything around us that was created by the hand of man . . . is the product of human imagination and of creation based on this imagination.”<sup>12</sup>

If the imagination is an important vehicle for creativity across all human endeavors, it is necessary to look at early manifestations of that relationship. “From infancy humans seek to command the attention of others, to shape it more finely, and to share it more fully, than does any other species” (*OOS*, p. 96). This behavior is elaborated through the first year of life, and human infants quickly engage in interactive behaviors such as songlike vocalizations with their mothers (and other proximate adults and siblings given the opportunity) that stimulate patterning of simple cognitive play. This plausibly seeds and grows our interest in the complex-patterned cognitive interactions we can experience when we encounter art.<sup>13</sup>

Pretend play emerges around year two of a child’s life and is widespread across human cultures. Early in their cognitive development, children enthusiastically engage in the nonactual through pretense and games of make-believe. Piaget (following Freud) took this to indicate that the child’s imagination is egocentric, focused on satisfying immature desires, and employed to avoid dealing with realities that are difficult to comprehend, overwhelming, and even threatening. We

now know that this imaginative engagement plays a crucial role in the child's development of a conception of reality. As Vygotsky realized, the imagination and realistic thought are two aspects of an integrated process that develop together.<sup>14</sup>

From their earliest pretending, children draw on their current causal understanding of the physical and mental world, and are no more expressing immaturity than adults reading books or watching movies. The inclination of children to engage with alternatives to reality contributes to their acquisition of an objective perspective, and the manipulation of counterfactual situations and outcomes underpins the development of causal and moral judgments. When children's pretend worlds diverge from reality, they are inclined to take with them whatever conceptual knowledge they possess of the real world and apply it, often exploring the necessities and possibilities of the real world in the process. Denis Dutton links this "faculty for imaginative practical reasoning" to fictional storytelling, a creative process that "is an enhancement and extension of counterfactual thinking into more possible worlds with more possibilities than life experience could ever offer up to an individual" (*AI*, p. 114).

Stipulation of rules, conditions, and entities, which is primarily a collaborative parameter, plays an important role in children's games of make-believe. Moreover, artifacts of mature creativity such as scripts and scores can be seen as mechanisms for stipulation that creators sometimes generate as part of their acts of creating. An important aspect of much childhood make-believe stipulation is that entities and rules are invoked in a manner that prefigures characterization in adult fiction, theater, film, and many other creative fields. Once instantiated by children engaged in pretense, these entities possess causal powers within the stipulated rules that are measured against real-world knowledge. Adhering to or departing from reality can be essential in what unfolds, and this is a precursor of the decisions that adult writers, composers, and film directors make when they create and populate works designed to engage and elicit emotional responses from their audiences.

Paul Harris identifies four essential steps in childhood make-believe: (1) pretend stipulations, (2) acknowledgment of causal powers, (3) suspension of objective (real world) truth, and (4) an unfolding causal chain.<sup>15</sup> The last stage indicates that such scenarios typically parallel the ways in which the participants understand cause (or at least infer it to operate) in the real world. Children accept from a young age that make-believe stipulations are temporary and contingent in the sense

that they can be modified, with subsequent stipulations able to overwrite previous ones.

If Harris is right, that “pretend play is not an early distortion of the real world but an initial exploration of possible worlds” (*WI*, pp. 27–28), then it is also a precursor to the exploration of possibilities that drives many scientists and artists, and informs how mature audiences process fictional narratives. This aspect of normal development must therefore be addressed in relation to creativity in narrative arts such as fiction, theater, and film. It may also be relevant beyond narrative; for example, in parallel exploration of possibilities undertaken by utilizing existing conceptual knowledge, as occurs when a composer modifies, without fully disconnecting from, the conventions of a particular musical form.

When children collaborate in a pretense, they first do something akin to collective directing: they negotiate stipulations that define the initial conditions of the pretend world they are about to enter. Once the pretense is under way, they move away from this objective stance to “create and adopt the point of view of one of the protagonists within” that world (*WI*, p. 31). This acting from a position aligned with an invented characterization is similar to the way mature audiences engage with narrative art, and is often used to support the claim that spontaneous pretend play has evolved to scaffold simulations that drive development of a “theory of mind” and inform predictions of how other people will act.<sup>16</sup> The legacy of our shared childhood absorption in pretense is being exploited when a writer crafts a particularly compelling fiction that adult audiences easily find themselves lost in.

### III

While there is much debate about exactly when and how children use counterfactual thinking, there is little argument that they do, and that it plays a role in the ways they imagine during pretend play. In its simplest form, counterfactual thinking involves the mental modification of facts in the world to predict a change in consequences. For example, if I leave for work in my car at 8:00 a.m. (the antecedent) and am involved in a traffic accident (the assumed cause), with the result that I am late to work (the consequence), I might say, counterfactually, “Had I left home at 7:50 a.m., I would not have been late to work.” The thought “left home at 7:50 a.m.” is counter to the antecedent facts. Thinking in this way is practiced and refined during pretend play, and contributes to the ways adults interpret fiction. Counterfactual thinking is psychologically

demanding because significant aspects of two different scenarios must be held in mind: the one that occurred, and the one that is varied by virtue of changes the thinker makes to those facts.<sup>17</sup>

Timothy Williamson believes that “the role of conceivability and inconceivability in assessing claims of possibility and impossibility can be explained as a special case of the pervasive role of the imagination in assessing counterfactual conditionals.”<sup>18</sup> This provides a conceptual bridge between the (relatively) naive childhood use of the imagination to manipulate and depart from reality, and the mature, imaginative, exploratory manipulations of modality in which adult artists and scientists (and philosophers) engage. Except for deviations imposed by conscious will, the human imagination draws from our background knowledge of how nature works, and is deeply informed by perception. Young children incorporate what they know about the real world in pretense situations, and the real world is exploited in mature creativity, where it can inform both what a writer includes and how a reader responds to the resulting work.<sup>19</sup>

Formulating counterfactuals about past experience improves future performance in various tasks, and it is at least plausible that this is a factor in the development and extension of creativity. The relationship between counterfactual thinking and beliefs about cause play on a number of levels. First, there is the direct sense of “I did *X* a certain way before, but if I changed an antecedent the process would unfold differently and the product consequently vary from what was yielded in the noncounterfactual chain.” Then there are cases where the effect is internal to the work, especially in integrated, collaborative performances and narratives inhabited by characters that interact. A musician, a dancer, and a writer might all draw on this general cognitive capacity of considering counterfactuals to identify cause, then make decisions about details within their work, such as alternative ways to interact with another musician around a shared motif, modification of shared performance space with a dance partner, or stipulation of character motivations in a narrative.

Jerry Seinfeld describes an artistic counterfactual process in the documentary film *Comedian*,<sup>20</sup> which, among other things, explores the preparation and creativity that go into perfecting high-quality live comedic performances. He talks about first anticipating (imagining) how a joke will impact an audience, then reading and analyzing early audience responses (assessing data from the real, external world), considering changes (reposing the joke as a counterfactual), and reiterating that

process (improvising), always one way or another varying the components counterfactually to hone a cause/effect relationship.

#### IV

Improvisation is crucial to any explanation of creativity, but it is typically associated with highly complex, often abstracted creative contexts such as jazz music or free dance. To approach improvisation from that perspective is as counterproductive as defining human creativity on the basis of a small number of rare and exemplary creators. Recent work by Aaron Berkowitz<sup>21</sup> goes a long way toward demystifying virtuoso improvisation and demonstrating that it is “ordinary” creativity highly elaborated and refined, not a separate, opaque species of creativity firewalled from ordinary human endeavor.

Improvisation generates and exemplifies creativity, and is directly accessible to the senses because it unfolds in time and space and incorporates exploration, combination, illumination, elaboration, and transformation. Collaborative improvisation can be thought of as a conduit between individual minds and the physical and social environment. Early childhood pretense, counterfactual thinking, and thought experiments are all improvisations that involve apparently spontaneous creativity against a background of experience and knowledge (however limited), within the context of, and influenced by, applicable physical and social environments.

Although artistic and scientific creativity usually begins in rule-governed contexts, it achieves exemplary status if it turns out to be rule changing and, ideally, rule generating. Alessandro Bertinetto (quoting Luigi Pareyson) holds that “art is the kind of doing that invents the modalities of doings while doing,”<sup>22</sup> and much creative activity is concerned with both necessity (in relation to precedents, norms, expectations) and possibility (how creativity can extend or even leave behind those precedents, norms, and expectations). Einstein invented the modalities of what he was doing just as surely as did Picasso.

It is often said that creativity needs constraint; that certain constraints enhance creativity, and the absence of constraints is counterproductive to creative aims.<sup>23</sup> Perception, experience, and our understanding of how the world works are all constraints on imagination, at least to the extent of inclining us to favor the plausible and physically possible when we imagine. John Elster divides constraints on creativity into three categories. The creator can *choose* constraints from elements that are

already in use within the relevant form or style, he can *invent* his own constraints, and he can undertake his work within the boundaries of *imposed* constraints, which typically arise from external circumstances and cannot be avoided.<sup>24</sup>

Studying improvisation is an excellent way to unpack the complex relationship between constraint and creativity. Leaving aside arguments about its fine-grained nature,<sup>25</sup> improvisation occurs in contexts where traditions, norms, and the physical facts of the world pertain, yet it can yield significant variation in ways we judge to be highly creative. There is often a sense of spontaneity attached to improvisation, and its results in any single instance are very difficult to repeat exactly. These characteristics accentuate our perception of novelty and originality, both of which have high value in assessments of creativity. Because improvisation often arises from the interplay between random, conjectural impulses and a matrix of constraints, it provides an excellent mechanism for investigating relationships between constraint and inventiveness in creative processes.

Improvisation also provides a practical way to investigate the relationship between creative acts and the whole suite of mental processes, including consciousness, attention, will, belief, and imagination. It is often said that consciousness inhibits some aspects of the creative process, and this is famously the explanation for why the organic chemist August Kekulé couldn't "see" the ring structure of benzene, even though he had all the contributing concepts in place, until his consciousness was subdued by dreaming. A similar interpretation is applied to Coleridge's creation of the poem "Kubla Khan" after the poet fell into an opiate-induced dream.

I believe that when approached as examples of improvisation by the whole mind, conscious and unconscious—when we abandon our chauvinism about consciousness—such cases will seem much less mysterious. Neither improvisation nor general human creativity is algorithmic, which makes it very difficult to duplicate computationally and undermines computational theories of creativity. Here I am thinking of Margaret Boden's acknowledgment that the concepts driving her theory of creativity "are drawn from artificial intelligence (the study of how to make computers do what real minds do)."<sup>26</sup> For computers to create in a manner indistinguishable from human beings, they will have to replicate the highest levels of human improvisation.

## V

The knowledge we already hold and the experience we have already acquired influence our responses in novel situations, often through what we call intuition: a sense of knowing or understanding that, when it occurs, feels minimally, if at all, dependent on rational analysis or direct evidence. Intuitions play a significant role in scientific research,<sup>27</sup> and scientists often approach the expansive realm of the possible by conducting thought experiments. What is intriguing about thought experiments is that they appear to license new beliefs about the natural world without any physical evidence directly derived from that world, and so can illuminate how the relationship of human imagination to belief and truth impacts artistic and scientific creativity.<sup>28</sup>

Even though science seeks to describe and explain how things actually are, and art is often dedicated to exploring situations and events that do not exist, may never exist, and in some cases could not possibly exist, both draw heavily on the imagination and employ acts of creativity to achieve their aims. This is because they have a common root in human mentation, which integrates imagining, rational thought, and emotion. While the aims may be different, the human beings creating science and art are compelled to use the same mental capacities, of which the central one is imagination, because it is suited to the exploration of modalities beyond the limitations of what we have directly experienced about the world.

I believe it can be productive to consider enabling artifacts that artists create, such as scripts and musical scores, as descriptions of scenarios on which to base the exploration of implications in a manner analogous to scientific thought experimentation. In this way, Tony Kushner's script for the film *Lincoln* and Einstein's book *Foundations of the General Theory of Relativity* share important characteristics that arise from their common use of the imagination to generate a particular scenario and to encode (or at least imply) its potential outcomes and consequences. In the case of a film script, the filmmakers, and eventually the audience in the movie theater, work through the implications, just as an audience of peers, and then the wider public, works through the implications of Einstein's book.

Tamar Szabo Gendler's concept of partial mapping (*IIPM*, p. 222) provides a way to understand how we can derive two significantly different results—the fiction of art and the facts of science—by a single process that draws, in an integrated way, on both what we know about

the world and what we are able to imagine, which is not and may never be in the world or part of our direct experience. It is not the case that as we age and accumulate more objective knowledge about the actual world we imagine less (or at least imagine in ways that more closely align with what we know). If we take adult artists and scientists like Kushner and Einstein to exemplify extreme creativity and imagination, then the opposite is the case. This is what makes it so important to naturalize imagination and to understand science, art, and all other fields of human endeavor as dependent on the same creative processes. To make the most of what we can become, we need to base our educational practices on a naturalized and comprehensive view of imagination and creativity.

## VI

In *The Art Instinct*, Denis Dutton proposes a cluster theory of art based on twelve core characteristics that define art “considered as a universal, cross-cultural category” (*AI*, pp. 51–52). Last on his list is imaginative experience, but Denis adds the caveat that this is “perhaps the most important of all characteristics [because] objects of art essentially provide an imaginative experience for both producers and audiences.” Maybe Denis had this in mind when, in our single conversation, he agreed that the creation of art justifies the same attention we give to its perception.

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1. Brian Boyd, *On the Origin of Stories: Evolution, Cognition, and Fiction* (Cambridge: Belknap Press of Harvard University Press, 2009); hereafter abbreviated *OOS*.
2. Denis Dutton, *The Art Instinct: Beauty, Pleasure, and Human Evolution* (New York: Bloomsbury Press, 2009); hereafter abbreviated *AI*.
3. Berys Gaut, “The Philosophy of Creativity,” *Philosophy Compass* 5, no. 12 (2010): 1034–46. He continues: “Most of these questions have not been examined in anything like the detail they merit, and the extensive psychological literature that bears on them has been too often ignored. But there is a growing body of philosophical work that addresses these issues, which, together with the psychological literature, forms a basis on which future work can build. Creativity is an emerging and exciting area of research within philosophy.”

4. "What Life Means to Albert Einstein: An Interview by George Sylvester Viereck," *The Saturday Evening Post*, October 26, 1929: 110–17.
5. Berys Gaut, "Creativity and Imagination," in *The Creation of Art: New Essays in Philosophical Aesthetics*, ed. Berys Gaut and Paisley Livingston (Cambridge: Cambridge University Press, 2003), pp. 148–73.
6. "All good science emerges from an imaginative conception of what *might* be true" (Peter Medawar, quoted in V. S. Ramachandran, *The Tell-Tale Brain* [New York: W. W. Norton, 2011], p. xvii).
7. Ilona Roth, ed., *Imaginative Minds: Proceedings of the British Academy*, vol. 147 (Oxford: Oxford University Press / British Academy, 2007), pp. xx–xxi.
8. For what follows on the apprentice learning model, see Kim Sterelny, *The Evolved Apprentice: How Evolution Made Humans Unique* (Cambridge: Bradford Books of the MIT Press, 2012), pp. 34–43; hereafter abbreviated *EA*.
9. Jean Piaget, *Play, Dreams and Imitation in Childhood* (New York: W. W. Norton, 1962), p. 164.
10. Brian Boyd, "Arts, Humanities, Sciences, Uses," *New Literary History* 44, no. 4 (2013): 575–94.
11. Lev Vygotsky did his work in the Soviet Union and died of tuberculosis at the age of thirty-seven, facts that account to some degree for his relatively small impact on educational theory in the West, which is significantly more influenced by Freud and Piaget.
12. This is a combination of quotes from Vygotsky's papers, available in six volumes: L. S. Vygotsky, *Collected Works*, ed. Robert W. Rieber and Aaron S. Carton (New York: Plenum Press, 1997–99). For a thorough contemporary analysis of the relationship between imagination and realistic thinking, see Ruth L. Byrne, *The Rational Imagination* (Cambridge: Bradford Books of the MIT Press, 2007).
13. For elaboration, see Boyd, *On the Origin of Stories*, and Ellen Dissanayake, *Art and Intimacy: How the Arts Began* (Seattle: University of Washington Press, 2000).
14. For an excellent summary of Vygotsky's thinking on imagination, see Natalia Gajdamaschko, "Theoretical Concerns: Vygotsky on Imagination Development," *Educational Perspectives* 39, no. 2 (2006): 34–40.
15. Paul Harris, *The Work of the Imagination* (Oxford: Blackwell, 2000); hereafter abbreviated *WI*.
16. For an overview of claims about the relationship between pretend play, simulation, and theory of mind, see *The Architecture of the Imagination: New Essays on Pretence, Possibility, and Fiction*, ed. Shaun Nichols (Oxford: Oxford University Press, 2006); and Jane Heal, *Mind, Reason and Imagination* (New York: Cambridge University Press, 2003).
17. For an excellent recent survey of how humans use counterfactuals in relation to causation, see *Understanding Counterfactuals, Understanding Causation*, ed. Christoph Hoerl, Teresa McCormack, and Sarah R. Beck (Oxford: Oxford University Press, 2011). In the section on children's fictional world construction of his chapter "Domain-specific Causal Knowledge and Children's Reasoning," David M. Sobel notes that "in constructing a

fictional world . . . children must appreciate the causal structure of the fictional world in question, and what kinds of causal violations (if any) that world can support. . . . [They] do not treat all fiction as one possible world" (p. 135). His analysis draws from Deena Skolnick and Paul Bloom, "The Intuitive Cosmology of Fictional Worlds," in Nichols, *The Architecture of the Imagination*. Exactly how counterfactual reasoning and causal knowledge are linked is still a matter for debate; however, it is widely accepted that causal knowledge impacts counterfactual reasoning of the kind children engage in during pretend play.

18. For the development of this position, see Timothy Williamson, "Philosophical Knowledge and Knowledge of Counterfactuals," *Grazer Philosophische Studien* 74, no. 1 (2007): 89–123, and "Knowledge of Counterfactuals," *Royal Institute of Philosophy Supplement* 64 (2009): 45–64.

19. Our experience of the real world contributes to our detection of deviations from how we understand the real world to be.

20. *The Comedian*, directed by Christian Charles (2002; Needham: Echo Bridge Home Entertainment, 2011), DVD.

21. Aaron Berkowitz, *The Improvising Mind: Cognition and Creativity in the Musical Moment* (New York: Oxford University Press, 2010)

22. Alessandro Bertinetto, "Improvisation and Creativity," *Proceedings of the European Society for Aesthetics* 3 (2011): 81–103.

23. For elaboration, see David Novitz, "Creativity and Constraint," *Australasian Journal of Philosophy* 77, no. 1 (1999): 67–82.

24. John Elster, *Ulysses Unbound: Studies in Rationality, Pre-commitment and Constraint* (Cambridge: Cambridge University Press, 2000).

25. See David Davies, *Art as Performance* (Oxford: Blackwell, 2004).

26. Margaret Boden, *The Creative Mind: Myths and Mechanisms* (New York: Routledge, 2004).

27. See William I. B. Beveridge, *The Art of Scientific Investigation* (Caldwell: Blackburn Press, 2004). This is a reprint of a book by a Cambridge University pathologist first published in 1957.

28. For a discussion of relationships between intuitions, thought experiments, and imagination, see Tamar Szabo Gendler, *Intuition, Imagination, & Philosophical Methodology* (Oxford: Oxford University Press, 2010); hereafter abbreviated *IIPM*.