

ON SEEING MOUSE AND THINKING HUMAN

ON SEEING MOUSE AND THINKING HUMAN:
EXPERIMENTAL SCIENCE, CORPOREAL EQUIVALENCE, AND THE LITERARY
MODEL ORGANISM

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ABSTRACT

This thesis examines literary texts that represent encounters with model organisms in ways that enact an interspecies ethics that turns the narrative of bodily relationality embedded within the model organism into a source of care, friendship, respect, and mourning. My project understands model organisms as material beings as well as semiotic and narrative entities; I suggest that the very ‘materiality’ of the model organism’s body is symbolic precisely because it is designed to refer to bodies other than its own. The model organism involves a double relationality between the categories of ‘animal’ and ‘human’ because it serves as a mediator between human nature and nature at large. This is not to say that that human biology is not part of ‘nature’ but rather that anthropocentric and human exceptionalist ideologies pervade discourses of human biology and thus the model organism provides a link to our biological and corporeal ‘selves’ in a way that maintains species divisions. The texts I analyze throughout this dissertation offer alternative ways of thinking about the model organism by exposing the multiple meanings and narratives that coexist within them both as representations and as living sentient beings. This project centers around two questions: How do cultural texts represent and negotiate disconnects between how model organisms signify within scientific discourses and their broader cultural identities? How does literature specifically engage with scientific knowledge in ways that both disrupt and affirm the status of the model organism as a scientific object?

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Introduction | When Mice Become Human

At the dawn of the twenty-first century, the face of biology may well be that of a laboratory mouse.

—Angela Creager et al. (*Science Without Laws* 1)

‘Gee Brain, what do you want to do tonight?’ ‘The same thing we do every night, Pinky, try to take over the world!’

—*Pinky and the Brain* (Theme Song)

In an episode of the animated series *Pinky and the Brain* (1995-1998) called “Of Mouse and Man,” Brain, a genetically modified mouse who has gained super-human intelligence, stands trial to determine whether he is a mouse or a human. This trial is part of one of Brain’s nightly schemes to take over the world that the series chronicles. In this episode his scheme involves donning a larger than life mechanized human-suit in order to infiltrate a large insurance company, staging a work-place incident involving a microwave oven and a non-dairy powdered coffee creamer that transforms him from a human into a mouse, and suing the company for worker’s compensation. The plan backfires, and the judge ultimately determines that he is “not a mouse but simply, and also sadly, just an odd-looking little man” (*Pinky and the Brain*). The comedy of this verdict rests on the irony of Brain’s inability to convince the courtroom that he is a mouse after ridiculously passing as a human for the majority of the episode leading up to the incident. Satire and comedy aside, this episode encapsulates the paradox at the center of my dissertation: mice—a species that in every other context we consider to be

fundamentally different from us—not only stand in for but *become us* in scientific experiments that model our most fundamental physiological structures.



Figure 1. Brain’s mechanical human suit. Screenshot from *Pinky and the Brain*, “Of Mouse and Man.”

Brain’s mechanical human suit embodies the technologically mediated transformation of the model organism from an animal to a human within the theoretical framework of the experimental science. Brain’s suit also reverses the Cartesian paradigm in Western culture that positions animals as mechanical automatons by suggesting that within contemporary biomedicine the human body is mechanized and manipulatable at a genetic level and that this process has been achieved in part through model organisms (Hacking “Cartesian Vision” 162; Grosz *Volatile Bodies* 8-10). However, the irony of this Cartesian reversal for Brain is that he cannot signify as an animal once he has taken

on his role as a human. Thus, Brain's failed attempt to testify to his animality reflects the disconnect between the fact that mice become impossibly 'human' within experiments and then remain impossibly 'animal' outside of them. Similarly, that the judge's verdict rests on Brain's mental capacity and ability to use language ultimately raises the question: how many human qualities does it take to be considered human while remaining a mouse in bodily form?

The issues raised in Brain's trial anticipate those currently being asked by the medical and bioscientific communities surrounding the moral and corporeal status of genetically modified animals. For example, fifteen years after "Of Mice and Men" aired, the United Kingdom's *Academy of Medical Sciences* issued a report to the Home Office on the "ethical and regulatory issues that emerge" from the creation, distribution, and use of what they call "animals containing human materials (ACHM)" (5). This report is especially important for a consideration of mice as model organisms because, as the report describes, "mice are the most frequently used due to their small size, short generation time and well-understood biology and genetics; the development of rodents with biology more like that of humans is an important aspect of inter-species research" (15). Mice are by far the most widely used model organisms across all scientific disciplines and in many ways they have, to put it in terms of *Pinky and the Brain*, "taken over the world" of modern science. As the report outlines, the central issues that incited the report revolve around the ambiguous moral and social status of animals that contain human DNA and are used as models for human disease:

Many ACHM models, such as transgenic rodents each containing one (or a few) human genes, and animals with human tissue grafts, have a long history of

research use without major ethical or regulatory difficulties. However, technologies are advancing rapidly; more extensive sections of DNA can be manipulated, and methods using human stem cells to replace parts of tissue, or even whole organs, are becoming increasingly refined. By enabling progressively more extensive, and precise, substitution of human material in animals, these approaches may soon enable us to modify animals to the extent that might challenge social, ethical, or regulatory boundaries. (5)

This summary of the overarching concerns of the report reflects both a growing anxiety for the pace at which biotechnology develops and the scope of its ability to alter organic tissue and indeed organic life itself. Lurking beneath these concerns is a discomfort about the extent to which the permeability of species boundaries—and thus the breakdown of human biological exceptionalism—is being exploited by biotechnology. Furthermore, that the report frames all of these contemporaneous concerns as social, ethical, *or* regulatory calls attention to the disconnect between how the biotechnology industries and their governing policies view genetically modified animals as tools of the trade and how the general public is expected to view them. Ultimately, the report puts forward three areas that “merit special consideration” for the relevant legislative bodies of human medicine (6):

Extensive modification of the brain of an animal, by implantation of human-derived cells, which might result in altered cognitive capacity approaching human ‘consciousness’ or ‘sentience’ or ‘human-like’ behavioural capabilities.

Situations where functional human gametes (eggs, sperm) might develop from precursor cell-types in an animal; and where fertilization between either human (or human-derived) gametes and animal gametes might then occur.

Cellular or genetic modifications which could result in animals with aspects of human-like appearance (skin type, limb or facial structure) or characteristics, such as speech. (6)

Each of these points directly revolves around the blurring of boundaries between animals and humans corresponding to mental, reproductive, or physical characteristics of the human species. Thinking back to *Pinky and the Brain*, Brain's predicament in the courtroom surrounding his species identity reflects the first and third points on this list whereby the judge and jury, as symbols of systemic and institutional enforcement of social norms, fail to identify Brain as an animal precisely because of his cognitive capacity and physical characteristics. The legal setting of the scene also evokes the biopolitical connotations of genetically modified animals whereby Brain's confused species status reflects the acceleration of biomedicine's manipulation of both human and animal bodies. With this in mind, Michel Foucault's formulation of biopower as a new type of political power "that is directed not at man-as-body but at man-as-species" can be extended to model organisms as a well, or perhaps the shift in power Foucault described implicated non-human species from its earliest origins (*Society* 243).

I argue that we can understand Brain's predicament by considering what Nikolas Rose calls "molecular biopolitics" ("Molecular" 4). Rose points out that while "most people still imagine their bodies at the 'molar' level, at the scale of limbs, organs, tissues, flows of blood, hormones and so forth" contemporary biomedicine "visualizes life differently" ("Molecular" 5). Rose argues that today:

Life is understood and acted upon at the molecular level, in terms of the properties of coding sequences of nucleotide bases and their variations, the molecular mechanisms that regulate gene expression and transcription, the link between the functional properties of proteins and their molecular topography, the role of intracellular components—ion channels, enzyme activities, transporter genes, membrane potentials—with their particular mechanical and biological properties. ("Molecular" 5)

Rose's point is a significant disconnect exists between everyday conceptions of the 'molar' (human) body and the bioscientific body that is both split apart into its microelements and also "flattened" into a "field of open circuits" ("Molecular" 7) resonates with the concerns I pointed out in the report on animals containing human materials. We are continually uncomfortable with the breakdown of the human body within biomedicine into its constituent parts as significant power can be wielded by them precisely because they are invisible to us; we appear for all intents and purposes to be molar entities even though we are not.

Where does this leave the animals who are and have been used to generate this knowledge that is ultimately wielded as molecular biopower? What I find most interesting about the implications of Rose's theory is precisely the fact that, despite the tremendous power of molecular knowledge, so much still rests on the molar body and how it positions certain beings as either on the *production* side—as models, measurements, and tools—or the *application* side of molecular power—as biopolitical subjects. In other words, when we bring animals into the picture, the molar and the molecular become blurred from the very beginning. However, I argue that this is precisely the point because once the species boundary is dissolved in favour of a molecularized body, model organisms are compared to humans on this micro level without altering their status as animals. *Pinky and the Brain* transports the question of molar and molecular corporeality into a broader social context where these mice remain mice despite our best efforts to make them human. *Pinky and the Brain* is indicative of a set of cultural representations of the mouse model organism that remind us of the simple,

but obscured fact of these beings' animality; they remain, despite the stories we have been told about the power of genetic technologies, mice.

I am interested in literary texts that represent encounters with model organisms in ways that enact an interspecies ethics that turns the narrative of essential relationality embedded within the model organism into a source of care, friendship, respect, and mourning. My project understands model organisms as material beings as well as semiotic and narrative entities; I suggest that the very materiality of the model organism's body is symbolic precisely because it is designed to refer to bodies other than its own. The model organism involves a double relationality between the categories of *animal* and *human* because it serves as a mediator between human nature and nature at large. This is not to say that that human biology is not part of nature but rather that anthropocentric and human exceptionalist ideologies pervade discourses of human biology and thus the model organism provides a link to our biological and corporeal selves in a way that maintains species divisions. My project looks to literary texts because they offer a way to understand the model organism as what Rheinberger calls a "space of representation" where narratives of the molecular substrates that are "common to all life" are written overtop of the bodies of mice in order to learn about the human body (118). The texts I analyze throughout this dissertation offer alternative ways of thinking about the model organism by exposing the multiple meanings and narratives that coexist within them both as representations and as living sentient beings.

Literature offers a way to encounter model organisms as animals rather than merely a multiplicity of molecular processes because the conventions of literature

necessitate a certain level of molar representation—in other words, even if model organisms are symbols for molecular processes, they appear in literature primarily in the bodily form of an animal. I argue that literature provides a space in which to encounter model organisms in two primary ways: First by representing the complex social networks that surround model organisms and indeed craft them into beings that come to represent scientific fact; and second by challenging the single narrative of the model organism-as-molecularized-object by providing an ethical space for speculative encounters that position model organisms as beings worthy of consideration. This discussion leaves several open questions that are central to my project: How do cultural texts represent and negotiate disconnects between how model organisms signify within scientific discourses and their broader cultural identities? How does literature specifically engage with scientific knowledge in ways that both disrupt and affirm the status of the model organism as a scientific object?

To explore these questions, I turn to four very different literary texts whose stories stage ethical and moral confrontations between social and scientific understandings of human and animal corporeality in ways that challenge common understandings of model organisms as scientific tools and objects: Zadie Smith's *White Teeth*, Robert C. O'Brien's *Mrs. Frisby and the Rats of NIMH*, Daniel Keyes' *Flowers for Algernon*, and Max Ritvo's "Poem to My Litter". I see these texts as participating in an archive that draws on concepts and tropes derived from the biological and genetic sciences to think through the questions of where model organisms fit into the changing landscape of biopolitics and how advances in scientific knowledge are reconfiguring life itself. Furthermore, by

situating model organisms in the history of scientific thought and contemporary scientific practice, these texts position model organisms as central to our understanding of the vital workings of biology, as well as how that knowledge is mobilized as biopower. In each text, animals function as affective reservoirs for human hope, healing, and gratitude, as well as pain, grief, and mourning, through their positions as model organisms.

As such, each of these literary representations of model organisms complicates scientific narratives that cast them as human-made creations and tools for research rather than animals with whom scientists and laboratory technicians often form complex relationships. These texts are part of a larger body of work that also includes Jay Hosking's *Three Years with the Rat* (2016), Karen Joy Fowler's *We Are All Completely Beside Ourselves* (2013), Allegra Goodman's *Intuition* (2006), Pat Murphy's *Rachel in Love* (1987), and James Tiptree Jr.'s "The Psychologist Who Wouldn't Do Awful Things to Rats" (1976), all of which question the often unacknowledged roles that model organisms play in the story of contemporary biomedicine as both the material substrate of its practices and its rhetorical ambassadors to the public. However, this burgeoning interest in the relationships between the model organism and the biopolitics of the human and animal body has yet to be analyzed in any sustained manner. As the first study to address this important topic in contemporary literature, my dissertation asks: what do literary representations of model organisms tell us about the ontological challenges that biotechnology and the genetic sciences pose for humanist worldviews? What is it specifically about the figure of genetically altered mouse that evokes these challenges but at the same time disrupts their fragmenting effects?

Corporeal Equivalence and Bodily Form

When I first set out to work on this project, I planned to focus my analysis on how, despite developments in genetic technologies that demonstrate the fluidity of species boundaries and thus contradict traditional humanist philosophy, this fluidity is often obscured by conceptions of genetically modified animals as unnatural products of science and metaphors for human domination over nature at the same time. As the ACHM report that I mentioned at the outset points out, mice are the most commonly used animals in medical research, so the more I read about laboratory animals, the more mice I encountered. Thus, mice became the center of my project. I decided to explore how O'Brien, Keyes, Smith, and Ritvo position the mouse model organism as a tool for the reconstitution of the human subject in the modern biotechnological era. However, as I explored these texts, I began to realize that they all exceed and indeed challenge established narrative frameworks for thinking about how the concept of the model organism orients humans and animals within scientific discourse. In particular, it became clear to me that, despite positioning mice in terms of what Haraway calls "instrumental relationality" (*Species Meet* 71) with human characters, these texts also demonstrate that the conditions of this instrumentalism do not preclude and even call for a more robust affective relationality between humans and animals. With this in mind, instead of reading these texts exclusively through the lens of critical animal studies frameworks that understand scientific discourses of the model organism solely in terms their objectifying and instrumentalizing effects, my project puts them into dialogue with recent debates in the fields of science studies, feminist materialism, and the environmental humanities

around the need to understand how human and animal bodies are co-produced and shaped by biomedical discourses of corporeality. Thus, drawing on these fields, my project interrogates the ways in which these co-productions are never actually complete because the animals exceed the discursive containment of the model organism.

In the most basic sense of the term, a model organism is a non-human species that is “extensively studied in order to understand a range of biological phenomena, with the hope that data and theories generated through use of the model will be applicable to *other organisms*” (Ankeny and Leonelli 30; emphasis added). I emphasize the words “other organisms” this definition for two reasons: first, because they signal the primary epistemological function of the model organism as a transfer point for biological information. Second, I want to call attention to the misleading generality of the phrase “other organisms.” While it is true that information gathered through model organism science is premised on the near universality of biological functions across species, the ultimate goal of this research is to gain better understanding of the human species. In other words, similarities are drawn between the human species and all “other organisms” in order to understand the human and never the other way around. In other words, the universality of biological processes across species makes all animals available as a model for the human species, but the human is never a model for other species. I argue that it is important to understand scientific arguments for the universality and translatability of biological processes across the animal kingdom as a form of power that supports human subjugation over other animals.

From an animal studies perspective, I argue that the case of the model organism is

unique because as opposed to other forms of animal exploitation where the primary means of violence involves philosophical justifications based on fundamental *difference*, the concept of the model organism is premised on fundamental *similarity* between humans and animals. Moreover, the usual set of animal studies arguments that call for an acknowledgment of the biological similarity of animals and humans aligns with how biologist and geneticists think about animals like mice. For instance, a recent Jackson Laboratories advertisement, “Why Mouse Genetics: JAX” claims that the mouse is an ideal model for human genetics because we share “98%” of our genome with them (jax.org).

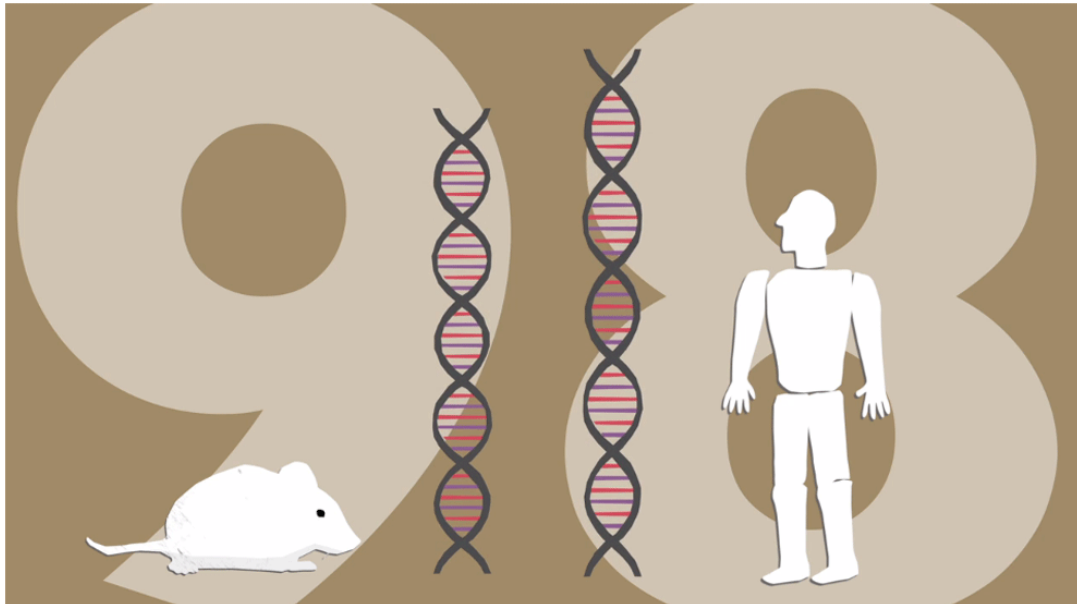


Figure 2. “Why Mouse Genetics: JAX”. Image from Jackson Laboratory Advertisement.

This image depicts what Gail Davies calls “corporeal equivalence” to refer to how the bodies of mice are equated with humans on the genetic level (Davies “Humanized Mouse” 4). There are three ways that the mouse and human are equated in this image: the

alignment of the DNA, the setting of this alignment against the backdrop of the 98%, and the colour scheme of the image. The comparison between mouse and human bodies is encapsulated within the 98%, the DNA strands have identical colour sequences, and the whiteness of both bodies all come together to allow what would—at least visually—be very difficult to depict in a single image because of the obvious differences in the corporeal forms of mice and humans. Drawing our attention to the center of the image where the two DNA strands are aligned with the numbers, the advertisement privileges a comparison between mice and humans on a genetic level. Furthermore, due to the lack of eyes and the limbic fragmentation, the human body more closely resembles a mannequin or a marionette than an actual human. Thinking back to my analysis of Brain's mechanical human suit in *Pinky and the Brain* and its Cartesian underpinning, we can read the human body as an abstract entity that is reduced to an object of the genetic sciences *through its comparison to the mouse body*. However, like many of Jackson Laboratories advertisements, the text that accompanies this image on the jax.org website exhibits a decidedly personal tone, using second person pronouns to address readers directly and inform them of the “benefits of mice as models for human diseases” (jax.org). My point is that discourses of the human body-as-machine and the human body-as-subject coincide within the model organism because as animals they are fundamentally different from humans, but as biological bodies we are similar.

Furthermore, this advertisement highlights corporeal equivalence as a discourse of species embodiment that, as Derrida argues, “brings man so close to the animal, inscribing them both in a relation of proportion [...] in order to oppose them” (*Beast* 14).

My project uses corporeal equivalence as a way to theorize and understand the multiple ways that animals and humans are brought together within experimental science—from the literal equivalence of genetic editing, to the design of experimental spaces that simulate behaviors that can be read as human or human-like, to more abstract symbolic equivalences that appear within textual representations. The concept of corporeal equivalence propagates throughout my dissertation to articulate how scientific discourses navigate the radical implications of species contiguity by making comparisons between mice and humans on a genetic level and contrasting them on sociopolitical and cultural levels. My dissertation posits that literary representations of mice as model organisms demonstrate how narratives of corporeal equivalence exclude other forms of human-animal relationality by limiting the comparison between us to biological and genetic functionality. Moreover, literary representations disrupt the schematics of this compare/contrast by coopting corporeal equivalence to enact affective and ethical forms of relating to model organisms.

The Model Organism and Scientific Epistemology

The simultaneous bringing together and pushing apart of model organisms and humans evokes current discussions within the philosophy of science surrounding the function of the model within scientific epistemology as both a representation and a form of embodied knowledge (Hesse 158; Sismondo 247; Morgan and Morrison 10; Shostak 316; Myers 22). As Ian Hacking suggests, “models are doubly models. They are models of the phenomena, and they are models of the theory” (*Representing and Intervening*

216). Following this formulation, Hacking argues that we can think about models as “intermediaries” between scientific theories and the world because they simplify and isolate phenomena, allowing it to be more easily represented (*Representing and Intervening* 217). Mary Morgan and Margaret Morrison radicalize this double functioning and argue that models exhibit a form of vital autonomy from both the world and scientific theory because they “embody an element of independence from both theory and data” and are thus “outside the theory-world-axis” (14, 18). However, others are beginning to point out that this notion of the model as abstract representation does not so easily map onto the model organism (Ankeny 261; Ankeny and Leonelli 10; Keller 75; Rheinberger 27), because, as Nicole Nelson points out, they are “organisms with their own biology and natural history that some might argue is nearly as complicated as that of the humans that they model” (Nelson *Capturing Complexity* 86). In other words, the Jackson Laboratory advertisement is right: we do share ninety-eight percent of our genome with mice because of our shared genetic heritage, and thus many of our biological functions are similar. However, this similarity, despite being different by only two percent, is not enough to bridge the species gap and corporeal equivalence can never be complete. With this in mind, we can conceive of corporeal equivalence as a process that is cultivated and maintained within the bodies of model organisms in order to negotiate the tension between molar and molecular understandings of the body that I briefly discussed at the outset of this introduction. This maintenance takes on many forms, including data sharing between individual research teams, data banks, gene ontology consortiums, and laboratories that develop models and genetic technologies.

Similarly, between the biotechnical networks that make model organisms and the mechanics of individual experiments, corporeal equivalence is achieved in various ways. For instance, the C57BL/6J inbred strain (Black-6), is described by the Jackson Laboratories as a “general purpose strain” because of its wide array of human disorders and diseases that range from cancer, ageing and Alzheimer’s, to anxiety and alcohol addiction (jax.org). Techniques such as gene editing and targeted gene mutation make animal bodies more like humans by inserting human DNA into their genomes; however, as Nicole Nelson argues, these techniques are used in conjunction with external and theoretical apparatuses to make corporeal equivalence function. “Building the epistemic foundations of animal models for human disorders involves [...] both a vertical process of making more or less general and risky statements about the knowledge that can be produced using animal models, and a horizontal process of making *links* between the animal and the human” (*Capturing Complexity* 89; original emphasis). Arguments made by using model organism are “risky” precisely because they are made using models and not actual human tissue, thus requiring material *and* theoretical links between the animal and human context. For this reason, Nelson argues further:

From the many similar and dissimilar features that mice and humans share, researchers select specific pieces of information that can be linked together to create convincing foundations from research programs. The resulting arguments that support the validity of animal models for human disorders resemble ladders rather than chains, in that claims about the general applicability of animal models are supported by a series of more or less risky links between the mouse and the human. Different kinds of arguments make different kinds of ladders joining the mouse and the human, which can be assembled into an *epistemic scaffold* that supports research programs. (*Capturing Complexity* 89; original emphasis)

Nelson’s comments highlight the point that model organisms do not represent humans on

their own, nor does the entire body or behaviours of the mouse signify the phenomenon under examination. The notion of the epistemic scaffold is useful for understanding *how* the model organism models human disease and genetic disorder because it acknowledges the factors external to the animals' bodies that contribute to the transfer of information from the animal to the human body. This is why Hans-Jörg Rheinberger refers to "model systems" in experimental biology in conjunction with "model" or "model organism" (108-109). Rheinberger argues that at the foundation of all modern biological science is the notion of the experimental system as a singular "well-defined empirical instance embedded in the elaboration of a theory and performed in order to corroborate or refute a certain hypothesis" (27). However, as Rheinberger points out, following Ludwik Fleck, "every experimental scientist knows just how little a single experiment can prove or convince. To establish proof, an entire system of experiments and controls is needed" (27). In other words, a researcher does not work with a single experiment in relation to a theory or hypothesis, and further, "the experimental scientist deals with systems of experiments that usually are not well defined and do not provide clear answers" because this would presuppose that the scientist already knows what will happen (28). Because experimental systems are "experimental," they involve a series of hypotheses and exploratory procedures that bring together the "scaffolds" that "support research programs" (Nelson *Capturing Complexity* 89). There are scaffolds that hold up the claims made with and about model organisms as research tools, but model organisms are in turn used as scaffolds for the research agendas of laboratories and scientists. Nelson's view of the model organism puts it into perspective as part of a practice of building and

maintaining corporeal equivalence that is embedded within a system that starts well before the experiment begins. This outline of the system that binds human and animals together also elucidates how, despite the genetic homologies between humans and mice, a great deal of framing is necessary to connect the mouse and the human.

I have been talking about how model organisms and humans are materially related through our shared genome but that many more elements come into play to *make* mice and humans corporeally equivalent. I have outlined the networks of techniques and practices that physically and environmentally bring mice and humans together, but what about the actual comparison itself? How are the similarities and differences between humans and animals negotiated on the narrative level in written reports, research publications, and press releases? As Nelson explains, “the epistemic scaffolds [that support the model organism] can be thought of as extended, bi-directional metaphors that researchers can use to highlight particular features of either the human or the mouse” (Nelson *Capturing Complexity* 127). What she means by the term “bi-directional metaphor” is that, in written reports and conversation, researchers use mice behaviour to talk about human behaviour, but they also frame mice behaviour in experiments “as if” they were humans, creating a kind of representational feedback loop between the two organisms. As Rheinberger puts it, “nature itself only becomes real, in a scientific and technical sense as a model,” because it provides a “space of representation” for science to observe and create “things that otherwise cannot be grasped as objects of epistemic action” (108). Biochemical representations, in particular, create an extracellular space for reactions assumed to take place within cells. Traditional wisdom has it that such a

representation constitutes a model of what is going on ‘out there in nature’” (108). Further, Rheinberger contends, “the process of modelling is one of shuttling back and forth between spaces of representation. Scientific objects come into existence by comparing, displacing, marginalizing, hybridizing, and grafting different representations with, from, against, and upon each other” (108). While Morgan and Morrison contend that this “shuttling” is ultimately the source of the “representative power” of models because it gives them agency from both the phenomena and the theories that they represent, I argue that it means that models are fundamentally unstable—precisely because their job is to translate and transfer information between two sites or “spaces” of representation (11). Moreover, it is because of the instability of models that the supplemental apparatus of narrative and figurative epistemic scaffolding is required in the first place. I am not saying that the information gathered through model organism research is untrue, but rather that the connections—or epistemic scaffolds—between the model organism and the human require a system of complex representation that allows the bodies of mice to simultaneously represent themselves as complex biological beings with their genomes, and the human as a unified species.

As Davies points out, this speculative *as if* narrative formula is crucial to how model organisms signify in the dissemination of scientific research in the public realm. These narratives reveal, she argues, “how new relations between animal biology and human disease take shape and are inserted” into the context of medical and scientific discourse as uncontested knowledge (“Experimental Life” 130). While Davies writes primarily about “translational medicine” that seeks to expedite drug development by

closing the gap between lab work and patient care, I argue that narratives of equivalence function similarly within all fields of experimental science that make use of model organisms. Davies further stresses that relationships between model organisms, research, and hypothetical human contexts “are not fixed, but performed, in part through the narratives that are told about them. Narratives in science, as elsewhere, are important as they order histories as well as pointing towards futures: framing temporality, allocating cause and effect” (“Experimental Life” 130). Because narrative plays such a significant role in how and why model organisms are objectified within scientific epistemology, theorizing literary representations of them—which involves contending with alternative forms of representation—becomes all the more difficult, but imperative.

The Literary Model Organism

None of us see animals clearly. They’re too full of the stories we’ve given them. Encountering them is an encounter with everything you’ve ever learned about them from previous sightings, from books, images, and conversations.

–Helen MacDonald (“What Animals Taught Me About Being Human”)

In this section, I outline the parameters of what I call the literary model organism as a term to account for how the model organism is, as Donna Haraway puts it, “simultaneously a metaphor, a technology, and a beast living its multilayered life as best it can. This is the normal state of the entities in technoscience cultures, including ourselves” (*Modest_Witness* 83). Haraway’s observation that model organisms occupy several ontological, institutional and disciplinary categories points to one of the significant difficulties in approaching representations of model organisms in literature

because literature already consists of representations. I suggest that the literary model organism functions like a *mise en abyme* that reflects the instability of the model organism as a form of representation that signifies both animality and humanity—or rather, one that signifies a kind of ontological feedback-loop that reflects and refracts the animality of the human and humanity of the animal simultaneously. Because scientific processes so heavily mediate model organisms, it is difficult to read them in literature: they are ready-made metaphors and metonyms for human experiences of medicine and the scientific gaze; they are figures of hybridity, genetic determinacy, and futurity; they are symbols of biopower and scientific control of life itself; they are furry creatures that can be companions, co-workers, or friends.

My conception of the literary model organism is informed by recent debates in literary animal studies scholarship around the question of how to apprehend the literary animal *as such*. Scholars in literary animal studies often position the field in terms of a desire to allow animals to *be themselves* and thus to *represent themselves* in literature. However, this desire struggles to navigate (if it does not entirely avoid) a fundamental question: can animals represent themselves in literature written and read by humans? Can anything (including representations of the human which animal studies often position as the antithesis of animal representation) be represented in ways that are not symbolic? I suggest that the literary model organism complicates this configuration of animal-for-itself by foregrounding their mediation by human discourses—both inside and outside of literature. The model organism is well suited to this approach because they are more thoroughly manipulated than most other animals, but also because very few of us have

actual or “real” knowledge of, or first-hand experience with, mouse model organisms because of the physical isolation of these animals within animal housing facilities and laboratories. Following Helen Macdonald, I am more interested in complicating narratives of literary animal scholarship as a search for an a-textual, a-symbolic, realism by acknowledging how “none of us see animals clearly.”

Literary animal studies scholars have taken up the question of the real vs. the symbolic animal in several ways. As Roland Borgards summarises, “literary animals are created by words [...] as beings made out of words these literary animals seem to differ clearly from the real animals in the real world” (155). However, Borgards continues, this distinction “is by no means self-evident, trivial, natural or easy” because “real” animals inform how authors craft literary animals (156). Copeland and Shapiro expand on this notion by arguing for an approach to literary animals that focuses on how animals exist alongside humans in literature; they explain that animals can become a kind of mouthpiece for human concerns and are thus “replaced by a human with fur” (344). Copeland and Shapiro are interested in finding alternatives to symbolically reductive representational forms of animal representation (344). Building on Erica Fudge’s notion that “we lack a language at present in which we can think about and represent animals to ourselves as animals, in ways that are not metaphorical,” Copeland and Shapiro outline a kind of methodological guideline for reading representations of animals in literature (qtd. in Copeland and Shapiro 345). First, scholars should “deconstruct reductive, disrespectful” representations. Second, they should “evaluate the degree to which the author presents the animal ‘in itself,’ both as an experiencing individual and as a species-

typical way of living in the world. Third, the authors argue that literary animal studies should “include an analysis of human-animal relationships in the work at hand” (Copeland and Shapiro 345). Furthermore, the authors contend, “it is not enough to describe instances of such relationships. The critical task is to explicate the form of that relationship and to place it in the universe of possible relationships” (345). They argue that a human-animal literary studies approach has an advantage because it seeks to understand how humans and animals live together in complex social networks.

Susan McHugh takes Copeland and Shapiro’s methodological guideline to its logical extreme, calling for a “textual politics of literary animals [that] suggests a thorough-going critique attuned to the traces of species, to markings of potentials for different orders of agency beyond the human subject” (“Animal Agents” 487). “The perforation of species boundaries—proliferating today, for instance, through genetically modified organisms in agrifood flows,” McHugh argues, “casts literary aesthetics in a pivotal moment in which it has become both difficult to critique anthropocentric models and imperative to elaborate creative new forms of agency” (“Animal Agents” 489). Drawing on Donna Haraway’s notion of companion species, McHugh contends that focusing on how animals actively participate in human representations of them “distinguishes animals as agents of an order different from that of human subjectivity—more precisely, as actors operating in accordance with a logic different from that of intentionality or psychological interiority” (“Animal Agents” 491). Where Copeland and Shapiro are concerned with the ways in which literature represents animals and humans in a “shared world” (345), McHugh argues that, while textuality is a multispecies

production, it is important to understand the differences between human and animal representations and to read animals through the lens of subjectivity would mean to erase the specificity of animal in literature. In *Animal Stories: Narrating Across Species Lines* she expands on her theory of literary animal agency by drawing on scientific understandings of animals. McHugh develops what she calls “narrative ethology that emphasizes embodied relations of agency and form as distinct from, say, the content through which ethological, fictional, and all other narratives get sorted and shelved as the political problems of representation” (*Animal Stories* 217-218). For McHugh, the literary animal theorist’s role is to observe how animals behave in narrative and literature, much like the ethologist studies the behaviour of live animals. “This formulation,” McHugh argues, “affirms the ways in which ethology and fiction alike proceed from the complicated operations of affect, and leads to an ethics premised on feelings honoured as concrete, intense, and shared” (*Animal Stories* 217-218).

The emotional connections between people and animals should be taken seriously, but it is unclear how merging ethology and literary theory achieves a more ethical approach to human-animal relationships in literature. Falling back onto the argument that literary animal studies must apprehend the animal ‘as such’ if it is to do justice to other animals, McHugh reaches for ethology because of the field’s putatively objective study of other animal species as sentient beings. However, McHugh’s theory illustrates a major dilemma in thinking about what literature can offer animals where, as Rodolfo Piskorski eloquently states, “on the one hand, we have the belief that animals can be made to be present in texts by means of appropriate writing or reading practices.

On the other, there is a clear sense in which animals inhabit a completely separate realm against which the literary pushes” (231). Animals resist literary representation because it is not for them. They cannot participate in it, nor can they confirm or deny its accuracy as humans can. However, perhaps closing the gap between the organic and the literary is not the only way to do ethical work in animal studies because it “seductively compels us to grant a special kind of non-textual, material presence to animals” that blurs the line between textual representations and organic beings (Piskorski 233). McHugh’s and others risk constraining literary animal studies to a kind of pseudo materialist realism that ignores the symbolic value of literature (as well as other visual and textual mediums that strongly influence our thoughts and feelings about animals such as film, advertising, and social media) as well as the inherent symbolism that pervades our interactions with living animals.

More traditional literary and narrative theory has a lot to offer literary animal studies despite its general focus on representations of humans. For instance, Mieke Bal’s theory of “character effect” is a productive tool for considering representations of animals because it acknowledges the potential of literature as a symbolic space and shows how it is precisely because of this symbolism that representations of animals resist us in literature. A character, Bal argues, is “the effect that occurs when a figure is presented with distinctive, mostly human characteristics [...] As readers, we ‘see’ characters, feel with them and like or dislike them” (112-113). Bal’s theory can be extended to animal characters as well because literary texts similarly construct them from characteristics that cause readers to feel or think a certain way about them. Reading literary animals as

narrative “effects” shifts attention away focusing on whether they act “for themselves” and toward understanding how they operate discursively within the text. Bal further cautions against the tendency of literary theorists to forget that “literature is written by, for and about people. That remains a truism, so banal that we often tend to forget it, and so problematic that we often repress it with some ease” (113). Bal’s theory reminds us that both literary humans and literary animals are anthropomorphized to varying degrees and are both textual entities: “they are fabricated creatures made up from fantasy, imitation, memory: paper people, without flesh and blood” (113). Representations of animals and humans resemble beings or sets of ideas that evoke a particular species form, and this is where the work of literary theory begins.

For Bal, mapping organic embodiment onto textual representation is also misleading because it ignores the fact that representations are supposed to tell us something beyond their immediate presence in the literary world:

When we come across a detailed portrait of a character that has already been mentioned, we are justified in saying that that information—that portrait—’belongs to’ the character, it creates the character, maps it out, builds it up. A certain measure of coherence results. But relying on the analogy between character and human being, readers tend to attach so much importance to coherence that this material is easily reduced to a psychological ‘portrait that has more bearing on the readers’ desire to ‘recognize’ the character than on the interchange between story and fabula. (Bal 114)

Again, Bal focuses on human characters, but the same can be said for literary animals whether the text grants them minds or not. Animals in literature are “built-up” in similar ways through varying degrees of zoomorphic, anthropomorphic, anthropodenialist descriptions to achieve a recognizable picture of how animals look, act, smell, or sound. However, coherence is impossible to achieve because literature only “makes us believe in

the human nature of a creature that is constantly resisting that humanity, in favour of other important insights it has to offer” (Bal 119). Characters resist the reader because they are symbolic; they have multiple meanings that cannot and should not be beholden to their direct representation.

The search for literary animals that act only as and for *themselves* can be conceived of as a symptom of the drive to seek representational coherence in literature. Inevitably, arguments toward representations of animals-as-only-themselves partially account for the question of coherence; a focus on agency allows literary scholars to posit that the resistance of literary animal characters to interpretation is emancipatory because it creates the illusion that literary animals escape their representations entirely. In other words, agential approaches to literary animals position the ways that they confound our understanding as analogous to the agency of the biological animal. I suggest that the conflation of literary and biological animals limits textual analysis because it positions textuality itself as something that needs to be overcome, or even eliminated in favour of more embodied ways of knowing like ethology, or biology. However, this is a false dichotomy because not only do ethology and biology enact significant violence against animals as model organisms, but they too rely a great deal on textuality even as they engage with biological animals. Instead, following Bal’s theory, resistance does not mean that representations of animals emancipate themselves from the text, or that animals are exceptionally able to resist representation, but quite the opposite; *literary* animals are products of the text and should be read as such to understand how ideas about *biological* animals influence that production and *vice versa*.

The Biopolitics of the Model Organism

While up to this point I have been discussing the epistemology and representational politics of model organism itself, in this section I contextualize the model organism by outlining how the specific processes that manipulate them are predicated upon the development and application of therapies, pharmaceuticals, and technologies *for humans*. Following Sherryl Vint, I am interested in how humans *and* animals “are shaped and controlled by modes of biopower that designate ways of living and dying [and that] resistance to the biopolitical regime of neoliberal capitalism requires acknowledging the degree to which species difference has been foundational in structuring liberal institutions (“Animal Studies” 444). As such, my dissertation aims to bring the growing body of scholarship that articulates the central position that model organisms play in the rapidly growing fields of postgenomics and biotechnology together with more established conversations surrounding biopolitics and biopower. My understanding of how these fields of study interrelate is shaped by Donna Haraway’s formative conceptualization of transgenic mice and technoscientific human subjects as co-produced by the “material-semiotic domains of modern biology” (*Modest_Witness* 15). Or, as she elaborates, “[humans and transgenic mice] are transmogrifications or trans-substantiations of each other; they are kin, tied to each other by the passage of bodily substance” (*Modest_Witness* 15). Haraway’s configuration of transgenic mice as kin links the intimate ways that humans and mice are entangled in biomedicine and opens the door for new ethical understandings of animals who were otherwise considered unnatural scientific artifacts.

Furthermore, Haraway argues that one of the key features of what she calls the “technoscientific subject” is that it is constituted alongside and in relation to nonhuman animals through a process she calls “corporealization” (*Modest_Witness* 141). What she means by this is that the genetic sciences conceive of both human and animal bodies solely in terms of processes that occur inside our bodies “such as the cascades of action that constitute an organism or that constitute the play of genes and other entities that go to make up a cell” (*Modest_Witness* 141). Building on Haraway’s later work on companion species, Davies asks, “What might it mean to become with an inbred mouse?” (“Mobilizing” 130). Davies calls for a more robust understanding of the intricate ways that the bodies of a range of different forms of experimental mice contribute to “our understandings of human corporeality and potentiality,” from inbred and transgenic strains, to “mutant” and “humanized mice that exhibit varying degrees of human intervention” (“Mobilizing” 131). Davies draws attention to the fact that the knowledge gained from these mice has social and political implications because they are an intricate “part of the story through which biology becomes molecular, genetic life commodified and genetic explanations fetishized” (“Mobilizing” 132). Davies’ work is crucial because it connects Haraway’s theoretical approach to genetically altered mice with a more specific understanding of the intricacies of scientific practice, but also elaborates on the vast scale of the mouse model organism industry (“Mobilizing” 137).

Haraway’s and Davies’ work on transgenic mice is central to my project because it offers a critical vocabulary to discuss animals that are otherwise difficult to imagine as closely related to us—let alone to think about as beings that we can affectively relate to at

all. All of the texts I examine in my project negotiate difficult relationships with genetically altered mice while also navigating fragmenting and alienating discourses of the biologized human body. For instance, in Chapter Three, I consider how in Daniele Keyes' *Flowers for Algernon* the narrative “shuttles” between Charlie's (human) and Algernon's (mouse) cognitive development after each experiences the same biotechnical surgery. However, as Charlie becomes more aware of how medical discourses of mental illness affected him before his surgery, he also grows closer to Algernon and begins to identify with Algernon as a co-produced techno-scientific subject. In Chapter One, I investigate how Zadie Smith's *White Teeth* situates bioengineered mice within histories of eugenics, scientific racism, and calls for a post-race society. I examine how in the novel a disgruntled ‘over-weight,’ working class, mixed-race, teen named Irie, employed by a genetic scientist with a racist past, comes to admire and identify with a mouse called FutureMouse[©] because she sees in him a hopeful symbol of chimeric social identity outside normative conceptions of beauty and genetic purity. These texts exemplify the process through which encounters with literary model organisms call into question how modern biopower is often enacted on human subjects through animals like genetically modified mice.

Thinking back to my brief discussion of *Pinky and the Brain* and the “Animals Containing Human Materials Report,” my project situates transgenic mice within discussions of the changing landscape of biopolitical governance that account for the ways that advancements in biomedical technologies are changing how we conceive of ourselves as individuals, but also how we are configured as political subjects. Central to

these scholars' work are concerns that conceptions of life itself have been reshaped in ways that influence how governments and corporate entities view individual humans. As Rose argues, "contemporary medical technologies do not merely seek to cure diseases but to control and manage vital processes of the body and mind. They are no longer technologies of health but technologies of life" and that as a result, "human difference—between individuals, between populations—has been rewritten at the molecular level. ("Molecular" 8). Similarly, Sarah Franklin argues that "we are currently witnessing the emergence of a new genomic governmentality—the regulation and surveillance of technologically assisted genealogy" that is "necessitated by the removal of the genomes of plants, animals and humans from the template of natural history that once secured their borders, and their re-animation as forms of corporate capital, in the context of a legal vacuum" ("Life Itself" 188). By framing this shift in governmentality as a question of genealogy, Franklin draws attention to how genetic and genomic information reconceptualizes the spatial and temporal framework of inheritance both within and *across* species "so that genetic information no longer necessarily passes in a one-way, linear path of descent from one generation to the next. Rewritten as information, message, code or sequence, the gene becomes newly flexible as it also becomes differently (re)productive" ("Life Itself" 190). Franklin's point is that traditional conceptions (and mechanisms) of biological inheritance are repurposed to allow for a lateral transfer of genetic traits across species but that this reconfiguration is done in the name of capitalist enterprise.

Building on Franklin and Rose's discussion of the effects of new biopolitical

regimes of biomedicine, Catherine Waldby and Kaushik Sunder Rajan argue for the importance of discussing biotechnology in the context of global capitalism. Waldby's theory of "biovalue" (310) and Rajan's theory of "biocapital" (Rajan *Biocapital* 146) account for the ways that the field of biotechnology has always been a capitalist endeavour that commodifies living organisms and tissues and "induces" living processes "to increase or change their productivity along specified lines, intensify their self-reproducing and self-maintaining capacities" (Waldby 310). As Waldby points out, the commodification of life occurs,

not at the level of the body as a macro-anatomical system but at the level of the cellular or molecular fragment, the mRNA, the bacterium, the oöcyte, the stem cell. Moreover it takes place, not *in vivo* but *in vitro*, a vitality engineered in the laboratory [...] Here a repertoire of biotechnical procedures can be developed that induce the fragment to expand, to accelerate or slow down, to unfurl or recapacitate, to produce new substances or develop along new pathways, to recombine with other fragments and swap properties. (Waldby 310; original emphasis)

Waldby situates the production of biovalue as an "in vitro" fragmentation of life and life processes that can be manipulated and sold as commodities. Thinking about biovalue together with Rose's notion of the somatic and the corporeal and Franklin's arguments about cross-species genetic inheritances, we can see the molecularization and commodification of the human body alongside the animal body. My project focuses on the implications of concepts like the somatic self, biovalue, and biocapital for thinking through the role that model organisms play in what each author describes as the hyper-corporealization and molecularization of the human body. I argue that these theories offer a crucial link between the work that model organisms do within science and the application and dissemination of that science as biopower.

Why Mice?

Before concluding, I want to address a question that has been following me throughout my dissertation: why mice? During interactions with peers, friends, and family members, questions during conferences, and more casual conversations with people about my project, I have been confronted with emotions that range from amusement to hostility about why I chose to study the mouse. In response, I would often deflect and draw attention to the number of mice used each year and discuss at length how these animals fit within biotechnology and biomedicine. I found that once I put this into perspective, people could relate to the project and understand its value as a research project. However, I have struggled with these responses because they only captured one side of the question, because my interest in the question of mice as model organisms stems just as much from a consideration of mice as worldly creatures as it does from their situatedness within the institutions of biopolitics. I see in mice a kind of vulnerability that extends from their position as pests and vermin to their positions as technological beings. More than this though, the biotechnology industries have almost made it impossible to save mice and even difficult to think about them as animals to save because the vastness of their institutional existence is difficult to comprehend. Further, many strains of mice are unsavable because their bodies are not capable of living outside of the specialized spaces of the laboratory and animal housing facilities.

This is a bleak picture. However, I find potential in representation because even in the most instrumental depictions of laboratory mice such as advertisements and

catalogues it is possible to read something in excess of their use-value, in the ways they remain impossibly worldly and animalistic despite how the texts framed them. To illustrate this point, I briefly draw on two images from the 2017-2018 *JAX Mice: Clinical and Research Services Catalogue*. The first image depicts, along with the corporeal information of several immunodeficient mouse strains, images of what the actual mice look like. The names written in blue underneath the pictures are shortened forms of the longer names written in grey. In each case, these designations tell the story of their genetic backgrounds as well as their purpose within biomedical experiments. For instance, in the case of the first two white mice, “NOD scid” and “BALB scid” the lower case “scid” designation refers to “severely combined immune deficiency”; these mice have human immune cells growing within them to allow researchers to study human immunity. The uppercase “NOD” and “BALB” refer to the names of the “genetic stock” strains; “NOD” refers to “non-obese diabetic” and thus are used to study immune deficiency as it relates to diabetes whereas the “BALB” is “general purpose” strain.

	NOD <i>scid</i>	BALB <i>scid</i>	B6 Rag1	Outbred and Inbred Nude
Name & Stock Number	NOD.CB17- <i>Prkdc</i> ^{<i>scid</i>} /J (001303)	CBySnm.CB17- <i>Prkdc</i> ^{<i>scid</i>} /J (001803)	B6.129S7- <i>Rag1</i> ^{<i>tm1Mem</i>} /J (002216)	J:NU (007850) NU:J (002019)
Mature B cells	Absent	Absent	Absent	Present
Mature T cells	Absent	Absent	Absent	Absent
Dendritic cells	Defective	Present	Present	Present
Macrophages	Defective	Present	Present	Present
Natural killer cells	Defective	Present	Present	Present
Complement	Absent	Present	Present	Present
Leakiness	Very low	Very low	Absent	N/A
Irradiation tolerance	Low	Low	High	High
Lymphoma incidence	High (thymic lymphoma)	High (thymic lymphoma)	Low	Low
Benefits	<ul style="list-style-type: none"> Higher take-rates for slow-growing cancer cell lines than BALB <i>scid</i> or nude xenograft models Xenotransplantation of some solid human tumors Adoptive transfer from strains on NOD background enables study of cell function & tracks cell movement 	<ul style="list-style-type: none"> Allows allogeneic and xenogeneic cancer cell lines & tissues Engrafts hematopoietic cancer cell lines, some primary cells Improvements in engraftment efficiency over nude models for some cancer cell lines 	<ul style="list-style-type: none"> Radiation resistant, providing an alternative to <i>scid</i> mutants Adoptive transfer from strains on B6 background permits the study of cell function and tracks cell movement 	<ul style="list-style-type: none"> Engraftment of human & mouse tumor cell lines Easy assessment of subcutaneous tumor growth due to lack of fur
Considerations	<ul style="list-style-type: none"> Develops thymic lymphomas by 8-9 months—best used in short-term experiments Sensitive to irradiation About 36 weeks median 	<ul style="list-style-type: none"> Innate immunity intact NK cell activity limits engraftment Sensitive to irradiation 	<ul style="list-style-type: none"> Innate immunity intact Poor host for primary cell transplantation 	<ul style="list-style-type: none"> Innate immunity intact Little engraftment of hematopoietic cancer cells Not suitable for primary cell transplantation
References	Shultz et al.1995 (PMID: 7995938)	Nonoyama et al. 1993 (PMID: 8473734)	Mombaerts et al.1992 (PMID: 1547488)	

Figure 3. “Immunodeficient Strains” Screenshot from Jackson Laboratory 2017-2018 *JAX Mice: Clinical and Research Services Catalogue*, pp. 7.



Figure 4. “Immunodeficient Strains” Screenshot from Jackson Laboratory 2017-2018 *JAX Mice: Clinical and Research Services Catalogue*, pp. 17.

While the details of the specific strains, their classification, and use are outside the scope of my project, I want to talk briefly about the image of the white and nude mouse on the far right and its repetition ten pages later. As you no doubt gathered from my brief description of the two “scid” mice, the list of “benefits” underneath the images and their designation as immunodeficient mice models, that these mice are very sick—in fact, their whole ‘purpose’ is to be sick and model the effects of medical treatments. As Lynda Birke argues mice such as the ones represented in the catalogue “have been created to bear our diseases [...] they have been transformed from bearers of highly contagious diseases such as plague to become benign assistants in the medical fight against infections” (214). What I find interesting in these images is the subtle affectionate grooming between the two mice despite the striking difference in appearance between the nude and coated mouse. The affection captured between the two mice stands in stark contrast with what I just described as their ‘purpose.’ In fact, I would argue that the “cuteness” of these images derives from the contrast between the bodily forms of the two mice, their differing mousenesses and levels of immunodeficiency signified by their coats, and the implicit knowledge of the reader (remember that this catalogue is aimed at scientists and researchers) that these mice are painfully sick. The “cuteness” of mouse-affection is symptomatic of the species’ transformation from carriers of threatening disease to helpful “assistants” and “benign bearers” of our disease. As Sianne Ngai argues, there is inherent violence to cuteness that applies here because it provokes “ugly or aggressive feelings, as well as the expected tender or maternal ones. For in its exaggerated passivity and vulnerability, the cute object is as often intended to excite a

consumer's sadistic desires for mastery and control as much as his or her desire to cuddle" (816). The latent violence of these images is thus twofold: first, the knowledge of mice's sickness and thus the instrumentalization of their deaths—or in other words, the knowledge of their 'purpose'; second, there is an implicit pleasure in this violence that is revealed in the mobilization of the mice's "cuteness" to euphemistically refer to the inevitability of their pain, suffering, and death. The cute violence of these images is, I argue, ultimately inseparable from the vulnerability of the mice. Furthermore, in light of the ideas I have been tracing throughout this introduction, the fact that this vulnerability comes to the fore within a commercial catalogue is telling because it brings together corporeal equivalence and biopolitical discourses of the human body in order to sell mice as a form of biocapital.

The successive chapters of this dissertation examine the diverse functions literary model organisms, which at times act as a reflection of the desire and efforts to fortify the human-animal boundary and at other times significantly challenge human exceptionalism by advocating for compassion and interdependence between humans and animals. Each of my three chapters looks to a range of critical and cultural texts to analyze the novel in question. Chapter One examines the pivotal role mice played as mediators of scientific racism and eugenics in the twentieth century. I examine Zadie Smith's novel *White Teeth* as it depicts a web of relationships connecting white and diasporic subjects to multiple histories of colonial racism and trauma. Central to this web is Futuremouse[©] a mouse bred to die on the eve of December 31, 1999. Futuremouse[©] encapsulates how scientific claims for human genetic security use and rely on the bodies of mice, and contextualizes

such claims within a resurgence of racial determinacy in our neoliberal era. Chapter Two analyzes the interconnections between Robert C. O'Brien's *Mrs. Frisby and the Rats of NIMH* and the scientific experiments of John B. Calhoun that were the inspiration for the novel's rodent characters. Despite the decidedly pessimistic nature of Calhoun's experiments that compared the breakdown in rodent populations as they reached the carrying capacity of their experimental environments to over-crowded human urban environments, O'Brien's novel tells a surprisingly upbeat tale of two groups of rodents that try to escape human society. I read *Mrs. Frisby and the Rats of NIHM* alongside Calhoun's experiments to explore how the novel appropriates the human-animal symbolism of the model organism by reconfiguring it into a classic form of literary anthropomorphism commonly utilized in children's literature. By comparing the functionality of literary anthropomorphism to that of the model organism, I analyze how O'Brien's novel reveals a relationship between how literature and science use animals to tell stories about the human condition. This analysis demonstrates how literary model organisms often become entangled in complicated narratives that position them as educational tools to advance ideas about human social order. Chapter Three considers the relationship between the model organism and the human test subject. This chapter looks to Daniel Keyes's novel, *Flowers for Algernon*, the story of a mentally disabled man who becomes a genius after receiving brain surgery and his mouse companion, who receives the same surgery. Framing the discussion of the connections between model organisms and human test subjects within the concept of labour sheds critical light on how model organisms function as institutional doorways to gain access to human test subjects. I posit

that there is a potential for political and affective solidarity between these two corporeal contexts. In the conclusion to this project, I read Max Ritvo's "Poem to My Litter" through the lens of Ursula Le Guin's concept of "subjectification." I demonstrate that Ritvo's poem blends poetic and scientific understandings of transgenic mice. Through his poetic imagining of his relationship with twelve mice created with his DNA, Ritvo offers a nuanced vision of responsibility and gratitude that uses the comparative logic of the model organism to question the limits of scientific objectivity.

Previous critical discussions of the mouse model organism have tended to focus on the material composition of the model organism, on its role as a tool for the production of science, and as a measure for the advancement of biotechnology. As I outlined above, this scholarship is crucial for understanding the central role that mice play in the creation and distribution of bioscientific knowledge. My hope in writing this dissertation is that we can begin to understand our relationships with these animals in ways that exceed the strict boundaries and confines of the laboratory. As I argue through the following dissertation, the material conditions of corporeal equivalence—the 'fact' of our bodies' relationship to the bodies of mice—can give rise to empathy and consideration rather than indifference.

Chapter One | Race, Species, and Biocapital in Zadie Smith's *White Teeth*

FutureMouse[©] is the bioengineered mouse whose genes have been altered to develop mammary cancer and die on the eve of December 31, 1999, in Zadie Smith's *White Teeth*. The novel, “Smith’s opus on multiracial Britain”(McMann 616), explores the lives of three families over three generations and traces the complicated intersections of these families across imperial and post-imperial Britain. As the families become enmeshed, a conflict brews over the unveiling of a public experiment—in which FutureMouse[©] will be publicly displayed for seven years as it develops pancreatic carcinomas, skin papillomas, lose all pigmentation (thus becoming white), and finally die of cancer in the first month of the new millennium. FutureMouse[©] is the creation of Marcus Chalfen—the protégé of a Nazi scientist—is the culmination of his life’s work, but he also embodiment of the postgenomic utopic “promise of a new phase in human history” where humans are no longer “victims of the random but instead directors and arbiters of our own fate” (Smith 432-33). Further, FutureMouse[©] becomes the focal point of the final action of the novel where he is unveiled to a mash-up of disparate political entities that have gathered to protest Chalfen’s work—from K.E.V.I.N a radical Islamic group, to a Jehovah’s Witness congregation, to F.A.T.E, an extreme antivivisection coalition. Each of these groups is opposed to Chalfen’s work on moral and philosophical grounds whether they see it as tainting of God's creation, the destruction of nature, or as cruel and unethical treatment of animals.

FutureMouse[©], its creator, and its detractors embody the complicated cultural position of transgenic model organisms within western culture. As I briefly outlined in

the introduction of this dissertation, the model organism occupies several ontological, institutional, and disciplinary categories within modern science. Donna Haraway is right to point out that “the bioengineered mouse is simultaneously a metaphor, a technology, and a beast living its multilayered life as best it can” (*Modest_Witness* 83). Following Haraway’s lead, I recognize that bioengineered mice serve a whole host of needs within science and within larger cultural discourses, including their own. And yet I am hesitant to fully agree with Haraway’s characterization of bioengineered mice because by stating that they live the “best [they] can” implies a misleading anthropomorphic—and anthropocentric—conception of ‘life’ that overwrites the harsh reality of these animals who have very little agency. Ascribing agency to bioengineered mice is a large part of Haraway’s critique of model organisms, arguing that animals are “active participants in the constitution of what may count as scientific knowledge” in her early work and “co-workers” and “unfree partners” in her later work (*Primate Visions* 310-311; *Species Meet* 72-73). Haraway positions laboratory animals in these ways in order to unseat human exceptionalism and to unsettle the prestige and fetishism of scientific knowledge production. However, as Zipporah Weisberg argues, “animals in labs are not workers—not even alienated workers—but worked-on objects” (37). Of, course Haraway partially accounts for this critique by referring to model organisms as simultaneously metaphors, technologies, and individual beings. In other words, Haraway’s point is that scientists never fully render model organisms into objects because they rely on animal participation in experiments. The problem, then, that I find with Haraway’s theory of model organisms as actors and participants in science is not her ascription of agency *per se* but rather what

form this agency takes. As Gail Davies puts it, “our understandings of human corporeality and potentiality are increasingly enacted through the individual bodies and multiple forms of a multitude of laboratory mice [...] These both undercut human exceptionalism and reinscribe the role of human agencies in the lived lives of animals and humans” (“Experimental Life” 130). The genetic sciences only *appear* to challenge human exceptionalism by demonstrating the similarities between mice and human bodies. Scientific practices “reinscribe” human exceptionalism within the model organism both because they stand in for us in experiments and because they are scientific creations. In each case, there is an exceptionalism attached to these animals that makes them appear to have agency but it is simply a function of their roles as model organisms. With this in mind, what we could call model organism agency following Haraway is actually that of the human actor that works ‘on’ not ‘with’ model organisms.

In this chapter, I suggest that in *White Teeth* Smith portrays FutureMouse[©] as a being that exceeds scientific frameworks of propriety and instrumentality and thus has some agency; however, I suggest that his agency is dependent upon different understandings about what transgenic mice *are*—sentient animals? Technologies? Experimental sites? Or, one of God’s creations?—and thus cannot be separated from the social positions of the humans who hold these views. Much of the scholarship on *White Teeth* positions the novel within postcolonial and multicultural contexts and focuses on the connections the text makes between cultural and scientific understandings of race, biotechnology, and legacies of eugenics embedded within the history of the genetic sciences. Ashley Dawson argues that the novel “underlines the increasing politicization

of biological and social reproduction in postcolonial Britain” and represents how contemporary discourses of “biological determinism are gaining purchase in societies already saturated by forms of biopower” (152). Dawson outlines how the novel satirizes utopic and “hubristic” claims for the potential of the postgenomic sciences by linking them to the eugenics projects of the 20th century (152). Similarly, Mindi McMann argues that the novel “unequivocally posits a relationship between the demonized eugenic work done by Perret [the Nazi eugenicist and mentor of Marcus Chalfen] in the 1940s and Chalfen's progressive genetic engineering in the 1990s” (619). McMann mobilizes the notion of the “black box,” theorized by Norbert Weiner to describe a system, object, or device that can only be observed in terms of its inputs and outputs, to understand how *White Teeth* positions contemporary understandings of race and science (619). Other scholarship looks at how the formal elements of the novel are influenced by scientific discourse. Josie Gill argues that the novel “interrogates the relationship between science and fiction” that “illuminates the narrative and fictional aspects of contemporary genetics” (18).

Unilaterally, these considerations of the *White Teeth* position FutureMouse[©] as a rhetorical extension of Smith’s critique of how genetics influences contemporary discourses of race. I do not suggest that the scholarship ignores FutureMouse[©] in any fundamental way, but rather, it neglects to engage with the character as a representation of model organisms with their own complicated set of politics and discourses that are not reducible to points of rhetorical leverage for arguments about biotechnology and human eugenics. I suggest that it is the logic of the model organism within genetic science rather

than genetic science in general that is the most crucial aspect of how FutureMouse[©] functions in the novel. I argue that *White Teeth* stages an essential critique of how the genetic sciences generate and mobilize ideas of human life through model organisms like FutureMouse[©] but also that this mobilization is an extension of broader cultural beliefs about animal life.

This chapter is divided into three parts that coincide with different aspects of model organism representational politics. Part One explores how *White Teeth* positions FutureMouse[©] as a proxy for white middle-class social and political identities by comparing how Smith positions ideas of what FutureMouse[©] means to both the animal liberationist group F.A.T.E and the domestic life of Marcus and Joan Chalfen. I argue that Smith makes connections between how the people in each case are drawn to FutureMouse[©] as a way to legitimate their white middle-class subjectivities that have been decentralized by multicultural politics. Through these connections, Smith demonstrates how animal lives are made inseparable from the human actors that utilize animals—and the cultural ideas that are associated with them—as a way to conceptualize their identities. In the case of FutureMouse[©] white middle-class actors are drawn to him precisely because he is a transgenetic organism and thus represents science, genetics, and racial neutrality. In Part Two, I consider the notion of “mouseness” by examining more specifically how the novel engages with the concept of the model organism and its epistemological roles both in and outside the laboratory. I argue that Smith complicates discourses of scientific neutrality attached to transgenetic organisms (through their status as “scientific tools”) by exposing the rhetorical work these animals do for the promotion

of scientific research in the public realm. Part Three considers a scene in *White Teeth* where Irie Jones—a black, “overweight” teen with “nappy” hair—imagines herself as a transgenic organism. I argue that by placing Irie in comparison to a transgenic model organism, the text asks us to consider both how animal bodies are mobilized on behalf of the desire to perfect humanity, and also how humans are also controlled and manipulated by the same discourses.

Part One: Mouse Politics

“The Damage is Done:” Hysteria, (Post)(Neo)Humanism, and Antivivisection

In a chapter called “The End of History Versus the Last Man,” as the radical animal rights group *Fighting Animal Torture and Exploitation (F.A.T.E)* plot their liberation of FutureMouse[©], a new-comer to the group, Joshua Chalfen (the son of FutureMouse[©] engineer Marcus Chalfen), interjects, “this isn’t like the other animals you bust out. It won’t make any difference. The damage is done. The mouse carries around its own torture in its genes. It’s like a time-bomb. If you release it, it’ll just die in terrible pain somewhere else” (Smith 485). Though surrounded by the humour of Joshua’s coveting of Joley’s body—one of the main reasons why he joined the group—and the general faux-militarism of the group’s plan to ‘take down’ Marcus Chalfen, his statement lays bare what antivivisection activists face when they try to liberate transgenic mice. In most cases, these mice are severely immunodeficient and have debilitating tumours, making their quality of life once liberated questionable at best. In response, Paddy, another F.A.T.E member exclaims, “Well, basically... would you not help a political

prisoner to escape from jail because he had a terminal disease?” (Smith 485). Similarly, this response, though gloved with comically overwrought militarism, represents another important discourse within animal liberationist groups that Rosi Braidotti calls “post-anthropocentric neo-humanism” (76) whereby activists grant animals a kind of liberal humanist subjectivity by analogy. By considering FutureMouse[©] a comrade rather than an animal with its own interests, the activists perform an anthropomorphism that does more to legitimate their political identities than it does to help the cultural position of model organisms like FutureMouse[©]. F.A.T.E.’s anthropomorphism is further elaborated in the ensuing scene where Crispin, the group’s leader puts it to a vote:

Yes, Paddy, yes that’s right. I think Joshua’s wrong there and I think Paddy has presented to us the choice we have to make. It’s one we’ve come up against many times before and we’ve made different choices in different circumstances. We have in the past, as you know, gone for the perpetrators. Lists have been made and punishments dealt out. Now, I know in recent years we have been moving away from some of our previous tactics, but I think even Joely would agree this is our biggest, most fundamental test of that. We are dealing with seriously disturbed individuals. Now, on the other side of things, we have also staged large-scale peaceful protests and supervised the release of thousands of animals held captive by the state. In this case, we just won’t have time to employ both strategies. It’s a very public place and—well, we’ve been over that. As Paddy said, I think the choice we have on the 31st is quite simple. It’s between the mouse and the man. (Smith 485-486)

This passage represents a common debate within political activism between peaceful protest or violent intervention, but Joshua’s comment is left unaddressed because there is no serious consideration of FutureMouse[©] as a biologically engineered mouse. Instead, Crispin and Paddy’s remarks shift the attention back to themselves as activists so that when Crispin says, “it’s between the mouse and the man,” he strikes an odd comparison between Dr. Chalfen and FutureMouse[©] reminiscent of post-anthropocentric neo-

humanism whereby the actions of the perpetrators are codified as acts against the activists, not the animals. In other words, the comparison exemplifies another kind of objectification of animals whereby they become the means by which the identity of the crisis is formed in opposition to other human actors. Further, in the kind of satirical jest that has made *White Teeth* famous, Smith does not let us dwell on the seriousness of this conundrum for as Crispin and Paddy argue for a vote, Joshua has already lost interest: “Has anyone got any problem with taking a vote on that? Joshua? [Crispin says,] Joshua sat on his hands to lift himself up and give Joely better purchase on his upper back massage. ‘No problem at all,’ he said” (486).

Critics of the novel have interpreted this scene in many different ways. Nick Bentley argues that these moments of overt comedic satire pick out the “unavoidable foibles, hypocrisies and moral expediencies of the main characters. This style serves to avoid the didacticism of political correctness, whilst maintaining an underlying serious approach” (497). In this view, we read Joshua’s desire for Joely against his more serious concerns for the fate of FutureMouse[©], exposing the complicated and fraught nature of earnest political engagement. Taking this point to its cynical extreme, literary critic James Wood coined the term “hysterical realism” to describe Smith’s tendency to satirize such earnestness. Wood has two primary critiques important for a discussion of how to read FutureMouse[©] and antivivisection in the novel: first, *White Teeth* is not a realist novel, but an “exhausted” and “overworked” mutation of realism that mistakes plot devices for “real” moral and ethical storytelling; second, and perhaps more confusing, *White Teeth* is devoid of “real human beings,” and humanity in general (1). “This is not magical realism.

It is hysterical realism,” writes Wood, “storytelling has become a kind of grammar in these novels; it is how they structure and drive themselves on. The conventions of realism are not being abolished but, on the contrary, exhausted, and overworked” (1). Wood is afraid that novels like *White Teeth* appropriate the serious moral penetration of classical realism and use realist literary conventions to evade reality (3). It is difficult to discern what exactly Wood means by the evasion of reality until his second criticism is brought to light. “Stories, after all,” Woods states, “are generated by human beings, and it might be said that [*White Teeth* is] full of inhuman stories, whereby that phrase is precisely an oxymoron, an impossibility, a wanting it both ways”(3). Basically, the novel is not humanist enough; it does not approach the human condition with enough seriousness and moral understanding because its characters are not “really alive, not fully human, their connectedness can only be insisted on. Indeed, the reader begins to think that it is being insisted on precisely because they do not really exist. Life is never experienced with such a fervid intensity of connectedness” (5).

Notwithstanding the condescending anger in Wood's tone, the centrality of his anxiety over the lack of “real humans” (1) in *White Teeth* is important for thinking about how and *why* a genetically altered mouse fits in the book. While Wood does not actually reference the term, the negative connotations of “hysterical realism” seem to be rooted in anxieties about the posthumanism of *White Teeth* for the opposite reason that Braidotti is uneasy about the “post-anthropocentric neo-humanism” (76) of animal rights activists. On the one hand, Wood critiques Smith for not being humanist enough; on the other hand, Braidotti critiques post-anthropocentric neohumanists like F.A.T.E for

appropriating humanism for nonhumans. Ironically, Smith exposes the ironic confluence of Braidotti's and Wood's anxieties with the story of the founding of F.A.T.E by Crispin and Joely:

Joely and Crispin met and fell in love at the University of Leeds the winter of 1982, two young student radicals, with Che Guevara on their walls, idealism in their hearts and a mutual passion for all the creatures that fly, trot, crawl and slime across the earth. At the time, they were both active members of a great variety of far-left groups, but political in-fighting, back-stabbing, and endless factionalizing soon disillusioned them as far as the fate of *homo erectus* was concerned. At some point they grew tired of speaking up for this species of ours who will so often organize a coup, bitch behind your back, choose another representative and throw it all back in your face. Instead, they turned their attention to our mute animal friends. Joely and Crispin upgraded vegetarianism to veganism, dropped out of college, got married and formed Fighting Animal Torture and Exploitation in 1985. (478-479; original emphasis)

At first glance, the narrative of F.A.T.E's origins reads as a pathology of post-anthropocentric neo-humanism where Crispin and Joely progress from idealist human activists—signified by the leftist appropriation of Che Guevara as a symbol of anti-capitalist, anti-imperialist, social democracy—to animal activism—signified by their “upgrade” to veganism. However, the obvious and heavy sarcasm of the passage crucially exposes the simultaneous hypocrisy of liberal humanism as well as its progression into its post-anthropocentric form. Smith is careful not to let the criticism fall too far to either side because the whole point of this portrait is to show how the class and racial privilege of these Londoners lead them to animal activism. With this in mind, we can focus more on the situation as a whole: both Crispin and Joely are white, middle-class twentysomethings that find liberal humanism and leftist politics at university, then choose to opt out of caring about disenfranchised humans because they cannot securely occupy the central role of a political organization. Instead, they switch to caring “our mute animal

friends” because they can neither “organize a coup, bitch behind your back, choose another representative, [nor] throw it all back in your face” (Smith 479). The contrast in the sentiment between muteness and lack of ability to advocate for oneself is key to Smith's critique of animal rights discourse because it implies that the most appealing—and hence most ironic—aspect of animals as objects of critical advocacy work is that they lack political subjectivity. This lack of subjectivity is appealing to Crispin and Joely because animals can neither advocate for themselves, nor can they choose who speaks on their behalf. The point of this scene is to show how liberal humanism and post-anthropocentric neo-humanism are closely related by how they position their cause: in both cases Che Guevara (as a metonym for popularized political conflicts that have been appropriated by the American left) and veganism are proxies for middle-class white subjectivities that legitimate themselves by linking themselves to large-scale political movements that concern bodies other than their own.

Upon second glance, however, we can read this scene as a critique of posthumanism as an animal-oriented post-race politics. This second glance also reveals how Smith's writing accounts for a “hysterical realist” critique because it is aware of its own posthuman (and possibly antihuman) sentiments. She does this first by making connections between middle-class tendencies to form identity politics that mimic and appropriate the political movements of disenfranchised and racialized people, and animal liberationist politics as mentioned above. Second, a central object of the satire of F.A.T.E is both their excess political agency and their total lack of race (gender, and sexual) politics. I argue that to make these two critiques Smith needed to use some of the

techniques Wood mentions, however, rather than reflecting a particular “inhuman” narrative as Wood states, Smith’s representation of animal rights and the genetic sciences as identity categories for white middle-classes reflects the posthumanist politics already central to modern British society; nowhere is more apparent than in Smith’s portrait of the Chalfens.

“A lapsed-Catholic horticulturist feminist:” Postracial Genetic Humanism and Joyce Chalfen’s Social Ontology

As Michele Braun points out, drawing on Brooks Landon’s term “science fiction thinking” to describe “both an identifiable science fiction subculture and a broad complex of science fiction-shaped cultural assumptions about science, technology, and the future” (in Braun 221), discourses of genetics are central to how *White Teeth* critiques contemporary post-racial, multicultural London. Braun argues that *White Teeth* chronicles different understandings of how genetic lineage affects identity and demonstrates “how genetic discourse can sometimes subvert, and sometimes reify, personal and familial history” (222). Braun argues that Smith contrasts traditional understandings of lineage in terms of cultural influence and inheritance with the Chalfens, who use the language of genetics to describe almost every aspect of their lives (226). I push this further and argue that the Chalfen’s internalization of genetics as a social ontology that justifies their middle-class privilege and structures how they perceive themselves as members of British society in a similar way that the members of F.A.T.E see themselves in relation to animal rights. Whereas the members of F.A.T.E socially position themselves as proxies for FutureMouse[®], the Chalfens understand themselves as

the social antecedents of FutureMouse[©], as a messianic tool for human perfection.

However, rather than see this messianism as a part of FutureMouse[©] him/herself, Joyce and Marcus Chalfen ascribe it to themselves as representatives of ideal white middle-class life. In this way, FutureMouse[©] embodies a secularized cosmology where science allows humans to transcend nature and become the engineers of our biological future.

Nowhere is this relationship between genetics and middle-class white identity more evident than in Smith's depiction of Joyce Chalfen. At the beginning of the chapter called “Canines: The Ripping Teeth” an excerpt from Joyce Chalfen's book, *The New Flower Power* draws connections between “the sexual and cultural revolution” of the 1970s and “the horticultural revolution that has taken place in our herbaceous borders and sunken beds” (209). “Where we were once satisfied with our biennials, poorly coloured flowers thrusting weakly out of the earth and blooming a few times a year (if we were lucky)” Joyce provokes,

now we are demanding both variety and continuity in our flowers, the passionate colours of exotic blooms 365 days a year. Where once gardeners swore by the reliability of the self-pollinating plant in which pollen is transferred from the stamen to the stigma of the same flowers (autogamy), now we are more adventurous, positively singing the praises of cross-pollination where pollen is transferred from one flower to another on the same plant (geitonogamy), or to a flower of another plant of the same species (xenogamy). (Smith 309)

Joyce reads the three modes of plant fertilization—autogamy, geitonogamy, and xenogamy— as a model for human cultural and biological reproduction whereby she projects the genetic difference between plant species onto human social difference such as the “cross-pollination between a lapsed-Catholic horticulturist feminist [Joyce], and an intellectual Jew [Marcus]” (310). Joyce's analogy between her marriage and horticultural

practices for genetic mixing links hers and Marcus's ethnic and religious heritages and also codifies her white class privilege, summed up by Marcus's phrase “good genes” to explain their family's exceptionalism (Smith 311):

[Joyce] liked to pull [Marcus] away from [his work] and show him the latest remarkable thing that Joshua had done or learnt; sounds, letter recognition, coordinated movement, imitation: *just like you*, she'd say to Marcus, *good genes*, he'd say to her, patting her behind and luxurious thighs, weighing each breast in his hand, patting her small belly, generally admiring his English Pear, his earth goddess... and then she'd be satisfied. (Smith 311; original emphasis)

The phrase “good genes” signifies what I would call genetic heteropatriarchy whereby Marcus's genes are the source of his position as the most important person in the family or the head of the household. Smith drives this genetic heteropatriarchy home with the satirical way that Marcus treats Joyce as a sexual object and uses cliché phrases that refer to her “shape.” This conflation of Marcus's social status with his genes is taken to its logical extreme when the narrator describes how Joyce imagines Marcus's work with FutureMouse[®]. “[Joyce's] husband didn't just make money” the narrator describes, “he didn't just make things, or sell things that other people had made, he *created* beings. He went to the edges of his God's imagination and made mice Yahweh could not conceive of” (311). Joyce values Marcus's job because of how it positions her family socially; they are superior to the rest of the middle-class because he created a life that God himself could not. With this in mind, transgenics is at the center of the Chalfen family's exceptionalism but also how they imagine their class privilege as a direct consequence of their genetic selves. Joyce takes this a few steps further when she describes Marcus's work in more detail, blurring the line between FutureMouse[®] as a model organism and Marcus:

Mice who year after year expressed more and more eloquently Marcus's designs: from the hit-or-miss process of selective breeding, to the chimeric fusion of embryos, and then the rapid developments that lay beyond Joyce's ken and in Marcus's future—DNA microinjection, retrovirus-mediated transgenesis (for which he came within an inch of the Nobel, 1987), embryonic stem-cell mediated gene transfer— all processes by which Marcus manipulated ova, regulated the over or underexpression of a gene, planting instructions and imperatives in the germline to be realized in physical characteristics. Creating mice whose very bodies did exactly what Marcus told them. And always with humanity in mind—a cure for cancer, cerebral palsy, Parkinson's—always with the perfectibility of all life, in the possibility of making it more efficient, more logical. (Smith 311-312)

This excerpt ties back to the press conference and Marcus's humanitarian justifications for his work except here Joyce makes the social connections between Marcus's “genius,” his genes, and their social privilege—all through an explanation of Marcus's work with mice that are born and grow in ways that Marcus says they will. The logic of Joyce's description of Marcus's research is similar to how in the discussion of F.A.T.E mice end up standing in for the interests of human liberationist politics, except that in this case mice stand in for the social superiority of the Chalfens and act as a justification for their class privilege. More specifically, this passage achieves two important goals for Smith's critique of the way in which science fits into how middle-class white people view themselves socially. First, by listing scientific practices such as microinjection and transgenesis as reasons why Marcus is a superior husband, Smith points out that even if notions such as DNA microinjection and embryonic stem-cell mediated gene transfer are “beyond the ken” of lay people like Joyce, they have a great deal of social and political capital. Second, genetically modified mice become symbols for the moral worth of genetic science by translating them into humanist narratives of the “perfectibility of all

life.” Indeed, the creation of mice is what makes Marcus such a good husband because the mice symbolize the humanist worth of Marcus's science.

Part Two: Mouse Science

“Victims of the Random:” From OncoMouse™ to FutureMouse®

There has been speculation in the scholarship on *White Teeth* about whether (and indeed how much) Zadie Smith modelled FutureMouse® after the infamous OncoMouse™, the first patented organism, and whether she got the idea from reading Haraway’s *Modest_Witness@Second_Millennium.Femaleman_Meets_Oncomouse™* where she describes OncoMouse™ as an example of the how genetic science uses animals like mice: “Passing through the wormhole of technoscience, field mice emerge as the finely tailored laboratory rodents—model systems, animate tools, research material, self-acting organic-technical hybrids—through whose eyes I write this essay. Those mutated murine eyes give me my ethnographic point of view” (*Modest_Witness* 52). For Haraway, OncoMouse™ is an example of the complex web of interrelations between human and animal life, technology and biology, nature and culture in modern western culture. She refers to OncoMouse™ as a “sibling” to acknowledge how transgenic animals are central to how modern science shifts our understandings of ourselves as natural and cultural entities, but also that this shift is predicated on many old assumptions, political motivations, and power dynamics. Haraway argues that “transgenic organisms are at once completely ordinary and the stuff of science fiction [and she uses] them to metonymically mark world-shaping changes in biology since the 1970s”

(*Modest_Witness* 57). OncoMouseTM stands in for the ways that “the organism has been retooled materially [and] semiotically” (*Modest_Witness* 57) by new developments in biotechnology in the life sciences. But OncoMouseTM also stands in for the biocapital that these discourses have gained as genetic engineering and biotechnology began to take over the life sciences in the mid-twentieth century. As Haraway states further,

the global scramble for the control of genes—the sources and engines of biological diversity in the regime of technobiopower—drives venture capitalists, crafters of international treaties, makers of national science policies, bench scientists, and political activists alike. The control of genes means access both to naturally occurring diversity and to the material, social, and semiotic technology to recraft its riches to produce beings new to the earth. (*Modest Witness* 57-58)

It is in this cluster of biopolitics, life making, and world-building that I situate Zadie Smith's *White Teeth*, for FutureMouse[©] closely resembles the OncoMouseTM of Haraway's work in several informative ways. I suggest that Smith uses FutureMouse[©] to explore how discourses of genetics influence and collide with our understandings of race, identity, and the human species in contemporary culture by foregrounding the contradictory roles that transgenic mice play in this epistemic contrempe as model organisms. As Michele Braun points out, Smith's marking of FutureMouse[©] with the copyright symbol is “a similar meeting of literary ownership and rodent ownership” embodied in the title of Haraway's *Modest_Witness@Second_Millennium.FemaleMan[©]_Meets_OncoMouseTM*. Following Braun's lead, I find Haraway's remarks on her use of copyright symbols helpful for reading some of the implications of Smith's similar marking of FutureMouse[©]. “The [©] and TM of my title,” Haraway writes, “mark the syntax of the natural / social / technical relationships congealed into property. Built into the Constitution and early legislative acts of the United States, these marks [...] are about the

origin and faces of nations as well as of personal and corporate individuals” (*Modest Witness* 7). Now that the legal and social codification of ownership that was once resigned to the realm of ideas and objects can be applied to organisms and genetic material as well, Haraway argues that the things once thought “natural” can now be “made” social in ways that affirm rather than contradict old and power-laden distinctions between nature and culture. In the case of OncoMouse[©], what is normatively referred to as nature, and thus determined not worthy of moral significance, such as a small rodent, is codified as property and leveraged as a biocapital.

In *White Teeth*, the scene where Irie reads the press release for FutureMouse[©] to a journalist illuminates how the incommensurable relationship between the species being of mice and biological knowledge functions rhetorically as a pivot for the hypothetical applications of Marcus Chalfen’s research for humans. Smith critiques the rhetoric of the press release by contrasting the sober, straightforward narrative of the press release with the humorous dialogue between Irie and the journalist. As Marcus’s secretary and assistant (a topic I will discuss later), Irie has to manage the public relations side of the FutureMouse[©] experiment, and before she reads the press release to the journalist the narrator reflects on Irie, her job, and the project:

‘All right,’ said the journo. ‘Tape’s running.’ And here Irie stumbled at the first hurdle of PR: believing in what you sell. It wasn’t that she lacked the moral faith. It was more fundamental than that. She didn’t believe in it as a *physical fact*. She didn’t believe it existed. FutureMouse[©] was now such an enormous, spectacular, *cartoon* of an idea (in every paper’s column, agonized by journos—*Should it get a patent? Eulogized by hacks—Greatest achievement of the century?*), one expected the damn mouse to stand up and speak by itself. (Smith 431; original emphasis)

By framing the press release with Irie's skeptical and comedic commentary, Smith calls into question public relations strategies of the genetics and biotechnology industries that rely on narratives of discovery and utopic futurism. Irie's disbelief of the “physical fact” of FutureMouse[©] undermines the assertions of the press release that FutureMouse[©] is a credible “site” for an experiment, and thus scientific truth. In essence, Irie's disbelief forces us to separate the rhetoric of “utopic discovery” from the experiment itself and to consider whether model organisms actually do model human disease, or if their modelness is itself part of the rhetoric of science. Thus, Irie's sarcastic sentiment that she “expected the damn mouse to stand up and speak by itself” reflects her disbelief that FutureMouse[©] represents what Marcus says he does. However, this scene also raises questions about model organism agency: what would FutureMouse[©] say if he spoke? Would he speak *for* himself, or as a mouthpiece for the science? Or, perhaps more insidiously, does he already speak for science as a model organism? After all, the question is whether FutureMouse[©] would speak *by himself* not *for himself*. While the text ultimately leaves this conundrum unresolved, it unsettles the surety of the narrative of the press release that poses the implications of the work for human genetics as undisputable truth rather than experimental hypothesis:

Professor Marcus Chalfen, writer, celebrated scientist and leading figure of a group of research geneticists from St. Jude College, intends to ‘launch’ his latest ‘design’ in a public space; to increase understanding of transgenics and to raise interest and future investment in his work. The design will demonstrate the sophistication of the work being done on gene manipulation and demystify this maligned branch of biological research. It will be accompanied by a full exhibition, a lecture hall, a multimedia area and interactive games for children. It will be funded in part by the government’s Millennial Science Commission, with additional monies from business and industry. A two-week-old FutureMouse[©] is

to be put on display at the Perret Institute in London on 31 December 1992. There it will remain on public display until 31 December 1999. (Smith 432)

While explicit mention of copyright is absent from this passage, the language of design and fabrication paired with that of interest, investment, business, and industry in the first half of the press release mirrors Haraway's critique of patenting. Further, as Irie's thoughts about how journalists obsess over questions of whether FutureMouse[©] should be patentable, or if it really is the "greatest achievement of the century" (Smith 431) demonstrate, patenting and funding are always at stake with FutureMouse[©]. This first portion of the press release represents how the funding of genetics research involves the interests of individual researchers and research institutions, but also private research corporations. Of course, it must be noted that the pairing of industry and research institutions is not a conspiracy and is quite an ordinary practice in most research institutes all over the world, but it is not always so straightforward. This is especially pertinent considering that the exhibit and experiment are on display at the Perret Institute, named after its founder Dr. Perret the infamous Nazi Eugenicist that Irie's Father attempts to execute at the close of WWII. While this will be discussed below, Smith symbolically links eugenics and genetics by having the experiment take place within such an institution.

The next section of the release focuses on the specific scientific practices and biochemical elements of the experiment and is disrupted by the comical banter between the journalist and Irie:

This mouse is genetically normal except for a select group of novel genes that are added to the genome. A DNA clone of these genes is injected into the fertilized mouse egg, thus linking them to the chromosomal DNA in the zygote, which is

subsequently inherited by the cells of the resulting embryo. Before injection into the germline, these genes are custom-designed, so they can be ‘turned on’ and expressed only in specific mouse tissue and along a predictable timetable. The mouse will be a site for an experiment into the ageing of cells, the progression of cancer within cells, the progression of cancer within cells, and a few other matters that will serve as surprises along the way!

The Journalist laughed. ‘Jesus. What the fuck does that mean? ‘I dunno,’ said Irie. ‘Surprises, I guess.’ (Smith 431-32)

The journalist's disrupting question serves as comic relief for the otherwise dense description of experimental practices, but in being critical of the language of the press release the journalist undermines the straight-forward narrative of the experiment by inviting us to read the notion of surprise as ominous and scary rather than cheerful and upbeat as the press release clearly intends. By reading the notion of surprise in this way the journalist generates a pause for reflection upon what exactly is so bad about the press release. Given Irie's sceptical reflections upon the “physical fact” (Smith 431) of FutureMouse[©] and how she expects it to “speak for itself” (Smith 431), we can read the journalist's confusion as a critique of how the experiment makes light of what happens to the mouse in the experiment and calls into question how the press release refers to the mouse as a “site” for experimentation.

The final section of the press release draws connections between the “site” of the model organism to the future potential of the experiment once it has been extrapolated to the human context:

The mouse will live the seven years it is on display, roughly double the normal life expectancy of a mouse. The mouse development is retarded, therefore, at a ratio of two years for every one. [...] Four years into the experiment the mouse will begin to lose its ability produce melanin by means of a slow, programmed eradication of the enzyme tyrosinase. At this point, the mouse will lose all its pigmentation and become albino: a white mouse. If no external or unexpected interference occurs, the mouse will live until 31 December 1999, dying within the

month after that date. FutureMouse[©] offers the public a unique opportunity to see a life and death in ‘close-up.’ The opportunity to witness for themselves a technology that might yet slow the progress of disease, control the progress of ageing and eliminate genetic defect. The FutureMouse[©] holds out the tantalizing promise of a new phase in human history where we are not victims of the random but instead directors and arbiters of our own fate. (Smith 431-33)

Smith shows how the rhetoric of genetics draws connections between the “site” of the model organism to the future potential of the experiment once it has been extrapolated to the human context—something I will describe in detail below. Further, coming back to Haraway’s critique of OncoMouseTM, the way that the press release transitions between describing the specific phases of the FutureMouse[©] experiment by way of the witnessing spectator alludes to Haraway’s discussion of the modest witness. The experimental scientist is ‘modest’ because he in a sense gives up his human subjectivity for the objectivity of the experiment, thus allowing the experiment to speak for nature. However, as Haraway points out, “this kind of modesty is one of the founding virtues of what we call modernity. This is the virtue that guarantees that the modest witness is the legitimate and authorized ventriloquist for the object world, adding nothing from his mere opinions, from his biasing embodiment” (*Modest_Witness* 24). As the ventriloquist of the object world, the experimental scientist changed how western culture understood the notion of subjectivity and thus reorganized what constitutes knowledge by privileging facts that are ‘verified’ by ‘objective’ experimentation. The scientist, as a modest witness, is thus “endowed with the remarkable power to establish the facts [...] His narratives have a magical power—they lose all trace of their history as stories, as products of partisan projects, as contestable representations, or as constructed documents in their potent capacity to design the facts” (Haraway *Modest_Witness* 24). This plays out in the press

release in the way it constructs the narrative of the transformation of FutureMouse[©] from a “mouse” in the first half to “a technology” when the narrative shifts to address the general public—all the while not mentioning any explicit human action. This echoes Irie’s complaint that “FutureMouse[©] was now such an enormous, spectacular, *cartoon* of an idea [...] one expected the damn mouse to stand up and speak by itself” (Smith 431; original emphasis).

The modest witness is a term Steven Shapin and Simon Schaffer initially introduced in a chapter of their study of the invention of experimental science called “Seeing and Believing: The Experimental Production of Pneumatic Facts” to describe the classical figure of the experimental scientist who erases his presence from the experiment in order to emphasize the agency of the experiment as a representation of nature. Speaking of Robert Boyle, an early English experimental scientist, Shapin and Schaffer explain that since Boyle argued that “if knowledge was to be empirically based [...] then its experimental foundations had to be *witnessed*. Experimental performances and their products had to be attested by the testimony of eyewitnesses.” (56; original emphasis). However, this posed a problem for early experimentalists because “the problem of eye-witnessing as a criterion for assurance was one of *discipline*. How did one police the reports of witnesses so as to avoid radical individualism? Was one obliged to credit a report on the testimony of any witness whatsoever?” (Shapin and Schaffer 56; original emphasis). I take up the question of the credible witness and scientific literacy in the next section but here I suggest that Smith shows how, in public performances, such as the one the press release describes, the modern incantation of the “disciplined” witness is

reversed because scientists count on a lack of “discipline” to generate support. In other words, Smith satirizes how public discourses of the biotechnology industry utilize a lack of scientific literacy in the general public to sensationalize the implications of its products and research. Whereas for Robert Boyle and early scientists, “one way of securing the multiplication of witnesses was to perform experiments in a social space” (Shapin and Schaffer 57) that counted on members of the upper-classes to validate experiments with their disciplined eyes, today scientists like Marcus Chalfen stage performances that reverse the class politics of their predecessors by democratizing the witnessing procedure. Finally, the press release mirrors Haraway’s analysis of an advertisement for OncoMouse[®] called “Stalking Cancer” that featured a small white mouse on a spectral path crawling toward a white light, and a painting by Lyn Randolph called “The Laboratory, Or The Passion of OncoMouse[®]” that depicts a Christ figure with the body of a human crouching human, the head of a mouse with a thorny crown, and contained within a block box with human eyes observing through holes cut in the box. Reading Randolph’s painting against the advertisement Haraway states, “as a model, the transgenic mouse is both a trope and a tool that reconfigures biological knowledge, laboratory practice, property law, economic fortunes, and collective and personal hopes and fears” (*Modest_Witness* 47). Looking back to how the press release situates FutureMouse[®] itself (and not Marcus) as the guarantor of “the tantalizing promise of a new phase in human history where we are not victims of the random but instead directors and arbiters of our own fate” (Smith 433), Smith satires the ways that transgenic mice are used as rhetorical tools for experimental genetics to sell their findings to the public. As

Haraway puts it, although the promise of OncoMouse™ is “decidedly secular, s/he is a figure in the sense developed within Christian realism: s/he is our scapegoat; she bears our suffering; she signifies and enacts our mortality in a powerful, historically specific way that promises a culturally privileged kind of salvation—a ‘cure for cancer’” (79).

However, *White Teeth* complicates the narrative of FutureMouse® as a saviour by contrasting it with the how the journalist responds to Irie after she reads the press release: “bloody hell,’ said the journo. ‘Scary shit” (Smith 433). The journalist’s response invites reflection upon how Chalfen rhetorically positions FutureMouse® as a “saviour” by reading the experiment as something terrifying rather than something promising or hopeful.

“Messing about with the body:” Scientific Epistemology and Model Organisms

In the scene previous to Irie’s conversation with the journalist, a political science undergraduate confronts Marcus with her concerns about the social and historical implications of his work. This scene functions as sort of Socratic dialogue that walks the reader through the epistemological disconnect between the genetic sciences and the public. This scene presents two interrelated philosophical disconnects: the first involves the seeming unwillingness of genetic science to situate itself in the history of attempts to standardize and purify the human genome. The second disconnect involves the animality of model organisms. I suggest that this scene poses a critique of the logic of the model organism that both erases the “animality” of mice in order to make them what Chalfen

calls a “site” for experimentation and also mobilizes a “modified” form of animality that references their original animality *for the experiment*.

In the scene in question, in a chapter titled “The Return of Magid Mahfooz Murshed Mubtasim Iqbal”, while waiting for Magid’s plane to arrive at Heathrow Airport, Marcus encounters a “slim, pretty Asian girl” (Smith 415) reading his recently published popular science book *Time Bombs and Body Clocks: Adventures in Our Genetic Future*. The young woman is a political science student who voices her fear and objection to Marcus's claims—although she doesn't know that he is the author of the book. This fear is similar to that expressed by the journalist in response to the press release except that in this case, the young woman challenges the author (Marcus) by holding him accountable to the social implications of his work. In typical Smithian fashion, the scene resists singular interpretation and instead foregrounds the disconnect between the two characters: on the one hand the young woman is afraid of the implications of the genetic technologies Marcus describes in his book given the history of eugenics and scientific racism. On the other hand, Marcus is at a complete loss as to how the young woman makes these connections because all he sees are objective, scientifically verified facts. When Marcus asks the young woman her opinion of the book, she responds first by saying it is “a bit bloody weird. Bit of a headfuck” and when he presses further, she reveals that it is “not so much weird. I guess, more scary” (Smith 416). “Yeah you know,” she explains,

messing about with the body. They reckon there's a gene intelligence, sexuality—practically everything, you know recombinant DNA technology [...] Once you know the restriction enzyme for a particular, like, bit of DNA, you can switch anything on or off, like a bloody stereo. That's what they're doing to those poor

mice. It's pretty fucking scary. Not to mention, like the pathogenic, i.e., disease-producing, organisms they've got sitting around in Petri dishes all over the place. I'm a politics student, yeah, and I'm like: what are they creating? And who do they want to wipe out? You've got to be seriously naïve if you don't think the West intend to use this shit in the East, on the Arabs [...] reading this shit you realize just how close science is to science fiction. (Smith 417)

Michele Braun rightly characterizes these fears as symptomatic of contemporary “science-fictional imagination” of the implications of most of the hard sciences, but especially genetics and biotechnology (35). However, recombinant DNA technologies (rDNA) are hardly science fictional given that these techniques are basic practices used in everything from medicine and pharmacology to agriculture and genomics. It is only when these technologies are extrapolated into the context of human bodies that the young woman's fears become science fictional. This is not to say that Smith has her science wrong, but rather that although genetic engineering is normalized within genetic science the link between altering mice DNA and bio-warfare can be easy to make. More importantly, the more exaggerated and “science-fictional” elements of the young woman’s point of view stem from her empathy for the “poor mice” because she reads (or imagines) FutureMouse[©] as a tool for scientific racism. When Marcus presses the young woman further she elaborates her opinion and makes more interesting connections that further blur the line between science, science fiction, and the history of science:

‘I mean, they [the author of the book] talk about progress [...] they talk about leaps and bounds in the field of medicine yada yada yada, but bottom line is, if someone knows how to eliminate the “undesirable” qualities in people [...] There is just something fascist about the whole deal... I guess it’s a good book, but at points you do think: where are we going here? Millions of blonds with blue eyes? Mail order babies? I mean, if you’re Indian like me you’ve got something to worry about, yeah? And these people, like, *program* the mouse, plot its every move, yeah, when it's going to have kids, when its going to die. It's just *unnatural*. (Smith 418; original emphasis)

The young woman makes the connections between mice, genetic technology, and Nazi eugenics to current racism and xenophobia by interrogating the notion of “progress” as a rhetorical device that public discourse of science used to foster support—and indeed *trust* from the general public. As Haraway argues, “the promise of technoscience is, arguably, its principle social weight. Dazzling promise has always been the underside of the deceptively sober pose of scientific rationality and modern progress” (*Modest_Witness* 41). The “bottom line,” as the young woman calls it, is that progress is a lie if these technologies imply that scientists can gain control of the human genome. Again, this statement can be read as science fictional, but that is precisely the point. Smith contrasts the “sober pose of scientific rationality” against the fears of marginalized people who seem irrational if the history of scientific racism is forgotten and current science is maintained as an a-cultural and objectively neutral entity. The young woman reads Chalfen’s research as a false promise because she sees both the western privilege of the genetics research and the similarity between the desire to perfect the human genome and the Nazi’s desire for racial purity. Through the young woman’s confrontation with Chalfen, Smith stages this cluster of ideas that cut across scientific, cultural, and historical contexts by replicating the way that transgenic mice mediate discourses of human genetics.

As I mentioned above, the text resists a singular interpretation of this scene. Marcus’s internal and external response is interesting because the whole time the young woman explains her fears about his book Marcus is dumbfounded because from his perspective she has completely misinterpreted his work:

It was exhausting just to listen to her. Nowhere in the book did Marcus even touch upon human eugenics – it wasn't his field, and he had no particular interest in it. And yet this girl had managed to read a book almost entirely concerned with the more prosaic developments in recombinant DNA–gene therapy, proteins to dissolve blood clots, the cloning of insulin –and emerge from it full of the usual neo-fascist tabloid fantasies. (Smith 418-419)

Echoing Haraway's critique of the modest witness's omission of history, Josie Gill notes, “what might otherwise be a sympathetic portrait of a scientist struggling to communicate the truth of his science is undermined” by the fact that “Marcus has ignored the truth of his science's history [:] FutureMouse© is the direct result of the racial scientific research of the Nazis” (21). But why doesn't Marcus see the fact that his work is linked to Nazi eugenics through his mentor Dr. Perret? Because he is so focused on the objectivity of experimentation, he neither sees his work as social discourse nor does he see it as historical. This is solidified in the next quote:

‘But surely,’ Marcus began, more rattled than he expected himself to be, ‘surely that's rather the point. All animals are in a sense programmed to die. It's perfectly natural. If it appears random, that's only because we don't clearly understand it, you see. We don't properly understand why some people seem predisposed to cancer. We don't properly understand why some people die of natural causes at sixty-three and some at ninety-seven. Surely it would be interesting to know a little more about these things. Surely the point of something like oncomouse is that we are given the opportunity to see life and death stage by stage under the micro—’ ‘Yeah, well,’ said the girl, putting the book in her bag. ‘What-ever’ (Smith 420; original emphasis)

Marcus is “rattled” because the narrative he has of his work is situated in nature rather than history; his “programming” of animals to die is a continuation of nature in the laboratory. Similarly, he takes for granted that connections his work makes between transgenic animals and humans are part of a logic that everyone understands. Indeed, this passage illuminates the difference between the way that he mobilizes nature to justify his

work and the way that this narrative itself is naturalized within genetics and public discourses of genetics. This is not to say that the scientists that Marcus represents do not gain a “better understanding” of cancer, but that this understanding is not incontestable. Marcus’s comparison between FutureMouse[©] and OncoMouse[™] foregrounds the representational authority of OncoMouse[™] as a model organism by illuminating the circular logic of the modest witness: in order to justify to his research, he can only refer to another model organism to make his point.

This brings us back to Marcus’s quandary I quoted in the introduction of this chapter where in the middle of his conversation with the young woman Marcus himself puzzles over the fact that when people think about FutureMouse[©], they see a mouse instead of a research project:

To determine a mouse’s future stirred people up. Precisely because people saw it that way: it wasn’t the future of cancer, or a reproductive cycle, or the capacity to age. It was determining the future of *the mouse*. People focused on the mouse in a manner that never failed to surprise him. They seemed unable to think of the animal as a site, a biological site for experimentation into heredity, into disease, into mortality. The mouseness of the mouse seemed inescapable. (Smith 419; original emphasis)

While perhaps offering some comic relief to the heavier handed conversation about genocide, eugenics, and systemic racism, this passage also signals that another kind of biopolitical power is at stake in genetics. This passage opens an important philosophical window into FutureMouse[©] as a political representation of the ethics of animal experimentation. I agree with Michele Braun’s point that Marcus’s “ignoring the ‘mouseness’ of the mouse is an instrumental view of the animal” (233) and that this instrumentalization is an integral part of Smith’s critique of genetic science, but there is a

lot more to this quote that needs to be unpacked. It is not enough to merely point out the instrumentalization of animals in experimental science, but to look more closely at how it works and to ask, why does Marcus see an experiment when he looks FutureMouse[®]? Or rather, why doesn't he see a mouse? This question seems simple enough, but it requires an understanding of what an experiment is, and how model organisms function in them.

In a basic sense, as noted in the introduction to this dissertation, an experiment is a type of representation. As Hans-Jörg Rheinberger suggests, “when it comes to the heart of what the sciences are about, we touch on representation. The sciences, so the story goes, aim at a specific, in-the-limit, ‘true’ representation of the world. This was the grand project leading to enlightenment: science’s duty is to represent the world as it is in order to make its domination possible” (102). Rheinberger pulls on an important tension within scientific discourses between “truth” and “representation” whereby one contradicts the other because how can science be “true” if it is a representation—not the actual thing under investigation, but an abstraction from it? As with any representation, Rheinberger argues, in the experimental sciences “the representation of an object involves producing another object which is intentionally related to the first by a certain coding convention which determines what counts as similar in the right way” (Rheinberger 103).

Rheinberger distinguishes between two forms of linguistic representation: X is a representation *of* Y; X acts *as* if it were Y. In the latter case, Rheinberger uses the example of a play, where someone acts out a fictional character and “in this case, representation takes on a double meaning: that of vicarship and that of embodiment. Every play is governed by this tension, this ‘paradoxical trick of consciousness, an ability

to see something as ‘there’ and ‘not there’ at the same time” (103). However in experimental science, this displacement of the observed “object” is different because if an experimental scientist “tells us that he or she has produced or represented a particular substance in his or her laboratory, the meaning of ‘representation of’ is gone, and instantiation in the sense of the production of a particular substance has taken over. In this latter case, we deal with the realization of a thing. There is a continuum from vicarship to embodiment to realization” (Rheinberger 103). In an experiment, the realization of an object (for instance something molecular or cellular-like a particular gene pairing) necessitates a form of representation because in order to be comprehended as such it requires abstraction. This necessity thus produces the tension described above between “truth” and “representation” because in order to maintain truth status within experimental science the “particular substance” is referred to as if it were not representation but actual and material. For this reason, Rheinberger argues that

the activity of scientific representation is to be conceived as a process without ‘referent’ and without assignable ‘origins’ [...] As paradoxical as it may sound, this is precisely the condition of the often touted objectivity of science and of its peculiar historicity as well. If we accept this statement, any possibility of a deterministic referential account of science, be it based on nature or on society, is excluded. (105)

Rheinberger is suspicious of scientific epistemologies that act as if they have no referent and no origins because it is through these erasures that “truths” are produced in experimental systems that cannot be refuted. As I mention in the introduction of this dissertation, for this reason, he calls for an analysis of the “spaces of representation” (105) within experimental science so that these kinds of erasures can be accounted for and contested.

This is where the concept of the model organism comes into play because as Rheinberger states “nature itself only becomes real, in a scientific and technical sense, as a model” because it provides a space of representation for science to observe and create “things that otherwise cannot be grasped as objects of epistemic action. Biochemical representations, in particular, create an extracellular space for reactions assumed to take place within cells. Traditional wisdom has it that such a representation constitutes a model of what is going on ‘out there in nature’” (108). Further, Rheinberger points out that “the process of modelling is one of shuttling back and forth between spaces of representation. Scientific objects come into existence by comparing, displacing, marginalizing, hybridizing, and grafting different representations with, from, against, and upon each other” (108). Because the logic of the model implies multiple points of comparison, it is in a sense ontologically unstable—precisely because its job is to translate knowledge from one context into the other. In the case of model organisms like transgenic mice, they “shuttle” back and forth between murine and human contexts and I would argue that this instability is at the core of Marcus's frustration over the “mouseness” of FutureMouse[©].

In his essay, “Sacrifice and the Transformation of the Animal Body into a Scientific Object,” Michael Lynch argues that the seemingly contradictory way of understanding model organisms is central to how scientific research mobilizes them epistemologically. Lynch argues that experimental science produces a division between what he calls the “naturalistic animal” and the “analytic animal.” The naturalistic animal, Lynch explains, is,

the animal of common sense, the animal as it is viewed and acted upon in the world of everyday life. The ‘naturalistic animal’ is the animal appreciated by laymen; a subject of scientifically unfounded attributions which have little possibility of rigorous verification. It is the animal championed by animal rights advocates and to which human-like ‘feelings,’ perceptions, and even ‘thoughts’ are attributed. (267)

The naturalistic animal is the animal whose existence Marcus laments, the one that people outside science will not let go of, and the one that interferes with a better understanding of his research. On the other hand, the animal that Marcus sees and understands is the “analytic animal” that Lynch defines as,

an artefact [or] product of human intervention. It is actively shaped by human agency, and in some cases literally carved up. Descartes’ argument that the animal is no more than a machine becomes a self-fulfilling prophecy, since laboratory procedures assure the removal of the characteristics that make up the naturalistic animal (its life, its holistic and reciprocal presence, and its ‘subjective’ attributes) in the scientific rendering phenomenon. (269-270)

This is helpful for understanding why Marcus refuses to see FutureMouse[©] as a mouse because the foundation of his research depends upon the exclusion of animality—the “mouseness of the mouse.” However, I disagree with Lynch’s straightforward assumption that model organisms *are* “artefacts” because, as he seems to suggest, later on, model organism more accurately *act as* “artefacts” within scientific experiments. I push this further and argue that the purpose of the “scientific rendering phenomenon” is not necessarily to remove the animal characteristics of model organisms *per se*, but rather to repurpose these characteristics for human consumption, or to generate corporeal equivalence. As I discussed in the introduction of this dissertation, corporeal equivalence is a term used to describe the how model organisms are genetically altered to stand in for humans in experiments—both through techniques of genetic manipulation that make

them more “human-like” by inserting human DNA into their genes, but also through the philosophical and epistemological positioning that Rheinberger and Lynch describe. However, model organisms do not become “more human” regardless of how much human DNA they contain; nor is the extent to which mice already are “like us” as fellow mammals acknowledged because once their genome is altered they become things rather than animals. As Lynch describes, the thingness of model organisms, that is, the result of a “rendering” of the naturalistic animal into the analytic animal, is enabled by their status as animals:

‘Animal’ is thus a quantitative index—a coherent grouping of documents ultimately referring to an animal that once lived, but more immediately signifying a graphic rendering of the animal’s remains [...] the ‘animal’ index is significant in so far as it helps constitute a graphic ‘point’ in a mathematical account of a biological process, while at the same time it retains a reference to the original ‘naturalistic animal’; the [animal] that once lived prior to being reduced to preserved fragments and statistical frequencies. This index enables concrete artefacts such as plastic disks, micrographic montages, and statistical graphs to be viewed as documents of ‘natural’ phenomena. (271)

Lynch calls attention to the concept of the animal because of the epistemological “work” that it does in experimental science to transform *nature* into *science*—as it translates information from animal to human contexts. The animality of a model organism is an index because it is, in Rheinberger's terms, the space of representation where information is examined and explored but also recoded. This recodification thus requires the model organism to ‘stay animal’ so the experiment can refer back to the ‘natural’ living functions of the animal but simultaneously requires information technologies to make the translation real in a scientific sense. Returning to Marcus's confusion over why people see a mouse when they consider his work, the way that he refers to mice reflects the

philosophical quandary about how and *what* model organisms model in scientific experiments. On the one hand, when he refers to “determining the future of *the mouse*” (Smith 419; original emphasis) he does not necessarily call the animality of a mouse into question *per se*, but rather the specific mouse in an experiment: they don’t see the future results of the experiment, but the mouse whose body was used to get those results. On the other hand, what he refers to as “mouseness” is, in essence, the autonomous individual and species characteristics of a mouse, or for lack of a better word, its specific animality. These two subtly different mice reflect the notion of the animal index and how this indexical framework produces a contradiction within scientific discourses because they rely on a common sense understanding of animality in order to convince people that the animals used in experiments are merely a space of representation, a site, or an index for the translation of information.

Part Three: The Urge To Merge

“Terminal disease?...What terminal disease?” Irie’s Transgenic Identity and Model Organism Performativity

If transgenic mice exist in scientific discourses as an index and space of representation for arguments about the human body, doesn’t it also mean that there is space for misrepresentation and interpretation? Marcus’s confusion over the “mouseness” of FutureMouse[©] points to such a gap in scientific representation and a space for critique, but *White Teeth* takes this a step further in a scene where Irie Jones begins her orientation as Marcus Chalfen’s assistant and encounters a series of images depicting FutureMouse[©] in various stages of development. Similar to how Smith uses the encounter between

Marcus and the young woman in Heathrow to explore ideas of genetics, cultural legacies of eugenics, and the animality of transgenic organisms, in this scene Smith stages a “misreading” of corporeal equivalence that undermines the representational logic of the model organism.

Irie embodies the anxiety that many racialized women feel in Western cultures as a result of the aggressive pressure to model western standards of beauty. As Mindi McMann points out, these “anxieties about Irie circulate not around her hybrid identity, but around the fact that she has a body that signifies blackness, not Britishness” (629). This is exemplified in a chapter called “The Miseducation of Irie Jones” that contains the most complete description of Irie’s body: “Now, Irie Jones, aged fifteen, was big. The European proportions of Clara’s figure had skipped a generation, and she was landed instead with [her Grandmother’s] substantial Jamaican frame, loaded with pineapples, mangoes and guavas; the girl had weight; big tits, big butt, big hips, big thighs, big teeth” (Smith 265). Irie’s perception of her own body is the major source of her need to seek out the middle-class stability of the Chalfens because they offer her a space to adopt and perform middle-classness. However, given how the text positions FutureMouse[©] as a proxy for white middle-class identity, Irie’s gravitation toward the Chalfens coincides with an interest in FutureMouse[©] looks to FutureMouse[©] as a way to orient herself (and her body) within their world. Smith’s focus on Irie’s body critically highlights discourses of corporeal equivalence by generating a relationship between Irie’s inability to signify as a proper British subject and the position of FutureMouse[©] has within Chalfen’s experiment as a model organism. As the narrator sums up, “England, a gigantic mirror,

and there was Irie, without a reflection. A stranger in a strange land” (Smith 266). The metaphor of the mirror signifies Irie’s inability to model herself after idealized white British femininity. This inability pushes Irie into an obsession with white heteronormativity and what the narrator calls “the mantra of the make-over-junkie, sucking it in, letting it out; unwilling to settle for genetic fate; waiting instead for her transformation from Jamaican hourglass [...] to English Rose” (Smith 266-267). Irie finds this normativity in the Chalfen household where Marcus and his wife Joyce try to mentor her newly found white middle-class sensibilities. Similarly, she finds a way to reconceptualize her “genetic fate” by looking to FutureMouse[©] as a model for her new hybrid middle-class identity.

During Irie’s orientation to his work, Chalfen tries to explain the genetics behind FutureMouse[©] and how it functions as a model organism. However, the orientation is a failure because Irie refuses to let Marcus convince her of his experimental system and the implications of his work on a broader social scale. Instead, Irie performs her own reading of the photos Marcus shows her of FutureMouse[©] at different stages of its development. Rather than seeing the mouse as an experimental site for tumour growth, she sees an anthropomorphic trickster “mouse” with a kind of ironic agency, playing along with Marcus’s experiment and mocking his scientific objectivity. The mouse that Irie sees, however, is not the hypothetical mouse of the “mouseness of the mouse” dilemma that plagues Marcus in his conversation with the young woman. When Marcus passes the first photo of “a mouse on its back” to Irie, the narrator describes how Irie perceives the mouse:

Its stomach was littered with little mushroom-like growths, brown and puffy. Its mouth was unnaturally extended, by the prostrate position, into a cry of agony. But not genuine agony, Irie thought, more like theatrical agony. More like a mouse who was making a big show of something. A ham-mouse. A luvvie-mouse. There was something sarcastic about it. (Smith 339)

While Irie's anthropomorphism is disturbing and grotesque, it also undermines the logic of corporeal equivalence that governs how FutureMouse[©] is supposed to be read as a model for human cancer. Instead of a model organism, Irie sees an anthropomorphic animal performing an illness that is out of alignment with Chalfen's experiments. Further, Irie's disruption of corporeal equivalence via anthropomorphism exposes similarities between how each functions socially as a method for drawing humans and animals into comparison. Chalfen asks Irie to look at the image of the mouse and see its tumours and to understand that the tumours were put there by a complex system of genetic manipulation that aims to replicate the conditions of human tumours. Instead, she reads the image as a performance, but of what? How does a mouse perform a "theatrical agony"? This can be read a number of ways. Irie registers that the mouse is in pain but instead of reading its pain as something worthy of moral reflection (in the way a member of F.A.T.E might), she uses humour to gloss it over and thus avoids any reflection. This reading would certainly align with critiques of Smith's work as lacking a solid critical foothold, but it also ignores the possibility that she is being self-reflexive by calling attention to the critical work that her satire does to unsettle expectations and straightforward interpretations. I find the latter more compelling because it suggests that the point of the scene is to compare how both Marcus and Irie fail to grasp the "mouseness of the mouse" in different ways. Thinking back to Rheinberger's theory of

representation where he distinguishes between X as a representation *of* Y and X acts *as if* it were Y, we can understand Irie’s “theatrical agony” as a challenge to how Marcus’s scientific representation displaces the existence of anything outside the molecular and genetic components of his experiments. In other words, Irie refuses to see the tumours themselves as the primary signifier of the photographs and instead sees a holistic mouse—even if this “mouse” is highly anthropomorphized. However, even though Irie still doesn’t quite grasp FutureMouse[©] as a mouse for its own sake, the text positions Irie’s anthropomorphizing as an alternative to scientific equivalence and all its social capital. As Sheryl Vint points out, science has historically been hostile to anthropomorphism in order to shut out ways of thinking about animals as complex and intelligent beings:

‘The fallacy’ of anthropomorphism is an alibi for human behaviour toward [other animals]: they do not feel pain but merely respond to stimuli as do automatons, says Descartes; they do not suffer when separated from their young, says the dairy industry; they have no capacities for consciousness and hence cannot experience boredom, says the factory farm and research industries. (*Animal Alterity* 13)

Vint challenges “the fallacy” of the anthropomorphism because she sees it as a philosophical and psychological barrier that separates humans from animals and justifies their mistreatment because they are fundamentally different from us. Anthropomorphism is thus an “alibi” because it offers a ready-made cultural narrative for why humans turn animals into objects. With this in mind, Irie’s sarcastic “theatrical agony” can be read both as a critique of how animal pain in laboratories is dismissed by denying animals’ abilities to think and feel pain, but also that their participation in laboratory experiments is performative. Moreover, Paul Guthrie points out the irony in how model organisms are

used in laboratory experiments because their physiological characteristics mirror our own, but any suggestion of a similar mirroring of emotional and cognitive characteristics are dismissed as anthropomorphic (23). Irie's reading is elaborated in the following lines when Chalfen begins to explain the inner workings of the mouse model, but Irie refuses to pay attention and continues imagining the mouse within her own interpretive frame:

‘You see, embryo cells are all very well, they help us understand the genetic elements that may contribute to cancer, but what you really want to know is how a tumour progresses in *living tissue*. I mean, you can't approximate that in a culture, not really. So then you move on to introducing chemical carcinogens in a target organ but...’

Irie was half listening, half engrossed in the pictures passed to her. The next one was of the same mouse, as far as she could tell, this time on its front, where the tumours were bigger. There was one on its neck that appeared practically the same size as its ear. But the mouse looked quite pleased about it. Almost as if it had purposefully grown new apparatuses to hear what Marcus was saying about him. Irie was aware this was a stupid thing to think about a lab mouse. But once again, the mouse face had a cunning about it. There was a mouse-sarcasm in its mouse-eyes. A mouse smirk played about its mouse-lips. *Terminal disease?* (the mouse said to Irie) *What terminal disease?* (Smith 341; original emphasis)

Again, Irie ignores Marcus's scientific descriptions and reads the mouse in the image as having agency over its own representation, but she pushes it further by thinking about how the mouse is more actively participating in the experiments by imagining the mouse growing “new apparatuses” to listen to Marcus. These “new apparatuses” further entrench the notion that Irie's anthropomorphism is critical because it undermines Marcus's confidence that he is the only actor in the experiments. Irie also becomes more self-reflexive and affirms the unlikeliness of her interpretations. This draws our attention, not to the unlikeliness of the mouse performing for the scientific gaze, but the unlikeliness that we see in the pictures of model mice can be reduced to what scientists

tell us about the images. This is especially evident in the last line where Irie questions the very notion of representing a terminal human disease in a mouse model. Alongside Irie, we are also prompted to ask, “what terminal disease?” and to think critically about how disease is represented by scientists through model organisms.

The text contrasts these questions against Chalfen's inflated sense of self-worth, his delusions of grandeur, and his blatant and contradicting desires to rule the world and save humanity:

And this mouse, the one you're looking at, is a *unique* mouse, Irie. I plant a cancer cell and a cancer turns up precisely when I expect it. Fifteen weeks into development. Its genetic code is *new*. New breed. No better argument for a patent, if you ask me. Or at least some kind of royalties deal: 80 percent God, 20 percent me. Or at least the other way around, depending on how good my lawyer is. Those poor bastards in Harvard are still fighting the point. I'm not interested in the patent, personally. I'm interested in the *science* [...] You eliminate the random, you rule the world [...] Why stick to oncogenes? One could program every step in the development of an organism: reproduction, food habits, life expectancy' --- automaton voice, arms out like a zombie, rolling eyeballs—'WORLD DOM-IN-A-SHUN' [...] Seriously though,' said Marcus, rearranging his photos in the folder and moving towards the cabinet to refile them, 'the study of isolated breeds of transgenic animals sheds crucial light on the random. Are you following me? One mouse sacrificed for 5 billion humans. Hardly a mouse apocalypse. Not too much to ask.' (Smith 341; original emphasis)

Marcus's use of the word “random” in these lines echoes both the language of the press release and his conversation with the young woman in the airport except here he uses it not to evoke hope for a utopic genetic future but to signify his desire for power. The contrast between this admission and the earlier discussions of “the random” represents how the genetic sciences use a rhetoric of hope and faith to control nature and sacrifice animals for the sake of an imagined unified global humanity held together by the promise of genetic purity. The scene is also a satirical critique of how the life sciences and the

biotechnology industries propagate biocapital as benevolent scientific discoveries rather than capital-driven industrial endeavours. This critique reveals the dual calculation of human versus animal life and the economic nature of this calculation whereby one animal life is said to save billions of humans, but Chalfen also gains world domination and shares in the royalties with “God” for being this saviour. His statement at the end of the paragraph “Not too much to ask” summarizes the exaggerated claims that the biotechnology industries make on behalf of the world as it exposes the empty rhetorical strategy of constructing animal participation in laboratory studies as a sacrifice for humanity.

After Irie’s orientation is over Chalfen asks her if she is still interested in being involved with his project now that she knows what it entails. Irie takes a moment to reflect upon Chalfen, FutureMouse[®], and her relationships with them: “Irie knew the deal she was about to make; she didn’t run into it drunk or stoned or desperate or confused [...] Furthermore, she *wanted* it; she *wanted* to merge with the Chalfens, to be of one flesh; separated from the chaotic, random flesh of her own family and transgenically fused with another. A unique animal. A new breed” (Smith 342; original emphasis). Given her proclivity towards normativity, it is not surprising that she is eager to get involved with Chalfen but more interesting is how she imagines herself as a model mouse. Michele Braun suggests that Irie’s attraction to transgenesis is appealing because it allows her a “fantasy of escape from the tyranny of her family life and her part-black, part-white bodily traits because she imagines a blended identity will transcend the limits of either black or white” (224). However, in light of Irie’s reading of FutureMouse[®] as

having a sarcastic agency in the images Chalfen shows her we can also read her identification with transgenesis as a critique of the transspecies biopolitics of genetic discourses that ask us to think about ourselves and other animals as genetically determined. For Irie, this means thinking about her race, size, body shape in terms of a series of genes that did or did not express themselves but it also means that they are things that can be manipulated to fit certain standards of beauty. Irie as a character shows how old ideas of racial purity have been given a new purchase in contemporary culture through discourses of genetic perfectibility. Through her identification with FutureMouse[©], Irie ironically aligns herself with these discourses because she desires the kind of social agency that the Chalfens have attained by aligning themselves with genetic science. By placing Irie in comparison to a genetically altered model organism the text demonstrates the how human difference effects one's relationship to genetic science. Whereas the Chalfens take on the role of car-takers and custodians of FutureMouse[©], Irie imagines herself as FutureMouse[©] because her genes are already 'different'. The ultimate irony, then, of Irie's identification with FutureMouse[©] is that she mistakes the Chalfen's racial and class politics as the answer to her problems rather than the cause of her problems.

Conclusion: "Go on my son!" Of Mice, Memory, and Great Escape

In the final chapter "Of Mice and Memory," almost all the characters in the novel gather for the "unveiling" of FutureMouse[©] at the Perret Institute. This scene is the culmination of all the parallel plot lines of the novel that pit social groups and individuals

against one another, Marcus Chalfen, and FutureMouse[®]. In conclusion, I focus on Irie's father, Archie's experience of the event because it extends Irie's anthropomorphic vision of FutureMouse[®] into a critique biotechnology as an institution. It is through Archie's eyes that we witness the FutureMouse[®]'s miraculous escape in the final sentences of the novel as the press release erupts into chaos. Archie's vision of the escape embodies the text's final critique of the logic of the model organism by recasting Joshua Chalfen's ominous prognosis about FutureMouse[®]'s fate within the space of the institution.

When Archie arrives at the Perret Institute to witness the FutureMouse[®] exhibit he immediately reflects upon the spectacle of the event; “it's just like on TV!” Archie thinks, “And that is the most superlative compliment Archie can think of for any real-life event. Except this is just like on TV but better. It's very *modern*.” (Smith 520; original emphasis). Archie's reflection brings the discussion of genetics and model organisms into dialogue with discourses of modernity and the central role the genetic sciences has had in shaping modern culture, but it also illuminates how genetic science has become a source of entertainment—or, rather ‘infotainment.’ The FutureMouse[®] display as a whole signifies how public relations rhetoric surrounding the genetic sciences spectacularize genetics by relying on theatrics to convince the general public of its value. As the narrator continues to explain Archie's reaction to the scene at the Perret Institute, the text unfolds a string of associations linking Irie's anthropomorphic performing mouse with the notion of science-as-entertainment in modernity. “Now he's seen a lot of these press conference larks, Archie has” the narrator states:

But this is miles better because at the center of the table is something quite interesting: [...] a mouse. Quite a plain mouse, brown, and not with any other

mice, but its very active, scurrying around in this glass box that's about as big as a television with air holes. Archie was a bit worried when he first saw it (seven years in a glass box!), but it turns out it's temporary, just for the photographs. Irie explained there's this huge thing for the institute, full of pipes and secret places, space upon space, so it won't get too bored, and it'll be transferred there later. So that's all right. He's a cunning looking little blinder too, this mouse. He looks like he's pulling faces a lot of the time. You forget how alert looking mice are. Terrible trouble to look after, of course. That's why he never got one for Irie when she was small. Goldfish are cleaner—with shorter memories. In Archie's experience, anything with a long memory holds a grievance and a pet with a grievance (that time you got the food wrong, that time you bathed me) just isn't what you want" (Smith 521)

Archie's reflection frames the mouse as an "attractive" spectacle by comparing the "glass box" cage with a television set. The comedy of Archie's reflection rests on the fact that Archie is the perfect audience for this reflection, being of lower intelligence and attention span; however, this comedy also serves to soften the ethical concerns he has for the imprisonment of the mouse for "seven years in a glass box!" However, the reflection also brings Irie's anthropomorphic mouse into a new context, showing how the performativity she associates with the mouse serves a rhetorical purpose within the FutureMouse[©] beyond her identification with him. Similar to Irie, Archie's observation that the mouse is a "cunning looking little blinder too" who is "pulling faces a lot of the time" functions similar to Irie's "sarcastic" mouse; however he thinks about the mouse in terms of entertainment and pet ownership. Perhaps the most interesting part of Archie's reflection is his fear of the mouse's memory because it mirrors the narrator's commentary on Archie's realization that the Perret Institute is named after the Nazi scientist he fails to assassinate in WWII: "...it is Dr. Marc-Pierre Perret. A remarkable man and a very great...' Every moment happens twice: inside and outside, and they are two different histories. Archie does recognize the name, faintly, somewhere inside" (Smith 432). While

it is out of the scope of this conclusion to go into depth about the entirety of Archie's failed assassination, it is important to note that it serves as a symbol for the cultural amnesia surrounding the shared histories of genetics, eugenics, and the scientific racism of the Nazi regime. As the narrator describes the moment before Millat accidentally shoots Archie because he jumps in front of Perret: “So as he sees the light, he is *there* [back in WWII on the side of the road where Archie was supposed to kill Perret], he is there before Samad can stop him, he is there with no alibi, he is there between Millat Iqbal's decision and his target, like the moment between thought and speech, like the split-second intervention of memory and regret” (Smith 533). Archie suddenly realizes the irony of the two histories—the one that happened and the lie that resulted in him being shot inside the institution of the same Nazi he was supposed to kill. With this in mind, we can read Archie's fear of the memory of FutureMouse[©] as the embodiment of legacies of eugenics and a warning of sorts for how the same desires for genetic purity are played out not by making people into animals but by utilizing animals for biocapital.

But where does this leave FutureMouse[©] and the question of “the mouseness of the mouse”? After the narrator tells the story about what actually happened between Archie and Dr. Perret that fateful night at the end of WWII and Archie lies bleeding on the display table that moments ago held FutureMouse[©], the narrator describes how Archie looks up and watches his escape:

It would make an interesting survey [...] to examine the present and divide the onlookers into two groups: those whose eyes fell upon a bleeding man, slumped across a table, and those who watched the getaway of a small brown rebel mouse. Archie, for one, watched the mouse. He watched it stand very still for a second with a smug look as if it expected nothing less. He watched it scurry away, over his hand. He watched it dash along the table, and through the hands of those who

wished to pin it down. He watched it leap off the end and disappear through an air vent. *Go on my son!* thought Archie. (Smith 541-542; original emphasis)

The narrator's description of Archie continues the comic anthropomorphism discussed above but here the mouse actually escapes both the logic of the model organism as well as the humanizing gazes of Archie, Irie, and F.A.T.E. The escape evokes Haraway's argument that animals maintain agency within experimental science as "co-workers" and "unfree partners" (*Primate Visions* 310-311; *Species Meet* 72-73). The escape at the close of the novel signifies an irony inherent to transgenic mice that ultimately defy human understanding by remaining essentially mouse-like despite scientists' best efforts. As I have been tracing throughout this chapter, this essential form of corporeal agency represents how model organisms resist scientific epistemologies simply by being animal. However, *White Teeth* complicates this resistance because, as Joshua Chalfen reminds us, "the damage is done" (Smith 485) and FutureMouse[©] will eventually undergo the bodily changes of the experiment even though he escaped. This reading of the escape may seem cynical, but it also acknowledges the reality how of transgenic animals don't fit within our narratives of animal advocacy that center around reductive views of liberation and emancipation. But this is the point; the novel ultimately leaves us with the question of how do care for animals that are never going to be free in any absolute sense? Does this mean we have no obligations to them, or do we have to find different ways of imagining animal freedom and different ways to conceptualize animal agency when it comes to model organisms?

Chapter Two | Social Pathology and Animal Characters in Robert C. O'Brien's *Mrs. Frisby and the Rats of NIMH*

Between 1962 and 1973 the American ethologist John B. Calhoun conducted a series of experiments that involved confining breeding pairs of mice and rats within elaborate physical structures that he called “utopian environments” because they contained abundant food, water, and shelter. Calhoun observed that as populations outgrew their “utopias,” the members of the community became violent, cannibalistic, and suicidal. Calhoun coined the term “behavioural sink” to describe this phenomenon because eventually, infant mortality would become so high that the population diminished entirely. These studies generated a great deal of interest because they provocatively framed anxiety, depression, and crime as both products of the urban environment and symptoms of societal collapse. Calhoun's work seemed to offer explanations for many of the problems plaguing urban environments (Ramsden and Adams 748). As Edmund Ramsden points out, Calhoun was part of a larger group of scientists interested in the study of population density who used the laboratory as a way to identify how “various social, physiological or behavioural pathologies that emerged under conditions of extreme density could function as population control mechanisms” (“Traveling Facts” 229-30). However, Calhoun's work was distinct in the way he “relied on the descriptive power of his experiments. He told a story—and a dramatic one at that” (Ramsden “Traveling Facts” 231). Calhoun constructed a story about overcrowding that was at once zoomorphic of humans and anthropomorphic of rodents and thus blurred the lines between scientific animal modelling and analogical storytelling. Calhoun utilized

the structures of behavioural experiments and rodents as model organisms but, as Ramsden argues, he relied on the conventions of story and storytelling to organize and communicate his findings. Perhaps seizing this emphasis on story, Calhoun's work inspired a range of popular representations of overcrowding, from Tom Wolf's *The Pump House Gang*, a series of short stories surrounding an infamous New York City gang; J.G. Ballard's novel *High-Rise*, about a disintegrating science-fictional luxury condo building overrun by violent gangs; to the comic and movie franchise *Judge Dredd*, centered on a biologically enhanced super-cop as he faces the extreme violence of the apocalyptic cityscape in a distant future (Ramsden and Adams 768-69). Central to these representations is the notion that overcrowding leads to violent behaviour that poses a fundamental threat to social order—if not the total collapse of humanity itself.

Of all the influence Calhoun's work has had on popular literature, one stands out as an anomaly: Robert O'Brien's science fiction/fantasy novel for children, *Mrs. Frisby and the Rats of NIHM*, which tells the story of a single-mother field mouse, as she tries to relocate her family to avoid being ploughed over by the expansion of a nearby farm garden. Mrs. Frisby's quest leads her (with the help of the wise old mouse, Mr. Ages) to a group of hyper-intelligent rats who agree to help her fulfill a debt they owe to her late husband, Jonathon. After becoming acquainted with the rats, she learns that they the survivors of a laboratory experiment that left them with unnatural intelligence and long life. Mrs. Frisby also learns of their grand plan to start a utopian rat civilization in the nearby mountains that will forever shun the society of humans and live independently by its own labours. *Mrs. Frisby and the Rats of NIHM* is unique amongst all the literary

works inspired by Calhoun's experiments because it is the only text written for a young audience and it features rodents as the central protagonists. Whereas the works mentioned above tell stories of humanity at war with itself amongst the crumbling infrastructure of a civilization that can no longer function, *Mrs. Frisby and the Rats of NIHM* tells a more upbeat story of a community of animals trying to build their own society outside of the reach of humans. However, below the surface of this upbeat animal story contains darker themes of death, starvation, sickness, social hegemony, and animal exploitation. I draw attention to Calhoun's influence on the novel not to argue that it can (or should be) mapped directly onto Calhoun's experiments; instead, I foreground the relationships between the epistemological structure of the model organism and anthropomorphic animal characters to reveal how the seemingly disparate forms of animal representation utilized by each discipline actually function quite similarly. I also extend this comparison by showing that while literary model organisms may rely on a similar representational strategy, literature can intervene in scientific narratives.

Previous scholarship on the novel is split between early reviews and responses that focus on the pedagogical applications of the novel in the classroom, praising its focus on literacy and tackling difficult moral issues (Seiter 51; Pauly 224). More recent animal studies scholarship positions the novel as a critique of speciesist discourses of animal agency and subjectivity embedded in the practice of animal experimentation. For instance, in her analysis of the cultural politics of animal agency and science fiction Amy Ratelle argues that the novel presents the laboratory as “a site of intersection between human and animal that [...] serves to undermine an exclusively human notion of

subjectivity” by demonstrating that “the borders between human and animal are permeable and [are in fact] continually in flux” (103). Similarly, Catherine Elick outlines how the novel’s engagement with science fiction and fantasy tropes “stimulates in readers reflection and dialogue about how humans might respond more tolerantly to advances in animal agency” (211). In this chapter, I complicate this line of criticism by examining how O’Brien’s novel exhibits a more complex engagement with science and the model organism that *both* draws on its representational formula by using animals as analogies for human society and subverts this representation by challenging conceptions of model organisms as experimental objects.

As such, the present chapter is more speculative and experimental than the other two in this dissertation because unlike *White Teeth* and *Flowers for Algernon*, its relationship to Calhoun’s experiments complicates the representation of model organisms in *Mrs. Frisby and the Rats of NIH*. I read *Mrs. Frisby and the Rats of NIH* alongside Calhoun’s experiments to understand how the novel appropriates the human-animal symbolism of the model organism by reconfiguring it into a classic form of literary anthropomorphism commonly utilized in children’s literature. I suggest that O’Brien’s animal characters roughly follow two specific threads of Calhoun’s experiments that map onto the mice and rats: his early work on the social pathology of group stress and his later work on cultural evolution. I argue that O’Brien also challenges Calhoun’s experiments by exploring questions of animal agency through a diegetic interlude in the text that tells the story of the rats of NIMH.

This chapter is divided into two parts that correspond with the two narrative threads of the novel: first, the frame narrative of Mrs. Frisby and her plea to the rats for help to save both her home and her son; second, Nicodemus' story about the rats of NIMH. In Part One, I consider the concept of the model organism as a device for formulating ideas that shuttle between humans and animals. I analyze how the initial characterizations of Mrs. Frisby, her family, and the rats of NIMH loosely follow two phases of Calhoun's research. While Mrs. Frisby and her family implicitly extend Calhoun's fears of human social collapse, what he called the behavioural sink, the rats of NIMH represent Calhoun's later research that sought to “ameliorate” the pathological effects of the behavioral sink by instigating “cultural evolution” and technological ingenuity in rats (“Scientific Quest” 20). I argue that the frame narrative that circulates around Mrs. Frisby’s struggles replicates the broad narrative structure of Calhoun’s experiments that positions a crisis of motherhood, reproduction, and futurity that require the help of scientific intervention. The rats of NIMH are thus positioned as human-animal hybrids that ultimately save Mrs. Frisby and her family in ways that reflect the aspirations of Calhoun’s utopic experiments. In Part Two, I consider Nicodemus’ first-person account of experimentation and escape from NIMH as a *mise en abyme* that, when read in relation to the novel’s engagement with Calhoun’s work, offers a critique of the notion of the model organism. However, there remains a discursive ambivalence about the relationship between the model organism and the wild animals because the text seems to suggest that the only way animals like mice and rats can escape persecution from humans is to become humanlike themselves. I argue that this ambivalence reflects

discourses of model organisms in the biological sciences and the biotechnology industry where model organisms signify an ‘advancement’ of certain animal species ‘beyond’ their animality and thus approach a technological humanism—but one that fundamentally ties them to human science as tools.

Part One: Thinking with Model Organisms in Science and Literature

“We make a world, and put people in it:” Heuristic Animals, Literary Models, and Anthropomorphic Characters.

In an essay on *Mrs. Frisby and the Rats of NIMH*, Sarah Conly, the daughter of Robert C. O’Brien, recalls that her father visited NIMH “where he actually saw rats being tested for intelligence” (205). However, as she states further, “those rats (as far as we know) never became any smarter and never escaped to form a new civilization. The idea set him thinking, though, and what it seems to have made him think is that greater intelligence could lead to a better civilization—one where people are more egalitarian, more just, and simply more kind” (205). Conly goes on to make a case for the novel as a didactic young adolescent novel that offers readers a robust exploration of how human society requires that humans be responsible to each other (Conly 206). The question of literature’s ability to teach or instruct people on moral or ethical problems is central to Conly’s argument. The rodents and their connection to scientific research are the focal points of her discussion, and she uses them to pivot between Calhoun’s science and her father’s literature: the rats in *Mrs. Frisby and the Rats of NIMH* seem to gain importance through a symbolic relationship with the rodents in Calhoun’s NIMH laboratory. I mostly agree with Conly about the influence of Calhoun’s experiments on how her father

conceived of the novel, its message of ethical responsibility, and that genetically modified rats could show us how to construct a better society. However, *Mrs. Frisby and the Rats of NIMH* has a more complicated relationship to Calhoun's science than Conly gives it credit for. The novel certainly draws from Calhoun's experiments, but it also challenges and contradicts how they position model organisms as narrative devices for Calhoun's grim and pessimistic message about human society.

As Conly points out, her father died shortly after the publication of *Mrs. Frisby and the Rats of NIMH* and thus we can only speculate about the extent to which Calhoun's experiments influenced his work (205). However, in his 1974 Newberry Prize acceptance speech, O'Brien discusses at length how he conceived of the rodent characters in the novel as moral and ethical heuristics for childhood education. O'Brien begins his acceptance speech by reflecting on the two most common questions he is asked as the author of *Mrs. Frisby and the Rats of NIHM*. "One is quite sensible, the other quite incredulous" O'Brien explains, "The sensible one is: Why do you write books for children? The incredulous one is: why, with all the world to choose from, did you have to write about *rats*?" (83; original emphasis). His answer to the first question seems pretty straightforward: "because it is good for children to read books" (85). However, this answer takes on a much more complex connotation in light of his answer to the second question:

I had been, and still am, concerned over the seeming tendency of the human race to exterminate itself—and who is not? I have wondered: If we should vanish from the earth, who might survive us? What kind of civilization might survive ours? [...] This, of course, is not precisely what *Mrs. Frisby* is about. In the book, there is no war and the human race has not been exterminated [...] I suppose it's a rather grim idea to serve as a background to a children's book. But once I got

started, the rats took charge, and they turned out to be much saner and much more pleasant than we are. (O'Brien *Newberry* 84-85)

O'Brien's reflection upon the origins of the novel shows us that this text is deeply rooted in his despair about the history of human civilization that rivals Calhoun's experimental pathologies. However, the difference between the two is that O'Brien turned to animal stories as a way to help him come to terms with the dark realities of human existence by imagining an alternative form of social organization that is less anthropocentric. O'Brien's emphasis on human-animal cohabitation is particularly noteworthy given that his story features two of the most widely despised animal species. His answer to the second question reflects two interrelated justifications for the hatred of rats (and mice): they reproduce very quickly and thrive in human society despite our best efforts to eradicate them. Perhaps more interestingly, O'Brien's speech indicates that it was precisely these qualities that made them good literary characters. I suggest that more than merely rodents' cultural identity as vermin and pests, O'Brien was drawn to mice and rats because of Calhoun's research—and hence their use as model organisms. Toward the end of O'Brien's *Newberry* speech he expands what he sees as the moral and ethical function of literature:

We may be happy that our society is not yet perfect. Still we must not strive for imperfection; it is contrary to our nature. We cannot go around taking the knobs off all the doors so they won't open, merely because it would keep our minds alert. Or can we? Of course, we can. That's what books are all about—books of fiction, at least. We make a world, and put people in it, and make things go wrong, all without making doing any damage at all to the real world [...] when a child (or an adult) reads a book, I think his mind is getting pretty much the kind of exercise it gets when it deals with real life problems [...] from books [the child's mind] learns that it is not that doors are simply open or shut, and that even rats can become heroes. (*Newberry* 87-88)

O'Brien understands children's literature as a heuristic tool for shaping the minds of young readers by offering them the space to think through otherwise sensitive moral and ethical problems (such as the death of a parent or sibling's illness). That O'Brien positions rats so prominently in his theory—even as heroes—suggests that he considers anthropomorphic animal characters to be a large part of how literature provides a speculative space for children to reflect on and internalize moral lessons.

Anthropomorphic animal characters offered O'Brien a way to create, as Burke and Copenhaver argue, “the intellectual or emotional distance” to encounter difficult social issues by letting the animal characters “take risks and absorb the punishments when plans fail or solutions fall through” (212). However, as O'Brien's speech suggests, it is important for children to empathize and identify with animal characters on a personal level. While this general formula in itself is not out of the ordinary for children's literature, O'Brien configures anthropomorphic characters as *literary models* by adapting the representational formula of the model organism—that directly maps humans onto animals while allowing the animal to retain its distinct form—into literary representation.

As Erica Fudge points out, identification with literary animal characters changes depending on how the story positions the relationship between the characters' human and animal attributes. Fudge distinguishes between three forms of anthropomorphism in children's literature. First, she argues that the anthropomorphism of *The Wind and the Willows* is both “all-encompassing” and “invisible” because it maps human characteristics completely overtop of animal characters thus inviting the reader to “forget that animals are animals” (Fudge 71-72). Second, in *Charlotte's Web*, anthropomorphism

is slightly more visible asking its readers “to believe that animals can speak to each other, but also makes it clear that [readers] are privileged to hear them” (Fudge 73). More specifically, *Charlotte’s Web* positions children as arbitrators or confidants to the animal world because Fern, the central character, is the only human able to hear the animals’ conversations. In *Lassie Come-Home*, yet another form of anthropomorphism is at play, one that is more distant and “pseudo-documentary” than the other two novels where we gain no insight into the mind of an animal character but are presented with “a human interpretation of a canine situation” (Fudge 74-75) that is external to the animal character. Fudge's point is that each of these stories involves a different speculative vision of human-animal relationality that impacts how animals signify as either simple conduits for human stories, semi-symbolic companions that teach children lessons about death and vulnerability, or as sentient creatures who have the ability to communicate with us in their own ways. In other words, the extent to which human qualities over-write animal qualities effects how we read characters as either symbols of human or animal stories.

In *Mrs. Frisby and the Rats of NIMH* anthropomorphism functions much more dynamically than Fudge’s examples because there are different forms of anthropomorphism at play in the novel and thus the animals represent different types of speculative engagement. Catherine Elick argues that the novel maintains such a dynamic representation of animal characters by alternating between “naturalistic” and science fictional modes of storytelling (211-12). Extending Elick’s initial observations, these two anthropomorphisms map onto *Mrs. Frisby* and the rats of *NIMH* respectively. O’Brien uses these different anthropomorphisms to “model” different moral messages by

mobilizing different types of rodent animality through representations of the “wild” mouse and the “laboratory” rat.

The text describes Mrs. Frisby in terms of her naturalistic and animal features: she “hops” while foraging, uses her “forepaws” and “sharp teeth” to de-husk corn, and “lope[s] along briskly, moving in the easy, horse-like canter mice use when they are trying to cover ground” (O’Brien *Mrs. Frisby* 6, 7, 13). Furthermore, the text continually ties Mrs. Frisby’s ‘naturalistic’ features to her role as a single mother. This dual characterization of Mrs. Frisby as a naturalistic mouse and single mother structures the plot of the novel’s framing narrative, for as the opening lines state:

Mrs. Frisby, the head of a family of field mice lived in an underground house in the vegetable garden of a farmer named Mr. Fitzgibbon. It was a winter house, such as some field mice move to when food becomes too scarce, and the living too hard in the woods and pastures. In the soft earth of a bean, potato, black-eyed pea and asparagus patch there is plenty of food left over for mice after the human crop has been gathered. (O’Brien *Mrs. Frisby* 3)

This initial characterization of Mrs. Frisby simultaneously sets up the *mise en scene* of the novel and what I will call the terms of her anthropomorphism: Mrs. Frisby lives in a garden owned by a human farmer, and she survives each winter by feeding off the excess waste from the harvest each fall; Mrs. Frisby is mostly an animalistic animal, but we are to interpret her situation *as if* she were a human mother who lives in an “underground house”. However, since Mrs. Frisby’s world is given to us both in terms of her domestic role as sole provider and in relation to the human farm that provides her family with food, this *as if* is flexible because we know that human characters also exist in the story. Mrs. Frisby’s anthropomorphism is more prominently animalistic, but it is altered by a humanization of her family’s place on the farm: the Frisby’s do not merely exist on the

farm as *pests*, but rather they are a *family* (of humanlike mice) that lives off the excesses of human agriculture.

The text builds off this initial naturalistic anthropomorphism on the next page by subtly extending Mrs. Frisby's humanism and elaborating on her situation: "although she was a widow (her husband had died only the preceding summer), Mrs. Frisby was able, through luck and hard work, to keep her family—there were four children—happy and well fed" (O'Brien *Mrs. Frisby* 4). This elaboration on Mrs. Frisby's initial characterization as simply the "head of a family of mice" (O'Brien *Mrs. Frisby* 3) adds a socioeconomic critique to her character and the message of the story by reframing her as disenfranchised. Mrs. Frisby's anthropomorphism thus imprints narratives of family cohesion and single motherhood onto the framework of her mouseness or her mousey form. Further, both elements of her anthropomorphism come together in the story to make Mrs. Frisby a heroic underdog for, as Amy Ratelle argues, she is "the pivot on which the narrative turns. Her activities motivate the web of [interspecies] interdependence around which the novel is structured" because of the great lengths she goes to save her son (105).

While O'Brien describes Mrs. Frisby in terms that revolve around the family and the domestic, he describes the rats in much more humanistic anthropomorphic terms. In their first appearance in the text, Mrs. Frisby observes them "marching" toward the barn to retrieve a section of wire and "hauling it laboriously through the grass, inching it along in the direction of a very large, wild rosebush" (O'Brien *Mrs. Frisby* 37). Then, after they disappear into the rosebush, she reflects that they "looked as well drilled as a group of

soldiers” (O'Brien *Mrs. Frisby* 37-38). Mrs. Frisby's initial observation of the rats establishes a contrast between the rats as genetically enhanced beings and herself as an ordinary wild field mouse. As such, the terms of the rats' anthropomorphism are different from Mrs. Frisby's precisely because their abilities are science fictional: they build with human materials, they work together as a team, and have a central organization. The full extent the rats' science fictional anthropomorphism is not revealed however until after Mrs. Frisby's son Timothy becomes ill, forcing her travel to their colony seeking help. Once Mrs. Frisby is inside the colony, the rats lead her through a series of technologically advanced spaces that build off her initial characterizations of their behaviour by revealing the extent of their abilities:

The tunnel led gently downward, and after the first dozen steps they were in darkness. Mrs. Frisby could see nothing at all. Behind her Mr. Ages limped along; ahead she could hear the scuffle of Justin's footsteps. She followed the sound blindly. Then she heard his voice [...] 'The dark part doesn't last long.' Now what did he mean by that? She thought it over for a minute or two as she walked and had just decided to ask him, when to her surprise she saw ahead of her a faint glow. A light! But how could there be a light down so far? [...] Ahead of her stretched a long, well-lit hallway. Its ceiling and walls were a smoothly curved arch, its floor hard and flat, with a soft layer of carpet down the middle. The light came from the walls, where every foot or so on both sides a tiny light bulb had been recessed and the hole in which it stood, like a small window, had been covered with a square of coloured glass. [...] Justin was watching her and smiling. 'Do you like it?' The carpet and the coloured glass we don't really need. Some of the wives did that on their own, just for looks. They cut the glass, believe it or not, from old bottles. 'It's beautiful,' Mrs. Frisby said. 'But how...'" (O'Brien *Mrs. Frisby* 76)

As an initial introduction to the colony, this scene establishes a kind of exceptionalism around the rats by juxtaposing their mastery of electricity and civil engineering against Mrs. Frisby's awe and surprise as well as her social disenfranchisement. The focus on electricity in this initial description of the rat colony has a symbolic component that

suggests her time with the rats will be illuminating and that the rats will use their skills both to help her relocate her home as well as teach her how to live more sustainably. This contrast shows that through teamwork and cooperation the rats avoid the kinds of problems that Mrs. Frisby has: the rats are thriving underground not only because of their intelligence but also because of their organizational skills and communal lifestyle.

The text further demonstrates the advantages of the rats' commune in the next scene when, after passing through a series of winding tunnels and using the rats' electric elevator, Mrs. Frisby enters the rats' assembly room:

They continued along the corridor, which curved always slightly to the right, so Mrs. Frisby could never really tell how long it was, and which soon began to incline more steeply into the ground. Mrs. Frisby noticed that the air, which should have been dank and damp so deep underground, was, on the contrary, fresh and clean, and she thought she could even detect a very faint breeze blowing past her ears as she moved. [...] The room before her was at least three times as big as the one they had just left, and corridors radiated from it in all directions as petals from a daisy. Directly opposite the elevator an open arch led into what looked like a still larger room—seemingly some kind of an assembly hall, for it had a raised platform at one end. And now there were rats. Rats by the dozens—rats standing and talking in groups of twos and threes and fours, rats walking slowly, rats hurrying, rats carrying papers. (O'Brien *Mrs. Frisby* 78-79)

Up to this point, Mrs. Frisby has encountered no other rats than those she initially met upon entering the colony because there is an assembly taking place to decide the future of the rat colony and its relocation to the nearby mountains (O'Brien *Mrs. Frisby* 80). Thus, when Mrs. Frisby enters the assembly hall, nearly the entire population of the colony is in that room. This scene demonstrates the level of organization the rats have achieved with their use of human technology and their enhanced abilities. Whereas the focus of the previous scene was on the technical aspects of the colony, here, the spatial dimensions of the assembly room reflect the efficiency and scale of rat society and governance. Mrs.

Frisby's tour elaborates on the terms of the rats' anthropomorphism: the rats are animals like Mrs. Frisby in their outward appearance, but they are more humanlike in their actions and behaviours. Furthermore, the rats' anthropomorphism is more complicated than Mrs. Frisby's (whereas I mentioned above, we read her *as if* she were a human mother) because the *as if* of their human qualities are more intellectual. While Mrs. Frisby and the rats share a base communicative framework when they interact with one another *as if* they were the same kind of human, the rats have added superhuman abilities that exceed that of the reader.

The point of this extended outline of anthropomorphism in the novel is to demonstrate how the text builds different ideas into each set of characters so that the interplay of their human and animals characteristics—the terms of their anthropomorphism—models these ideas within the story. The biggest question left open is: what is the difference between a literary character and a literary model—or a scientific model for that matter? I approach this question in the next section by applying philosophy of science scholarship on the relationship between literature and scientific models to the characters in *Mrs. Frisby and the Rats of NIMH* in order to speculate about their connections to Calhoun's experiments.

“For an animal so complex as man:” Heuristic Fictions, Fabular Models, and Calhoun's Influence on *Mrs. Frisby and the Rats of NIMH*

Up until this point, I have analyzed how O'Brien's concept of the heuristic animal character applies to *Mrs. Frisby and the Rats of NIMH* and illuminates how the text uses anthropomorphosis to position the characters as something approaching what I call a

literary model. In this section of the chapter, I shift focus slightly in order to talk about Calhoun's experiments, how they position model organisms as similarly heuristic, and to speculate about the relationship between the novel and the experiments. I argue that O'Brien's theory about literature as a "world" that he "puts people into" (O'Brien *Newberry* 87-88) resembles how philosophers of science configure the structural similarities between how literary and scientific representations create meaning by bringing together two (or more) words or meanings to learn something new about one or both of the words or meanings. While the philosophy of science scholarship uses literature to understand the scientific model, I am interested in what models can tell us about literature.

Max Black argues that scientific models are "speculative instruments" that provide scientists with "heuristic fictions" that allow them to imagine processes or phenomena that they can neither physically grasp nor see (*Models and Metaphors* 228). Black's theory of the model builds off his "interaction view of metaphor" that theorizes metaphoric statements as "systems of associated commonplaces" attached to individual words that make up the two components of the metaphor ("Metaphor" 285, 289). Further, the connections between associated meanings prompt the reader to selectively focus on the properties of each system that make the connections possible. This process of "interaction" leads the reader to see both words (and their associated meanings) in a different light. As Mary Hesse elaborates, using the fabular metaphor "man is a wolf" as an example, the two concepts "man" and "wolf" are influenced by their metaphoric comparison:

they seem to interact and adapt to one another, even to the point of invalidating their literal descriptions if these are understood in the new, post metaphoric sense. Men are seen to be more like wolves after the wolf metaphor is used, and wolves seem to be more human. Nature becomes more like a machine in the mechanical philosophy, and actual, concrete machines themselves are seen as if stripped down to their essential qualities of mass in motion. (163)

Black argues that this type of epistemic interaction is also central to how scientific models function because they (like metaphors) “require analogical transfer” of specific words and phrases (along with their associated meanings) as well as physical structures associated with the two elements of the model. For example, Black argues that in John Dalton's Billiard Ball Model (wherein racked billiard balls model the relationship between individual atoms and elements: the balls represent individual identical atoms, and the rack represents their containment within the element) the physical properties of the billiard ball and their use in billiards impacted how Dalton conceived of the concept of the atom as a spherical ball-like substance. Ultimately, Black is hesitant to align metaphor and models too closely, suggesting that perhaps an allegory or fable might be a better comparison (*Models and Metaphors* 238).

Building off Black's suggestion, Nancy Cartwright offers an extended analysis of the similarity between fables and scientific models. Following G.E. Lessing's theory that fables use simple, but “concrete,” animal narratives to “fit out” or “clothe” (qtd. in Cartwright 37) their moral message, Cartwright argues that scientific models transform abstract physical laws into concrete events (Cartwright 37). For example, in Dalton's Billiard Ball Model, the billiard balls “fit out” the abstract theory of atomic structure by applying a concrete form to conceptualize the theory. Cartwright uses a fable that Lessing wrote to explain his theory of fitting out: “A marten eats the grouse; A fox throttles the

marten; the tooth of the wolf, the fox” (qtd. in Cartwright 43). The moral of this fable, “the weaker are always prey to the stronger,” Cartwright argues, is difficult to grasp on its own, so it requires something “intuitive” and concrete to embody the moral message (Cartwright 37). Much like Black's theory of symbolic transfer, Cartwright's comparison between scientific models and fables revolves around bringing together two sets of ideas in order to create new meaning about either moral judgment or the physical world. However, Cartwright is more interested in how abstract ideas are communicated through other ideas that are considered more understandable because they draw on *associations that readers already understand*. In this sense, fables and models are still “heuristic fictions” (Black *Models and Metaphors* 228) that help conceptualize complicated ideas, but Cartwright's theory accounts for the epistemological work that *known* concepts or ideas do to make *unknown* concepts graspable. Cartwright's discussion of the fable echoes O'Brien's literary models because of how she positions the symbolic associations of animal fables in relation to scientific models. “In the fable Lessing proposes,” Cartwright argues,

the grouse is the stereotypical character exhibiting weakness; the wolf, exhibiting strength. According to Lessing, we use animals like the grouse and the wolf because their characters are so well known. We only need to say their names to bring to mind what general features they have—boastfulness, weakness, stubbornness, pride, or the like. In physics it is more difficult. It is not generally well known what the stereotypical situations are in which various functional forms of the force are exhibited. That is what the working physicist has to figure out, and what the aspiring physicist has to learn. [...] This point can be illustrated by looking at the table of contents of a typical mechanics textbook [whose job it is to teach] you which abstract force functions are exhibited in which stereotypical situations. That is like teaching you what everyone already knows about the grouse, that it is weak *vis-à-vis* the marten; or about the marten, that it is weak *vis-à-vis* the fox. (43; original emphasis)

The animals in Lessing's fable bring with them certain moral connotations from their historical place in the extended bestiary of western culture—from moral and political philosophy, fairy tales, and the biblical tradition. Animals are useful for fables because they provide a well-known and easily understood figure upon which the author can attach the moral of the fable by building on moral characters that are *already attached to animals*. In fables, the moral message and the animal characters coincide within an extremely minimal narrative framework that functions by stringing together abstract yet highly causal associations between animals. The moral of the fable functions as a verbal cascade (for example: marten *eats* grouse; fox *throttles* marten; wolf *kills* fox) where each subsequent clause relies on the one previous to make sense by narratively creating something approaching an epistemological shortcut between symbolic representations and their underlying ideas. Cartwright argues that models in science use a kind of epistemological shortcut similar to fables that allow for an abstract representation to stand in for something as complex as a force function without having to recall all the intricate details of how that force acts on objects in the physical world.

Cartwright is interested in this comparison solely in terms of how the fable and the model function; however, I want to extend her discussion to see what happens when the model in question is an animal. Because Cartwright (and Black for that matter) speaks exclusively about models in physics, she does not consider the roles that animals play in the life sciences where the line between science and morality is not so clear-cut. Cartwright's formulation of the fabular model is more complicated when applied to model organisms because there are two sets of ideas attached—the stereotypical

anthropomorphic characteristics that Cartwright and Lessing identify as well as the scientific associations generated by experimentation.

In Calhoun's experiments, the fabular implications of model organisms are very close to the surface because he often uses highly abstract moral issues to frame the implications of his research findings. Furthermore, Calhoun attaches moral frameworks to the species identities of his rodent models in order to create a chain of associations that links the background associations of wild rodents (their identities as plague-like pests and disease carriers) to his rodent model organisms and thus to the types of social pathologies he extrapolates to human society through their behaviour. For instance, in the opening sentence of “Death Squared: the Explosive Growth and Demise of a Mouse Population,” he makes a provocative analogical statement that positions mice as a kind of rhetorical lens through which we can read the fate of the human species:

I shall largely speak of mice, but my thoughts are on man, on healing, on life and its evolution. Threatening life and evolution are the two deaths, death of the spirit and death of the body. Evolution, in terms of ancient wisdom, is the acquisition of access to the tree of life. This takes us back to the white first horse of the Apocalypse [...] set out to conquer the forces that threaten the spirit with death. Further in Revelation (ii.7) we note: ‘To him who conquers I will grant to eat the tree of life, which is in the paradise of God’ and further on (Rev.xxii.2): ‘The leaves of the tree were for the healing of nations.’ (“Death Squared” 80)

Three major theoretical movements in this opening paragraph establish the primary epistemological framework for the paper. First, by stating that he will “speak of mice” but that his “thoughts are on man” (“Death Squared” 80), Calhoun announces that the ideas that are contained in the paper will be based on the behaviour of mice but that the reader is to understand these behaviours as analogies for human society. He announces that the experiments he refers to are structured around the concept of the model organism.

Second, he identifies the primary symbolic concept of the paper, the second death (or the slightly more mathematical, “death squared”). The second death is a Judeo-Christian concept found in the book of Revelation that refers to the eternal punishment of the unsaved people after the apocalypse. Calhoun also indicates that he understands the notion of second death in terms of evolution: rather than a literal punishment, he interprets second death as an evolutionary death of the species. Third, Calhoun elaborates on the second death by quoting two bible passages that define the concept and suggest that he considers the perpetuity of the human species as a kind of immortality. Both of these two quotes refer to the rewards of salvation and being part of the new kingdom of heaven on earth.

In keeping with Calhoun's interpretation of salvation-as-evolutionary-perpetuity, the bible quotations support the primary moral message that the paper: human civilization is in a state of degeneration that is equivalent to a kind of evolutionary apocalypse. Coming back to the first point, mice play two roles in Calhoun's framing: symbolic (or fabular) and modelistic. The interconnection of these two roles is more apparent in the next two paragraphs where Calhoun cites another quote from the *Book of Revelations* and maps the quote onto the ecology of mouse populations. “This takes us to the fourth horse of the Apocalypse (Rev vi. 7),” Calhoun continues, quoting from the Bible:

‘I saw...a pale horse and its rider's name was Death, and Hades followed him; and they were given power over a fourth of the earth, to kill with the *sword* and *famine* and with *pestilence* and by wild *beasts* of the earth.’ This second death has gradually become the predominant concern of modern medicine. And yet there is nothing in the earlier history of medicine, or in the precepts embodied in the Hippocratic Oath, that precludes medicine from being equally concerned with healing the spirit, and healing nations as well as healing the body. (“Death Squared” 80; original emphasis).

Again, Calhoun connects the Bible with science by referring to medicine’s primary objective as the maintenance of the human species. Calhoun uses the conception of medicine as a backdrop for his comparison between mammalian ecology and the third biblical plague, “pestilence.” As Georgie Carroll points out, pestilence is specifically referred to in other books of the Bible as a plague of mice and given his introduction to the paper it is not too much of a stretch to assume that Calhoun references the plagues of Revelation in order to evoke cultural perceptions of mice as a plague-like species (25). Calhoun capitalizes on connections between the pestilence of mice and his definition of the behavioural sink by directly mapping the biblical causes of the apocalypse he references at the beginning of the paper onto what he calls the “five mortality factors” (“Death Squared” 81) of animal ecology:

The Second Death

<i>As in Revelation vi.8</i>	<i>Ecological expression</i>
(1) Sword	(1) Emigration
(2) Famine	(2a) Resource shortage
	(2b) Inclement weather (and fire and cataclysms of nature)
(3) Pestilence	(3) Disease
(4) Wild beasts	(4) Predation

Figure 5. “Table One: The Second Death.” Reproduced from John B. Calhoun’s “Death Squared: The Explosive Growth and Demise of a Mouse Population,” pp. 80.

This table serves as an extension of his biblical apocalypse imagery mentioned above; it also marks a rhetorical transition in how the paper frames mice as “evidence” of his theory of the behavioural sink. The table transfers highly moralized biblical concepts into the language of mammalian ecology and ultimately serves as the structure for Calhoun's

analysis of his experimental environments—what he alternately refers to as “utopian environments” (“Death Squared” 81) and “morality-inhibiting environments” (“Death Squared” 82). The “five mortality factors” (“Death Squared” 81) on the right-hand side of the table represent the major theoretical framework behind Calhoun's experiments that induced the behavioural sink by placing groups of mice in enclosed spaces without the presence of these “mortality factors.”

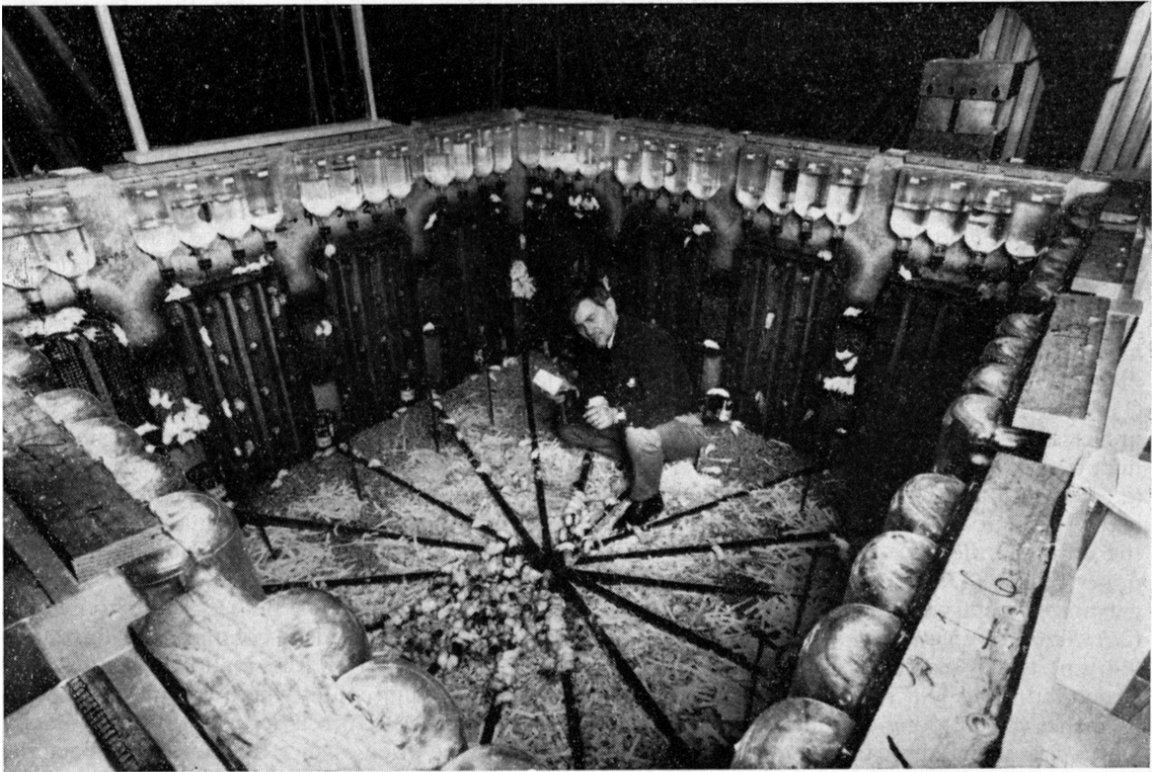


Fig 1 *Universe 25, February 10 1970, 681 days after colonization. Calhoun in universe with an exceptionally large aggregate of pooled withdrawn mice on the floor just across the centre of the floor from him. Note the aggregation of mice on some food hoppers in contrast to their near absence on others. This is the ‘behavioural sink’ phenomenon in which the learned need for proximity to others as a secondary reinforcer at a resource site gains dominance over the primary need, in this case food. Photo by Yoichi R Okamoto*

Figure 6. John B. Calhoun in “Universe 25.” Screenshot from John B. Calhoun’s “Death Squared: The Explosive Growth and Demise of a Mouse Population,” pp. 81.

With my discussion of anthropomorphism in *Mrs. Frisby and the Rats of NIMH* in mind, I argue that a dual epistemological layering is also present in the animal characters:

while the basic structure of the characters' anthropomorphoses function as I outline them above, they also contain traces of Calhoun's fabular model associations. Mrs. Frisby's Calhounian counterpart resides in his social pathology experiments such as “Death Squared,” while the rats of NIMH are influenced by later experiments on how to ameliorate social pathologies such as the behavioural sink. In the novel, these two sets of ideas come together to build the structure of the framing narrative where Mrs. Frisby represents a crisis in social cohesion, and the rats are tasked with the amelioration of social pathology.

One of Calhoun's last published articles, “Scientific Quest for a Path to the Future,” outlines three concurrent research projects at his NIMH laboratory during the early 1970s: one overcrowding experiment that replicates those detailed in “Death Squared” involving mice, and two new “culture inducing” experiments involving rats. Calhoun brings these experiments together under a common theme of human salvation-as-evolutionary-perpetuity that echoes “Death Squared;” however in this paper, he theorizes rodent behaviour in sociological rather than biblical terms. “We believe,” Calhoun writes, “that these studies can influence the path of the human future. Animals and humans live in a threefold environment. They live in a physical setting; they are embedded in a social milieu; and they inhabit a conceptual space in which events have meaning” (“Scientific Quest” 20). Calhoun links human and animal society not to discuss the somewhat radical assertion that animals do indeed exhibit society, but rather to set up his comparison in terms of animals' ability to model human behaviour. Again, while this model follows a similar logic as his previous research, here, he is focused explicitly on

group behaviour as an information network that can be manipulated to generate stronger social bonds rather than the breakdown of social bonds.

The primary difference between the pathology-inducing and culture-inducing environments are several special features that fostered “creative learning” and cooperation such as the “cooperative drinking device” (labeled “C” in Figure 5) that required a rat to enter the device and press a lever so that other rats could drink.

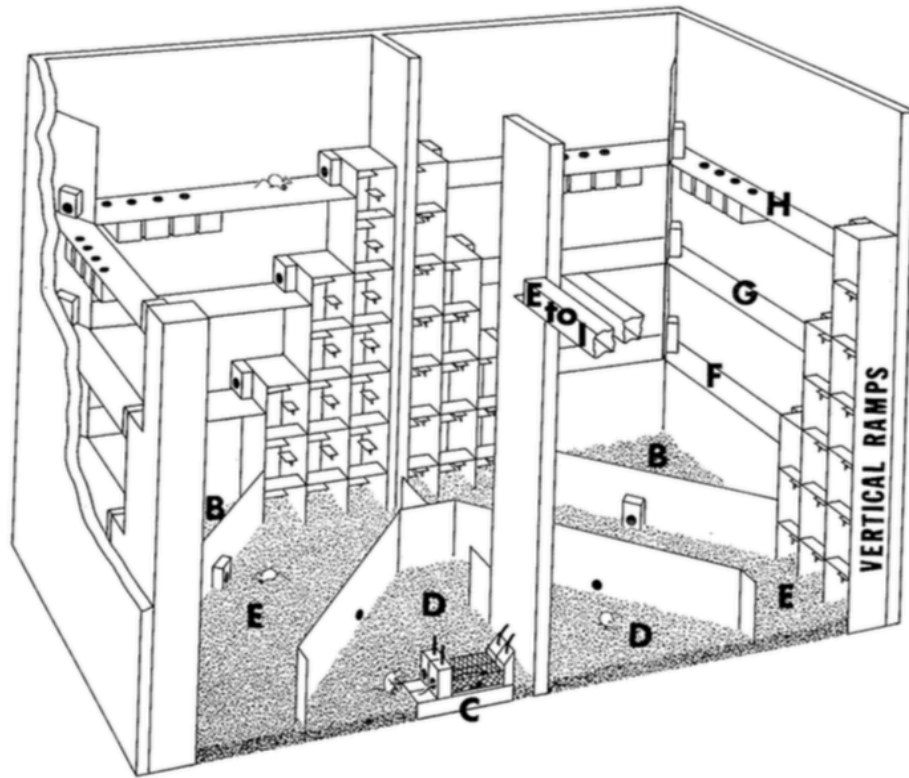


Figure 4. Culture-inducing universe for rats.
The front wall of this 9 x 18 x 12 ft. (2.74 x 5.49 x 3.66 meter) space is removed. B = food resource compartments, C = a “STAW”, a cooperative drinking device. D = water resource compartment containing 4 STAWS. E = public, intercompartment, space. F, G, H = residential compartments, shelves with suspended nest boxes. E to I = part of 2 ramp and tunnel systems leading to two 9 x 9 x 12 feet (2.74 x 2.74 x 3.66 meters) cooperative, creative, learning spaces. An identity recording portal is attached to each opening between compartments, such as between B and E.

Figure 7. “Culture-Inducing Universe for Rats” Screenshot from John B. Calhoun’s “Scientific Quest for a Path to the Future,” pp. 24.

Calhoun theorized both that the newly designed environments “should weave the population into a communication network and produce a nearly three-fold increase in individual capacity for coping” with overcrowding (“Scientific Quest” 25). Furthermore, Calhoun argued, “if our hypothesis is confirmed we will have gone a long way toward establishing the central principle of evolution: systems with enhanced capacities to acquire, process and utilize information are more likely to survive” (“Scientific Quest” 25). In other words, Calhoun sought to establish a mechanism for utilizing information to promote evolution and thus stop pathological behaviours from occurring. Calhoun states that his motive for replicating the mouse experiments was to refine his pathology-inducing methodology and to determine,

how and why a history of increased crowding so interferes with brain function and maturation that individuals become incapable of expressing their most complex behaviours. The human animal produces ideas as well as themselves. For humans, producing and using ideas represents their most complex behaviour. A comparable history of crowding might eliminate this, our most complex behaviour. Would we then be threatened with extinction? (“Scientific Quest” 22).

In this passage, while he does not mention the concept by name, Calhoun equates the behavioural sink with the breakdown of humans' ability to “produce and apply ideas.” While it is difficult to determine what Calhoun means by a “history of crowding might eliminate [...] our most complex behaviour,” his provocative question implies that he thought an extended behavioural sink would eliminate our species' ability to produce and use ideas, resulting in the extinction of our species. Calhoun argues that such a breakdown in human thought is the result of a breakdown in all childrearing behaviour that both stops the passing of information between generations and a dramatic increase in infant mortality (“Scientific Quest” 22-23). Calhoun positions the questions raised by this

experiment as those he intends to solve with the other two experiments outlined in the paper.

Thus, in “Scientific Quest,” the pathological behaviors of mice stand in for pathological behavior itself and are associated with large-scale behavioral events that are contrasted against the individuality and social abilities of the rats in the next two experiments who were chosen because of their “relatively high development of social behavior” (“Scientific Quest” 22). Calhoun also qualifies his choice of rats by explaining that while “of course, [the rat] has a much smaller brain than humans,” the primary objective of the experiment was to “simply encourage them to acquire sufficient culture, compatible with their small brains, to offset the pathologies produced by an eight-fold increase in density above the optimum. Just as our forefathers shaped our culture for us, so we as researchers will provide culture for our rats” (“Scientific Quest” 22-23). The familial metaphor in this statement confuses the biological and cultural similarities of rats while also denying that the rats themselves have their own cultures and thus don’t need to “inherit” ours—or for that matter, the possibility that humans and rats “evolved” together and that our social networks already mirror each other.

As such, much like Mrs. Frisby’s visit to the rat colony where her observations establish a discursive platform for the novel to explore the exceptionalism of the rats, in “Scientific Quest,” Calhoun pivots from a brief description of the first mouse-replica experiment to a detailed outline of the two cultural-inducing rat experiments. I am not suggesting that *Mrs. Frisby and the Rats of NIMH* maps identically onto Calhoun’s articulation of this experiment but that certain similarities suggest O’Brien replicated

some of the more basic narrative elements of Calhoun's comparison of mouse and rat studies. With this in mind, we can read the novel's preoccupation with a crisis of childrearing that brilliant rats have to resolve as a kind of Calhounian framework. The central conflict of the novel reflects Calhoun's focus on infant mortality as the most devastating result of the behavioural sink and the ultimate cause of the resulting population crash.

For instance, in the paragraph following the announcement of Mrs. Frisby's widowhood, the narrator describes Timothy's illness: "Then, one day at the very end of February, Mrs. Frisby's youngest son, Timothy fell sick" (O'Brien *Mrs. Frisby* 4). Timothy's illness is an extension of Mrs. Frisby's disenfranchisement as a single mother because she has to balance treating his illness with finding a new home. The narrator's description of Timothy's physical disposition expands on Mrs. Frisby's troubles and provides the primary link between the Frisby household and the rats of NIMH by requiring her to seek help from the rats:

He was the thinnest of her children and had a dark complexion like his father and brother. He was narrow in the face; his eyes were unusually large and bright, and shone with the intensity of his thought when he spoke. He was, Mrs. Frisby knew, the smartest and most thoughtful of her children, though she would never have admitted this aloud. But he was the frailest, and when colds or flu or virus infections came around he was the first to catch them and the slowest to recover. He was also—perhaps as a result—something of a hypochondriac. But there was no doubt he was really sick this time. His head felt as if he had a high fever, and his pulse was very fast. (O'Brien *Mrs. Frisby* 10)

This description of Timothy's illness reinforces the centrality of Frisby's motherhood through her careful observations of his symptoms, but his characterization as a runt and a hypochondriac also reflects a degree of Calhounian pathological psychology. Timothy's

health, general demeanour, and physical fitness firmly root the inciting incident of the novel's frame narrative within Mrs. Frisby's struggle to maintain a healthy and productive domestic space.

While the novel resists the negative connotations of Calhoun's experiments, the rats serve a similar purpose in the frame narrative: they are a solution to the social problems on the farm by both curing Timothy and relocating the Frisby family. The rats' abilities reflect Calhoun's experiment in two primary ways: they revolve around ingenuity and intelligence, and they allow the rats to form human-like culture. While I will expand on the implications of their abilities in the next part of this chapter, here I want to briefly discuss how these abilities are explained the final scene of Mrs. Frisby's tour when she meets Nicodemus, the leader of the rats in the colony's library:

Mrs. Frisby looked around her. The room—the library, Nicodemus had called it—had, in addition to its shelves of books several tables with benches beside them, and on these were stacked more books, some of them open. Books. Her husband, Jonathan, had told her about them. He had taught her and her children to read (the children had mastered it quickly, but she herself could barely manage the simplest of words; she had thought perhaps it was because she was older). He had also told her about electricity. He had known these things—and so, it emerged, did the rats. It had never occurred to her until now to wonder how he knew them. He had always known so many things, and she had accepted that as a matter of course. But who had taught him to read? (O'Brien *Mrs. Frisby* 81-82)

This scene establishes the library as a place where knowledge is revealed and connects Mrs. Frisby to the rats through her husband's past. Further, by symbolically linking the rats' mastery of electricity with their literacy, the text positions reading as a technology that has allowed them to attain their advanced culture. As Mrs. Frisby investigates the library, she realizes that it doubles as both a classroom and the place where they strategize about how to achieve their ultimate goal of complete self-sufficiency from

humans and human technology that they call “*The plan of the rats of NIMH*” (O’Brien *Mrs. Frisby* 83; original emphasis). Furthermore, the plan itself reflects Calhoun’s framing of his rat experiments in “Scientific Quest” because of its utopic qualities: the plan serves throughout the story as an answer to all of the rats’ problems because once the plan has been carried out the rats will have attained community without predation or intrusion (human or otherwise).

What does this extended comparison of *Mrs. Frisby and the Rats of NIMH* and Calhoun’s experiments tell us about how literature and science use representations of animals? As I have demonstrated throughout this section, while the structure of literary and scientific representations are similar, the end to which each discipline uses these representations remains very different. For instance, while much of the plot of the novel has been influenced by Calhoun’s research, giving its representation of motherhood a chilly undertone, the fact that O’Brien wrote Mrs. Frisby’s character as heroic rather than tragic suggests that O’Brien wanted to depart from the message in Calhoun’s experiments. This difference is precisely the point; the comparison between O’Brien and Calhoun can allow us to see *Mrs. Frisby and the Rats of NIMH* as an antiquated representation of motherhood and its central role in the “structure” of society. However, we can also read the novel as a more hopeful reconstruction of Calhoun’s experiments—and thus his use of model organisms. Thinking back to my discussion of the heuristic animals and literary models, we can think of O’Brien’s remarks as a hesitation, that he saw potential in the way Calhoun used animals to tell his story but that he wanted to tell a different story.

Part Two: Anthropomorphic Narration and (Narrative) Animal Agency

“Mice that entered scientific laboratories before 1900 were far more likely to be stray creatures looking for food or shelter. By 1960 mice had become laboratory fixtures in cancer studies and mammalian genetics [...] embedded with multiple, co-existent meanings of their ‘usefulness.’ The former were animals trying to further their own basic survival. The latter were animals whose bodies and representations were re-engineered by humans, to further the local goals of particular research communities as well as the social aims of those people and institutions that surrounded and supported this work—including other scientists, foundations, and members of the American public. In short, what remained of their animal agency in the human world was far more complex than merely searching for scraps of food or warm shelter.”

—Karen Rader (*Making Mice* 13)

“The animals [in behavioural research] are material-semiotic actors in the apparatus of bodily production. They are not ‘pre-discursive bodies’ just waiting to validate or invalidate some discursive practice, nor are they blank screens waiting for people’s cultural projections. The animals are active participants in the constitution of what may count as scientific knowledge. From the point of view of the biologist’s purposes, the animals resist, enable, disrupt, engage, constrain, and display. They act and signify, and like all action and signification, theirs yield no unique, univocal, unconstructed ‘facts’ waiting to be collected. The animals in behavioural biology are not transparent; they are dense.”

—Donna Haraway (*Primate Visions* 310-311)

In the second half of this chapter, I explore a tension within *Mrs. Frisby and the Rats of NIMH* between two different conceptions of model organism agency that are roughly represented in the two epigraphs above. As Rader points out, in the context of distinguishing between the wild mice that were used in early scientific research and those that were extensively modified through selective breeding and genetic manipulation, model organisms lose their “[wild] animal agency” because their corporeal functions are manipulated to suit the needs of research. Further, the types of lives that model organisms live are indistinguishable precisely because the activities and processes that once determined their lives are also reoriented around scientific procedures and experimental

practices. And yet, as Haraway argues, model organisms remain in excess of the scientific apparatus that Rader describes—and in fact, there is an ethical imperative to think around this apparatus and to read these animals *as animals* despite what seems like an impenetrable institution. Furthermore, Haraway argues that model organisms signify in ways that are outside of the epistemological framework of experimental science and that the facts of science rely on the participation of animals in the experimentation process. In other words, notwithstanding the material loss of agency that these animals experience, they retain their animal agency on semiotic and epistemological levels. The question of the animal agency of model organisms is further complicated in literary representations because of the layers of symbolic and semiotic meanings that are inevitably drawn into the figure of the model organism. In *Mrs. Frisby and the Rats of NIMH*, the tension between these two conceptions of animal agency plays out in two primary ways within Nicodemus' story about how the rats of NIMH gained their abilities. First, following from the tension that I described in the previous section between the novel's didactic message to young readers and its influence by Calhoun, the novel positions the story Nicodemus tells about his transition from pestilent rat to super rat as a symbolic lesson about the value of reading and intellectual pursuit. Second, after the rats escape the lab, they face a corporeal and existential dilemma as more-than-rat and less-than-human. I argue that both because of the cultural insecurity surrounding genetically modified animals and the novel's symbolic association between the rats' new abilities and their more-than-animal-agency, the novel seemingly suggests that the best way for

animals to escape human hegemony is to forsake their animality as such and become human.

“The story begins...” Anthropomorphic Narration and Animal Modeling as a Signifying Practice

In *Mrs. Frisby and the Rats of NIMH* When Mrs. Frisby and Nicodemus meet in the library at the end of her tour through the rat colony, he tells her the story of how the rats came to possess their abilities. As I mentioned above, the situatedness of Nicodemus’ story within the library connects the novel’s message about the importance of reading to the rats of NIMH and their exceptional abilities. In fact, within Nicodemus’ story, the text positions the ability to read as the rat’s most important ability because once the rodents learn to read they teach themselves how to use the locking mechanisms on their cages and emancipate themselves from the laboratory. Nicodemus’ story relies on a series of contrasts between his memories of being a rat before the NIMH experiments, his experience of the procedures, and his perspective as a hybrid creature produced by science. David Herman argues that, as a reflexive hypodiegetic narrative, this shift in perspective “reflects the rats’ awareness of their own interstitial, between-species status, and hence the limitations of human models for other than human social collectives” (187, 338). I agree that the hypodiegetic narrative signals a transformation in the rats’ species identity. However, as I discuss in the next section, as Nicodemus reflects on his animal self with his new abilities that allow him to perceive the world in human (and humanist) terms, he eventually forsakes his animality almost entirely—even though he remains a rat in corporeal form.

Nicodemus' story also upsets the contradictory meanings embedded within cultural narratives of the differences between rodents as wild and model organisms for as he tells Mrs. Frisby, "the story begins not at NIMH, but at a marketplace on the edge of a big city. It was called the Farmer's Market, at a great square of a place with a roof over part of it and no walls to speak of" (O'Brien *Mrs. Frisby* 99). The beginning of Nicodemus' story parallels the opening scene of the novel that establishes Mrs. Frisby's domesticity as a wild mouse, linking the rats' origins with Mrs. Frisby. Although this association affectively links the rats with Mrs. Frisby's materialism, it ultimately builds on the contrast established between the two characters in her tour of the rat colony I discussed in the previous section by highlighting the rats' transformation from wild to laboratory animals. As Nicodemus continues his story, he describes how one day he and a friend ventured out to the market and they "noticed that there was a white truck of an odd, square shape parked on the street bordering [the market]" (O'Brien *Mrs. Frisby* 101). Then he pauses to reflect on his memory of the truck and clarifies by stating: "I say I noticed it—I did not pay any particular attention to it, for trucks were common enough in that part of town; but if I had, I would have noticed that printed on each side of it were four small letters: NIMH. I would not have known what they were, of course, for at that time neither would I nor any of the other rats know how to read" (O'Brien *Mrs. Frisby* 101). This initial past perfect qualification situates Nicodemus' anthropomorphic point of view as a split between a pre- and post- laboratory subjectivity that hinges on the ability to read—something that becomes much more central later on in his story. Similarly, the initial reference to the potential of reading opens up questions of how animals read and

interpret humans, but also how we read animals differently depending on their cultural identities and the social spaces in which we keep them.

The relationship between literacy and animality becomes increasingly crucial in Nicodemus' story as he enters the laboratory and begins his new life as a model organism. Once in the laboratory, the rats rely on their ability to read human behaviour to gauge their expectation of the scientists based on how they treat them. “[The] cage was my home for a long time,” Nicodemus explains,

It was not uncomfortable; it had a floor of some kind of plastic, medium soft and warm to the touch; with wire walls and a ceiling, it was airy enough. Yet just the fact that it was a cage made it horrible. I, who had always run where I wanted, could go three hops forward, three hops back again, and that was all. But worse was the dreadful feeling—I know we all had it—that we were completely at the mercy of someone we knew not at all, for some purpose we could not guess [...] As it turned out, the uncertainty itself was the worst suffering we had to undergo. We were treated well enough, except for some very small, very quick flashes of pain, which were part of our training. (O'Brien *Mrs. Frisby* 107-8)

This initial description of the cage recalls the discussion of the home at the beginning of Nicodemus' story. By situating the first in-depth reflection of life inside the laboratory as a matter of home, the text highlights questions of ontological separations between the wild and the domesticated. Nicodemus' focus on uncertainty *itself* as the greatest harm challenges the certainty of scientists' ability to interpret animal behaviour by turning the scientific gaze back onto the scientist, asking the reader to think about the anthropomorphism already embedded within the model organism. This anthropomorphism becomes more explicit in the next chapter where Nicodemus describes his experience of being inside a radial-arm maze:

The small doorway in the wall led into a short corridor, which opened, or seemed to directly onto a green lawn. [...] Were they letting me go?

I made a dash toward the open end of the corridor—and then jumped back. I could not go on. About two feet from my cage (still open behind me) there was something dreadfully wrong with the floor. When I touched my feet to it, a terrible, prickling feeling came over my skin, my muscles cramped, my eyes blurred and I got instantly dizzy. I never got used to that feeling—no one ever does—but I did experience it many times [...]

Yet I was in a frenzy to reach that open lawn, to run for the bushes to get away from the cage. I tried again [...] No use. Then I saw, leading off to the left, another corridor. I had not noticed it at first because I had been looking so eagerly at the open end of the one I was in. The second one seemed to stop about five feet away in a blank wall. Yet there was light there: it must turn a corner. I ran down it, cautiously, not trusting the floor. At the end it turned right—and there was the lawn again, another opening. I got closer that time; then, just as I thought I was going to make it—another shock. I pulled back and saw that there was still another corridor, leading off to the right. Again I ran, again I saw the open escape hole, and again I was stopped by shock. This was repeated over and over; yet each time I seemed to get a little closer to freedom [...] Why would I bother to run through it at all, if I knew it was only a trick? The answer is I couldn't help it. When you live in a cage, you can't bear not to run, even if what you're running toward is an illusion. (O'Brien *Mrs. Frisby* 113-14)

By focusing on Nicodemus' confusion and frustration as well as his desire to escape rather than on his pain and the indignity of being tested on, the text gets at more implicit questions of what rodents experience while inside experimental apparatuses. The narrative point of view of this description undermines the aerial bias of the scientific gaze that looks down animals as they move through the arms of a maze. The excerpt from Nicodemus' point of view demonstrates how the scientific gaze reduces what is otherwise a very complex and disorienting experience into a set of verifiable "behaviour" observations rather than more empathetic reflections. The text demonstrates how the architecture of the maze itself produces verifiable behaviour (in this case most likely "anxiety") through Nicodemus' reference to the misleading open end of the arm that coincided with an electric shock. While Nicodemus' state of "frenzy" after feeling the shock would be read as generalized anxiety by the scientists, he experiences it as a cluster

of different emotions that he associates with the exhaustion of repetition and confinement.

Of course, as Vinciane Despret argues, scientific epistemology actively resists asking questions such as: “What could they [the animals] possibly be interested in?” (91). She argues that experiments are designed to exclude the possibility of animals' interests and motivations by isolating certain types of response to the experimental apparatus. Scientific epistemology excludes animals' interests on the basis that such consideration would be anthropomorphic. However, as Despret argues, behavioural science doesn't necessarily “restrict” anthropomorphism per se, but rather makes it imperceptible and “invisible” by framing experiments in such a way that it “blocks the possibility that the animal could show how he takes a position with respect to what is asked of him” (Despret 91). By blocking the possibility that animals maintain a certain amount of agency within experiments, scientists also resist any consideration about what animals might think and feel about their participation.

The novel performs a similar critique of experimentation through Nicodemus' experience by focusing primarily on his choices and thought processes as he navigates the maze. This focus requires that we think, along with Nicodemus, about the disconnect between his experience and scientific evidence of behaviour. The text contrasts what he wants for himself and what the scientists want him to do, exposing a particular kind of anthropomorphism that Despret argues,

is always there, for what could be more anthropomorphic than an apparatus that requires an animal to deny his own habits to privilege those that the researchers think humans themselves do in the experience of learning? Except that researchers do not actually ‘think’ that humans conduct the experiment in this

way, and they don't even consider this; it isn't their problem. Their problem is that learning should be done for the 'right reasons,' which is to say for reasons that lend themselves to experimentation. (94)

In a similar way that Despret describes, Nicodemus' point of view is critical of the scientific anthropomorphism that is already central to how the model organism functions. By representing what an animal might experience in an experiment, Nicodemus' perspective offers an alternative form of anthropomorphism that exceeds the anthropomorphism of the experiment that translates rodent choices into human behaviour. This critical anthropomorphic point of view demonstrates what literary representation can offer model organisms by suspending and pushing back against the empiricism of the scientific gaze both by questioning what the 'right reasons' are for conducting experiments on animals and by making scientific anthropomorphism perceptible as such.

The question of the 'right reasons' for a rodent to behave and learn is central to how Nicodemus and the other animals ultimately escape from NIMH. In the next chapter, called "A Lesson in Reading" Nicodemus describes how one of the scientists taught the rats how to read by spelling the word "R-A-T" (O'Brien *Mrs. Frisby* 123) on a chalkboard and holding up a picture of a rat next to it. By having the rats learn the word "rat" the text further points to the importance of signs and signification for model organisms. As we saw in the discussion of the rhetorical value of rats versus mice in Calhoun's work, the words we use to refer to animals impact how people read them and how certain discourses are attached to them. Although the rats already 'know' that they are considered vermin and pests because of how humans treat them, this initial scene of

learning the word “rat” symbolizes the rats’ becoming-aware of the symbolic dimension of their species identity. Soon after the initial reading lesson Nicodemus recounts how he began to see the word “rat” everywhere around him: “The top line of black marks on the wall were instantly familiar: R-A-T-S; as soon as I saw them I thought of the picture that went with them; as soon as I did that I was, for the first time, reading. Because that’s what reading is: using symbols to suggest a picture or idea” (O’Brien *Mrs. Frisby* 124). Nicodemus realizes that everything in human society involves reading and that there are signs all around him in the laboratory that tell him who he is and how he fits within human society.

However, Nicodemus is not merely reading signs; he is reading himself in relation to the world, linking literary embodiment and reading to Nicodemus’ growing self-awareness. By becoming aware of the symbolic nature of animal identity, Nicodemus learns how to negotiate life in the laboratory and his place within it. In doing so, he gains agency over the laboratory and the scientists’ control:

But then a puzzling thing came up, a thing we’re still not sure about even now. Apparently, Dr. Schultz, who was running the lessons, did not realize how well they were succeeding. He continued the training, with new words and new pictures every day; but the fact is, once we had grasped the idea and learned the different sounds each letter stood for, we leaped way ahead of him. [...] I’m sure Dr. Schultz had plans for testing our reading ability [...] but apparently he did not think we were ready for it yet. I think maybe he was even a little afraid to try it; because if he did it too soon, or if for any other reason it did not work, his experiment would be a failure. He wanted to be sure and his caution was his undoing (O’Brien *Mrs. Frisby* 126)

In this scene, there is a disconnect between Dr. Schultz’ motivation for teaching the rats to read in order to demonstrate the success of his genetic therapy and Nicodemus’ awareness of his relationship to language, signification, and identity. The text critiques

scientific signifying practices, for, thinking back to Calhoun's elaborate associations between rodents and humans, the text reminds us that regardless of what scientists say and write about the meaning of model organisms, they will never encapsulate the animals' experience of the experiments. The novel makes this point not only speculating about what experiments might be like from the point of view of model organisms but rather by highlighting reading as an active process within experiments—for both humans and animals. By taking advantage of Dr. Schultz' caution, the animals turn his strategic collapse of the human and animal against him by using his lessons to escape.

Soon after Nicodemus reflects on the unanticipated success of Dr. Schultz' reading lessons, he tells Mrs. Frisby how, once the rodents had learned to read the signs on the walls of the laboratory they also noticed a small sign underneath the locking mechanisms of their cages: "To release door, pull knob forward and slide right" (O'Brien *Mrs. Frisby* 126). With this in mind, the text liberates us from the symbolism of experimentation, for as Nicodemus reflects at the end of the chapter, "By teaching us to read, they had taught us how to get away" (O'Brien *Mrs. Frisby* 129). The rats' experience of the laboratory critiques the notion that scientists know everything about rodents and presents the possibility that rodents gain a certain amount of agency over the experimental system. The text points us toward an alternative understanding of the model organism by showing us not only how much of their meaning is semiotic since their bodies signify in ways that the scientists create through the experimental apparatus, but that they also have the capacity to exceed such representations.

“Where does a group of civilized rats fit in?” Escaping NIMH, Escaping Pestilence, Escaping Animality

After the rats escape from NIMH, the novel explores the consequences of their participation in scientific experiments both in terms of their altered physiology and how it effects their ability to interact with other rats and participate in rat social customs.

Whereas Nicodemus’ narrative of the laboratory focuses on the disconnect between scientist and animal perceptions of experimentation, after the rats escape, the text uses his point of view to explore philosophical questions about where laboratory animals fit within discourses of animal life after they no longer serve as model organisms. As Justin, another NIMH rat, puts it during a discussion about what to do after they escape:

‘We don’t know where to go because we don’t know what we are. Do you want to go back to living in a sewer pipe? And eating other people’s garbage? Because that’s what rats do. But the fact is, we aren’t rats anymore. We’re something Dr. Schultz has made. Something new [...] we can read, and with a little practice, we’ll be able to write too. I mean to do both. I think we can learn to do anything we want. But where to do it? Where does a group of civilized rats fit in?’
(O’Brien *Mrs. Frisby* 137)

Justin’s ontological question about what genetically modified animals become beyond the laboratory is a question the text leaves unanswered. However, foregrounding the question in terms of civilization suggests that they occupy a new category of life that is neither human nor animal. This passage defines the rats’ in-between category based on the mixture of human abilities (literacy, writing, and culture building) housed in an animal form, suggesting that their newfound agency over human society is something entirely produced in the laboratory. As such, the cornerstone of their agency is their ability to redefine their species identity from pestilent scavengers to ‘civilized’ and self-sufficient humanized creatures. We can read the rats’ predicament as symptomatic of O’Brien’s

unease about the place of genetically modified organisms and their moral and philosophical position between human and animal.

As I discussed in the previous chapter, the question of “where to go” (O’Brien *Mrs. Frisby* 137) also reflects the problem animal rights activists face when they try to liberate genetically modified laboratory animals who are often not able to survive outside the laboratory because of compromised immune systems, tumours or other diseases. Justin’s reference to being ‘civilized’ symptomatically points to the idea that to be “civilized” is to be altered into a state where one can no longer survive without the physical support of technology. Similarly, the dependence on technology implies a dependence on humans as well, whether in the form of companionate domestication or the more invasive support of hermetically sealed rooms and incubators. Justin’s reference to the rats as ‘civilized’ also reveals the text’s Calhounian anthropocentric and human exceptionalist investment in writing human culture onto rats. Once the rats leave the laboratory, the text increasingly positions their exceptionalism—that was initially established by the contrast between the rats and Mrs. Frisby—as a hybrid human-animal exceptionalism by focusing on how their ability to read and write allows them to become more ‘civilized.’ The text extends the rats’ exceptionalism when Nicodemus describes his encounters with wild rats:

During the next few weeks we lived as we could. We had, in a way, to learn all over again how to get along, for although the world outside the laboratory was the same, we ourselves were different. We were a couple of times reduced to eating from dumps and garbage cans. But knowing how to read, we quickly learned to recognize signs on buildings [...] Occasionally we came upon other rats, and few times we talked with them, but not for long. Because after just a few words they would begin to look at us strangely, and edge away. Somehow they could tell that we were different. I think that we even looked different; either the diet or the

injections at Nimh had made us bigger and stronger than other rats, and all the strange rats we saw looked, to us, surprisingly weak and puny. So we were set apart from our own kind. (O'Brien *Mrs. Frisby* 143-44)

Again, Nicodemus positions their escape in terms of a double bind where they are pleased to have escaped the laboratory but are no longer satisfied with living as 'normal' pestilent rats. In this sense, the rats must try to make a subsequent escape from their species that ultimately has its origins in the laboratory. The rats affirm discourses of scientific superiority embedded within narratives of experimental sciences that position science as a neutral, objective search for epistemic advancement through their mental and physical superiority and their desire to isolate themselves from both human and animal society. The exceptionalism of animal-human hybridity is a common trope in advertisements for model organisms where they link exceptionalism to notions of "genetic purity" and "the precision of historically traceable gene lines" that ultimately promote laboratory animals as good consumer products (Arluke 146).

In the case of the rats of NIMH, the text promotes the desirability of the pursuit of knowledge and literacy for its young audience. The value of education is solidified in the next chapter when the rats happen upon an empty estate that they occupy after discovering that the owners of the estate are on vacation for several weeks. While at the estate, the rats enter a period of intense self-education that shapes them into liberal humanist subjects:

The reading we did! We knew very little about the world, you see, and we were curious. We learned about astronomy, about electricity, biology and mathematics, and about music and art. I even read quite a few books of poetry and got to like it pretty well. But what I liked best was history. I read about the ancient Egyptians, the Greeks and Romans, and the Dark Ages, when the old civilizations fell apart and the only people who could read and write were the

monks. They lived apart in monasteries. They had the simplest kind of lives, and studied and wrote; they grew their own food, built their own houses and furniture. They even made their own tools and paper. Reading about that, I began getting some ideas of how we might live. (O'Brien *Mrs. Frisby* 159)

This description of the library positions reading as the primary way that the rats learn how to emancipate themselves, but it also creates a learning continuum between the library and the laboratory. Nicodemus' idealized account of ancient human civilizations reflects Calhoun's assertion that his rats would inherit human society and suggests that while the laboratory may not have been a good experience for the rats, it ultimately allows them to transcend their animality and take advantage of the benefits of being quasi-human subjects. While Nicodemus acknowledges the anthropocentric content of the library, what little they learn about the history of rat-human conflict pushes them to further dissociate from their species:

Most of the books were about people; we tried to find some about rats, but there wasn't much. We did find a few things. There were two sets of encyclopedias that had sections on rats. From them we learned that we were about the most hated animals on earth, except maybe snakes and germs [...] it seemed to us that the main reason we were hated must be that we always lived by stealing. From the earliest times, rats lived around the edges of human cities and farms, stowed away on men's ships, gnawed holes in their floors and stole their food. Sometimes we were accused of biting human children; I didn't believe that, nor did any of us—unless it was some kind of subnormal rat, bred in the worst of city slums. And that, of course, can happen to people too. (O'Brien *Mrs. Frisby* 159-60)

This scene represents the second time the rats learn about their species and the connotations of being associated with the word *rat*. In the same way that learning the meaning of the word “R-A-T” in the laboratory led to their emancipation, here, the awareness of the historical context of human hatred for rats liberates them from the behaviours that make their species hated by humans. Much like in Calhoun's

experiments, Nicodemus' post-laboratory life embodies a critique of only certain parts of humanity and the desire to transcend it through education. The text takes this one step further in the next paragraph when Nicodemus links pestilence to laboratory animals and their ability to model humans. "Had we, then, no use at all in the world?" Nicodemus asks, "one encyclopedia had a sentence of praise for us: 'The common rat is highly valued as an experimental animal in medical research due to its toughness, intelligence, versatility and biological similarity to man.' We knew quite a bit about that already" (O'Brien *Mrs. Frisby* 160). This excerpt sheds a different light on the beginning of Nicodemus' story in the market and his brief discussion of pestilence with Mrs. Frisby because it suggests that the rats deserved to be taken to the laboratory because of their dependence on humans and that ultimately their experience as experimental subjects was worth the pain and discomfort.

Conclusion: "Had we, then, no use at all in the world?" Literature and the Capacity of Animals

How do we reconcile the conflicting discourses of use value and agency within Nicodemus' story? Does Nicodemus' exhalation of the rats' 'human' qualities repress their 'animal' qualities? Or, is his position a reaction to his subjugation as a model organism? Reading *Mrs. Frisby and the Rats of NIMH* in light of Calhoun's experiments offers two explanations for Nicodemus' embrace of humanism and his disgust of wild rats. We can read the rats' desire to use their human abilities to create a better society as a Calhounian model for human society to curate its social and evolutionary future by cultivating creativity and technocratic governance. As I discussed in the first part of this

chapter, I think O'Brien was influenced by Calhoun's "culture-inducing" experiments and his hypothesis that rats could be manipulated into creating human-like culture. However, we can read the novel more reflexively and think about Nicodemus' position as a critique of how scientific experiments appropriate animal agency by using it as a model for human behavior. In other words, experiments such as Calhoun's position animals as complex and sentient beings but only to make a case for them as good models for humans. Nicodemus' embrace of humanity, then, might represent a desire to take back animal agency and to resist such an appropriation. This aligns with O'Brien's gesture towards letting animals "take charge" in literature and suggests that while literature can be guilty of the same types of appropriation, that it can use them to tell stories about both humans and animals.

Chapter Three | Grieving for the Model Organism in Daniel Keyes' *Flowers for Algernon*

In *Algernon, Charlie and I: A Writer's Journal*, Daniel Keyes's memoir about writing *Flowers For Algernon*, he recounts how the inspiration for the mouse character, Algernon, came from a traumatic experience of a lab dissection in medical school. Keyes recalls how the initial sight of a dead mouse and the thought of dissecting it had little effect on him, however, upon his first incision he noticed that the mouse had a distended uterus with a littler of unborn pups inside. "What had startled me at first, now saddened me," Keyes writes, "Several tiny lives had to be snuffed out so that I could have a hands-on dissection experience" (*Journal 20*). Keyes recalls how the realization of this mouse's pregnancy changed him: whereas he began the dissection with confidence, he then became "paralyzed," "sickened" by the thought of "removing the foetuses" from the mouse's body (*Journal 20*). In other words, there was something about the mouse's distended uterus and the multiplicity of the animal's "sacrifice" (to use laboratory terminology for the deaths of model organisms) that startled him into feeling remorse. Keyes does not elaborate on his feelings, however, because as he continues, "I dashed out of the lab into the lavatory, washed my face and hands and stared at myself in the mirror. I had to go back and finish what I started. After a few minutes I returned to the lab [...]" Embarrassed at having fled, I covered up my over-reaction by blurting out, 'as the proud grandfather of a litter'" (*Journal 21*). Keyes reaction, though disturbing in its own right, offers a great deal of insight not only into Algernon and his relationship with the primary human character, but also how the novel approaches him as a literary character in his own

right. By “fleeing” the dissected mouse body, Keyes acknowledges that he was unable to come to terms with his compassion and the possibility of caring about the animal(s) that were “snuffed out” so that he could learn about mammalian anatomy.

Although Keyes’ response is quite self-reflexive, his unwillingness to reconcile his feelings with his identity as a “great surgeon to be” (*Journal 21*) is symptomatic of cultural attitudes to animals used as model organisms—especially rodents like mice whose “tiny-ness” evokes a particular set of contradictory feelings. Thinking back to my discussion of cute violence in the introduction of this dissertation, we can understand Keyes’ mixed feelings about the violence of dissection and the tiny-ness of the mouse in relation to the cuteness in the Jackson Laboratories catalogue. Keyes’ hesitation about the mouse body stems from a conflict between his “ugly or aggressive feelings, [and his] expected tender or maternal ones. For in its exaggerated passivity and vulnerability, the cute object is as often intended to excite a consumer’s sadistic desires for mastery and control as much as his or her desire to cuddle” (816). Because, as Ngai argues further, a large part of the desire for mastery and control of the cute object stems from a smallness and “softness that invites physical touching—or, to use a more provocative verb, fondling,” it is hard not to read Keyes’ conflict in this light (816). A large part of the reason why schools use small rodents for classroom dissections is that their size makes them convenient to reproduce and store. Similarly, their size, and indeed their bodily form, makes them more approachable as objects of dissection because their organs are smaller and less offensive. However, Keyes’ story resists a straightforward reading of cute violence because the mouse body causes him to pause and eventually resist

objectifying the mouse body. Keyes' story exposes the contradictory affect surrounding the mouse as a tool for scientific research by critically examining the relationship between cuteness and violence.

In this chapter, I am interested in thinking about how these conflicting and contradictory feelings make their way into literary representations of model organisms such as Algernon in *Flowers For Algernon*. More specifically, I consider how the model organism, as a form of representation, influences the narrative form of the novel. I trace the various ways that *Flowers for Algernon* brings the model organism into view as a complex being worthy of consideration, care, and even mourning in a way that offers an alternative to the (strictly) instrumental logic of the model organism. However, primarily due to the humanist conventions of the novel as a literary form, *Flowers for Algernon* replicates the kind of disavowal that Keyes describes in his memoir by adopting science as a representational filter. I argue that because the concept of the model organism structures the plot of the novel, it relies on a relatively static understanding of Algernon as a diagnostic tool for Charlie's intellectual development. In this way, the plot of *Flowers for Algernon* mirrors narratives of the model organism within the biological sciences that position their deaths as pedagogical events.

This chapter is divided into three parts. Part One considers *Flowers for Algernon* as a diary novel and argues that the formal structure of the novel establishes Algernon as a comparative device—and thus a model organism—through the inner monologue of Charlie Gordon as he transforms from an intellectually disabled man into a genius after an experimental surgery. The limited viewpoint of Charlie's "progress reports" imposes a

temporal scheme on the characters that restricts and distances the reader's perception of the story. In Part Two, I consider how the novel frames Charlie's intellectual disability as a social construction of otherness by linking Charlie's experience of discrimination with animality. I argue that the novel contrasts discriminatory threats of animality that dehumanize people with intellectual disabilities with a more affirmative understanding of animal life approaching what Sunaura Taylor calls a "shared experience of ableism" (*Beasts of Burden* 13). In Part Three, I focus on Charlie and Algernon's escape from the physical confines of the laboratory and attempt to live a 'normal life.' I argue that while this section of the novel poses a series of significant questions about what it means to think about model organisms as individual beings outside of scientific discourses, ultimately the formal constraints of novel make this impossible because the plot requires Algernon to get sick so that Charlie can learn from his death. In conclusion, I consider Algernon's death at the close of the novel through the lens of Donna Haraway's notion of "noninnocent responsibility" (*Modest_Witness* 82) in order to articulate the ethical implications of Charlie's grief and mourning of Algernon's death.

Part One: Narrative Structure and the Model Organism Experiment

The narrative of *Flowers for Algernon* is told from the first person point of view of Charlie Gordon and is presented as a series of progress reports closely resembling diary entries, which detail Charlie's experience of his shifting mental state before and after his experimental surgery. We also witness the parallel development of Algernon who, having undergone the same surgery as Charlie, serves as a model organism for

Charlie within the experiment. The progress report form is a mimetic device that performs an objectifying scientific gaze by simulating a scientific document. At once a personal diary detailing Charlie's everyday life, thoughts, and concerns, as well as a scientific document intended for the analysis of experimental scientists tracking the development of a set of hypotheses, the progress report blends scientific and introspective narrative forms. The narrative form of *Flowers for Algernon* is thus slightly different from that of a standard novel diary: the “progress report” has a distancing effect on the narrative because it presumes a scientific intervention between the writer of the report/diary and the reader. Although like most diary novels, *Flowers for Algernon* tells the story of a human character that uses a diary to enhance his or her subjectivity, Charlie’s subjectivity is represented as a product of scientific intervention and is thus objectified as a scientific event. However, I argue that the novel self-reflexively folds the objectivity of the scientific report back onto itself by continually forcing the reader to question the difference between Charlie’s experience of his growing sense of self (along with his observations of Algernon’s) and the objectifying force of the scientific gaze. In other words, the novel contrasts the narrative *structure* of the report form and the *content* of the reports: while the report form mimetically performs scientific objectivity, we also witness Charlie and Algernon’s dual development and begin to identify with them as characters.

The diary-like form of the text propels the narrative with a time-scale measured by a contrast between the two developmental arcs of Charlie and Algernon. Because Algernon is a model organism for Charlie—and thus has his surgery first—the temporal

arc of his transition from ordinary to genius to death is ahead of Charlie's, continually foreshadowing what will happen to Charlie. I suggest that, while the overall narrative of the novel explores the question of how intelligence influences the development of human subjectivity and social agency, Charlie's subjectivity is inseparable from Algernon's *and vice versa* precisely because the novel constructs their association as a model organism experiment through Charlie's diary-like progress reports. Approaching the novel as a diary novel is useful for thinking about how the text links Charlie and Algernon throughout the novel, but also for how the form of the novel influences its representation of science, disability, and model organism-ness, by imposing a temporal scheme that restricts and distances the reader's perception of the story.

“Like a pet store with no customers:” Situational Irony and Charlie's ‘Naïve’ First Person Point of View

Lorna Martens defines the diary novel as “a fictional prose narrative written from day to day by a single first-person narrator who does not address himself to a fictive addressee or recipient” but rather assumes the persona of a fictional writer as if he was actually writing in the same space and time as the reader (4). Martens argues that, contrary to other forms that utilize first-person narrative forms, the diary-novel “emphasizes the time of writing rather than the time that is written about [because] the progressive sequence of dates on which the diarist writes gives the narrative its temporal continuity” (4-5). Because of its mimeticism, the diary novel replicates the *act of writing* as much as it communicates narrative content: “the present-tense progression tends to dominate the subject matter, so that the diarist usually writes about events of the

immediate past—events that occur between one entry and the next—or records his momentary ideas, reflections, or emotions” (Martens 5). In other words, the day-to-day temporal framework drives the narrative and organizes it as a sequence of daily writing acts from outside the temporality of the narrative itself. Martens calls this a “framed communicative situation” where the normal “narrative triangle” (composed of the narrator, the narrated world, and the reader) of first-person narration—where the voice of a narrator narrates the events of a fictive universe—is “framed” by a fictional writing event (4-5). The effect of this mimetic frame is that “the narrator can take his present self as subject [resulting in] something like a folding over of the subject of discourse onto himself” (Martens 5). In other words, because the diary-novel mimetically constructs the story as a diary, it does not require an omniscient explanation of the narrator's position in the fictive world. Instead, the narrator exists *in medias res* reflecting upon himself (as the subject of the narrative) and addressing him or herself (as a reader/writer) at the same time so that the reflection is synonymous with the narrative. However, the mimetic devices of the form itself contain formally omniscient qualities that situate the narrator/writer with the “framed communicative situation” (33). What this means is the concept of the diary stands in for omniscient narrative contextualization (such as “once upon a time,” or “Early in the morning, late in the century, Cricklewood Broadway” (Smith 3)) because it assumes that readers are already familiar with the concept of a diary. Because of the form's lack of direct omniscience, the diary novel tends toward a “one-way channel of communication [in] an attempt to increase self-knowledge or to explain one's self for the benefit of others” (Field 9). Whether the premise of a given

work's diary-ness is exclusively personal or a personal narrative meant for a reader other than the fictional writer, the address of the diary novel is “one-way” (Field 9) because the “framed communicative situation” that Martens outlines implies that the fictional writer of the diary addresses only him or herself as a subject (4-5).

Flowers for Algernon has a similar narrative frame because Charlie writes his “progress reports” as if they were diary entries addressed to himself; however, it is also clear that the progress reports are meant for the scientists experimenting on Charlie so they can track his development. Because the progress report form mimetically represents a lab report that details experimental findings, it means that Charlie's reflections about himself are both intimate personal reflections *and* the work product of the scientific experiment in which he participates. Instead of a narrative collapse that makes the self of the narrator synonymous with the self of the narrative, it makes the self of the narrator the object of the fictional scientific experiment that alters his consciousness. Further, the second narrative triangle of the progress report form generates a dramatic irony whereby the reader understands more about Charlie's experience than he does. The text establishes this irony in the first report where the form contrasts the objectivity of Dr. Strauss as a scientist who needs to know every detail of Charlie's experience to track the progress of his experiment against Charlie's lack of awareness of why Strauss asks this of him:

Progris riport 1 martch 3

Dr. Strauss says I should rite down what I think and remembir and evrey thing that happins to me from now on. I dont no why but he says its important so they will see if they can use me. I hope they use me because Miss Kinnian says maybe they can make me smart. I want to be smart. My name is Charlie Gordon [...] I am 32 yeres old and next munth is my birthday. I tolld dr Strauss and perfesser Nemur I cant rite good but he sys it dont matter he says I shud rite just like I talk

and like I rite compushishens in Miss Kinnians class at the beekmin collidge center for retarded adults. (Keyes *Flowers* 1)

Dr. Strauss's instructions to "write it all down" indicate that he will be reading Charlie's reports, looking for things that may not be important for Charlie to know but are important for the experiment. The dramatic irony of the progress report form isolates Charlie both from the events of the story. H. Porter Abbott argues that this kind of isolation is central to how the diary form functions, because "aloneness itself is, as it were, continually and empirically verifiable in the aspect of staggered composition" that repeatedly situates the reader within a "new beginning in the present" of each diary entry (24). For Charlie, this isolation also has to do with the apparatus of the experiment because the "point of temporary withdrawal" (Abbott 24) required for his progress reports is framed by the mental disability that the experiment aims to 'fix.' However, more importantly, because of the dramatic irony established by the reader's hyper-awareness of Charlie's cognitive disability, we understand that the scientists monitor Charlie's isolation as they evaluate his eligibility for participation in the experiment. Similarly, Charlie's statement "I hope they use me" (Keyes *Flowers* 1) situates his subjective experience within the ironic framework generated by the progress report by referring to his *use*-value as an experimental subject.

The centrality of Charlie's "usefulness" becomes more apparent in the next report where he participates in a Rorschach test:

progris riport 2-martch 4

I had a test today. I think I faled it and I think maybe now they wont use me. What happind is I went to Prof Nemurs office on my lunch time like the said and his secertery took me to a place that said psych dept on the door with a long hall

and alot of little rooms with onley a desk and chares. And a nice man was in one of the rooms and he had some wite cards with ink spilld all over them. He sed sit down Charlie and make yourself cunfortible. (Keyes *Flowers* 1)

Again, there is a contrast between the second narrative triangle of the progress report (the fictional act of writing that frames the content of the story) and the narrative of Charlie's confusing experience of the Rorschach test. Similarly, the “folding over of the subject of discourse” (Martens 5) onto the self of the writer that Martens describes, does so ironically. We read Charlie's lack of understanding against the objectivity of the progress report and the evaluative potential of the Rorschach test: Charlie does not know that he is going through a psych evaluation, but we know that the scientists are studying him and that he cannot understand their results. However, what becomes clearer in this report is that the dramatic irony turns the progress report back onto Charlie, incorporating the reader in the logic of the report, co-opting the reader's experience of the narrative into the objectification of the experiment. As we experience the story, we begin reading Charlie's writing symptomatically for behavioural and intellectual traits, tracking them as they progress and evaluating them for signs of disability and development. The way that the novel tracks Charlie's interior progression is characteristic of the diary novel for, as Abbott outlines, diary novels are often about “the improvement of subjectivity—or the possibility of its improvement. Indeed, much of the dramatic tension [of diary narratives] derives from how the external world impinges on the diarist’s consciousness, how these impingements are represented, and the consequences of those representations” (45). However, *Flowers for Algernon* does not entirely conform to Abbott’s characterization of the diary novel because the novel focuses progression *and* regression as it occurs within

the framework of an experimental system that persists even after Charlie and Algernon escape the laboratory. The progress report has subtly different connotations because it is less of a vehicle for developing a growing sense of self than a mimetic performance of an objective record of intellectual development that fluctuates *forward* and *backward* (and coincides with a wavering self-awareness and self-identity). I will discuss the implications of Charlie's regression—and Algernon's role in defining it—in the final section of this chapter, but first, it is important to consider Charlie's first visits to the laboratory where he meets Algernon. These scenes solidify the mimetic objectivity of the progress report and call it into question by contrasting Charlie's perception of the laboratory with how the scientists present it to him.

As Charlie becomes initiated into the lab in progress report 4, it becomes clear that the scientists' interest in Charlie's pre-surgery lack of intelligence is not just crucial for establishing his value for the experiment, but also for evaluating Algernon's post-surgery intelligence. Before introducing Algernon, the text offers the reader a baseline demonstration of Charlie's problem solving skills:

progris report 4

Later the other testor Burt in the wite coat came back his name is Burt Selden and he took me to a different place on the same 4th floor in the Beekman Univeristy that said PSYCHOLOGY LABORATORY on the door. Burt said psychology means minds and laboratory means a place where they made spearminets. I thot he ment like where they made the chewing gum but now I think its puzzels and games because thats what we did.

I coudnt werk the puzzels so good because it was all broke and the pieces couldnt fit in the holes. One game was a paper with lines in all directions and lots of boxes. On one side it said START and on the other it said FINISH. He told me the game was *amazed* and I should take the pencil and go from where it said START to where it said FINISH without crossing over any of the lines. (Keyes *Flowers* 6; original emphasis)

This passage is full of things that Charlie does not understand but are essential to his evaluation as a research subject and to how we perceive his state of mind. The first concept, “PSYCHOLOGY LABORATORY,” frames the irony of the scene by contrasting the seriousness of Psychology as a revered scientific discipline and the laboratory as the culturally sanctioned space of proper scientific endeavour with Charlie’s naïve experience of having his problem-solving abilities tested. Charlie’s naïveté is thus established by contrasting the seriousness of the test with the comic relief of his mistaking the words experiment for “spearmint” and maze for “amaze,” as well as thinking the test was simply a “puzzle.” The comic relief depends on the reader knowing that the “puzzle” is a psychological evaluation about which Charlie has little understanding, making him an unreliable narrator. However, Charlie’s unreliability has a kind of perceptive naïveté about it that casts doubt on the gravitas of scientific experimentation as the production of truth because although Charlie does not have a complete grasp on the concepts he misspells, his earnest observation that the maze was a puzzle is not necessarily wrong. Charlie misinterprets the intent of the maze because he does not grasp how the scientists intend to use his performance as a test of his ability to problem solve. Charlie’s naïveté draws attention to the “epistemic scaffolding” (*Capturing Complexity* 89) of the experiment, highlighting it as a contingent, interested epistemic framework rather than common sense structure of knowledge and meaning.

Later in progress report 4, we see how this dynamic becomes the foundation for the comparison between Charlie and Algernon, but before this relationship is established, the text frames Algernon with a specific set of interspecies discourses:

I didn't understand the amazed and we used up a lot of papers. Then Burt said look Ill show you something lets go to the spearimental lab maybe youll get the idea. We went up to the fifth floor to another room with lots of cages and animils they had a monkey and some mouses. It had a funny smel like old garbidge. And there was other pepul in wite coats playing with the animils so I thot it was like a pet store but there was no customers. Burt took a wite mouse out of the cage and showd him to me. Burt said that's Algernon and he can do this amazed very good. I told him you show me how he does that. (Keyes *Flowers* 6-7)

The text establishes Algernon's lab-animality in contradistinction to the notion that he could be a pet. This scene opens a critical window that questions how our social relationships with animals are often highly conditioned by spatial contexts. How would Charlie have perceived Algernon if he was a pet mouse rather than a laboratory mouse? This scene represents the lab as a social space that has a set of conventions that dictate how to think about and approach animals. In the lab, just as in the pet store, animals are treated as objects and commodities, but each social space requires different socially acceptable behaviours for both humans and animals. Furthermore, this critical window is opened by the formal aspects of the text that I have been outlining in this section because Charlie's lack of understanding and his confusion about the space of the lab generates the comparison between the lab and the pet store. We are supposed to know that the people in the white coats are not "playing" with the mice, but rather are working on them in order to create science. However, because we read the scene through Charlie's perception, we cannot help but think about the difference between *playing with* and *working on* animals. From the moment we meet Algernon, his identity as a laboratory mouse is called into question and from this point on there is a slight shift in Charlie's perception of his use-value for the scientists to a comparative view of the *already-useful* Algernon:

When he said go I tryed to go but I didnt know where to go. I didnt know the way to take. Then I herd Algernon squeeking from the box on the tabel and his feet skratching like he was runing already. I startid to go but I went the rong way and got stuck and a little shock in my fingers so I went back to the START but evertime I went a different way I got stuck and a shock. It didn't hert or anything just made me jump a littel and Burt said it was to show me I did the wrong thing. I was haffway on the bord when I herd Algernon squeek like he was happy again and that means he won the race [...] I dint know mice were so smart. (Keyes *Flowers* 8)

This race demonstrates what the reader already knows but Charlie does not: Algernon is an exceptional mouse because he has been scientifically modified. In this first race, since the irony of the narrative framework aligns the reader and the scientists, the text uses Charlie both to evaluate Algernon and to demonstrate Algernon's success as an experimental subject. Further, the evaluative comparison of this initial test establishes Charlie and Algernon's development as co-constitutive because they serve as baselines for each other throughout the rest of the novel. After Charlie's evaluations and initial races with Algernon that serve as the foundation for their relationship, Charlie witnesses a conversation between the two lead scientists on his experiment about his worth to the experiment that reveals the ambitions of the project. In a similar way that Charlie's lack of understanding establishes Algernon as a co-constitutive research subject, this conversation shows how the scientists are not interested in raising Charlie's intelligence for the sake of improving his life; instead, their aim is explicitly biopolitical:

Prof Nemur was worryd about my eye-Q getting too high from mine that was too low and I would get sick from it. And Dr Struass told Prof Nemur something I dint understand so wile they was talking I rote down some of the words in my notebook for keeping my progris report. He said Harold thats Prof Nemurs first name I know Charlie is not what you had in mind as the first of your new breed of intelek** couldnt get the word ***superman. But most people of his low ment** are host** and uncoop** they are usually dull and apathet** and hard to reach. (Keyes *Flowers* 9-10)

Although we have to interpret Charlie's reporting, it is clear that the scientists have eugenic ambitions to create a “new breed” of “supermen,” and that Charlie is an ideal candidate because he is highly motivated to increase his intelligence. Formally, this scene is significant because there is a slight shift in the narrative address, for Charlie usually doesn't comment on other people's conversations and sticks closely to his experience of being tested. Here, Charlie addresses the reader more directly, revealing the scientists' goals. Martens argues that this kind of hiccup in narrative form indicates the “presence of a second voice in the narrative. [...] This voice will appear in difference guises in different novels and can be refracted into several voices: the voice of the plot, of irony, of symbol, and so forth” (34). Martens argues that this voice is often the author inserting plot devices or philosophical arguments, but here it serves to establish a contrast between Charlie's desire to be an active member of society and the scientists' professional ambitions, for shortly after this Charlie confesses what he hopes to achieve with his post-surgery intelligence: “I askd Prof Nemur if I could beet Algernon in the race after the operashun and he sayd maybe. If the operashun werks good Ill show that mouse I can be as smart as he is even smarter. Then Ill be abel to reed better and spell the werds good and know lots of things and be like other pepul” (Keyes *Flowers* 12). Charlie associates the possibility of out performing Algernon with being able to conform to normative society thus linking scientific success and social success together with Charlie and Algernon's co-constitution. Beyond simply reinforcing cultural narratives of model organisms as tools to make humans better, Charlie's competitiveness suggests that their co-

constitution is not necessarily beneficial thus setting the tone for their post-surgery relationship when Algernon's surgery starts to reverse and his cognitive abilities regress.

“Its part of the esperimint:” Objectifying Resources and the Co-Constituted Research Subject

Along with the compositional framework of the progress report, purposeful spelling and grammar mistakes are the primary mimetic devices the text deploys to demonstrate Charlie’s cognitive disability. As mentioned above, the mistakes extend the dramatic irony generated by the report form and force us to pathologize Charlie and to keep an objectifying distance from him. Statements such as Charlie's pre-surgery vows to “show that mouse I can be as smart as he” and to be “abel to reed better and spell the werds good and know lots of things and be like other pepul” perform his mental capacity for the reader and position Algernon as the primary measure of his mental development (Keyes *Flowers* 12). After his surgery, the text signifies Charlie’s development through a gradual disappearance of grammar and spelling mistakes that coincides with his more sophisticated understanding of his social world. This gradual shift allows the reader to witness Charlie’s transformation as we begin to identify with him as he begins to perform normative mannerisms and approximates more normative forms of self-expression. Similarly, as his spelling errors disappear the text becomes more naturalized as prose fiction—to the point where Charlie overcompensates and adopts a mock or satirical academic voice. In the first post-surgery report, Charlie recalls a nurse teaching him how to spell:

PROGRESS REPORT 7 MARCH 11

The operahun dint hurt. Dr. Strauss did it while I was sleeping. I don't know how because I dint see but there was bandiges on my eyes and my head for 3 days so I couldn't make no PROGRESS REPORT til today. The skinny nerse who watched me riting says I spelld PROGRESS rong and she told me how to spell it and REPORT to and MARCH [...] Anyway they took off the bandiges from my eyes today so I can make a PROGRESS REPORT now. (Keyes *Flowers* 13)

This scene alludes the excerpt from Plato's "The Allegory of the Cave" from *that* appears as an epigraph to the novel: "bewilderments of the eyes are of two kinds, and arise from either coming out of the light or from going into the light, which is true of the mind's eye, quite as much as of the bodily eye" (qtd in Keyes *Flowers* i). Charlie opens his eyes after the surgery to find that he has come out of the darkness of un-education and into the light smarter than he knows, able to write a proper progress report. The fact that this didactic scene takes place in the hospital is indicative of how the novel positions concepts of health, disability, and science. That Charlie learns how to spell and write properly in the hospital further links associations between the mimetic elements of the text with science and medicine. Charlie's reference to time, "I can make a PROGRESS REPORT now," also draws attention to the temporal scheme of the "framed communicative situation" (Martens 33) of the diary novel by reminding us that the "now" of the report is different from the "now" of the narrative. The text develops Charlie's growing awareness the progress report in the next scene where he recounts a visit from Burt Seldon, a graduate student and laboratory technician at Professor Nemur's laboratory, who explains to Charlie the importance of writing progress reports:

Burt comes in to see me evry day to rite down all the things like my tempertur and my blud preshur and other things about me. He says its on account of the sientific method. They got to keep reckerd about what happins so they can do it agen when they want to. Not to me but to other pepul like me who aint smart [...] Thats

why I got to do these ~~progr~~is *progr*ess reports. Burt says its part of the esperimint and they will make fortaststs of the ~~rip~~ reports to study them so they will know whats going on in my mind. (Keyes *Flowers* 14-15; original emphasis)

The erasures allow the reader to observe Charlie correcting his mistakes and applying his spelling lessons from the nurse. Moreover, the simultaneity of these erasures with Burt's lesson about the meaning the progress reports have within the experimental system of the laboratory extends the self-reflexivity of the novel's diary-like form because as Charlie learns how to spell "progress report" he learns about the concept of a progress report and the scientific method. Shapin and Shaffer argue that the history of the rise of experimental science has required the use of what they call "objectifying resources" such as reports and papers because they offer science the finitude of a written document.

While there is an obvious practical side to keeping notes and records, in the novel the reports offer this kind of objectivity because it coopts our sentiments and aligns us with the scientists by keeping us within the structure of the experiment. Shapin and Schaffer argue further that the primary function of the objectifying resource is to separate common knowledge from matters of scientific facts (49) and to create consensus among the scientific community by "multiplying witnesses" (57-60) and facilitating the repetition of experiments. Furthermore, Shapin and Schaffer point out that "we usually think of an experimental report as a narration of some prior visual experience: it points to sensory experiences that lie behind the text. This is correct. However, we should also appreciate that the text itself constitutes a visual source [...] of virtual witness that [is] agreed to be reliable" (61). The mimetic form of the progress report in *Flowers for Algernon* performs this kind of visual source for the reader but not to convince us of the absolute objectivity

of science. Instead, the novel consistently questions the efficacy of report's ability to generate objectivity and fact by drawing attention to certain discrepancies between Charlie's experience and accepted scientific norms such as the use and treatment of model organisms like Algernon.

The novel invites us to consider how although model organisms become objectifying resources within scientific discourses, their objectifying power relies on scientists making “risky links between the mouse and the human” (Nelson *Capturing Complexity* 89) that are contingent upon both embodied and experimental conditions. In *Flowers for Algernon* Charlie and Algernon are linked through their identical surgeries and their shared experience of the laboratory. These links between the mice and humans can be understood as “epistemic scaffolding” that supports scientific research agendas (*Capturing Complexity* 89). The novel demonstrates how the scientists generate the conditions of comparability between Charlie and Algernon in the scene where the scientists finally inform Charlie that Algernon is no “ordinary” mouse:

That's why Algernon beats me all the time in that amaze race because he had that operashun too. Hes a speshul mouse the 1st animil to stay smart so long after the operashun. I dint know he was a speshul mouse. That makes it diffrint. I could probably do that amazed faster then a regular mouse. Maybe some day Ill beat Algernon. Boy would that be something. Dr Strauss says that so far Algernon looks like he mit be smart permanint and he says that's a good sine because we both had the same operashun. (Keyes *Flowers* 21-22)

At this point, Charlie's understanding of Algernon changes from amazement and awe to a kind of hopeful competitiveness as he begins to understand that because Algernon's abilities are the products of surgery that he too can expect those same results. In other words, Charlie begins to understand Algernon as a model organism as such; Charlie's

new understanding of Algernon as a model organism initiates the beginning of a narrative shift in the novel where Charlie starts to be “let in on” the situational irony of the story. Shortly after the scientists tell Charlie about Algernon's “true” identity, they take him for a second tour of the lab where he learns about the institutional setting for the experiment. “The testing center isn't a hospital for animals like I thought before,” Charlie writes, “It's a laboratory for science. I don't know what science is except I'm helping it with this experiment” (Keyes *Flowers* 26). Charlie's new understanding of the laboratory as a “testing center” rather than a hospital inadvertently recognizes the instrumentality of animals in experimental science and that the wellbeing of model organisms like Algernon is predicated upon their sacrifice. This realization builds off his earlier remarks about the scientists “playing” with animals rather than testing on them and his mistaking the lab for a pet store (Keyes *Flowers* 6-7). Charlie's misunderstanding has several implications for how he positions himself in the experiment between the scientists and Algernon as his cognitive acceleration continues and his life changes drastically. But for the purposes of outlining how Algernon becomes Charlie's developmental baseline I will conclude this section by discussing the scene where Charlie finally beats Algernon in the maze race because it solidifies their co-constitutive relationship and sets the groundwork both for thinking compassionately about model organisms and begins to link Algernon's treatment as a model organism to Charlie's cognitive disability:

March 29—I beat Algernon. I didn't even know I beat him until Burt Selden told me. Then the second time I lost because I got so excited. But after that I beat him 8 more times. I must be getting smart to beat a smart mouse like Algernon. But I don't feel smarter.

I wanted to race some more but Burt said that's enough for one day. He let me hold Algernon for a minute. Algernon is a nice mouse. Soft like cotton. He blinks and when he opens his eyes their black and pink on the edges.

I asked can I feed him because I felt bad to beat him and I wanted to be nice and make friends. Burt said no Algernon is a very special mouse with an operashun like mine. He was the first of all the animals to stay smart so long and he said that Algernon is so smart he has to solve a problem with a lock that changes every time he goes in to eat so he has to learn something new to get his food. That made me sad because if he couldn't learn he wouldn't be able to eat and he would be hungry. (Keyes *Flowers* 31)

Charlie's defeat of Algernon in the maze marks the tipping point of his development where the situational irony that isolated Charlie from the reader narrows almost entirely: the spelling and grammar mistakes are less frequent, and it is apparent that he has a firm grasp on what is going on around him. That the disappearance of the textual signs of Charlie's disability coincides with his first physical contact with Algernon is also telling because it simultaneously embodies the scientific connection of their model organism pairing but also that there are consequences of this pairing that exist outside of scientific epistemology because of the affective bond that stems from this contact. Much like Charlie's previous naïve perceptions mentioned above, Charlie understands that Algernon's vulnerability is part of what makes him a desirable research object. Charlie's attention Algernon's his smallness, softness, and cuteness reflects his earlier puzzlement over the difference between a lab animal and a pet, a laboratory and a pet store (Keyes *Flowers* 6-7). Charlie's observations acknowledge that Algernon is a being that possesses individual qualities and does not deserve to have his food withheld from him. Charlie identifies the scientists' behaviour as a form of cruelty as such even if they consider it a means to an end within the experiment. In his naïve moments, Charlie sees through the veneer of scientific epistemology because he has not (yet) invested in the gravitas of

scientific exploration. Charlie's perceptive empathy opens us up to the possibility of thinking about his disability and Algernon's animality as being ethically and morally aligned. However, it is important to note that text makes the connection between Charlie's disability and Algernon's animality at the precise moment when Charlie begins to demonstrate his intellectual development out of disability and thus calls a strict comparison between the vulnerability of disability and animality into question. Instead, what emerges at this moment is a contradiction in the logic of the experiment that equates disability and animality via the model organism relationship at least in the terms that the experiment lays out—instead, Charlie begins to care for Algernon as an individual more than an object of science.

Part Two: Cognitive Disability, Autonomy, and the Medical Sciences

As Charlie's intelligence surpasses Algernon's, they both stop practising the maze, and the novel focuses on how Charlie adapts to becoming more intelligent and aware of the discrimination he endured because of his cognitive impairment. I suggest that Charlie's growing awareness of himself manifests as a realization that his previous cognitive impairments constituted a disability *as such*. Charlie learns that although his physiology changed when he became intelligent, he remains disabled because he remembers the humiliation and pain he suffered at the hands of his family, friends, and co-workers, but also because the scientists treat him like an object of science. As Charlie investigates his memories and past relationships with other people and learns how he has been discriminated against and dehumanized, he turns his attention to Algernon as a

comparative anchor for understanding the isolating effects of discrimination. Charlie realizes that he never really became un-disabled just as Algernon never stopped being an animal and thus he resists the notion that the scientific procedure gave him the “ability” to overcome “disability” through a physiological change in his brain chemistry (Siebers 10). Charlie begins to realize that the scientists consider both Algernon and himself as if they were products of science with no real future or place outside the laboratory rather than autonomous beings with their own motivations. I argue that the text positions disability and animality as categories of difference that bring Algernon and Charlie together through their shared vulnerability that results from being reduced to experimental objects. Before discussing how the text brings these two categories together, it is important to outline how the text establishes Charlie's awareness of his cognitive disability, much like the relationship between Charlie and Algernon, as a function of the self-reflexive past tense narrative structure of the progress report. Charlie's disability is crucial for understanding his and Algernon's relationship in the latter half of the novel because it frames Charlie's realization of his discrimination as the foundational to his empathy for Algernon as a model organism.

“I see Charlie—eleven years old...” Post-Surgery Charlie and Past-Tense Disability

Once Charlie has recovered from the surgery, the text structures his growing awareness of his past life by using the progress report form to dissociate pre-surgery Charlie (Charlie1) from post-surgery Charlie (Charlie2). Because of the diary form, the entirety of the story is reflected on in the past tense; however after Charlie reaches the

tipping point discussed above, the text begins to fragment Charlie's experience of the past by distinguishing between moments that are contemporaneous to the act of writing progress reports and flashbacks by having Charlie2 refer to his past self, Charlie1 in the third person. Formally, Charlie2's reflective third-person narrative point of view turns the objectivity of the progress report form, and thus the situational irony outlined in the previous section, in Charlie2's favour so that he begins looking back on Charlie1 from a vantage point that is similar to how the scientist sees Charlie in the opening section of the novel. However, Charlie's retrospection acts as a critical window into his experience of discrimination, abuse, and neglect and thus begins to undermine the scientific gaze that the formal elements of the novel generate in the opening section of the novel. In this way, the novel offers a critique of what disability scholars refer to as the “medical model of disability,” a prevalent cultural discourse that positions disability as “a particular trait in the individual departing from what might be called *normal species functioning*” thus relegating it as a problem for medicine alone (Carlson *Faces* 5; original emphasis).

Disability scholars argue that the medical model of disability has had a tremendous impact on how our culture frames disability as a personal failure rather than a social one because it reflects historically specific, Western cultural assumptions about what constitutes ‘normal’ abilities. Sunaura Taylor argues that “the medical model of disability locates a disabled person's struggle solely within their own bodies: something is wrong with the disabled person, which makes them unable to function in the world fully. This perspective is taken for granted now as common sense or as proof of our advancement as a civilization” (Taylor *Beasts of Burden* 13). In other words, disabled

people are isolated by a kind of medical individualism that discourages disabled people from thinking about themselves a part of a community while also positioning them as somehow outside social responsibility because they are problems and puzzles for doctors, medicine, surgery, or genetics to solve. Moreover, the medical model of disability biologizes the exclusion of disabled people from society instead of acknowledging the socio-political determinants of their participation. In response to the medical model of disability scholars like Tobin Siebers define “disability not as an individual defect but as the product of social injustice, one that requires not the cure or elimination of the defective person but significant changes in the social and built environment” (4).

Flowers for Algernon represents Charlie’s cognitive disability in a way that critically demonstrates how medical discourses impact the everyday lives of people with cognitive impairment. The text constructs this critique by positioning Charlie’s medically enhanced understanding of the world as a critical window for exploring how medical discourses shape perceptions of cognitive impairment and legitimate discrimination against people who are cognitively impaired. This window is achieved through a series of flashbacks that allow us to witness Charlie’s experience of abuse. However, because these flashbacks are triggered by events in Charlie’s experience of negotiating post-surgery life, we can read them as critiques of cultural constructions of intelligence and disability. Charlie’s first flashback recalls his expulsion from public school because of a practical joke played on him by one of his classmates. “I see Charlie—eleven years old” Charlie recalls, “He has a little gold colour locket he once found on the street. There’s no chain, but he has it on a string, and he likes to twirl the locket so that it bunches up the

string, and then watch it unwind, spinning around with the sun flicking into his eyes” (Keyes *Flowers* 51). The narrative shift to the third person distances the Charlie writing the report from the Charlie who is the subject of the report. By having Charlie2 see himself in retrospect with the knowledge and awareness of a person with above average intelligence, the text extends the dramatic irony established in the opening section of the novel, keeping Charlie1 in ironic isolation. On a textual level, this ironic isolation performs Charlie2's repression of Charlie1; however, it also functions critically to explore Charlie1's discrimination by having Charlie2 reflect on it as a newly ‘undisabled’ person, offering a window into the experience of a person with cognitive impairment. Furthermore, the flashback represents the social implications of preconceived notions for people with cognitive disabilities like autism and Down's syndrome whose behaviours, appearances, and communication are interpreted as dangerous or untoward by normative social standards:

It's Valentine's Day, and the boys are talking about valentines they're going to give Harriet, so Charlie says, “I'm gonna give Harriet a valentine too.” They laugh and Barry says, “Where you gonna get a valentine?” I'm gonna get her a pretty one. You'll see.”

But he doesn't have any money for a valentine, so he decides to give Harriet his locket that is heart-shaped like the valentines in the store window. [...] then he takes it to Hymie Roth the next day during lunch period in school and asks Hymie to write on the paper for him.

He tells Hymie to write: “*Dear Harriet, I think you are the most prettiest girl in the whole world. I like you very much and I love you. I want you to be my valentine. Your friend, Charlie Gordon.*” (Keyes *Flowers* 52-53; original emphasis)

Unbeknownst to Charlie, Hymie has written something inappropriate in the valentine, and Harriet's brothers find Charlie the next day, physically assault him, and warn him about further contact with their sister. The third person-subjective narration of this scene

is complicated because although the third person narrative voice has the usual effects of distancing the narrator from the action of the story, the narration is an experience of Charlie's but one that is not entirely his because of the Charlie1-Charlie2 split signified through the diary form. This split effectively allows us to identify with both Charlie1 and Charlie2 simultaneously: we feel for Charlie2's alienated sense of self that looks back on Charlie1 as the primary holder of the experience. Nonetheless, because we read the story from this perspective, we know that Charlie's intentions were innocent but that Hymie wanted to laugh at Charlie and perhaps to take revenge on Harriet for not reciprocating advancements from any of the other boys. This scene demonstrates how the behaviours that Harriet needs to be protected from are only prohibited for Charlie because he is perceived as overly sexual, dangerous, and outside the social rules that supposedly govern normative behaviour.

Mirroring Charlie's exclusion from public school, once Charlie's intelligence is noticeably accelerated his coworkers at the bakery where he works begin to feel uncomfortable around him. This discomfort reaches a critical point when he figures out a new way of configuring the mixing machines to increase production and receives bonus and a raise. While Charlie assumes his coworkers would be happy and celebrate his newfound ability, they start to distance themselves from him:

Everyone seems frightened of me. When I went over to Gimpy and tapped him on the shoulder to ask him something, he jumped and dropped his cup of coffee all over himself. He stares at me when he thinks I'm not looking. Nobody at the place talks to me any more, or kids around the way they used to. It makes the job kind of lonely. Thinking about it makes me remember the time I fell asleep standing up and Frank kicked my legs out from under me. (*Keyes Flowers* 59)

The novel draws a connection between Charlie1's experience of discrimination and Charlie2's alienation from his old life and friendships. His coworkers feel threatened by Charlie2 because he can do his job better than they can, but also, similar to the incident with the locket, because Charlie1's primary social role at the bakery was to be humiliated and to make his coworkers feel better about their own lives and relative intelligence. However, now that Charlie is no longer disabled—and is more than merely 'undisabled' but above average—he has effectively reversed the power dynamic of the bakery. This reversal is signified in the scene by the way Charlie2 approaches Gimpy and touches him without prompt and in a more socially aggressive manner; he is now dictating the terms of social engagement with Gimpy and it frightens him. Furthermore, it is upon recognizing this social role reversal that he recalls Frank assaulting him years earlier:

It's me, and yet it's like someone else lying there—another Charlie. He's confused...rubbing his head...staring up at Frank, tall and thin, and then at gimpy nearby, massive, hairy, gray-faced Gimpy with bushy eye-brows that almost hide his blue eyes.

“Leave the kid alone,” says Gimp. “Jesus Frank, why do you always pick on the him?”

“It don't mean nothing,” laughs Frank. “It don't hurt him. He don't know any better, Do you Charlie?”

Charlie rubs his head and cringes. He doesn't know what he's done to deserve this punishment, but there is always the chance that there will be more. (Keyes *Flowers* 60)

Again, because this flashback is told from the split perspective of Charlie1-Charlie2 we sympathize with them and make connections between discrimination, intelligence, and abuse by experiencing Charlie1's confusion looking up at Frank not understanding why he continues to punish him for no reason. On the one hand, Charlie does not understand that Frank is not necessarily punishing him in the strict sense of the word; there is nothing

he *did* to deserve this treatment. On the other hand, he can see that Frank *is* punishing him for being different. With this in mind, the text implicitly shows us that Charlie¹ understands much more about his social relationships than others give him credit for. For instance, by referring to the situation as a punishment, he demonstrates that he has somewhat of a grasp on the kinds of power neurotypical people exert over people with cognitive disability precisely because it is socially sanctioned to disrespect them. Even though Gimpy intervenes in the assault, it is also clear that Gimpy's intervention is more or less a suggestion, and that Frank elects to stop picking on Charlie¹.

By paralleling Charlie's past discrimination of his "below average" intelligence with the social isolation of his above average intelligence the text establishes the dynamic between Charlie² and Charlie¹ as the primary ethical and empathetic framework through which we read Charlie and Algernon's relationship in the later half of the novel. The text exposes how the values attached to intelligence exist to maintain the status quo of normative social order. Thus, Charlie's friends and family only read his heightened intelligence as an extension of his disability because in both cases he cannot fit into normative standards of intelligence and ability.

"I was a person before the surgery:" The Scientific Gaze and the Social Construction of Intelligence

As Charlie's intelligence and awareness increases, so does his isolation after he discovers that his old boss Gimpy has been stealing from the bakery. As Charlie comes to terms with what he sees as an injustice to Mr. Donner, the owner of the bakery, he also realizes that he was often used as a tool in Gimpy's scam: "how many times had he used

me as a go-between to deliver packages to [Mrs. Wheeler], undercharging her so that later they could split the difference? Had he used me all these years to help him steal” (Keyes *Flowers* 87). Charlie is confused because he understands that Gimpy might get fired, but he also feels a moral obligation to Mr. Donner. “What’s right?” Charlie asks himself in his progress report, “ironic that all my intelligence doesn’t help me solve a problem like this” (Keyes *Flowers* 89). Charlie’s moral dilemma represents Charlie’s newfound social awareness, but the text uses the dilemma as a way to critique medical discourses of cognitive disability by bringing them into dialogue with Charlie’s experience of discrimination in the bakery. Furthermore, the text questions the narrowness of criteria on which assessments of cognitive ability are based.

In the next progress report Charlie recalls seeking out Professor Nemur for an answer to his moral dilemma; however, Nemur’s response is dismissive and condescending:

The fact that I’ve been used as a go-between doesn’t seem to bother him at all. If I didn’t understand what was happening at the time, he says, then it doesn’t matter. I am no more to blame than the knife is to blame in a stabbing, or the car in a collision.
‘But I’m not an inanimate object,’ I argued. ‘I’m a *person*.’ (Keyes *Flowers* 89; original emphasis)

For Nemur, Charlie’s disability means that he has no responsibility and thus no real moral obligation to act on his recently acquired knowledge of the theft. Nemur’s dismissal reflects how he views Charlie as being outside social and moral responsibility; Charlie is exempt from taking action he cannot understand the complexity of the situation. Nemur’s elaboration solidifies his condescension toward Charlie, revealing how

his more profound prejudice against cognitive disability stems from the way he sees the world as a scientist:

[Nemur] looked confused for a moment and then laughed. ‘Of course Charlie. But I wasn’t referring to now. I meant before the operation.’ Smug pompous—I felt like hitting him too. I was a person before the operation. In case you forgot—’
‘Yes, of course, Charlie. Don’t misunderstand. But it was different...’ And then he remembered that he had to check some charts in the lab. (Keyes *Flowers* 89).

This scene further establishes Charlie2’s self-awareness as a way to investigate and critique discourses of cognitive disability by challenging the notion that Charlie2 is more worthy of moral consideration. Moreover, Nemur implies that Charlie1 lacked personhood because of his disability. Even though Charlie2 makes use of this distinction himself by referring to himself in the third person when he reflects on his past (“I see Charlie...”), it is the way Nemur refers to Charlie1 as someone with less subjectivity that angers Charlie2.

As Sunaura Taylor argues, the reference to cognitively disabled people as lacking personhood is not unusual within the scientific and medical community. “The medical profession’s gaze on disability is calculated, measuring, labelling, and dissecting,” Taylor argues, “the disabled person becomes a body to be cropped, numbered, and labelled” (*Beasts of Burden* 194). Nemur’s scientific gaze means that he only sees value in Charlie2 as a “fixed” person, someone who has been recreated by science into a person with the ability to understand social complexity and thus participate in it. The text is critical of the scientific gaze both in how Charlie2 responds to Nemur and also in the way that Nemur deflects his criticism by attending to his charts, thus making connections between his

prejudice and the “calculated, measuring, labelling” (Taylor *Beasts of Burden* 194)

inherent to the concept of the chart.

Eventually, Charlie decides not to tell Mr. Donner, the owner of the bakery, about the theft, but to confront Gimpy and ask him to stop. Gimpy responds by ominously threatening to never “stick up” for Charlie again and one week later Mr. Donner calls Charlie into his office to let him go:

‘When [your uncle] Herman died—how old were you? Seventeen? More like a six-year-old boy—I swore to myself...I said, Arthur Donner, as long as you got a bakery and a business over your head, you’re going to look after Charlie. He is going to have a place to work, a bed to sleep in, and bread in his mouth. When they committed you to that Warren place, I told them how you would work for me, and I would take care of you. You didn’t spend even one night in that place. I got a room and I looked after you. Now have I kept that solemn promise?’ [...]

‘Let’s face it. You’re not the same Charlie who came in here seventeen years ago—not even the same Charlie of four months ago. You haven’t talked about it. It’s your own affair. Maybe a miracle of some kind—who knows? But you’ve changed into a very smart young man. And operating the dough mixer and delivering packages is no work for a smart young man.’ (Keyes *Flowers* 103-4)

This scene adds another dimension to how the text treats disability, social responsibility, medicine, and scientific advancement by recalling Mr. Donner's story of gaining custody of Charlie because of a promise to his uncle Herman on his deathbed. In many ways, Mr. Donner's relationship to Charlie is in binary opposition to Professor Nemur's because he understands Charlie as a person who should have his own life and not be institutionalized or have his disability cut out of him by scientific intervention. However, it is also clear Mr. Donner's responsibility for Charlie is limited to his disability. Because Donner thinks about Charlie² as “fixed” and thus fundamentally different from Charlie¹, he is no longer responsible for him. While Donner is unaware of Charlie's procedure and refers to Charlie's new intelligence as a “miracle”, we can read the contrast between Donner's

mysticism and Nemur's science as a critique of scientific literacy in the general public, and ubiquitous references to social cultural tropes of “the scientific miracle” or “the mysteries of science”. The novel draws connections between Donner's and Nemur's conceptions of disability by presenting them as two sides of the same coin of medical disability, whereby Nemur represents a doctor's scientific perspective, and Donner represents the influence of scientific thought on the general public that understands science as truth and fact. Donner's claim that he has “kept his promise” and thus is no longer responsible for Charlie is both symptomatic of the notion that science and medicine ‘fix’ people with disability and that after this ‘fix’ has occurred, it is up to that person to find their own way in life.

Before finally leaving the bakery Charlie confronts his coworkers, and they confess to getting him fired because they are afraid of him, but they accuse him of pomposity. The irony of this is not lost of Charlie, for as he points out “it had been all right as long as they could laugh at me and appear clever at my expense, but now they were feeling inferior to the moron. I began to see that by my astonishing growth I had made them shrink and emphasized their inadequacies” (Keyes *Flowers* 106). In keeping with Donner's claim that the bakery is no place for a “smart young man” (Keyes *Flowers* 103), this sentiment offers a critical reflection on the social construction of cognitive disability by comparing it to what might be called below average intelligence. Charlie is exiled from the bakery because he has risen *too* far past the other employees who are not cognitively disabled, but not quite able to “[as Frank says,] understand them big words or the names of the books” that Charlie has learned since the surgery (Keyes *Flowers* 106).

Similar to the scene where Charlie2 describes Frank's assault on Charlie1, this scene complicates the notion that clear distinctions exist between ability and disability. The poor grammar and word choice of his fellow employees look and sound similar to Charlie1's progress reports when contrasted with Charlie2's proper grammar, sentence structure, and clear articulation. Again, the contrast between Charlie2 and Frank signifies how the dramatic irony of the progress report form has shifted in his favour, aligning him with the reader. However, in the context of how the medical model of disability affects people with disability after they have been treated, we can think about Frank's and the other employee's rejection of Charlie2 as an extension of Mr. Donner's claim that he is not responsible for Charlie because he is no longer disabled.

By framing Charlie's exile from the bakery as an issue of insecurity about intelligence, the text draws attention to what Carlson refers to as the “unstable classification” of intellectual disability (93). Carlson argues that the history of intellectual disability reveals that the “criteria for defining this condition have been continually in flux and that the etiology and treatment for it have depended as much on social trends, stereotypes, and discriminatory practices and assumptions as they have on hard science” (93). The instability of intellectual classification is vital to keep in mind for discussions of animal cognition as well that are arguably built upon the same prejudices and instabilities. Charlie's self-reflections highlight how the text intimately ties discrimination against humans with intellectual disabilities to the concept of animality. I will discuss this discursive link in detail below, but it is important to note that the comparative context is different for model organisms because their proximity to people is based on *similarity*

rather than difference. However, *Flowers For Algernon* represents the complicated ways that this distinction is entangled with dehumanizing threats of animality.

Part Three: Disability, Animality, and the Model Organism

“I Feel Like an Animal:” Speciesism and the Model Organism as a Literary Device

As Charlie processes the rejection of his friends and co-workers, he turns to Algernon as a way to understand his social isolation. Charlie starts to think about his relationship to Algernon in terms of a shared systemic abuse based on a mutual difference or otherness. While Charlie configures Algernon—and his animal otherness—as a rhetorical device to define his identity, the text opens up the possibility for thinking about the relationship between animality and disability (both the negative and positive associations). Charlie’s comparative reflections upon Algernon stir up memories of being abused by his mother and how she used to refer to him as an animal and threaten to lock him in a cage. In this way, the text compares Charlie’s internalization of himself as a model organism with his mother’s abuse. Charlie’s memories reinforce his interpellation as model organism after his surgery (and thus his “transformation” from Charlie1 to Charlie2) by linking the two sites of human-animal comparison. In other words, the text brings the model organism relationship that equates Charlie’s disability with animality within the clinical and experimental context with threats of animality that dehumanize humans with mental disabilities. Through a web of comparisons and affective associations, the novel also puts forward the contrary perspective of the model organism as a site of empathy, compassion, and friendship rather than contempt and

instrumentation precisely because it represents how the scientific gaze affects both animals and humans. By comparing himself to Algernon, Charlie comes to terms with the ways that medical discourses reduce him to a set of cognitive abilities and opens him up to seeing Algernon as a being affected by those same prejudices.

The first time Charlie compares himself to Algernon is in an attempt to understand how his coworkers and friends think about him now that he is not the same Charlie they knew:

There was nothing more to say [...] none of them would look into my eyes. I can still feel the hostility [...] This intelligence has driven a wedge between me and all the people I knew and loved, driven me out of the bakery. Now, I'm more alone than ever before. I wonder what would happen if they put Algernon back in the big cage with some other mice. Would *they* turn against him? (*Keyes Flowers* 108; original emphasis)

This comparison mirrors the logic of the model organism and frames Charlie's understanding of his situation in terms of experimental science. Charlie's comparison is understandable given that Algernon was a large part of Charlie's introduction to science, but it also sets the stage for how the novel positions Algernon in the rest of the novel as an emotional index for Charlie's experience as a subject of scientific research. Charlie develops this comparison further by comparing himself to an animal: "I feel like an animal who's been locked out of his nice, safe cage" (*Keyes Flowers* 111). Charlie's comparison is somewhat confusing. On the one hand, we can read it as a comparison between his own social exile and a model organism locked in the laboratory (or any captive animal for that matter). On the other hand, Charlie also seems to be contrasting relative safety of the cage with the dangers of the world outside it and that he has a kind of epistemic Stockholm syndrome.

It is also significant to point out that the simile form of the comparison hinges on the notion that Charlie is not an animal. Charlie's simile, in other words, maintains a fundamental difference between himself and Algernon. This distinction is essential to keep in mind because while Charlie and Algernon are equated within the experimental system, they remain individuals. In fact, a complete collapse would defeat the purpose of the model organism; the functioning of the model organism more generally is one that approaches simile by requiring the *like* comparison rather than the *as* comparison precisely because the distinct species identities of the two ends of the comparison need to remain intact in order to legitimate the objectification of the model organism. The novel also upholds this distinction between the species identities of Charlie and Algernon to maintain the experimental aspects of the narrative form that drives the plot. Shortly after writing that he feels *like* an animal, he has a flashback to a childhood memory of his mother beating him for getting an erection:

Now he had a clear picture of Charlie's mother, screaming at him, holding a leather belt in her hand and his father trying to hold her back. 'Enough, Rose! You'll kill him! Leave him alone!' His mother is straining forward to lash at him, just out of reach now so that the belt swishes past his shoulder as he writhes and twists away from it on the floor.

'Look at him!' Rose screams. 'He can't read or write, but he knows enough to look at a girl that way. I'll beat that filth out of his mind. [...] He's got no business to think about girls. A friend of his sister's come to the house and he starts thinking like that! I'll teach him so he never forgets. Do you hear? If you ever touch a girl, I'll put you away in a cage, like an animal for the rest of your life. Do you hear me?' (Keyes *Flowers* 112)

In a similar way that Charlie's encounter with Frank in the bakery evokes a memory of abuse in the workplace, his experience of alienation from his job and thoughts of Algernon remind him of his abusive mother. This is not the only time Charlie's mother

refers to him as an animal (Keyes *Flowers* 73), but the context of this flashback is worth noting because it links Charlie's two primary sites of abuse with Algernon and the experiment. Charlie's mother's simile, similar to Charlie's, functions by maintaining the difference between animality and humanity, mobilizing the threat of violence associated with animality against Charlie.

There is a long history of animalizing people with disabilities in order to imprison, violate, kill, and experiment on them. Among the various classes of disability, people with severe cognitive impairment have been most vulnerable to being animalized. The taxonomic status of people with mental disabilities, especially the "feeble-minded" or "mentally retarded," has been intensely debated for centuries (Gelb 95; O'Brien 323). Gerald V. O'Brien notes, at various points in history philosophers and scientists have renewed the debate—from Lovejoy's *The Great Chain of Being* that equated cognitively disabled humans to primates, to Darwin's the *Origin of Species* that provoked interest in the missing links of human evolution, to the modern eugenics movement—each adding new elements to how and why the cognitively disabled become classified as subhuman (O'Brien 332-33). In her essay on Michel Foucault's *Madness and Civilization*, Licia Carlson traces the centrality of the animality within Foucault's history of madness as it emerged as an object of knowledge in Europe during the Renaissance. As Carlson summarizes, Foucault outlines how "animality was integral to the Classical conception of madness in three interrelated ways: it defined madness as a category; it allowed the madman-animal to emerge as a distinct individual; and it provided the justification for the treatment of this group of human others" ("Another Animal" 120). Carlson argues that

Foucault's history of madness shows how animality “not only provides the soil within which the meaning of madness could be nourished, it also offers a face to the madman and a shape to the institutional structures that would attempt to ‘cure’ him” (“Another Animal” 121). Given how central animality has been to the systematic and institutional discrimination of people with cognitive disabilities, it is not surprising that disability scholars have been hesitant—if not hostile—to animal rights discourses that use disability to leverage arguments against anthropocentric definitions of intelligence and cognitive ability as baselines for ethical consideration.

Known as the “argument from marginal cases” within animal rights discourse, activists and philosophers argue that if human infants, the senile, the comatose, and the cognitively disabled maintain moral status, animals should have a similar status, since there are no morally relevant abilities that those marginal-case humans have that animals lack. The marginal cases argument is most often associated with utilitarian philosophy and Peter Singer's work on animal liberation. As Sunaura Taylor notes, “it is arguably because of Singer that animal rights and disability rights are nearly always seen as at odds” (*Beasts of Burden* 124). “What has Singer's work done to garner such strong reaction?” Taylor asks, “in many of his books and article he has argued that some disabled babies should be killed at birth and that some severely intellectually disabled people lacking specific cognitive capacities are not full persons” (*Beasts of Burden* 124). As Steven Best summarizes, Singer attempts to “distinguish between two different classes of life, not humans and nonhumans, but persons and non-persons.” Best continues, “defining personhood as the possession of traits like the capacity to feel and

reason, self-awareness and autonomy, and the ability to imagine a future, Singer finds cases of humans who are not, by this definition persons (e.g., the comatose) and nonhumans who are persons e.g., great apes and possibly all mammals” (qtd. in Taylor *Beasts of Burden* 127). Singer is against what animal rights discourses call speciesism as a way to shift normative definitions of what attributes constitute a being’s inclusion in the moral umbrella away from ontological and scientific categories of being and toward the possession of certain physiological and cognitive traits.

Best and Taylor don’t disagree with Singer’s arguments against speciesism *per se* but take issue with how he uses disabled humans as rhetorical leverage by shifting the criteria for ethical consideration from species to personhood based on cognitive abilities. Singer defines speciesism as “a prejudice or attitudes of bias in favour of the interests of members of one’s own species against those of another species” (6). Singer elaborates by putting speciesism in the context of other kinds of discriminatory ideologies: “Racists violate the principle of equality by giving greater weight t the interests of members of their own race. Sexists violate the principle of equality by favouring members of their own sex. Similarly, speciesists allow the interests of their own species to override the greater interests of members of other species. The pattern is identical in each case” (9). This argument has become the hallmark of animal rights discourse and scholarship since singer popularized it in the 1970s. However, Taylor reminds us that Singer’s position is not necessarily one that unilaterally makes animals unkillable because he ties personhood and cognition to suffering:

It follows that if one were able to kill beings who don’t have these cognitive capacities without causing them to suffer, it would not be as wrong to kill them as

it would be to kill other beings who do—as long as the good consequences of doing so outweigh the bad [...] in fact, according to Singer, if the being in question were sentient but had none of the attributes of personhood he describes, killing them painlessly and instantly might not be wrong at all. (129)

This obvious proves problematic for thinking about people with cognitive disabilities because Singer actively promotes their euthanization. Furthermore, Singer makes numerous assumptions about what kinds of capabilities people with disabilities possess and heavily relies on the scientific model that almost always sees disability as detrimental, biological mistakes. Given this position, it is not surprising that Singer applies his argument to experimentation. While it is important to note that Singer doesn't necessarily advocate for using disabled humans in research, he argues that hypothetically, if we accept that intelligence is the determining factor for deciding which beings are available for experimentation, then, logically, it follows that we should be open to using cognitively impaired as well as animals. However, Singer is opposed to the use of neurotypical humans because they would suffer even more than animals: in *Animal Liberation* he writes,

The same argument gives us reasons for preferring to use human infants or severely retarded human beings for experiments, rather than adults, since infants and retarded humans would also have no idea of what is going to happen to them. So far as this argument is concerned non-human animals and infants and retarded humans are in the same category; and if we use this argument to justify experiments on non-human animals we have to ask ourselves whether we are also prepared to allow experiments on human infants and retarded adults; and if we make the distinction between animals, on what basis can we do it, other than bare-faced—and morally indefensible—preference for members of our own species. (16)

This argument has many implications for thinking about how human and animal rights and human-animal relationships figure in *Flowers For Algernon*. By situating Charlie's

self-comparison and his mother's violent threats together within a more extensive section of the novel that deals primarily with traumatic flashbacks to moments of physical abuse and discrimination, the novel draws connections between animalization and abuse. What also emerges from these comparisons and the discussion of Singer's leveraging of cognitive disability against animal rights is that the novel offers a more complicated view of human disability and laboratory animals than Singer's espouses.

Whereas Singer replicates the logic of rhetorically equating disabled humans and animals for the sake of invalidating animal testing, Charlie and Algernon's relationship demonstrates that it is perhaps more productive to think about the two situations as linked in meaningful ways. Furthermore, Singer completely skirts the historical fact that, as Melinda Cooper and Catherine Waldby point out, institutions for cognitively disabled people have been sites for experimental human trials for medical therapies, pharmaceuticals, and vaccines (118). More often than not, these trials were often done in conjunction with animal trials and not as a replacement. With this in mind, we can read *Flowers for Algernon* as a representation of how laboratory animals and cognitively disabled humans have been brought together in the name of scientific advancement, as well as possibilities for a different kind of connection based on alliance and friendship.

“A couple of experimental animals:” The Human Test Subject, and the Model Organism

In the second half of the novel, Charlie and Algernon emerge as *both* friends and co-constituted research subjects. However, the threat of scientific or epistemic violence that reduces both humans and animals to information, results, and data looms in different

ways for each of the characters. For Charlie, this threat manifests as a reductive comparison that sets him in relation to the categories of ‘idiot,’ ‘retard,’ or ‘moron’ as his condition begins to revert past his previous level of cognitive disability. For Algernon, even as he and Charlie become close, his status as special mouse begins to change as symptoms of his reversion manifest and he is reduced to a body that contains information rather than a thinking, feeling, living creature. In both cases, the novel presents Charlie and Algernon's altering identities through a series of comparative events that highlight the contradictions in how they are perceived, categorized, and treated by the other characters.

The novel utilizes these contradictions to show how animals and people are oppressed by something approaching what Sunaura Taylor refers to as a “common ableism” that positions both animals and people with disabilities as “less than” normative humans. “All animals—both those we human beings would call disabled and those we would not,” Taylor argues, “are devalued and abused for many of the same basic reasons disabled people are. They are understood as incapable, as lacking in various abilities and capacities that have long been held to make human lives uniquely valuable and meaningful” (Taylor 43). The central tenet of Taylor's conception of species ableism is intelligence: “intellectual inferiority has been so easily animalized because animals themselves have long been understood as intellectually inferior [...] Cognitive capacity is widely accepted as an indicator of a nonhuman animal's value” (Taylor 74-75). Taylor critiques similar discourses of disability and animality that frame dependence as a drain on society and instead advocates for a conception of society that is based on shared

vulnerability. *Flowers for Algernon* makes a similar critique of ableism by countering the notion that Charlie and Algernon would be ‘better off’ with more intelligence.

Furthermore, Charlie and Algernon's shared experience of experimentation advances an ethics of vulnerability similar to Taylor's. However, the novel also demonstrates how the model organism is not so easily mapped onto a generalized vision of human-animal ethics and that the particulars of these animals' situations often go unarticulated and uncomplicated in theories of animal ethics and animal rights. As I mentioned in the introduction of this dissertation, the model organism stands in a different position to humans than other animals because the comparative apparatus reversed, so *similarities* rather than the *differences* are mobilized to establish and justify their use-value and, hence, oppression. The primary way the novel builds this critique is through the establishment of Charlie *as a human test subject* and comparing his experience to Algernon's *as a model organism*.

Soon after Charlie is expelled from the bakery and comes to terms with his memories of disability, Professor Nemur notifies Charlie of an upcoming presentation at a scientific conference where the laboratory will unveil the preliminary results of his and Algernon's procedures. During this time, Charlie becomes aware of how the scientists perceive him more as a tool of the experiment than a person with his own desires and motivations:

Progress Report 12

June 5—Nemur is upset because I haven't turned in any progress reports in almost two weeks (and he's justified because the Welberg Foundation has begun paying me a salary out of the grant so that I won't have to look for a job). The International Psychological Convention at Chicago is only a week away. He

wants his preliminary report to be as full as possible, since Algernon and I are the prime exhibits for his presentation.

Our relationship is becoming increasingly strained. I resent Nemur's constant references to me as a laboratory specimen. He makes me feel that before the experiment I was not really a human being. (Keyes *Flowers* 113)

This scene extends Charlie's resentment for Nemur's dismissal of his concern about the theft at the bakery by linking Nemur's inability to see Charlie as a real person with the idea that Charlie is an object of research and a model organism. Nemur's impatience with Charlie's lack of progress reports indicates that Charlie's resistance might be undermining the legitimacy of the experiment by leaving a gap in the narrative of Charlie's transformation. However, Charlie's resistance signals the novel's interrogation of the laboratory report because soon after this scene Charlie's progress reports break down into more traditional diary entries that focus on life experience, personal reflection, and philosophical speculation. As Charlie states, the main reason he stops writing progress reports is that he is all but consumed with the contemplation of his new life:

I told Strauss that I was too involved in thinking, reading, and digging into myself, trying to understand who and what I am, and that writing was such a slow process it made me impatient to get my ideas down [...] Strauss again brought up my need to speak and write simply and directly so that people will understand me. He reminds me that language is sometimes a barrier instead of a pathway. Ironic to find myself on the other side of the intellectual fence. (Keyes *Flowers* 113-114)

Charlie's self-reflection about his new position on the “other side of the intellectual fence” is an extension of his previous contrast between the “laboratory specimen” and the “human being.” For Charlie, human subjectivity has a lot to do with what it means to be an object of experimentation because the premise of the experiment that facilitated his intellectual growth positioned intelligence and subjectivity as mutually exclusive.

Later in the same progress report, Charlie compares his search for identity to the concept of the model organism by configuring the urban landscape of New York as a double metonymy for society and the scientific maze test:

June 8—What drives me out of the apartment to prow through the city? I wander through the streets alone—not the relaxing stroll of a summer night, but the tense hurry to get—where? Down alleyways, looking into doorways, peering into half-shuttered windows, wanting someone to talk to and yet afraid to meet anyone. Up one street, and down another, through the endless labyrinth, hurling myself against the neon cage of the city. Searching...for what? (*Keyes Flowers* 127)

This scene adds another dimension to the concept of animality and dehumanization discussed in the previous section by tying Charlie's search for social identity with model organism experimentation (while also contrasting the ontological categories of human and animal). Charlie's identification with the model organism is complicated because, on the one hand, Charlie opens up to an affirmative relationality with Algernon rather than asserting his humanity against Algernon's animality. Charlie's affirmation extends ethical consideration to Algernon because Charlie feels a kind of affinity for Algernon, but this passage also demonstrates that Charlie's identification with model organisms is mainly figurative. While Charlie doesn't directly leverage his humanity against Algernon, the novel positions Algernon as a rhetorical device to explore the philosophical implications of Charlie's experience of being a research subject. The imagery of the labyrinthine “neon cage” of urban life takes the position of the research object, but it also risks romanticizing the maze as an emancipatory tool for growth and personal discovery. Although, similar to Algernon, Charlie is ultimately doomed, he understands his position differently because he identifies with the humanist ambitions of experimental science to save future humans. The novel sets up this utilitarian distinction between Charlie and Algernon through a

series of complex comparisons that ultimately result in Charlie cutting ties with the scientists and escaping with Algernon.

Throughout the last two-thirds of the novel, it is difficult to distinguish whether the novel advocates for an ethics of joint human and animal experimentation or if we are meant to read Algernon as a kind of medical canary in the coal mine for Charlie's condition and a narrative guinea pig for the reader's expectations. Charlie refers to himself as a guinea pig when expressing his frustration with how the scientists refer to him strictly in terms of their experiment:

It may sound like ingratitude, but that is one of the things that I resent here—the attitude that I am a guinea pig. Nemur's constant references to having *made me what I am*, or that someday there will be others like me who *will become real human beings*.

How can I make him understand that he did not create me?
He makes the same mistakes as the others when they look at a feeble-minded person and laugh because they don't understand there are human feelings involved. He doesn't realize I was a person before I came here. (Keyes *Flowers* 145; original emphasis)

Significantly, this reflection follows a flashback in which Charlie recalls being taken to a gene therapist by his mother Rose and his epiphany about his initial motivations for wanting to get involved with the experiment. “Now I can see where I got the unusual motivation for becoming smart that so amazed everyone at first” Charlie writes, “It was something Rose Gordon lived with day and night. Her fear, her guilt, her shame that Charlie was a moron. Her dream that something could be done [...] I guess I never stopped wanting to be the smart boy she wanted me to be, so that she would love me” (Keyes *Flowers* 144). Similar to the discussion of disability and the scientific gaze in the previous section, the novel compares Rose's discrimination as a mother, and professor

Nemur's as a scientist. The contrast between being a guinea pig and a human person drives the climax of the story by grounding Charlie and Algernon's relationship within a conflicting humanist construction of moral values and an interspecies friendship based on mutual objectification by experimental science.

Five days after Charlie realizes that the scientists consider him more of a model organism than a person, Charlie and Algernon fly to Chicago for the annual conference of the "International Psychological Association" (Keyes *Flowers* 155). In Charlie's words, he and Algernon are to be the "main attraction" of the conference, and he resents the pressure he and Algernon are under to perform their genius for the conference (Keyes *Flowers* 156). Charlie's experience of the conference both solidifies his disgust at being treated as a specimen, a model organism, and a scientific creation because he finally gains perspective on the scientists by seeing them in a larger institutional setting, communicating their findings to their colleagues. This perspective also allows Charlie to see that not all science is created equal and that experimentation as a pursuit in and of itself is unethical, both for its treatment of animals and for its questionable contributions to knowledge:

Some of the psychological papers delivered at the meeting were impressive [...] but there were other kinds of papers too—P.T Zellerman's study on the difference in time it took white rats to learn a maze when the corners were curved rather than angular, or Worfel's paper on the effect of intelligence level on the reaction-time of rhesus monkeys. Papers like these made me angry. Money, time and energy squandered on the detailed analysis of the trivial. (Keyes *Flowers* 156-57)

While Charlie is primarily interested in the wasted time, energy, and research funding of these experiments, one cannot help but notice that there is a built-in critique of how animals are used as epistemic devices. Charlie's narrative of these experiments makes the

animals and their ‘trivial’ knowledge contribution inseparable. Later in Charlie's reflection, just before his and Algernon's performance, he expands on his critique of scientific ethics when he thinks of how the scientists treat Algernon. “In a short while,” Charlie narrates, “Burt would read a paper describing the procedures and results of administering intelligence and learning tests he had devised for Algernon. This would be followed by a demonstration as Algernon was put through his paces of solving a problem in order to get his meal (something I have never stopped resenting)” (Keyes *Flowers* 157). Charlie’s resentment is a reference to the early pages of the novel where the pre-surgery Charlie expresses concern over the fact that Algernon has to complete tasks to obtain food (Keyes *Flowers* 157).

In the context of the conference and Charlie's critique of experimental science, his resentment of how the scientists treat Algernon is an essential link between Charlie's selves—especially given my previous analysis of the lengths to which the novel goes to separate the two—because after he escapes the conference, he and Algernon become much closer. However, at the same time, Charlie also begins to understand how his present self is in many ways a manifestation of prejudice against mental disability. This realization is especially important for this chapter because it occurs mainly within the framework of a more sophisticated understanding of model organisms and their roles in experimental science. Furthermore, as the conference scene unfolds, the two forms of discrimination against cognitively impaired humans and animals become inseparable, starting with when Charlie learns (through the presentation of the scientists' research

findings of Algernon's condition) that the scientists have withheld important information from him:

Burt revealed one thing I had *not* known. At the peak of his intelligence, Algernon's performance had become variable. There were times, according to Burt's report, when Algernon refused to work at all—even when apparently hungry—and other times when he would solve the problem but, instead of taking his food reward, would hurl himself against the walls of his cage. (*Keyes Flowers* 158; original emphasis)

Thinking back to the opening section of this chapter that deals with how the novel sets up Charlie and Algernon's relationship as predictive—that is, given that Algernon's procedure happens first, his condition is a plot device that foreshadows Charlie's intellectual acceleration and decline—we can understand this moment as the fundamental crux of the novel where Charlie has finally grasped the implications of Algernon's involvement in the experiment, but also his utility as a model organism. This scene demonstrates that Algernon does have higher brain functioning akin to humans because of his complex reaction to the conditions of his experimentation. As readers, we feel sorry for Algernon in much the same way we would for a human character because his pain is psychological as opposed to the purely physical pain that laboratory animals are often associated with. However, we simultaneously read this as a foreshadow for the pain that Charlie is about to feel as his condition worsens once he reaches the peak of his intelligence after he escapes the conference.

Charlie's breaking point at the conference occurs during the portion of the presentation that shifts focus away from Algernon and toward the scientists' profile of his previous self and his transformation into a genius. Cruelly, this presentation involves showing videos of Charlie's early failed attempts to complete the maze test and his initial

losses against Algernon. After being humiliated by the audiences' outbursts of laughter, Charlie begins thinking about letting Algernon out of his cage so he could watch them all "scattering and crawling around on their hands and knees trying to retrieve a small, white, scurrying genius" (Keyes *Flowers* 159). Charlie wants to turn his humiliation against them and let them face Algernon to see how they measure up to his intellectual capacities, thus hinting at the kind of intelligence spectrum mentioned above and the fact that perhaps a neurotypical person would also have lost to Algernon. Charlie's anger toward the scientists speaks to the constructed nature of human disability but also hints toward the possibility of a similar construction of animal intelligence as well. Furthermore, the reader cannot help but connect their responses to the humour of Charlie's early progress reports—his misunderstanding of certain words and concepts, misspelling, and general confusion—to the audiences' reaction. The notion of the academic conference paper as a form of representation is reminiscent of the above discussion notion of the progress report. Charlie draws attention to this association when he reflects on how the presentation frames his relationship to Algernon:

I had come there as part of a scientific presentation, and I had expected to be put on exhibition, but everyone kept talking about me as if I were some kind of newly created thing they were presenting to the scientific world. No one in this room considered me an individual—a human being. The constant juxtaposition of "Algernon and Charlie," and "Charlie and Algernon," made it clear that they thought of both of us as a couple of experimental animals who had no existence outside the laboratory. (Keyes *Flowers* 160)

Charlie's irritation with the comparisons between himself and Algernon can be read in several ways: Charlie seems to take issue with being compared to Algernon because it dehumanizes him—the adverb "both" meaning that he thinks Algernon is the real

experimental animal and not him. However, it could also mean that neither he nor Algernon should be considered synthetic “experimental” creations because they both pre-exist the procedure that granted them their abilities. The possibility of considering both Charlie and Algernon as “experimental animals” is crucial for thinking about their relationship because it influences how Charlie sees Algernon after they escape—and especially when Charlie takes over the study. Charlie draws attention to the structure of the experiment that is fundamentally representational: the original data set is for Algernon, and then it is compared to that of Charlie. In other words, Charlie is referring to the representational violence of the datafication of both himself and Algernon. It is important to recognize the togetherness of this scheme because it highlights the fact that the model organism always has a reference point within the human. In this case, the scientists’ presentation requires both Charlie and Algernon’s bodies in order to make their case to the scientific community because of the corroborating data sets are associated with each other.

By referencing the relegation of himself and Algernon to the inside of the laboratory, Charlie evokes crucial questions about the space of representation: that the model organism as a representational form is closely tied to the laboratory and the fields of science and biotech try to uphold a division between science and culture. Nemur's extended description of Charlie furthers this: “[Nemur:] When Charlie came to us he was outside of society, alone in a great city without friends or relatives to care about him, without the mental equipment to live a normal life. No past, no contact with the present, no hope for the future. It might be said that Charlie Gordon did not really exist before this

experiment” (Keyes *Flowers* 161). Echoing earlier sentiments that hinted at a view of cognitively disabled people as existing outside society, without the ability to properly speak or act for themselves, Nemur's speech prompts Charlie to reach down and open the door to Algernon's cage. Charlie and Algernon's escape positions their relationship as something that exceeds the laboratory—and thus the epistemological framework of experimental science. Further it sets up a contrast between the kind of relationship Charlie and Algernon had *within* the experimental system and *outside* in larger society, for as soon as Algernon is out of his cage, Charlie addresses him more like a fellow individual by directly engaging with him: “Run,” Charlie shouts to Algernon as he leaps off the stage, “the side door!” (Keyes *Flowers* 163). After Charlie meets up with Algernon in the bathroom, it is more clear that the two have an understanding and can communicate quite well: “Algernon was perched on top of one of the washbasins, glaring at his face in the mirror. “Come on,” I said. “We'll get out of here together.” He let me pick him up and put him into my jacket pocket. “Stay in there quietly until I tell you” (Keyes *Flowers* 164). While Charlie and Algernon's initial communication is somewhat basic, it is indicative of a shift in their relationship. Once Charlie and Algernon are back at the hotel, Charlie further reassures Algernon that they will leave together and start a new life outside the laboratory: “I closed the door behind me, and patted my pocket. A pink snout and white fuzz poked out and looked around. “I'll get my things packed,” I said, “and we'll take off—just a couple of man-made geniuses on the run” (Keyes *Flowers* 164-65).

“A pleasant companion?” Post-Laboratory Friendship and the Returns of Charlie and Algernon

After Charlie and Algernon escape the conference, they move to New York City and Charlie rents a small apartment. For the first time, Charlie and Algernon have the space to interact with one another without the direct supervision of scientists and the comparative technologies of the laboratory. In this more relaxed setting, the two characters develop a friendship that was not possible in the laboratory because of the physical and ideological barriers that separated them. However, scientific epistemology continues to cast a shadow on Charlie and Algernon's lives outside the laboratory because, as we learned during the press conference, the scientists have made a mistake that threatens both their lives. This ominous mistake generates a kind of scientific urgency underneath all of Charlie and Algernon's interactions—even as they grow much more personal and intimate—compelling Charlie to take matters into his own hands and become a scientist in his own right. Charlie's position in relation to science pivots and he starts to embrace the progress report and the overall logic of experimentation. “So many confusing thoughts to get down.” Charlie writes, “I tell myself that as long as I keep tapping my progress reports, nothing will be lost; the record will be complete” (Keyes *Flowers* 171). But where does this leave Algernon both as an individual and in relation to Charlie, the scientist?

Charlie is pulled between thinking about Algernon as a complex individual and reading him as a tool for self-discovery and scientific information. In fact, the novel makes it difficult to determine Algernon's place in Charlie's new worldview because on the one hand, he cares for Algernon, but on the other hand, he wants to figure out how to

save their lives. This conundrum represents a fundamental problem in thinking about transgenic model organisms: regardless of how Charlie thinks and feels about Algernon, the fact of his physiological condition continues to pull Charlie (and the novel itself) toward a scientific understanding of Algernon. Even where the text seems to have a desire to see Algernon as a complex social and emotional creature, there is a default to the objectifying gaze of science:

Algernon is a pleasant companion. At meal times he takes his place at the small gateleg table. He likes pretzels, and today he took a sip of my beer while we watched the ballgame on TV. I think he routed for the Yankees.

I'm going to move most of the furniture out of the second bedroom and use the room for Algernon. I plan to build him a three-dimensional maze out of scrap plastic that I can pick up cheaply downtown. There are some complex maze variations I'd like him to learn to be sure he keeps in shape. But I'm going to see if I can find some motivation other than food. There must be other rewards that will induce him to solve problems. (Keyes *Flowers* 172)

In contrast to the earliest scenes of the novel where we are introduced to Charlie and Algernon in within the structured procedures of the laboratory, at the new apartment they interact with each other in a more open, personal, and vulnerable manner. This scene is split between the first brief paragraph that demonstrates both Charlie's consideration for Algernon's comfort and wellbeing and that he considers Algernon as an individual. The primary characteristic of the mouse that has made it desirable as a model organism is its ability to reproduce quickly and frequently, allowing laboratories to more easily mass produce specialized strains. By offering Algernon a kind of individuality, the text begins to take down one of the biggest walls to thinking about laboratory mice as beings worthy of ethical and moral consideration. However, in the second paragraph, Charlie's description of his plans to build Algernon a new maze indicate that the text reaches a kind

of impasse when it comes to the implications of Algernon's individuality. That the text begins to approach the question of Algernon's individuality at the moment when Charlie takes control of their experimental lives suggests that perhaps the best Algernon can hope for is a caring scientist. While it must be pointed out that Charlie builds the maze out a concern to keep Algernon's mind “in shape” much like a person who has Alzheimer's or dementia, the persistence of the maze is symptomatic of the text's unwillingness to let Algernon escape the clutches of scientific epistemology.

The presence of the maze in this intimate, domestic, companionate space reveals the inevitable power relations that exist within companion animal relationships. In essence, what happens in this scene is that the power exerted on Algernon as a model organism shifts from the institution to the individual scientist. Making the transition to companion animal means that he performs his model-ness for Charlie—both for his pleasure and for the information Charlie gathers from that performance as a scientist. The transfer of power can mean that the novel offers a more complicated view of the model organism as both a tool and a companion. However, it can also be read as an indication of the text's unwillingness to let Algernon be a social creature because it would unravel the suspense built around Algernon's body as a scientific tool. This sentiment is perhaps best exemplified in the last two sentences where Charlie, referencing his earlier outrage that the scientists made Algernon work for his food, ponders alternative ways to “induce” Algernon to participate in the new maze. The word “induce” in this context is symptomatic of the text's ambiguity because although Algernon is granted autonomy in

the previous paragraph, referring to his behaviour as something that has to be “induced” implies a lingering notion of Algernon as a mechanistic being.

The text further develops Algernon’s dual position as both a companion and a model two progress reports later when Charlie describes his new advanced maze in more detail:

June 21—I’ve added time sequences of increasing complexity to the three-dimensional maze, and Algernon learns them easily. There is no need to motivate him with food or water. He appears to learn for the sake of solving the problem—success appears to be its own reward. But, as Burt pointed out at the convention, his behaviour is erratic. Sometimes after, or even during a run, he will rage, throw himself against the walls of the maze, or curl up and refuse to work at all. Frustration? Or something deeper? (Keyes *Flowers* 188; original emphasis)

Much like his reference in the previous scene to Algernon's behaviour as something that must be “induced” with proper inputs, Charlie’s extended description of the new maze is structured around a contrast between motivation and frustration, split between the two paragraphs of the excerpt. The first paragraph continues Charlie’s objection to using hunger as motivation for completing tasks while also building on the description of Algernon as a sentient companion by demonstrating that Charlie is aware of that Algernon has motivations for completing the maze outside the logic of experimental science. However at the same time, the activity of completing the maze—as an experiment—is designed to measure Algernon’s ability to problem solve not to measure his enjoyment or sense of accomplishment.

Charlie’s scientific tone and his identification with the scientists also demonstrate that Charlie is, to a certain degree, objectifying Algernon as a model organism precisely because the maze proves his sentience. In other words, Charlie's observations objectify

Algernon's sentience as a scientific phenomenon. Charlie's description of Algernon's "erratic" and "frustrated" behaviour in the second paragraph reveals how the contradiction in Charlie's description is largely the result of his adoption of the scientific gaze because it limits his ability to read Algernon as a complex being. While Charlie reads Algernon's frustration as a product of the maze, that the frustration is something that occurred as the result of Algernon's interaction with the maze itself rather than a frustration with the act of being tested by the maze, we can read Algernon's frustration symptomatically as the result of the confusion between friendship and measurement, animal and tool, ethical engagement and objectification. We can also read Algernon's "frustration" symbolically: perhaps Algernon's crashing into the side of the maze is symbolic of him crashing against the box science has put him inside. With this in mind, the notion of "something deeper" may be an acknowledgement of the limitations of Charlie's insistence upon thinking about Algernon as a model organism. The "something deeper" that Charlie can't quite grasp reveals the contradiction in the cultural identity of the model organism that is both animal and scientific object. After he adopts the scientific gaze, Charlie cannot come to terms with how Algernon's animal sentience haunts his status as a model organism.

The tone of Charlie's observations of Algernon is echoed in his self-observations once he begins to experience what the scientists described in Algernon's case during the conference as "variable performance" (Keyes *Flowers* 158); Charlie loses interest in science and learning, begins to drink, party, fraternize with his neighbour Faye, and ultimately experiences blackouts during which Charlie¹ tries to take back his body:

Somehow, getting drunk had momentarily broken down the conscious barriers that kept the old Charlie Gordon hidden deep in my mind. As I suspected all along, he was not really gone. The operation had covered him over with a veneer of education and culture, but emotionally he was there—watching and waiting. What was he waiting for? (Keyes *Flowers* 195)

Charlie2's characterization of Charlie1 as being with him all along materializes what the flashbacks, the dreams, and the memories of the earlier scenes hinted at: the experiment was repressed Charlie1 rather than replacing him with Charlie2. The notions of repression and the co-presence of Charlie1 and 2 at the end of the paragraph raise questions the possibility of another Algernon alluded to at the end of Charlie's observations in the last excerpt. Does the “something deeper” that Charlie refers to indicate that Algernon too has a subconscious where an Algernon1 struggles to gain control over its body? Does this Algernon1 represent the animal nature of Algernon that struggles against the scientific nature of Algernon2?

Shortly after Charlie2 struggles to come to terms with the presence of Charlie1, Algernon has a violent episode that leaves him with no choice but to return to the laboratory and take Algernon with him:

July 9—A terrible thing happened today. Algernon bit Fay. I had warned her against playing with him, but she always liked to feed him. Usually when she came into his room, he'd perk up and run to her. Today it was different. He was at the far side, curled up in a small white puff. When she put her hand in through the top trap door, he cringed and forced himself back into the corner [...] she made the mistake of trying to pick him up. He bit her thumb. Then he glared at both of us and scurried back into the maze [...] He calmed down after that. I observed him for more than an hour afterward. He seems listless and confused, and though he still learns new problems without external rewards, his performance is peculiar [...] Time and time again he turns into a corner too quickly and crashes into a barrier. There is a strange sense of urgency in his behaviour. I hesitate to make a snap judgment. It could be many things. But now I've got to get him back to the lab. (Keyes *Flowers* 196; original emphasis)

This scene is the culmination of the suspense built up around Charlie's contradicting descriptions of Algernon's behaviour as both a friend and a model organism. Charlie's description of Algernon's degeneration outlines the simultaneous break down of both these social roles. First, by biting Faye, Algernon breaks from the social performance of the domesticated companion animal who is called upon to be docile, to be held, and to allow the human to dictate the terms of all physical engagement. This scene is as much about miscommunication as it is about violence and cognitive degeneration; Faye is unable (or unwilling) to read Algernon's body language and this miscommunication results in her "mistake," violence, and Algernon's return to the laboratory. Second, Charlie's description of Algernon's behaviour as having "a sense of urgency," much like his earlier use of the word "frustration," indicates that Algernon is under a form of psychological duress that escapes Charlie's understanding. At least part of this misunderstanding stems from Charlie's inability to read Algernon's "peculiar" performances in the maze. In other words, Algernon's degeneration makes him unable to perform in a way that is identifiable to Charlie as a model organism. By crashing into the sides of the maze instead of running through its corridors, Algernon literally disrupts the normal flow and trajectory of the experiment. This disruption and implicit desire to escape the confines of the maze itself echoes my previous discussion of Vinciane Despret's question about what animals in scientific experiments are "interested in" (91). In Algernon's case, his most defiant and autonomous acts are what ultimately justify his being sent back to the laboratory. Similar to Charlie's previous descriptions of Algernon, we can read this scene symptomatically as Algernon's struggle to perform within the

social identities of the model organism, the companion, and the animal. His urgency and his crashes into the sides of the maze walls can be symbolic of contradictions between the three categories he occupies, one haunting the others.

Algernon's degeneration echoes Joshua Chalfen's point in *White Teeth* that when it comes to transgenic organisms, “the damage is done. The mouse carries around its own torture in its genes. It's like a time-bomb. If you release it, it'll just die in terrible pain somewhere else” (Smith 485). In Charlie's case, he seems to have no other options: he either has to let Algernon die in the apartment or take him back to the laboratory because the effects of the operation are out of his hands. The novel doesn't seriously consider the possibility of letting Algernon die in the apartment because his body still contains information vital to Charlie's life, but the closing section of the novel carries a great deal with the question of who or what Algernon becomes once he is no longer living, what to do with his body, and what his body means for Charlie—as both a person who faces the same fate as Algernon and a scientist who is interested in the physiology of Algernon's degeneration.

Conclusion: “What plans have you made for me?” Learning to Die with Algernon

In the final section of the novel where Charlie and Algernon re-enter the laboratory, the text extends the unsorted contradictions in their relationship as they begin to die together. While many of the problems that I have been unpacking throughout this chapter surrounding Charlie and Algernon as objects of science and their resulting friendship are ultimately unresolved, I am interested in how toward the end of the story

the text advances an ethical position toward Algernon that approaches what Donna Haraway calls “noninnocent responsibility” (*Modest_Witness* 82). In the context of vegan and animal rights arguments surrounding OncoMouseTM, Haraway argues that the mice used as model organisms are

sentient beings who have all the biological equipment, from neuronal organization to hormones, that suggest rodent feelings and mousy cognition, which, in scientific narratives, are kin to our own hominid versions. I do not think that fact makes using the mice as research organisms morally impossible, but I believe we must take noninnocent responsibility for using living beings in these ways and not to talk, writes, and act as if OncoMouseTM, or other kinds of laboratory animals, were simply test systems, tools, means to brainier mammals' ends, and commodities. (*Modest_Witness* 82)

By framing the discussion around model organisms in terms of both an acknowledgement of the fact that mice have “rodent feelings and mousy cognition” and that this acknowledgement requires us to take responsibility for own complicity in the biomedical and pharmaceutical industries, Haraway calls for a more robust interrogation of the grey areas between discourses of animal liberation and human exceptionalism. While, as I discussed in the previous chapter, it has been argued that Haraway's position ultimately supports and even justifies the biomedical industries and their violent, objectifying, and commodifying practices (see Weisberg 49), the advantage of her argument is that it shifts the attention from a strictly animal liberationist perspective to a more modest goal of asking people to consider model organisms as beings worthy of care, consideration, and responsibility. In *Flowers for Algernon*, even though Algernon ultimately dies, the kind of responsibility that Haraway advocates for takes the shape of a friendship that is expressed through Charlie's grief and mourning for Algernon's death.

While getting reacquainted with the laboratory on his first day back, Charlie notices an unmarked door. The technician, Burt, informs Charlie that behind this door is the “freeze and the incinerator” (Keyes *Flowers* 217). “We freeze our specimens before we dispose of them in the incinerator,” Burt elaborates, “It helps cut down on the odours if we control decomposition” (Keyes *Flowers* 217). This is the first time the novel hints at the bleak fate of the model organism and the absolute control that scientists have over their lives, deaths, and bodies. Immediately upon learning of this procedure, Charlie responds: ““Not Algernon [...] Look...if and...when...I mean I don’t want him dumped in there. Give him to me. I’ll take care of him myself”” (Keyes *Flowers* 217). Charlie disagrees with the disposability of laboratory animals after they have served their experimental purposes and feels a deep responsibility to give him dignified death and to treat his body with respect after he dies. By proclaiming that he will take Algernon’s body after he dies the text maintains a binary between disposability and mourning that frames how the final scene of the novel anticipates both Algernon’s and Charlie’s deaths. The text also poses complicated questions: how do you pay respect to and grieve for a dead laboratory mouse? How do you grieve for yourself? Is there a moral imperative to learn from both human and animal deaths?

The novel positions Algernon’s death as an ethical imperative for Charlie to save him from the disposability of an experimental object, but also as a rhetorical figure for Charlie to reflect on the possibility of his death and disposability. Soon after Charlie learns of the incinerator, he finds Dr. Nemur to confront him. “Tell me,” Charlie yells, “I just got a look at your incinerator for disposing of experimental animals. What plans have

been made for me?” (Keyes *Flowers* 217) Dr. Nemur explains that he negotiated with Charlie’s sister Norma to give consent for Charlie’s participation in the experiment upon the condition that the university would pay to have him committed to the “Warren State Home and Training School” if the experiment failed (Keyes *Flowers* 218). Upon hearing this news, Charlie jokes, “at least it's not the incinerator” (Keyes *Flowers* 220). It is difficult to know how to interpret this joke because it dismisses Algernon’s situation and complicates the comparative formula between the two characters that I have been tracing in this chapter by approaching a kind of cost-benefit analysis whereby Charlie begins to see Algernon (and his death) as a source of information about how to fix his own body. However, this shift in relationality is not without conflict. While Charlie feels empathy for Algernon, he is also afraid for his own life. This fear causes Charlie to reflect on his position in relation to Algernon philosophically and to push himself to learn from Algernon’s death in a way that both takes responsibility for his actions and maintains respect for Algernon as a sentient being.

The first of Charlie's reflections comes shortly after learning of the provisions that have been made for him should his condition begin to deteriorate. “Although we know the end of the maze holds death,” Charlie writes, “I see now that the path I choose through that maze makes me what I am. I am not only a thing, but also a way of being—one of many ways—and knowing the paths I have followed and the ones left to take will help me understand what I am becoming” (Keyes *Flowers* 221). This reflection is reminiscent of earlier scenes in the novel where the maze is a metaphor for human social life. However, here, the subject of the metaphor is much more confusing and open-ended.

Charlie uses the maze to position life itself as an action; he is not a “thing” but a “way of being—one of many ways.” The qualification “one of many” can be interpreted as “one of many [human] ways” of being, but it could also be read as a challenge to speciesism in the way that it moves away from a focus on organisms to modes of life. What would such a challenge mean for thinking about Algernon? Does it mean that there is something else to be learned from comparing the two paths through the maze? If so, then what has Algernon become now that his life is more or less terminal?

Charlie struggles with these questions throughout the final pages of the novel as signs of Algernon’s death become more concrete:

Algernon refuses to run in the maze any more; general motivation has decreased. I stopped off again today to see him [Strauss and Nemur] looked disturbed as they watched Burt force-feed him. Strange to see the little puff of white clamped down on the worktable and Burt forcing the food down his throat with an eye-dropper.

If it keeps up this way, they’ll have to start feeding him by injection. Watching Algernon squirm under those tiny bands this afternoon, I felt them around my own arms and legs. I started to gag and choke, and I had to get out of the lab for fresh air. I’ve got to stop identifying with him. (*Keyes Flowers* 231-32)

Similar to Charlie's reporting on Algernon's emotional breakdown at the apartment, Charlie seems confused about how to process Algernon's pain and his feelings of having witnessed the forced feeding. The first paragraph begins with Charlie's characteristic performance of scientific notation hinging on the use of the semi-colon and the single word “motivation” to refer to whatever is happening inside Algernon’s mind. There is also a disconnect in this sentence between “refuse” and “motivation” as if refusal is excluded from being a motivation in its own right. Charlie implicitly acknowledges the refusal by building his report around it as an event, but only as a negative—it is without

motivation, its absence signifies that Algernon is leaving the world of the experiment because the experiment requires motivation. However, at the same time, there is a warmth and concern in Charlie's observations, and the emotional tone of the scene hinges on the contrast between the softness and vulnerability of the “little puff of white” and the hard coldness of the metal and glass of the laboratory equipment. This description is reminiscent of Keyes' description of the dissection mouse that I discussed in the introduction of this chapter where the “tiny-ness” of the mouse evoked a moral response that caused Keyes to rethink the casual way he approached the death and objectification of mice. In this scene, Charlie acknowledges that he “identifies” with Algernon but also tries to distance himself from Algernon because he is frightened about his own future. That Charlie never fully stops identifying with Algernon forces the reader to morally consider the violence of scientific procedures for model organisms because we empathize with Charlie.

When Charlie disciplines himself into not “identifying” with Algernon, it draws attention to the emotional double bind that has been building throughout the novel. By representing Algernon as a character in his own right in a way that encourages the reader to invest in his condition alongside Charlie's, the novel shows us the stakes of experimentation—for both humans and animals. The novel does not, however, let us off easily; although we meet Algernon and experience him as a complex character, his fate is sealed *before* the story even begins because his procedure predates the fictional triangle of the novel. The novel doesn't intervene in Algernon's procedure but opens us up to the possibility of thinking about the barriers that are in place between humans and laboratory

animals. These barriers are the physical walls of the institutions that breed and circulate them, but also the ideological barriers that inoculate us against the empathy we may feel. We, like Charlie, find ourselves imagining Algernon's point of view while also forcing ourselves not to identify with him both because the novel is invested in science as a humanist endeavour and the story is told through Charlie's narrative voice. The reader cannot help but invest more in Charlie because, after all, our perception of Algernon is Charlie's: Charlie has feelings about Algernon because they share a common experience and these feelings affect us in return. Even though Charlie respects and cares for Algernon, he too wants to live and hold on to the advancement of science, and thus has no choice but to regard Algernon as a kind of epistemological tool. With this conundrum, the novel offers a situation in which we cannot so easily separate an ethics of animal life from human self-determination.

In the next report, when Charlie describes Algernon's death, the text expands the contradictions of his ambivalent identification with Algernon. Charlie is pulled toward a scientific understanding of animal life even as he mourns the loss of Algernon as a friend and thus enacts a kind of dual ritual of mourning and scientific sacrifice:

Algernon died two days ago. I found him at four thirty in the morning when I came back to the lab after wandering down at the waterfront—on his side, stretched out in the corner of the cage. As if he were running in his sleep.

Dissection shows that my predictions were right. Compared to the normal brain, Algernon's had decreased in weight and there was a general smoothing out of the cerebral convolutions as well as a deepening and broadening of the brain fissures.

It's frightening to think that the same thing might be happening to me right now. Seeing it happen to Algernon makes it real. For the first time I am afraid of the future.

I put Algernon's body into a small metal container and took him home with me. I wasn't going to let them dump him into the incinerator. It's foolish and

sentimental, but late last night I buried him in the backyard. I wept as I put a bunch of wild flowers on his grave. (Keyes *Flowers* 258)

As Algernon undergoes a kind of dual transformation, the scene is both touching and disturbing. In his dissection, Algernon becomes a body, a container of information for extraction at the same time that he becomes an object of mourning. Of course, humans are also dissected and autopsied. Post-mortem autopsy is an ordinary procedure, as is the dissection of human cadavers, but this is somewhat different because Algernon is a model organism. When we cut up a human cadaver there is the matter of consent (though not always given especially in historical perspective) and the cadaver is also a distinction that comes after death; it is not synonymous with the human-turned cadaver, and the human cadaver was not predestined to become a cadaver. Similarly, the person in question is required to give consent for the information to be gathered on behalf of the other humans represented within the experiment. But similarly, the person's illness, and thus their participation occurs by chance; they were not purposefully given the disease in question, nor were they primarily conceptualized as an embodiment of the disease in question. In some cases it is symbolically possible to refer to model organisms as not even possessing their disease: they contain the disease, the disease is inside them, but it is not theirs because the disease is a human one. Even though Algernon embodies information about what might be happening to Charlie, Charlie still gives Algernon a proper burial and a funeral of sorts. How can we reconcile the two performances of the scientific autopsy and the funeral that act upon and with Algernon's body?

The novel pulls us in two directions. A funeral often differentiates humans from animals. Funerals are a social rite of passage that allows the bereaved to show respect and

express that this person meant something to them. But even as Charlie weeps for Algernon when he lowers his body into his grave, he hesitates and tries to dismiss his emotions as foolish and sentimental. Again, this hesitation is reminiscent of Keyes story of his animal dissection and is symptomatic of the kinds of social performances that surround the deaths of animals in order to cover up or evade emotional reaction. On the final page of the novel we are left with Charlie¹ who, in his characteristically “naïve” way, is concerned with respecting and paying tribute to the memory of Algernon’s life: “P.S please if you get a chance put some flowrs on Algernons grave in the back yard” (Keyes *Flowers* 311). That this final act of mourning is constructed as a postscript hints at the liminal space Algernon takes up in the novel and implicitly acknowledges the limitations of the novel for representing model organisms. Unlike *White Teeth* and *Mrs. Frisby and the Rats of NIMH*, the novel does not leave us with the question of how to free Algernon from the confines of the laboratory. Instead, giving Algernon the last word in the postscript pushes us to more directly engage the confines of scientific epistemologies and interrogate how they foreclose our ability to make ties with model organisms as complex beings who we are capable of connecting to on emotional and affective levels.

Conclusion | The Poetics of Corporeal Equivalence

I guess I'm trying to subjectify the universe, because look where objectifying it has gotten us. To subjectify is not necessarily to co-opt, colonize, exploit. Rather, it may involve a great reach outward of the mind and imagination.

—Ursula Le Guin (“Deep in Admiration” M16)

In her essay “Deep in Admiration,” Ursula Le Guin reflects on the relationship between poetry’s and science’s engagements with the natural world. She argues that if we are to “relearn” how to cohabitate the planet, we have to remember our “kinship as animals with animals” (M15). Rather than polemicizing, pitting poetry and science on either side of an unbridgeable epistemological gulf, she argues that they are complementary: “Science describes accurately from outside; Poetry describes accurately from inside. Science explicates; poetry implicates. Both celebrate what they describe. We need the languages of both science and poetry to save us from merely stockpiling endless ‘information’ that fails to inform our ignorance or our responsibility” (M16). Le Guin’s point is that we cannot rely too heavily on one way of looking at the world; neither poetry nor science alone are enough. While Le Guin’s essay is informed by broader concerns for the environment, the environmental sciences, and the animals whom we live alongside in the ‘natural world,’ I am interested in what reading poetry alongside science can offer the animals who live in the ‘unnatural’ spaces of the laboratory. As a concluding gesture, I want to reflect on what it might mean to “subjectify” (Le Guin M16) model organisms through a close reading of Max Ritvo’s “Poem to My Litter.” Here I ask: what can poetry offer animals who have been so thoroughly altered and made into scientific objects? What do conceptions of animal kinship such as Le Guin’s mean for model organisms

when their objectification by science is based on the continuity between species? From the conditions surrounding their conception, lives, and deaths to their impenetrable ties to the laboratory and a lack of direct visibility or representation, how do we subjectify animals who occupy an almost complete absence of agency?

The literature that I have focused on throughout this dissertation demonstrates the ability to intervene in the scientific discourses of ‘pure objectification’ that surround the model organism. In line with Le Guin's ideas about the complementary relationship between science and poetry, I have explored how these literary texts have worked, not in opposition to science, but rather by taking scientific epistemologies of the model organism and injecting imagination, curiosity, and subjectification into the representational form of the model organism. In Chapter One, *White Teeth* revealed the openness of the model organism as a form of multispecies representation and enacts how the ideas that get imprinted onto animals depend on the perspective of the humans involved. Chapter Two turned to *Mrs. Frisby and the Rats of NIMH*, which takes the representational form of the scientific model and replaces a scientific corporeal equivalence with a story about animal empathy and compassion. *Flowers for Algernon*, in Chapter Three, takes the storying of the model organism one step further by directly grappling with the kinds of friendship, affect, mourning, and responsibility that can arise between human and animal experimental subjects. Since his relationship to mouse model organisms was direct and not symbolic, Max Ritvo’s “Poem to My Litter” offers something distinct by giving us the perspective of “corporeal equivalence” (Davies “Humanized Mouse” 4) *from the inside* of an experiment.

On August 23, 2016, Max Ritvo died of complications related to his decade-long battle with a rare form of bone cancer called Ewing’s sarcoma (Ledford). He was 26 years old and did not live to see the publication of his first book of poetry, *Four Reincarnations*. In 2015 Ritvo was invited to participate in an experimental drug trial involving transgenic mice that inspired “Poem to My Litter.” More specifically, Ritvo’s mice were highly specialized model organisms called “humanized mice” (Davies “Humanized Mouse” 3). Humanized mice are unique because they often involve the transplantation of individual human genetic material into their genomes. Drug trials such as these are known in the medical community as “translational medicine” because they involve directly “transferring laboratory findings into medical practice; colloquially moving research from bench-to-bedside” (Davies “Humanized Mouse” 4). In Ritvo’s case, this meant creating a group of mice with his specific tumours growing inside of them so that they could be tested with an experimental drug. “Poem to My Litter” offers a window into a concrete relationship between a human and model organisms where the life-and-death stakes of model organism experimentation become painstakingly clear. Even as Ritvo makes these stakes clear by centring the poem on a visceral and personal relationship between his body and the bodies of mice—through their mutual tumours—he configures them in terms of kinship and familial responsibility rather than as scientific objects.

The opening stanzas of the poem establish the material relationship between Ritvo’s body and the bodies of the mice as a specific comparison between their shared tumours:

My genes are in mice, and not in the banal way
that Man's old genes are in the Beasts.

My doctors split my tumours up and scattered them
into the bones of twelve mice. We give

The mice poisons I might, in the future, want
for myself. We watch each mouse like a crystal ball. (*Reincarnations* 14)

By contrasting the common sense understanding of the genetic continuity between all life on earth and the genetic transplantation of the humanized mice, Ritvo forces the reader to contemplate the relationship between his individual body and the bodies of the mice. The materiality of his individual bodily relationship structures the rest of the poem and serves as a background for Ritvo's figurative and emotional exploration of what it means to have mice created using his own DNA.

In the third stanza, Ritvo's matter-of-fact tone shifts to a more speculative and figurative articulation of the relationship between his body and the mice's bodies. I am interested in how this shift occurs at the moment when Ritvo begins to articulate the temporal schematics of corporeal equivalence, as if the scientific realism of the opening stanzas breaks down once the stakes of the experiment come into view: the mice have been given his tumours in order to test "poisons" that Ritvo "might in the future" want for himself (*Reincarnations* 14). These lines reference two timelines of illness and two registers of pain, suffering, and death: the mice suffer in order to alleviate his suffering, the mice are sick because he is sick. The imagery of futurity and poison circulate around both his body and the bodies of mice, collapsing the violence of aggressive cancer treatment into the relationship between his body and theirs. These images establish a conflicted sense of complicity and responsibility that builds throughout the rest of the

poem where Ritvo acknowledges the mice's suffering but also grapples with the fact that his life depends on that suffering. Similarly, at the moment when Ritvo makes the terms of his relationship with the mice explicit, he further extends the temporal framework of the poem with the fantastical imagery of the crystal ball. The image of the crystal ball is a symbolic rendering of corporeal equivalence whereby the scientists use the mice who have been created to bear his specific disease to envision the future of Ritvo's tumours and their pathways throughout his body in order to predict how his body will respond to treatment. In other words, the image of the crystal ball symbolizes the "epistemological scaffolds" (Nelson *Capturing Complexity* 82) of the experiment that hypothesizes and speculates about how the human body will react to treatment in the future, based on how it reacts in bodies of the mice.

In the next eight stanzas, Ritvo shifts back to a literal portrayal of his illness and the brutal reality of what happens to mice during experimental science. These stanzas complicate a straightforward narrative of experimentation and translational medicine by focusing on the imperfect relationship between how tumours grow in his body and the bodies of the mice:

I wish it were perfect, but sometimes the death we see
doesn't happen when we try it again in my body.

My tumours are old, older than the mice can be.
They first grew in my flank a decade ago.

Then they went to my lungs, and down my femurs,
and into the hives in my throat that hatch white cells. (*Reincarnations* 14)

In the first stanza, the imagery of death is depicted, uncannily, as the death of tumours and not as the death of either Ritvo or the mice. The usual connotations of death in

opposition to life is reversed because as a cancer patient Ritvo wants to witness and reproduce death. This uncanny reversal of death further highlights the imperfection and incompleteness of corporeal equivalence because the mice's bodies respond differently to their tumours. Ritvo's narrative of his illness complicates his initial reference to time in the opening stanzas by highlighting the fundamental differences between the age of his body and the bodies of his mice. This bodily comparison calls attention to the impossibility of achieving corporeal equivalence and frames the following exploration of Ritvo's relationship to the mice as a contrast between the bleak reality of his material relationship to the mice and the potential for imagination to offer some kind of consideration to them as living beings.

Ritvo extends this comparison in the next five stanzas by offering a parallel narrative of the mice's tumours and the violence of the scientific practices that force the mice's bodies to grow human tumours:

The mice have only a tumour each, in the leg.
Their tumours have never grown up. Uprooted
and moved. Learned to sleep in any bed
the vast body turns down. Before the tumours can spread
they bust open the legs of the mice. Who bleed to death.
Next time the doctors plan to cut off the legs
in the nick of time so the tumours will spread.
But I still have both my legs. To complicate things further,
Mouse bodies fight off my tumours. We have to give
The mice AIDS so they'll harbour my genes peacefully. (*Reincarnations* 14-15)

The matter of fact way that Ritvo describes the disturbing details of the scientists' strategies for encouraging the tumours to spread in the mice's bodies reflects Ritvo's

narrative of his tumours in the previous stanzas. However, this reflection does not garner sympathy for Ritvo, nor is the mice's suffering a metaphor for his suffering. Rather, this reflection implicates Ritvo; it demonstrates the different stakes for the mice and himself by exposing the brutal effects of corporeal equivalence. Moreover, the brutality of the scientists' attempts to force the tumours to migrate extends the notion that corporeal equivalence can never be complete and challenges narratives of scientific intervention that position transgenic science as the ultimate mastery over the body. The contrast between Ritvo's casual description of the mice's deaths and the poetic imagery of the body as a bed and the notion of "harbouring" genes "peacefully" calls attention to the alienating experience of cancer and the disconnect Ritvo feels between his experience of his own body and the growth of the tumours. Ritvo extends this disjunction to the mice as well by exposing his conflicting relationship with the mice, whereby it is in his best interest for the mice to inherit his tumours *in the right way*. However, he also feels sympathy for the mice and identifies with their pain; these mice are, after all, suffering from the same illness. Thus, there is a disturbing irony to Ritvo's use of the word "peace" because it refers to the instrumentalization of the mice's bodies: if their bodies are at peace in the formulation, then it means that they harbour Ritvo's cancer. This irony is extended in the next three stanzas where Ritvo positions the mice as if they were his children:

I want my mice to be just like me. I don't have any children.
I named them all Max. First they were Max 1, Max 2,

but now they're all just Max. No playing favourites.
They don't know they're named, of course.

They're like children you've traumatized
And tortured so they won't let you visit. (*Reincarnations* 15)

The first sentence of the quotation subverts the corporeal equivalence of the model organism by sarcastically co-opting its relationality to make a personal connection with the mice. The animated video produced by WNYC's "Only Human" for the initial release of the poem imagines Ritvo holding a group of mice against his chest as his mostly naked body hovers above the ground. As he looks down at the mice in his arms, the image contrasts the whiteness of the mice against a thin outline of his body in a manner reminiscent of the Jackson Laboratory "98%" advertisement I discussed in the introduction of this dissertation. Whereas in the advertisement two strands of DNA separate the mouse and human bodies, here, Ritvo holds the mice close to his chest.



Figure 8. Animation of Ritvo's corporeal relationality. Screenshot from video for "Poem to My Litter." Taken from WNYC's YouTube video.

This image captures how Ritvo's poem reconfigures the corporeal equivalence of his experimental trial by imagining the mice as a "litter" of offspring rather than a set of research objects. Ritvo's version of kinship is not sentimental nor is it one of affirmative multispecies cohabitation. Rather, Ritvo's vision of multispecies kinship is one of violence, trauma, and estrangement that is born both out of his difficult relationship with his own body and from his conflicted identification with the mice. By positing a filial relationship between himself and the mice, Ritvo ironically subverts the biopolitical vision of human reproduction in *White Teeth*. Whereas Irie appropriates FutureMouse[®]'s transgenesis as a way to position herself within middle class identity politics, Ritvo's filial imagery is an ethical paradigm that appropriates the corporeal equivalence of the experiment to make a closer connection with the mice.

Ritvo's evocation of filial estrangement is also a reference to the fact that Ritvo would never have directly encountered the mice. Thus, the lines "they won't let you visit" is an acknowledgement of the fact that mice such as those used in his experiments live their entire lives within the laboratory. In the final stanzas Ritvo shifts to addressing the mice directly:

I hope, Maxes, some good in you is of me.
Even my suffering is good, in part. Sure I swell

with rage, fear—the stuff that makes you see your tail
as a bar on the cage. But then the feelings pass.

And since I do absolutely nothing (my pride, like my fur,
all gone) nothing happens to me. And if a whole lot

of nothing happens to you, Maxes, that's peace.
Which is what we want. Trust me. (*Reincarnations* 15)

In this passage, Ritvo acknowledges the mice as individuals but also as symbolic counterpoints to his situation. The figurative associations in the stanzas transfer the bodily relationality of corporeal equivalence into a personal identification by blending Ritvo's emotional responses to illness and mortality with the bodies of the mice. The shift in address and the symbolic projection of Ritvo's emotions serve as a counterpoint to the earlier graphic descriptions of the scientific procedures by extending consideration to the mice even though if "nothing happens" to them then the trial would not be beneficial for him. Similarly, the "peace" Ritvo refers to at the end of the poem revises his earlier reference to "harbouring genes" (14). Here, it refers to the absence of tumour growth and communicates an implicit desire for a lack of intervention that might come with a failed experiment. Given that these creatures are the only beings who will carry his genetic material, he also wishes for the mice to inherit parts of him that are neither part of the experiment nor associated with his tumours. The poem closes with an acknowledgement that Ritvo and the mice exist outside the experiment, that their bodies, minds, and emotional capacities, exceed the epistemological framework of the experiment. However, it also acknowledges the fact that their relationality is premised on and facilitated by the experiments, that their coming together is a product of the scientific intervention he also hopes to end.

“Poem to My Litter” does not provide any easy answers for how to think about transgenic mice and our responsibility toward them. By situating his exploration of model organism relationality within his own struggles with cancer, Ritvo offers a way to think about animals like transgenic mice that works with the structures of scientific

epistemologies, but also moves beyond them. Ritvo puts forward a poetics of corporeal equivalence that subjectifies scientific practises and epistemologies by using them to explore the philosophical and ethical implications of transgenics. “Poem to My Litter” imagines a relationship to model organism that uses the molecularizing and objectifying effects of transgenics to connect with the mice on a personal level. More specifically, the poem exposes a personal connection already present in the model organism and forces us to engage with it directly. Ritvo offers us an example of how to imagine a consideration of model organisms that is not mutually exclusive with a care for the human patients who rely on them for treatment. Ritvo makes this kind of mutual exclusivity impossible by demonstrating how the forms of corporeal equivalence that are central to the model organism can be imagined as a way to create a mutual empathy for human patients and model organisms.

By illuminating various literary engagements with mouse model organisms, my hope is that we can begin to understand how the epistemologies that objectify these animals have the potential to allow us to see our responsibility to them. If Max Ritvo, whose life directly depended on transgenic mice, can imagine a kind of responsibility that arises from a multispecies understanding of kinship with model organisms, what might it mean for us to see the extent of our reliance on biomedical research that relies on the bodies of mice in laboratories?

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