

## Social Neuroscience, the Imitative Animal, and Aronofsky's *Black Swan*

### 1.

Early in Darren Aronofsky's *Black Swan* (2010) we are shown the protagonist, Nina Sayers (Natalie Portman) and her mother, Erica (Barbara Hershey) as Nina prepares to leave for her day as a working ballerina. The mother is preparing breakfast for Nina as if she were a little girl heading off to school. At one point they face each other on opposite sides of a narrow breakfast counter, and as the mother hands Nina her plate, they repeat in perfect unison Nina's child-like description of the breakfast: "so pretty," they say, giggling together. A distinct visual mirroring accompanies the verbal synchrony of mother and daughter. The mother takes a quick step to her right in order to be exactly across the breakfast counter from Nina at the instant of their speaking together. To add to the mirroring effect, both women have their hair tied back in identical buns. Though each clearly mirrors the other, Nina's mother is dressed ominously in black, while Nina wears the girlish pale pink and grey outfit that becomes a metaphor for her situation at the beginning.

This minor interaction initiates a major concern of the film: the relationships between mirroring, imitation, and identity.<sup>1</sup> Now, most film and literature scholars will likely think of Lacanian psychoanalytic theory as a foundation upon which to investigate any text that deals with mirroring and identity. I, however, will replace that foundation with a newer, and significantly different one: social neuroscience. Since social neuroscience may not be familiar to many of my readers, we will first take a detour through the theory before returning to this scene from *Black Swan*.

Broadly defined, social neuroscience studies the linkages between certain biological mechanisms—"neural, hormonal, cellular, and genetic"—and various forms of social behavior (Decety and Cacioppo 3). In the present case we will concentrate on what social neuroscience has to tell us about imitation. It hardly needs saying that imitation is important in human life. But social neuroscience (and cognitive psychology) has shown just how imitative we humans are. As imitators, humans have no equal. In one influential study, psychologists Andrew Meltzoff and Wolfgang Prinz studied forty infants with an average age of just

thirty-two hours and documented the fact that even neonates imitate facial acts of adults (Meltzoff and Prinz 23). Adult imitativeness has been studied as well. Social neuroscientists and cognitive psychologists have investigated the embodied bases of a phenomenon remarked upon for centuries: emotional contagion, our predisposition to automatically imitate the faces, voices, and movements of others, and so to take on their emotional state. Empathy, often related to emotional contagion, has also received much attention.<sup>2</sup>

One conclusion from this research is that imitation is a constitutive element of human social-psychology. Marcel Kinsbourne argues that imitation in newborns “becomes the source of most of one’s social knowledge base.” And such

imitation begins far too early in development to have originated as a deliberate and reasoned choice. Also it is far-reaching, beyond adaptation to the social norm. It is a prime mover in mental development, and . . . underlies affiliation both to individuals and to the group. . . affiliation has a neurobiological rudiment, mediated by imitation. (Kinsbourne 326)

Imitation can readily be seen as “a default social behavior. Imitation is not something we only occasionally engage in. Instead, we *usually* imitate—automatically—and not doing it is the exception” (italics in original) (Dijksterhuis 208). Imitation is useful. It gives humans a unique ability to learn from others by imitating their actions. From this fact V. S. Ramchandran argues that imitative learning “may have been the key step in hominin evolution, resulting in our ability to transmit knowledge by example” (Ramachadran 132). In a similar vein, Merlin Donald—one of our foremost thinkers about imitation, cognition, and evolution—has argued that in our evolutionary past as well as in the present, mimesis “is the elemental expressive force that binds us together into closely knit tribal groups. Of all our human domains, mimesis is closest to our cultural zero point” (Donald 263). Imitation, then, is a foundational ingredient of individual and cultural identity.

Why should this be? One important area of social-neuroscientific research has begun to answer this question. The research involves our mirror-neuron systems. Mirror neurons were first discovered in the 1990’s. Italian researchers studying the brains of macaque monkeys found that the same set of neurons that fired in the performance of an action also fired in the observation of another monkey’s performance of a similar action. Thus, observing another’s action produced, not just activity in the observer’s *visual* system, but a mirror-firing of neurons in the observer’s own *motor* system. Said another way, the observer experienced an internal simulation, or imitation, of that observed, external action. In the years since this discovery, research has been carried out on the human brain, and as a result the

“mirror neuron system is now well established in humans” (Keysers, Thioux, and Gazzola 528).<sup>3</sup>

The explanatory potential of the mirror-neuron system arises primarily from the fact that it appears to ground a rudimentary understanding of other minds—in the cognitive sciences variously called folk psychology, theory of mind, or social cognition—directly in our own bodily experience of being intentional human agents. The mirror-neuron system operates as an essentially “interindividual,” which is to say socializing, process (Semin and Cacioppo 120). This quality is made all the stronger because mirror neurons tend to fire specifically upon the observation of goal-oriented actions, rather than just actions in general. In other words the neuronal system is attuned to the kind of actions that most clearly reveal intentionality, or consciousness. For instance, a good deal of the research involves the observation of basic directed hand motions such as reaching for an object. As researchers Sinigaglia and Rizzolatti put it: “when mirror neurons fire in response to action observation they send information to other [neuronal] centers about *the goal* of the observed actions, exactly as when they are engaged in action execution” (Sinigaglia and Rizzolatti 65, italics added).<sup>4</sup> So because of this kind of neural wiring we automatically, unconsciously register others as intentional beings like ourselves. At this most basic level we don't have to learn self and other identity.

With all this said, it matters to be clear about how such findings can be useful in studying the realm of the social. We are not likely to be able to draw direct causal linkages between mirror-neuronal (or other) elements of our biology and social behavior. In other words the mirror-neuron system may be one causal element of certain properties of social being, but it will be at best only a necessary, not in itself a sufficient cause. What these findings about mirror-neurons system does provide is another substantial entry in a growing batch of converging evidence about the nature and importance of imitation in human life. If imitation has such clear importance for identity, and if imitative identity is anchored in the body this way, then we have, at least, a relatively solid basis on which to begin making claims about specific examples of imitation.<sup>5</sup>

Most importantly for my purposes, social-neuroscientific explanations of our imitative identity offer a biologically-based explanation for what Aristotle long ago called the human “instinct for imitation.” The definition of imitation in art, like so many fundamental human ideas, is constantly in dispute. I will use the word in its broadest sense: an imitation is a consciously or unconsciously-motivated production (action or artifact) that resembles some real or imagined source. Though specific cultural-historical contexts will determine what counts as resemblance—and

may willfully privilege anti-imitation—this base-line definition is true to both the everyday sense of imitation and to the history of art. All works of imitative art, apart from any specific form and content, share one important quality: they are willfully-created objectifications of the embodied process by which human social-psychological nature is established. To attend to an imitation is to attend to a simulacrum of the unconscious, embodied neuronal mechanisms by which we constitute self and other. Said yet another way, all imitative works of art are, on a foundational level, productions that resemble our unique kind of identity. This is not to say that in any given instance we consciously think of imitations this way. We typically don't, just as we don't consciously think of our own identities as imitative. The social-neuroscientific research establishes the neurologically-based *unconscious* constituents of certain elements of social behavior and belief, and thereby provides a lens through which to explain specific examples of such behavior and belief.<sup>6</sup>

Social-neuroscience helps us understand imitative art in general, but if it is to be practically useful in the humanities, it will also need to help us understand specific elements of specific works of imitative art. We return to the breakfast scene between Nina and her mother. This scene introduces an unavoidable negative possibility that must plague any imitative identity: the possibility of over-imitation.<sup>7</sup> The originating event of imitative identity begins with a child imitating his/her parent figure. As famously established by the Meltzoff and Prinz study mentioned above, infants automatically do this. It's one of the main ways in which we develop a sense of self. But this kind of imitation always runs the risk of going too far. We must get beyond our automatic mirror-responsiveness to our parental figure in order to become an individual. Nina is an adult young woman still over-imitating her mother, and so she risks never developing an adequately separate identity.<sup>8</sup> In this particular case the problem presented by over-imitation is exacerbated because Nina's mother is conflicted about Nina's success. Erica had also been a dancer, but had only ever been a part of the "corps de ballet": the traditional term for the troupe of dancers as a whole, as opposed to the headlining lead ballerinas, or soloists. Now she at once pushes Nina to excel, but at the same does not want Nina to perfect her skills to the point of becoming a soloist. Rather, she wants Nina to remain only her "sweet girl," as she calls her at the beginning of the film: unthreateningly imitative, repeating but never surpassing her own accomplishment. It's not just that the child is over-imitating the parent to a debilitating degree, but that the parent is supporting the over-imitation. If Nina is to perfect the Swan Queen, she will have to somehow get past her beginning identity as her mother's over-imitative "sweet girl." We

have, then, right at the beginning an imitative conflict on the most primordial level: between daughter and mother.

We may conclude that *Black Swan* is “about” the problem of over-imitation on the level of the child-parent dyad. But this imitative dilemma could be placed in any number of social contexts. What about the effects of placing it in the world of classical ballet? Let us consider the nature of ballet as a form of imitation. We have the story of a ballerina who is obsessed with perfectly performing one of the most famous roles in all of ballet: the Swan Queen in Tchaikovsky's *Swan Lake*. Ballet is one of the most formalized and demanding of all dance traditions, and it is a special case of imitative art. Like acting, ballet is one of the forms of imitative art in which the imitator's body, rather than some material substance, is the medium of the imitation. However, unlike acting (except in silent film and pantomime), imitative dance depends entirely on the body, with no help from any kind of language. Classical ballet as a kind of dance is imitative in unusually complex ways. It takes what Merlin Donald calls our built-in “kinematic imagination” to an extreme. Donald argues that the kinematic imagination—“the ability to envision our bodies in motion” in order to mentally review, physically repeat, and perfect a desired movement—is “the cognitive core of mimesis” which, as mentioned above, is the core of imitative identity (Donald 271). It follows that any given dance tradition will always be the result of an interaction between this core of identity and a specific cultural context. Like so many modern cultural practices, ballet takes a built-in element of our being—something that all normal humans can more or less readily do—and exaggerates its qualities to the point that only a tiny minority of people can possibly perform the act, and then only after a very long and demanding course of training.

All successful classical ballet dancers must learn to imitate perfectly a substantial set of standardized movements—“academic technique”—that has been practiced since the 17<sup>th</sup> century, and became canonized in the 19<sup>th</sup> century. “The goal of every student of ballet is to come as close as possible to the ideal classical form” (Paskevskaja 146). Beyond this, the classical positions and movements are always the means by which the dancer imitates events and characters of a pre-established story; typically a folk tale or legend or myth. In *Black Swan* Aronofsky is concerned with only a bare-bones version of the *Swan Lake* folk tale. The dance-master Thomas Leroy (Vincent Cassells) explains to his troupe that their goal will be to “strip [the classical ballet] down, make it visceral and real.” The plot of the “visceral and real” version is quickly summarized. A pure, virginal princess is turned into a White Swan by an evil sorcerer. A good prince nonetheless falls in love with her. But

then a ruthlessly sexual Black Swan steals away the good prince's love. In the end the White Swan dies, leaving both the good prince and the evil sorcerer in despair. The lead ballerina, then, must imitate, not just a princess or just a swan, but rather a musicalized version of a young princess who unwillingly inhabits a swan's body. Further, the ballerina must imitate the swan-woman, the accompanying music, and the prescribed classical technique all at the same time. Lastly, the one dancer must "embody" (Thomas's word in the film) the archetypally opposite white and black swans. From this we can see that no matter how "stripped down" this particular version of the story, we will necessarily have a densely complex form of imitative art.

## 2.

If we take together ballet as an uncommonly rich form of imitative art and social-neuroscientific claims about our imitative nature, we can expect that any film dealing directly with the art of ballet will very likely be "about" embodied imitative identity (meta-imitational we might call it), no matter what other contents may be present.<sup>9</sup> This is certainly true of *Black Swan*. We've already seen how it installs the dilemma of over-imitation on the parent-child level. Along with this the film weaves together the art of ballet with two striking visual elements: mirrors, and doppelgangers. Both are overloaded with meaning for imitation and identity. We will first discuss mirrors and then turn to the doppelganger below.

Mirrors and mirroring play a major part in making the production of *Swan Lake* "visceral and real." Significantly, of all the performance arts ballet most depends on mirrors. They are indispensable tools for training. *Black Swan* abounds with mirrors. The ballet rehearsal hall has mirrors for walls. It's rare to find any indoor space that does not feature at least one mirror, and often we see multiple mirrors in the same space, sometimes facing each other. We have elaborate cases of visual confusion produced by manipulating camera perspective and mirror reflection. A number of times we see strategic uses of mirror seams or joints to produce split reflections of characters. The camera concentrates twice on an elaborate mosaic mirror in Nina's apartment.

In this story mirrors are always more than just elements of a set. I will explain only one in detail. The first scene in the soloists' dressing room is as elaborate a use of mirrors as we are likely to see in any film. As far as I can tell, there are at least seven mirrors in this very small, rectangular space. We see wall mirrors facing each other on the longer walls of the room; double full-length mirrors at an angle on both shorter walls; two round, freestanding make-up mirrors with mirror-finish, stainless-steel backs, one in front of Nina, the other in front of one of the other

soloists; and a small octagonal mirror hanging next to Nina's wall mirror. Four women are present, all putting on make-up.

Camera, mirrors, faces, and bodies are arranged in such a way that frequently it is impossible to be sure who is exactly where in the room, how many bodies are actually present, or whether we are looking at a flesh and blood woman or a mirror-reflection. This visual uncertainty enhances, and is enhanced by the fact that all the women look fairly similar and are all doing the same kinds of actions. Even their faces are relatively similar. The use of mirrors in the scene visually dramatizes an outcome of the over-imitative nature of ballet as a performance art. At this highest level of physical accomplishment, ballet tends to require dancers whose bodies are quite similar in shape, condition, and height, so similar that the term "corps de ballet" begins to define the actual body-type required, rather than the troupe. To the eye the women are nearly interchangeable, copies of each other so to speak. And yet, ironically, as "soloists" they have been selected for their individual excellence. The interchangeability increases with the level of achievement. It reaches its limit later when Thomas chooses Lily as Nina's alternate, by which time the differences between prima ballerina and alternate have diminished to almost nothing. At that level a confusion of faces in mirrors will no longer adequately convey the extent to which the dancers have become copies of each other. Nina will come to feel this sense of interchangeability so powerfully that at times later on she will look at Lily, and will have the experience of looking at a mirror: she will see Lily as herself.

Mirrors and mirroring also operate in *Black Swan* at the level of imitative aesthetics. Mirrors have always held a special fascination for the imitative animal, and social neuroscientific claims about our imitative identity can explain why. They strike us as presenting visual imitations of whatever they "see." In this sense they appeal to us as do artistic imitations—we see something of our own imitative nature in them. But their effects are qualitatively stronger than other imitations because, except for the left-right reversal, the image in the mirror looks exactly like the world that we see with our own eyes: the mirror-image strikes us as a perfect imitation. For this reason mirrors have been taken since antiquity as the imitative ideal of art. In the normative case imitative art intends to produce a likeness of its model, and the closer the likeness gets to the model, the more perfect the imitation. The mirror-image appears to be obviously perfect in this way.

However, since a mirror has nothing to do with motivation—unconscious or conscious—in fact it is not an imitation at all. As a result, the mirror-ideal of imitative perfection turns out to be a self-cancelling endpoint. The closer a work of imitative art literally comes to the mirror ideal of imitative exactitude, the more

it becomes mere duplication, and so the further it gets from being a work of art (assuming of course that imitative art and duplication are not the same thing). This is one reason why mechanical reproductions of established artworks are not themselves considered works of art. If the difference between imitation and imitated entirely disappears, the artist fails just in the moment of putative perfection. This same self-cancelling possibility necessarily plagues an identity that is a function of imitation on the level of neurobiology. Though our individual identity depends on imitation, the closer we come to a perfect imitation of an other (over-imitation), the less remains of our individual identity. Imitation may be the sincerest form of flattery, but unconsciously-motivated mirror-duplication of an other is a debilitating personality disorder.<sup>10</sup> In this sense our identity is like imitative art, and the mirror is a kind of materialization of the risk of over-imitation. Mirrors, then, can always carry this excess of significance.

But what about the mirror ideal with respect to imitative art such as we find in *Black Swan*, in which the performance artist is doing with his or her very own being what a sculptor or painter does with stone or paint? In this case the disappearance of the differences between imitation and imitated is one sure sign of a perfect achievement. Acting provides the clearest example of what I mean. The actor succeeds to the extent that she erases the differences between herself as imitator and the character she imitates. The audience should not be aware of the actor, really, at all, but only the character. The same holds in principle for any imitative performance art.

And yet, although perfection in imitative performance means the positive disappearance of the differences between imitator and imitated, a negative, self-cancelling endpoint still remains; precisely because the imitator's own being is the medium of the imitation. The imitative-performance artist runs the risk of two kinds of failure. First, there's the risk run by an imitative artist of any kind. The imitation itself may just fail somehow. But there's also the distinct risk that the performer may lose his or her own identity to the imitation: another version of over-imitation. Just this risk must underlie, at least in part, our enjoyment of good acting. As imitative animals we know, consciously or not, that we are subject to loss of identity through the risk of over-imitation of an other. So we are fascinated when someone consciously takes on that risk purely for the sake of excelling at it. In other words we enjoy the self-loss defying element of acting in much the same way we enjoy the death-defying, or at least body-endangering, element of entertainments such as trapeze shows or NASCAR races or downhill ski-racing. These activities

entertain us because we are fascinated by someone who willingly risks injury or loss of life in the act of perfecting some form of entertainment.

With imitative performance, the more the performer's identity appears to dissolve into the imitation, the more the risk of self-loss; and therefore the more enjoyable for the spectators, assuming that the performer does not in fact lose her self. Imagine watching a performance in which the actor never returns to her own identity. All of this—our understanding of the linkages between the mirror ideal, imitative performance, and imitative identity—gives us another interpretive overview of *Black Swan* as a whole. The story in both its visual forms and its content is very much about the risks of imitative performance. It weaves together a distinctive use of actual mirrors along with two major conflicts that have to do with the self-cancelling end of the mirror ideal: a conflict of imitative identity—Nina's mirroring of her mother—and a conflict of imitative aesthetics—Nina's obsession with perfecting the role of the Swan Queen.

### 3.

Along with the constant presence of mirrors, we also find a kind of embodied mirror-image: the doppelgänger. On an unconscious level Nina understands from early on that if she is to succeed as the Swan Queen, she will have to end her over-imitative identity as her mother's "sweet girl." She consciously knows that she wants to perfect the Swan Queen role; and she unconsciously knows that she will have to give up the "sweet girl" imitation of her mother if she is to achieve that perfection. One sign of this unconscious knowledge is the appearance of her doppelgänger.

Nina first sees her duplicate shortly after the opening breakfast scene, as she travels by subway to the tryout for the Swan Queen role. She glances forward to the next car, and sees a woman in profile, listening to an MP3 player, who may look like herself. Neither Nina nor the viewer can be sure.<sup>11</sup> The woman is partially obscured, and immediately looks away. When Nina tucks her hair behind her ear, the woman, still looking away, duplicates Nina's action. But the train stops, the woman gets off, and Nina still can't be sure of what she may have seen. A key instant here is the duplication of hand motions; for though we can't be sure the other woman is Nina, we can be sure that both women perform the same hand-action at the same moment. The film has taken us from the breakfast scene of mother-child mirroring to a foundational example of the motor-mirror operation: a basic hand movement. The event is staged so that we see an externalized image of what normally is a purely internal operation of the mirror-neuron system.

Nina more clearly sees her doppelgänger after it appears that she won't be selected to play the Swan Queen. In her tryout for the role Thomas abruptly requires

her to go into one of the most demanding routines in the history of ballet. Called Odile's coda, it consists of a long, nonstop series of fouettés that climaxes the Black Swan's role. Nina's performance is broken up by the unexpected entrance of Lily, who will soon become Nina's competitor and nemesis. After Lily interrupts, Nina asks to try the coda again, but Thomas shrugs her off with, "I've seen enough." From Thomas's tone, Nina has to assume she will not be chosen as Swan Queen. Walking home alone after this defeat, she encounters her first doppelganger, one that links directly to the German term: double-walker. Her cellphone rings, displaying a pink caller-identification, "Mom". Given the mirroring of her mother at breakfast ("so pretty"), the association of pink with her "sweet girl" identity, and her apparent failure as the Black Swan, the pink "Mom" portends that Nina will remain only an imitation of her mother, never leaving the "corps," never perfecting the Black Swan. The cellphone screen operates as a kind of mirror at this moment. But she refuses to take the call. As she closes the phone with a snap, she hears the closing snap of another cell-phone, carried by a woman walking towards her from the opposite end of a sidewalk construction corridor. The woman, drawing nearer, is another Nina, dressed in black and going in the opposite direction. We barely hear scornful laughter as the woman passes. And we also see on the plywood wall to the woman's left, "Do Not Enter," scrawled in huge dark letters.

The modest act of consciously refusing her mother's call automatically (unconsciously) produces a maximum negative possibility: an embodied duplicate of herself. The doppelganger is an embodied analogue of the mirror-image. Just as an actual mirror image is identical to what the eye sees, except for the left-right reversal; so the double is identical to the embodied self except for the psychological reversal. The doppelganger is the kind of woman Nina must become—bold, self-confident, possibly ruthless—if she is to successfully perform the Black Swan. At this point her unconscious imitative-duplication of her mother is so strong that she can only conceive of the woman she must become as an entirely separate, and negative, mirror-imitation of herself.

Although Nina has asserted herself in this way, she still returns home to cry on her mother's shoulder. Later that night, Erica is tucking Nina into bed and trying to console her. She reminds Nina that, though she won't be the Swan Queen, at least she'll be able "to dance the pas de quatre" again. The pas de quatre is another standard piece of ballet choreography. *Swan Lake* carries one of the most famous examples of the type. Four "swans" holding cross-linked hands perform the entire, quite demanding dance in exact unison. This performance is truly fascinating to watch. Our understanding of humans as essentially imitative creatures can explain

why. We have a case of over-imitation as consciously-produced performance art. Because of our imitative nature, we find imitations interesting in general. Some imitations are especially interesting because they involve a positive case of one of the extremes of imitative identity: over-imitation. As mentioned above, we enjoy the display of people consciously risking self-loss by suppressing their individuality in order to become unusually similar to an other. In such a case mirror-duplication is the sign of perfection. The four dancers exactly duplicate each other's imitation of the musicalized swans. But though this might be a case of performance art as positive over-imitation, for Nina it means never making it to the level of soloist. Nina's mother, then, is satisfied if her daughter simply becomes another version of herself, never leaving the "corps."

The next morning Nina visits Thomas to ask for the Swan Queen role. It is in this scene that the film overtly introduces the problem of imitative perfection. "If now is not a good time. . ." Nina says when she asks to speak to Thomas. "Now is perfect," he replies. In his office with large mirrors on three walls, she asks him for the role in spite of having failed at Odile's coda the day before. Thomas, true to his name, doubts her ability. "For four years," he says, "I see you obsess about getting each and every move perfectly right, but I never see you lose yourself." Nina responds to his doubts by saying, twice, "I want to be perfect." From this we can see that there are two conflicted notions of "perfection" in play here; and the conflict between them is endemic to a creature whose identity depends on imitation. Thomas admits that Nina has achieved mirror-perfection. He says he does not question her "technique," her perfected imitation of each and every prescribed classical move. But ironically, no sooner does Nina perfect the prescribed moves, than another notion of perfection comes into play.<sup>12</sup> This kind of perfection requires her, as Thomas says, to "lose" herself in the imitation. His language is quite accurate. There's no risk of self-loss in perfectly imitating, mirror-style, only the moves themselves. It's the risk of self-loss in the *Black Swan character* that will make the imitative performance compelling. He of course means that she must only appear to lose herself. But it becomes clear to the viewer that if Nina is to perfectly imitate the Swan Queen, she will have to go beyond simply *risking* self-loss, as with the usual case of imitative performance. Nina will have to literally lose her "sweet-girl" self if she is to perfectly embody the Swan Queen. But then the suspenseful question becomes: will she have to lose all sense of identity, rather than just her identity as the "sweet girl," in the drive to imitative perfection?

An answer to this question shows up in a round-about, purely visual way just after Thomas, who does choose Nina, has introduced his new Swan Queen to the

world. As Nina waits by herself for Thomas in the grand foyer of the performing arts center, she studies at some length a huge bronze sculpture. An eight foot human figure with wings stands perched atop a three-foot globe of the earth. It might be an Icarus figure. But in the context of a story about ballet dancers, or Apollo's angels as Jennifer Homans calls them in her history of ballet, the association with angels seems most relevant; and in any case Icarus is an image of a fallen angel (Homans 2010). Traditionally a sculpture or, really, any representation of an angel is an imitation of an imaginary entity, who, apart from having wings and maybe a halo, looks like a perfect human being. But in this very haunting case the angel is drab, discolored, ugly and distinctly imperfect. Its wings are ragged and much too small to possibly give it flight. Its dark eyes look bleakly out of a face that appears to have been smeared amateurishly with grease-paint. Though it has a more or less normal human body, it has no genitalia, and so has no gender: its metaphoric value must apply to all human beings. And though it stands on top of the world, we are shown no sense of triumph or mastery or glory, a fact much amplified by the angel's size and the very low camera angle. The feeling is that if it makes even one tiny move, it will fall off into space, and its flimsy wings will never be able to save it.

The sculpture becomes a tragic commentary on the human fantasy of perfection, as well as a prevision of what is to come for Nina. If an angel is an imitation of a fantasy of positive perfection, Satan would be an imitation of a fantasy of negative perfection. In contrast to these polar opposites, this looming presence is an imitation of an imaginary contradiction: the imperfect angel. Nina stares up at it, quite fascinated, until suddenly interrupted by Beth (Wynona Ryder), the former Swan Queen whose place Nina has just taken. Beth begins to insult Nina, and is stopped only by the arrival of Thomas. Minutes before this, Thomas had bid public farewell to Beth, mentioning that both her first and her last performance for him had been in the role of Melpomene, the muse of tragedy. Now, Beth, like the sculpture, looks tragically imperfect: dressed in black, drunk, her dark eye make-up smeared. She has just fallen from atop the world of ballet, with no wings, literal or figurative, to save her. The implication is that Nina will necessarily become another version of Beth (though never mentioned in the story, the sculpture, by Fritz Scholder, is entitled *Future Clone*), and then that someone will become another version of Nina, on into the future, a series of interchangeable, tragically imperfect perfections. The figure's wings, which take us forward to Nina's final performance as the dying White Swan, augment this effect. In addition, when Nina is preparing to go onstage for her debut, she will wear make-up that takes us directly back to this image.

But if the sculpture answers our question of what the drive to imitative perfection will cost Nina, it also opens another question. The sculpture, after all, is imitative art, not imitative performance art. Its conspicuous inclusion in this particular story dramatizes just the differences between the two forms of imitation. So then, how will Nina's perfected imitation of the Swan Queen embody—literally since her body is her medium of imitation—imperfection?

Even after choosing Nina as his Swan Queen, Thomas continues to criticize her performance of the Black Swan. As her debut draws closer, the unconscious fear of losing herself in the imitation of the Black Swan grows stronger; the real risk of self-loss grows more likely, and as a consequence her encounters with her doppelgänger grow more and more dramatic. Often they are tied to her sexual uncertainty. For instance, as she is in the bathtub following Thomas' instructions to loosen up by masturbating, she submerges herself in the water. In an inverted Narcissus moment, she then sees herself, naked, bending over and peering down at her from above. After a night of dancing and drugs with Lily, she returns home alone and dreams of passionate sex with Lily, only to see Lily turn into herself. And at one point she imagines coming upon Lily and Thomas *in flagrante delictio*, but then Lily becomes Nina and Thomas becomes the evil Prince figure from *Swan Lake*.

Equally significant, though, along with the doppelgängers Nina begins to experience *imperfect* reflections of herself in real mirrors. As she is rehearsing by herself, she sees her mirror-image begin to move differently than her own body. This image is presented, not as some kind of distortion in the mirror, but rather a literal (to Nina) violation of the mirror's perfect reflectivity. The linkage between Nina's specific case and the more general case of imitative identity could not be more compelling. On the way to perfecting the Black Swan role Nina experiences complementary versions of two of the imitative animal's most negative (im) possibilities. She sees in the flesh what should only ever be seen in a mirror: a perfect visual duplicate of herself. And she sees what she should never see in a mirror: something other than her own perfect visual duplicate. For Nina, the self-cancelling endpoints of imitation are not simply logical or theoretical possibilities. They are manifesting themselves as material realities. For the viewer a complete loss of self-identity seems more and more the unavoidable end of the story.

#### 4.

Doppelgängers and mirrors finally come together in a violent climax. Just before Nina makes her debut as the White Swan, we are taken a step beyond Thomas's "I never see you lose yourself" idea from earlier. As she's putting on her make-up, which looks very much like what we have seen on the bronze sculpture, Thomas

says that “the only person standing in your way is you.” Now, it’s specifically the embodied self, the actual “person standing,” that must seem to disappear into the imitation.

Nina makes it through the first act as White Swan, but only after a devastating onstage fall. The inclusion of this event at this point—before the Black Swan performance—makes clear that *Black Swan* is not primarily concerned with the usual risk run by all imitative artists: the failure of the imitation itself. As an anatomy of the risks of imitation the film needs to present this possibility first, just in order to show that it is not what is most at issue. What most matters is the peculiar kind of risk—of self-loss—run by imitative performance artists.

After her fall Nina returns to her dressing room, distraught but still determined. Lily is there, already in the Black Swan costume, preparing to take Nina’s place. Lily stands up to confront Nina and suddenly becomes the doppelganger, who is now literally the person “standing” in Nina’s way. Nina explodes and thrusts the double against a standing mirror on the wall. The mirror shatters. The double falls amidst the shards, apparently dead, but then springs back to life. They struggle. The conflict ends as Nina stabs the double to death with a shard of mirror, at which point the double becomes Lily again. Within a few seconds of this act, after hiding Lily’s body Nina goes onstage as the Black Swan.

Aronofsky’s use of special-effects in the Black Swan dance sequence takes our fascination with the risk of imitative self-loss to a spectacular extreme. As Nina swoops and twirls with the evil prince (and the steadicam), she sprouts black feathers and immense black wings, the kind of wings that would have been “perfect” on the sculpture earlier. We know the wings can’t be real, so we take them as a visual image of her sense of her experience. Given the ways that the film has been focusing on imitative perfection and identity, we have to suspect that with this transformation she has literally lost her entire self-identity, not just her “sweet girl” self, to the role. This possibility is reinforced when Nina leaves the stage for a few seconds just before returning to perform the series of fouettés. Though she’s off-stage, she continues to move as if she were a swan on water. No one around her notices this, so once again we must conclude that we are seeing Nina’s sense of herself, in which the differences between herself and the character have evidently been entirely erased.

Finally, after the dazzling fouettés of Odile’s coda she takes her bow in an extreme long shot, taken from the theater-audience’s point of view. Now she is plainly a human dancer dressed in Black Swan costume. But at the same time we see on the curtain behind her a vision that the audience in the film cannot see: two

immense shadows, one to the left, one to the right, cast by stage lights at her feet. These shadows are, impossibly, of the woman who has literally become a swan. They, too, must be images of Nina's sense of herself at this moment. Whatever her state of mind, she has most definitely perfected this most challenging role. The audience goes wild. Even Thomas Leroy, the doubting dance-king, is left speechless. The other dancers are in awe.

In spite of our suspicions, though, we quickly find that Nina has not lost herself. We next see her walking normally as she returns to her dressing room to change into the White Swan costume for the final performance. So she has run the ultimate imitative risk and survived. In one decisive act she has shattered the dead-end of mirror-perfection, killed off both the doppelganger and her own "sweet girl" self, and perfected the Black Swan. Her triumph appears complete: except that the story has not reached its conclusion. In spite of the film's title and the build-up to the moment of glory as the Black Swan, the climax of the ballet actually comes with the final performance of the dying White Swan.

As Nina prepares for the final act, Lily shows up to congratulate her on her performance of the Black Swan. This forces Nina to re-examine the scene of her "crime." She finds that the mirror has been shattered, but there has been no murder. She discovers that there has nonetheless been an attack. Looking down, she sees a wound in her own stomach, from which she pulls the tip of the mirror-shard that she had imagined using to kill her double. Since this seems so very improbable—how could she possibly have performed the Black Swan with this damage to her body?—the viewer must suspect at first that the wound is not real, but only another visual image of Nina's state of mind. Nina goes on to perform the final act as the dying White Swan. Her performance is shot so that, except for one hard-to-register instant, we can't be sure the wound is really there. This tends to support the possibility that the wound is not real.

As Tchaikovsky's music reaches its tragic crescendo, she glides up to her perch above all the other dancers. She has mastered the two polar opposites—the perfectly pure, good White Swan and the perfectly impure, evil Black Swan—and so has risen both literally and figuratively to the top of this artistic world. Now we can see the wound clearly as she stands, fluttering her flimsy imitation wings in distress. They will no more be able to save her from falling than would the wings of the bronze sculpture who presided over her initiation into "perfection." We see no triumph in her face. We see her pain, both in her eyes and in the now-conspicuous, bloody wound.

No one else in the story appears to notice the wound though, so we still cannot be certain that it's real. We can only be certain after Nina falls from her pedestal as the dying White Swan. The curtain comes down, the other dancers and Thomas run on stage to congratulate her; and, like us, they now all see her wound. Therefore we must take it as a fact within the storyworld: the wound is real. When Thomas demands to know what Nina has done, she says, "I felt it. Perfect. It was perfect." The wound and her recognition of perfection occur together, and in such a way that we must assume the perfection has depended on the wound. And yet at the same time the reality of the wound remains utterly fantastic, even in this story that has had much to do with the fantastic. What can we say about this climactic (im)possibility?

We return to the relationships between our work of art—*Black Swan*—and our theory: social-neuroscientific explanations of imitation. Recall the film's own early description of the qualities required to bring this version of *Swan Lake* to perfection: the performance must be "visceral and real." It turns out that rather than being mere pep-talk, both "visceral and real" are meant literally. The reality of the visceral wound secures this story's insights into the vicissitudes of the imitative animal. The discovery of unconscious determinants of our conscious being is often distressing. We become conscious of, precisely, the fact that we are ongoingly constituted by unconscious mechanisms over which we have little or no control. Just this kind of knowledge is what investigations such as social neuroscience, cognitive psychology, and evolutionary psychology constantly discover. Rightly and/or wrongly, these kinds of knowledge often throw into doubt our everyday sense of ourselves as self-contained, self-determining, free-willed individuals. Art very often provides emotionalized expressions of the kinds of knowledge that, for instance, the sciences, philosophy, or economics present in their systematic ways. The real wound has done just that with the kind of knowledge about human beings that is now being established in, for instance, social neuroscience. Nina's discovery of the mirror in the flesh is the painful, wounding event of recognizing that the mirror-ideal is not simply out in the world, as a separate part of our otherwise non-human environment. It is embodied (embedded) in us, determining who we are. On a foundational level imitation is not simply a willful choice, but rather is an unwillful compulsion. It constantly both enables and threatens our unique kind of identity. Artists such as ballerinas are special people because their chosen profession involves, among other things, directly taking on the threat of imitative self-loss. For this reason we should not be surprised if they are more likely than most of us to come to a special awareness, conscious or unconscious, of the vexed nature of imitative identity. Nina's obsession with her role drives her to this awareness.

Both Nina and *Black Swan* “know” in the realm of art and experience what social neuroscience knows theoretically about human being.

## 5.

The social-neuroscientific understanding of imitation has provided a biologically-based foundation upon which to build an analysis of Aronofsky's film. At the same time the analysis should help provide a kind of humanistic support for the claims of *social* neuroscience. In other words given a creature whose identity depends on imitation at the level of neuronal systems, then we could predict that such a creature's social nature might likely involve certain kinds of beliefs and values, might tend to produce certain kinds of cultural practices, might tend to undergo certain kinds of experience, etc. If predictions of this kind are validated by social evidence, then we have at least some provisional validation in the other direction: of the scientific theory as a means of explaining elements of the social realm. In my mind *Black Swan* is the kind of story we might predict from the imitative animal, especially at our moment of modernity when, as mentioned above, so many of our built-in tendencies and pre-dispositions are pushed to such extremes. This cultural product, then, helps offer support for social-neuroscientific claims about the neuronal causes of our social being. With such a conclusion we arrive at a more satisfying, and more accurate, version of interdisciplinary knowledge. The science has helped us to know the art, and the art has helped us to know the science.

## Notes

<sup>1</sup> *Black Swan* deals with much more than just these issues, and is if anything overabundant with other content. We have, at least, the drama of the young woman under the thumb of an overbearing mother; the drama of thwarted love; the drama of a young woman confused and anxious both about sexuality in general and her own sexual orientation in particular; the drama of the hothouse world of professional ballet; the drama of the production of this particular ballet (*Swan Lake*), with its tyrannical ballet master and its metamorphosis of a White Swan to a Black Swan and back again; the drama of the short lifespan of idealized female beauty; the drama of the doppelgänger; and the drama of obsessive ambition. My focus—mirroring, imitation, and identity—would play a part in these thematic threads, but for reasons of space I will not be considering them here.

<sup>2</sup> For further reading on this see for example Hatfield, Rapson and Le; Iacoboni; Rizzolatti and Siniglia; Hatfield, Cacioppo and Rapson.

<sup>3</sup> Though there is a scientific consensus on the nature and possibilities of the mirror neuron system and imitation, there certainly remain objections and skepticism. For considerations of problems with the theory, see Hickok, and Turella et al. For

a recent broad review of, and conclusions about fMRI research on mirror neurons see Molenberghs et al. Whether or not mirror neuron systems themselves are as distinctly foundational as they seem, there is in any case “ample evidence for automatic imitation in humans. . .The reason we mimic automatically is that the perception of a certain behavior automatically activates our own motor representation of that action. . .humans seem wired to imitate, and imitation is the default in the innumerable social interactions we have” (Decety and Ickes 32).

<sup>4</sup> See also Jeannerod.

<sup>5</sup> Several recent considerations of, specifically, mirror-neuron theory and film are found in Konigsberg, Landay, and Grodal.

<sup>6</sup> A social-neuroscientific approach to the arts shares this epistemological orientation—explaining beliefs, practices, or productions by means of a theory of unconscious causation—with many of the various ideological approaches that have governed studies of literature, film, and the arts for the past decades: from gender studies to postcolonial studies to approaches based on concepts of deconstruction or Lacanian psychoanalytic theory. But of course the social-neuroscientific approach differs from these approaches in that its unconscious causal mechanisms are established by empirical-scientific research on the human animal.

<sup>7</sup> The imitative identity must also be plagued by the possibility of under-imitation, as demonstrated by a long list of fictional characters—from the Cyclops to the werewolf to Grendel to the contemporary psychopathic killer—who are constitutionally incapable of the basic act of identifying with others. But we need not consider that possibility here, because *Black Swan* is very much a study of over-imitation.

<sup>8</sup> Research into over-imitation has made some intriguing findings, particularly among young children, who tend to imitate adults to a fault. See Nielsen and Tomaselli; Lyons et al.

<sup>9</sup> Because ballet, like all dance, is an art of movement, it has always been of interest to motion pictures. Adrienne McLean has written the definitive study.

<sup>10</sup> Psychologists have labeled two related versions of this condition as personality disorders: echopraxia, the unconscious (unwilled) over-imitation of another’s actions, and echolalia, the unconscious over-imitation of another’s speech. See for instance Kinsbourne.

<sup>11</sup> With the advantages of stop-start home video controls, the viewer can come to be sure that the woman is actually Lily, but it’s hard to see how a viewer in a theater could know this.

<sup>12</sup> Aronofsky taps into an actual running problem in the history of ballet. Back in the 1970's Elvira Rone wrote: "There is something that needs stressing at the present time, when there is a strong tendency to treat dance training as a set of mechanical exercises that, if done correctly in the right order, produce the proper result after a few years. In fact they tend to produce dancers who are little more than robots, not interpretive artists. . ." quoted in Paskevka 146.

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