TOYS and TOOLS IN PINK
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Cultural Narratives of Gender, Science, and Technology

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Introduction

CULTURAL NARRATIVES AND THE “LEAKY PIPELINE”

This book analyzes the ways in which fictional and cinematic narratives consider “the leaky pipeline problem”: that women drop out of science, technology, engineering, and mathematics (STEM) at a number of stages of education and career. The question of what keeps women from participating in proportional numbers in scientific and technical fields has generated much scholarly and media attention in recent decades. Although witnesses at 2002 and 2009 U.S. Congressional hearings offered testimony documenting barriers and facilitators for women working in science, engineering, and computing and discussed applying Title IX to scientific and technical education, more media attention was paid to Lawrence Summers’s remarks in January 2005 characterizing the “intrinsic aptitude” of women as domestic rather than scientific.1

Then-president of Harvard University, Summers addressed the National Board of Economic Review (NBER) Conference on Diversifying the Science and Engineering Workforce in January 2005, telling participants, according to Elizabeth Spelke and Ariel Grace, that

three factors . . . might account for the underrepresentation of women in mathematics, science, and engineering (Summers, 2005). First, sex differences in motivation may produce more men who are drawn to the single-minded pursuit of knowledge. Second, sex differences in cognition may yield more men who are capable of mathematical and scientific thinking at the highest levels. Third, discrimination may cause men to have more favorable career outcomes in these fields. (57)²
Summers’s speech appeared to dismiss decades of scholarship documenting the effects of socialization, suggesting instead that innate sex-related biological traits and individual choice could be more responsible for differences in performance outcomes than education, parenting, peer relationships, and other social influences.

In response to Summers, critics pointed to social and cultural factors as salient influences on individuals’ decisions to avoid or leave STEM fields. The American Sociological Association’s statement listed a range of relevant environmental factors, including peer stereotypes and media representations:

Decades of social-scientific research provide a solid base of empirical knowledge about the power of unequal opportunities, limitations in access to formal and informal training, a lack of social and domestic supports, and lowered expectations about women’s capacity to achieve that sap their educational and professional confidence. Studies also show that peer pressures to conform to stereotypical behavior and exposure to popular media affect women’s and men’s choices and opportunities in the occupational world. These changeable social factors, not innate biological differences, provide the most powerful explanation for the continuing gap between women’s abilities and their occupational attainments.

About a month after President Summers’s January 2005 talk, Gwen Ifill of PBS’s show The News Hour opened a news segment detailing the continuing controversy about aptitude and performance in science, asking “So, how big is the Pandora’s Box the Harvard debate opened? What do we know about women and scientific achievement, biology and learned behavior?” Ifill’s tongue-in-cheek reference to “Pandora’s Box” points to a classical myth describing women as troublemakers in science, suggesting that literary and cultural accounts also shape perceptions of women’s capabilities.

Pandora, the archetypal woman, according to Hesiod’s Works and Days, illustrates why females are the “Other” sex, for she “introduced plurality, dissent and disharmony into human existence.” In Theogony (ca. 700 B.C.E.), Hesiod explains that Prometheus’s brother married the beautiful Pandora, who was created as punishment by Zeus. She releases a host of miseries on humanity when she opens a jar that Zeus demanded remain closed. Feminist critic Kate Millett allows that “Pandora . . . represents—a perilous temptation with ‘the mind of a bitch and a thievish nature,’ full of ‘the cruelty of desire and longings that wear out the body,’ ‘lies and cunning words and a deceitful soul,” a snare sent by Zeus to be “the ruin of men.”

Classicist John Ferguson characterizes the Titan Prometheus as “an ambivalent figure” (121), a master inventor and trickster whose rebellious intelligence helps humans rise above animals. Aeschylus’ fifth-century drama Prometheus
BOUND posits that Zeus grew angry at human achievements made possible by Prometheus; in the play, Might claims that Prometheus committed a “sin” in stealing fire to give to man and that his punishment, being chained to a rock, will teach him “to endure and like the sovereignty of Zeus and quit his man-loving disposition.” Whereas Prometheus’ heroic rationality resists Zeus and preserves the mortal race, Pandora exemplifies transgressive, destructive aspects of female curiosity about technology. The feminine story is cautionary and neither heroic nor redeeming, for Pandora’s actions inhibit human progress instead of encouraging innovation and invention.

**Literary and Cultural Accounts**

Fictional narratives help shape our understanding of individual achievements and social institutions. As stories entertain us, they also inform and instruct us about social norms and cultural values. Novels and films discussed in this book depict gendered aspects of settings, situations, and individuals while commenting on scientific and technical achievements or failures. Texts reference gender stereotypes to describe scientists’ attitudes, actions, and abilities, while plots about scientific research question characters’ authority, expertise, and morality, frequently by emphasizing their gendered qualities. Labs and other settings associated with scientific research and technical development appear as socially marginal or even deviant sites in many fictions and films that acknowledge gender norms.

Bernard de Fontenelle’s *Conversations on the Plurality of Worlds* (1686), an early modern text of fictionalized dialogue between a male philosopher and a female interlocutor, invites “female participation in the almost exclusively male province of scientific discourse.” Other Western European texts were used in teaching scientific and mechanical principles to young women, who, like the female pupil in Tom Stoppard’s play *Arcadia* (1993), were educated at home before the mid-nineteenth-century. A number of textbooks on mathematics, chemistry, and physics were published such as Jane Marcet’s *Conversations on Chemistry* (1805) and *Conversations on Natural Philosophy* (1819), detailing a female tutor’s dialogues with her two female pupils. These works were pitched to women, but their accessible, entertaining scientific explanations appealed to both sexes.

Since the Industrial Revolution, American and Western European narratives referencing science and technology have proliferated. Considering gender in fictional narratives about science and technology published after Mary Shelley’s *Frankenstein* (1818), my argument focuses on texts describing female scientists and technologists rather than their male counterparts; in most, but not
all, cases these female characters are white. Aspects of the feminine are elaborated as cultural memories, metaphors, and myths about gender, science, and technology that have been naturalized as “truths” for audiences. Characterizations of female scientists and technical experts in news media, drama, film, and science fiction blend issues of expertise, authority, and morality in science and technology with ideologies of masculinity and/or femininity. The narratives considered here associate gender with issues of competence and integrity, link specific features of gender identity with aspects of scientific and/or technical acumen, and outline normative scientific and social roles for characters.

The link between the feminine and disharmony associated with Pandora reappears in Shelley’s novel, subtitled The New Prometheus. Like Prometheus (and Faust), Victor Frankenstein is brilliant, brave, and overly ambitious. His experiments with artificial reproduction, which could eliminate the need for human pregnancy and procreation, identified in the fictional world as feminine, cause him to ignore his family and friends and disavow the creature he has produced. His egocentric ambition to supersede human reproduction results in death and destruction, as Frankenstein warns readers of the dangers that ensue when science and technology are pursued without a concomitant assessment of possible consequences.

Informed by feminist theories, this book considers narratives, beginning with Frankenstein, that reference women’s participation in and authority over science and technology. Annette Kolodny points out that feminist criticism possesses an acute and impassioned attentiveness to the ways in which primarily male structures of power are inscribed (or encoded) within our literary inheritance; the consequences of that encoding for women—as characters, as readers, and as writers; and, with that, a shared analytic concern for the implications of that encoding not only for a better understanding of the past, but also for an improved reordering of the present and future as well.

In a similar vein, Robyn Warhol considers that “the point of feminism has always been to ask ‘what difference does gender make?’ in how we see, feel, know, and are known.” Social conventions and stereotypes represented in literary and cinematic texts acculturate men and women into following, resisting, or reconfiguring cultural scripts in practicing science and in designing and using technology.

Fictional characterizations of female scientists reveal complexities and contradictions influenced by women’s expected social roles and public perceptions of science and technology. Women appear transgressive in being associated with science and technology, often by not following gender norms. A num-
ber of narratives represent science as opposed to domesticity, nurturing, and romantic love, hallmarks of femininity. For example, Walt Disney’s classic children’s cartoon *Snow White* (1937) offers a frightening image of the jealous stepmother-queen using science and supernatural powers to kill her stepdaughter. After the queen finds out from a magic mirror that the forester did not murder the infant princess as she instructed him, she retreats to her lab to create a poisonous apple. The elegant queen transforms into a hag-like witch, experimenting with beakers and test tubes and mixing deadly ingredients to produce a poison. The film represents chemistry as a malicious pursuit associated with female revenge; however, *Snow White* is saved by the Prince, as the plot points to the superiority of love and domesticity over jealousy and scientific villainy.

Narratives exploring women’s engagement with science and technology demonstrate Protean durability in Western literary and cinematic traditions. Readers/viewers are exhorted by various science fictions to delve into science and control technology for individual and social improvement. In Marge Piercy’s *He, She, and It* (1983), Margaret Atwood’s *Oryx and Crake* (2003), and other fictions, male and female scientists act on ethical principles that align with stereotypes of femininity: preferring cooperation over competition, valuing social progress as opposed to individual profit, and eclectically employing diverse modes of accessing knowledge rather than limiting one’s methodological approach. Negative and positive gender stereotypes in fictions and films connote women’s status as scientific and technical outsiders, providing details about environments that help shape views of readers and filmgoers.

A number of scholars have already analyzed how gender matters in science fiction. Because the genre tends to speculation rather than realistic representation, I consider only a few science fiction examples in chapters 6 and 7 and concentrate on the intersections of gender, science, and technology in realistically conceived fictional worlds. My argument tracks race in narratives about female characters who develop or use science or technology, and it delineates gender stereotypes in characterizations, plots, and settings that may also be replicated, reconfigured, or resisted in fictions focusing on underrepresented minorities. Empirical research in social science and science provides a context for discussions of gender, science, and technology in fictions and films.

**Science and Gender**

Scientific and social scientific research shows more overlap than difference in male and female cognitive abilities. Linda Birke outlines constraints affecting research on cognitive sex difference: how psychological tests are constructed or administered, what they measure, and how “inferences and assumptions”
Contributors to *Why Aren't More Women in Science?* acknowledge cognitive differences between males and females, including differences in performance on IQ tests, verbal abilities, spatial and problem-solving abilities, and brain architecture, but a clear majority agree that such slight differences do not explain why there are few women in science. Some experts note the success of females in Singapore and Great Britain who outperform males on mathematics tests as evidence that more than biology is at stake. In sum, while studies show few cognitive differences between men and women, these are not as salient as social and cultural factors in influencing who becomes a scientist.

Sylvia Ann Hewlett of the Center for Work Life Policy conducted a 2006–7 poll of almost 2,500 male and female workers in STEM (1,493 women and 1,000 men). Her report "paints a portrait of a macho culture where women are very much outsiders, and where those who do enter are likely to eventually leave." Poll data indicate that although women working in STEM “do well at the start with 75 percent of women age 25–29” receiving excellent performance evaluations, 52 percent of women exit their STEM jobs “around ages 35 to 40,” “some leaving for ‘softer’ jobs in the sciences’ human resources rather than lab bench work . . . and others for different work entirely.” This exit rate is twice that of men in STEM and “higher than the attrition rate of women in law or investment banking.” STEM fields “have in common” a masculine culture that is “at best unsupportive and at worst downright hostile to women”: 63 percent of Hewlett’s respondents report harassment on the job, 53 percent dismissive attitudes of male colleagues, and 51 percent a lack of mentors.

Media coverage of the challenges facing women in science has real-world impact, particularly for individuals working in STEM organizations, but also for the public and for prospective scientists and technologists. Mary Frank Fox notes, “The participation, status, and advancement of women in academic science and engineering have been pressing social concerns in the United States.” Unpacking narrative representations of women scientists, mathematicians, and engineers offers a potent means of confronting climate issues and transforming environments. Feminist interpretation of texts about science and technology demystifies theories and practices that too often have been obstacles for women. Analyzing texts about women, science, and technology prepares women for working in fields traditionally dominated by men and could help reduce bias and negative attitudes toward women.

Science and technology often appear in novels and films as domains of knowledge accessible in different ways to men and women. Texts link scientific and technical understanding and abilities of characters to aspects of masculinity or femininity, while concomitantly developing dynamic plots concerning the morality of characters’ actions and behavior. Scholars of literature, film, and
mass media have inventoried such depictions in a number of texts, sometimes in conjunction with surveying and interviewing readers and viewers.

Collaborative research reports by British scholars published by the United Kingdom Resource Center for Women in Science, Engineering, and Technology (UKRC) look at responses of females and males in a variety of age groups to portrayals of scientists and technologists appearing in recent television shows, films, newspapers, and other media. Considering role models in the media, the first report in the UKRC series analyzes interview data with 26 women working in science, engineering, and technology and responses of focus groups consisting of another 60 women training, returning, or teaching with STEM. The UKRC project collaborators and other scholars recognize that increasing the number of female role models and diversifying their representation to reflect different ethnicities and ages could improve access for women in professions now dominated by white males. United States scholar Jocelyn Steinke agrees: “There is also evidence that images and messages conveyed by the mass media contribute to the ‘masculine image of science.’” Interpreting stereotypical images and their postfeminist reconfigurations could encourage those studying and working in scientific and technical fields to consider dimensions of equity and level the playing field for women and underrepresented minorities.

Predicting what appeals to audiences’ tastes is not easy. The women interviewed in the UKRC project discussed the lack of role models for women of different ages and ethnicities among presenters in news shows and scientists in fictional shows. Respondents offered mixed interpretations and recommendations for future programming. They “were . . . keen to challenge the image of women in SET as socially isolated or geeky. However, promoting role models which might be too unattainable or unrealistic for the average scientist was also seen as problematic[,] . . . some media role models could be unrealistic and not particularly encouraging.” Viewers appeared to prefer watching shows offering aspirational realism rather than glamorous fantasy or pessimistic assessments of conditions, but more research is needed concerning audience reactions to particular representations.

Cultural Narratives

Print and film narratives are part of what Graham Dawson, among others, calls “a cultural imaginary,” “those vast networks of interlinking discursive themes, images, motifs and narrative forms that are publicly available within a culture at any one time, and articulate its psychic and social dimensions.” Dawson acknowledges that “cultural imaginaries furnish public forms which both
organize knowledge of the social world and give shape to fantasies within the apparently ‘internal’ domain of psychic life.” My argument considers selected American and European texts to map the terrain of the cultural imaginary in which science and technology appear as gendered pursuits. Representations of gender, science, and technology in fictions and films influence our ideas of who should study, practice, and deploy science and technology. Looking closely at how gender matters in literary and cinematic characterizations, plots, and settings reveals that narrative structures establish political and ethical claims concerning the status of women’s participation in scientific and technical fields.

Why Pink?

The title Toys and Tools in Pink emphasizes how females and feminine versions of science and technology appear always marginal, sometimes deviant, and often quirky. Because “toys and tools” denotes both children’s playthings and “tech toys and tools,” the phrase serves as shorthand for a variety of material cultural phenomena. “Toys and tools in pink” describes technoscience coded as feminine. Literary references to pink famously include the pink hawthorn and the lady in pink in Marcel Proust’s Remembrance of Things Past (1913–27). Historical associations with the color pink include the pink triangle of the Holocaust reserved for gays and lesbians and the pejorative label “pinko” for Communists. In recent years, pink ribbons identify the campaign (“Think Pink,” “Pink Zone”) for breast cancer awareness.

According to Lynn Peril, since the late 1950s, pink denotes “for girls.” Pink is not essentially pro- or antifeminist of any wave (what color could be?), but it has been eschewed by those resisting traditional stereotypes and has been replicated or reconfigured by others. Items in pink are feminized, which seems patronizing to some who regard such marketing “as rampant and unacceptable gender stereotyping,” and hip to others, including some female science, computing, and engineering majors in my classes who wear Pink Chuck Taylors or carry laptops in pink cases, or to those who grew up with a pink Nintendo DS or a strawberry iMac. High-profile women also embrace pink’s distinctive appeal. Business author Gail Evans asked that her book emphasizing how women should play as team members in business be packaged in pink to attract women. Designer Donatella Versace gave up her pink matched luggage and replaced it with purple because she felt that pink became tired, like black, while others, like MaryJane Butters, an activist and “life style brand” who drives a pink biodiesel truck, prefer “the juxtaposition of rugged and really pretty, grit and glam, diesel and absolutely darling.”

Many education scholars perceive girls’ interest and success in scientific
and technical fields as related to their experiences with material culture and influences of parents, peers, and teachers, and media. In the United States the color pink identifies toys for girls and tools designed to appeal to women. Not all representations and material objects used by women are pink, but they become so metaphorically and in practice. Consider the choice a parent in 1999 had between the Hot Wheels PC in primary colors of red, yellow, and blue or the Barbie PC in white and shades of pink. The first package included a steering wheel for racing games, while the Barbie version was sold with a digital camera and software that allowed the user to put photographed subjects in the same frame with a digital Barbie. Both PCs were cool toys, but the different configurations convey messages about appropriate activities and aesthetics for girls and boys.

The toy industry depends on stereotypes (i.e., marketing demographics) distinguishing gender differences in consumers, as visiting a toy store or the toy section of a department store or shopping via printed catalog or the Internet reveals. Boys' toys are louder, flashier, and more stimulating. They are often adventure or heroic toys as opposed to the domestic and friendship toys offered in the girls' aisle, which is dominated by pink, purple, and sparkly effects. Trying to persuade girls and women to purchase and use their products, manufacturers and retailers of toys and tools attempt to instill “feminine” aesthetics or philosophies, but they may risk alienating other customers who find such associations distasteful or pandering. Mattel decided to omit “Math class is tough” as a phrase uttered by a talking Barbie, but Dentist Barbie and Computer Engineer Barbie are still pretty in pink and blue. Although parents can resist purchasing objects they perceive as referencing negative stereotypes, designers' and manufacturers' perceptions of children's tastes, which are themselves affected by interactions with peers, parents, and media, drive the development and sales of gendered merchandise and, increasingly, the production of tie-in television shows, films, and books pitched to children.

Gender stereotypes remain salient, even when contradicted in practice, because they provide individuals, as well as institutions, with formulas for living. LEGO® and other construction-build kits are often cited as instilling familiarity with physical concepts important for scientists and engineers. During a 2000 visit to Lego headquarters in Billund, Denmark, I spoke with representatives about the company’s research and marketing. Lego developed three lines marketed to girls: two lines (the Scala and Belville series) consisted of white, pink, and other pastel pieces to build fantasy homes and castles, while Clikit pink and purple interlocking pieces create frames, purses, and other personal items. A Lego marketing representative acknowledged that their child development research indicates that “kids get older younger,” and that by ages seven to nine, some boys and many girls stop playing with toys. That boys appear
to play physically and girls more cooperatively is another insight influencing Lego's design, manufacturing, and marketing.

The Lego marketing division atrium was home in 2000 to a banner admonishing “Remember half the children in the world are girls.” While most employees involved with engineering research and development at Lego are male, many in marketing are female. All are under pressure to increase their sales to girls, especially those between eight and twelve years of age, a group that buys fewer toys than their male peers. Lego observes that adolescent girls are more interested in social relationships with each other than in fantasy play with toys. Playing with toys is often connected with tinkering (taking apart and constructing) behaviors connected to a developing interest in technology. Many women and men who succeed in science, math, and engineering report that Legos and similar tinkering toys were foundational for them. Some speculate that girls might want a different kind of Legos, in more attractive colors, easier to put together, and more useful.

Lego's financial problems in 2008 increased the company's motivation to sell products appealing to larger markets. The International Herald Tribune on March 7, 2008, reported that Lego's chief executive planned “to challenge Mattel and Hasbro, the U.S. companies that dominate the toy market. Girls are a market where 'we'll never stop trying,’ said Knudstorp. . . . 'I think there is something that genetically skews us towards boys, but we can do better.’” Assessments of Lego's balance sheet in 2009 indicate that the company's strategy to incorporate Hollywood storylines into its merchandise and to open "concept stores" have increased its profits while other toy manufacturers have been less successful during the most recent recession.

Product color affects consumer appeal. Some male and a few female students in a cultural studies of gender, science, and technology class at the Georgia Institute of Technology reported anxieties concerning the Lillian Vernon pink tool set, the iMac computer in fruit flavors, and the Black and Decker Mouse sander, identifying such items as too “cute,” “wimpy,” and “feminine” to qualify for purchase. Referring to these objects in classroom discussion and looking at catalog illustrations caused some students to shiver dramatically and enunciate “Ugh!” because they perceive using them as gender-bending behavior and want to perform this assessment for their peers.

Gendered boundaries are demarcated in texts for children as well as in toys, as books such as The Daring Book for Girls and The Dangerous Book for Boys are marketed to one sex or the other. In my fall 2007 “Introduction to Gender Studies” course, I asked approximately 30 students to determine the intended audiences for these and other books such as Danica McKellar's Math Doesn't Suck, which was designed to teach middle school math, and Fly Girls, which presents short biographies of early women aviators, along with a number of
books about science fair projects and famous scientists as well as popular periodicals directed toward children (Nickelodeon Magazine, National Geographic Kids, Popular Mechanics) according to the sex and age of the intended audience. There was no disagreement among students as they regarded topics and packaging colors as key indicators of intended masculine, feminine, or gender-neutral audiences. Any book with pink, fuschia, or purple on the cover or with many illustrations of girls was seen as produced for girls, while books with mostly boys depicted were considered written for them. A book with neutral colors and a balance of illustrations of girls and boys was judged as designed for both sexes. Literary and cinematic narratives also reflect and refract cultural codes regarding gender-appropriate identities and behaviors, as this book demonstrates.

Historical Accounts of Gender, Science, and Technology

Social and textual analyses create “crossover” between disciplines concerned, respectively, with practices and discourses, as historical and social scientific accounts of gender, science, and technology illustrate. Carolyn Merchant’s The Death of Nature was path-breaking in categorizing science as a male pursuit that “managed” nature, itself identified with women. David Noble describes early modern science as “a world without women” in his book of that title. Margaret Rossiter’s Women Scientists in America considers how the professionalization of science and the development of scientific societies excluded and marginalized women as researchers and professors in a range of fields. Evelyn Fox Keller’s A Feeling for the Organism tracks Barbara McClintock’s success as related to her marginal status. Cynthia Russett’s Sexual Science studied the sexual discrimination incorporated in Victorian scientific texts. Barbara Ehrenreich and Deirdre English’s book For Her Own Good reviews “two centuries of the experts’ advice to women” to explain the exclusion of women from the practice of medicine, “the sexual politics of sickness,” and “the pathology of motherhood,” among other subjects. Nina Baym’s American Women of Letters and the Nineteenth-Century Sciences acknowledges the contributions of female scientists and writers, explaining their styles and contexts.

Studies of gender and technology have also explored gendered aspects of technological development, production, and reception. In Feminism Confronts Technology and Technofeminism, Judy Wajcman theorizes the ways men and masculinity are associated with technology. Michèle Martin explains how early developers of the telephone discounted women’s preferences for informal conversation as a trivial use of the new technology. Virginia Scharff considers
how marketing for the electric car for women in the early twentieth century feminized the product in advertising and in the popular consciousness. Finding that technological innovations raise hygienic and emotional standards associated with housekeeping, Ruth Cowan’s *More Work for Mother* revolutionized how historians of technology think about domestic work. Developing and marketing a superior microwave, as Cynthia Cockburn and Susan Ormrod argue, became a site of conflict for one British company in the 1980s because the process replicated and reinforced the male/female division of engineer/home economist in the company; this conflict had its own color code of “brown” electronic goods designed for male consumers and “white” domestic appliances designed for females.56 *Boys and Their Toys?,* a collection taking its title from Ruth Oldenziel’s essay about boys building model cars to enter into the Fisher Body craftsmen guild competition, includes various essays about male work and play that analyze connections between technology and masculinity.57

These texts illustrate historical constraints placed upon women interested in science and technology. Identifying past exclusions helps to contextualize my analyses of narratives and offers an ethical opportunity to evaluate the progress and challenges associated with women’s history. Studying literature and history allows readers to consider strategies toward eliminating existing barriers. Women still confront questions concerning whether STEM fields offer appropriate work for women, whether women should hold executive/managerial appointments, and the difficulty of pursuing STEM work and raising children, as social scientists document.58

**Social Studies of the Leaky Pipeline**

We live in a period witnessing both decreasing public understanding of science and technology and growing skepticism about the motives and outcomes of these fields in many industrialized nations. The Organisation for Economic Cooperation and Development (OECD) notes that “social acceptance of new avenues for scientific research increasingly requires a permanent dialogue with an informed civil society,”59 for it is civil society that foots most of the bills for research in engineering and science. A cross-cultural survey of individuals from 40 countries revealed that “people who are more scientifically literate have more positive attitudes to science in general, but are not necessarily more positive about specific technological applications or specialized areas of scientific research.”60 Movements to expand science education and to incorporate consideration of science and technology in schools are promoted as ways of enhancing citizens’ scientific and technical literacy and attracting more minorities and girls to these fields.61 As previously noted, the majority of social
scientists find that environmental (social and cultural) factors affect the leaky pipeline and outweigh any slight outcomes due to genetic differences between girls and boys.

Despite initiatives designed to increase diversity in the STEM workforce, questions about the proportional representation of women in science have simmered for decades. Robert K. Merton’s 1963 analysis of gender differences in science formulated the Matthew effect as the outcome of cumulative advantages accruing to a male scientist in the meritocratic hierarchy of science, while Margaret Rossiter described as a 1993 corollary to Merton’s formulation the Matilda effect, which “consists of the cumulative disadvantages accruing to a female scientist” by “undercutting, undercounting, and minimizing” the achievements of women. Social and political changes in the 1970s opened up access to university degrees and careers for women and ethnic minorities, and the proportions of girls and women studying and working in STEM have increased since; however, many talented women and minorities pursue work in non-STEM fields (business, education, and law, largely) or stop working outside the home rather than continue in science or engineering.

Recognizing the significant roles played by science, mathematics, engineering, and technology in society and its changing demographics, some educational institutions have worked to create programs to assist female and minority students by developing more welcoming university environments. Research studies in the United States document the problems of access, retention, and promotion that have given rise to the terms “chilly classroom” and “hostile workplace” for women studying, teaching, and practicing science, mathematics, and engineering.

Programmatic transformations are necessary to advance women in these fields. In the United States, statistics and testimonials support the need to make more effective efforts at recruiting, retaining, and promoting women in scientific and technical fields, a problem that is linked to maintaining a diverse workforce. The National Science Foundation (NSF) has tracked progress and provided grants to encourage the continued participation of women in science, computing, and engineering. Since 2001, NSF has also awarded ADVANCE funds to universities to “transform” institutional climates and to model leadership programs to make these higher-education environments more equitable for women, a change that improves institutional environments for all.

Grades in core university math and science courses are the most reliable predictor of which American students will remain in scientific and technical fields; not surprisingly, students who have taken more high school courses in these subjects tend to have higher achievement test scores and better grades in university courses, as well as better rates of retention in universities. Female STEM majors at some institutions have higher grades and test scores as well
as higher retention levels than their male counterparts, but disproportionately low numbers of women in STEM are due to environmental hurdles. Sandra Hanson's *Swimming against the Tide: African American Girls and Science Education* sums up a situation that many students in STEM majors recognize as prevalent in their institutions: “the culture of science continues to be a white male culture that is often hostile to women and minorities.” Among the strategies to improve the number of undergraduate and graduate students in STEM are bringing in notable women to serve as role models and mentors; enlisting parents, employers, and faculty as supporters of girls and women in STEM; coordinating living and learning programs for female students in on-campus housing and offering events and activities directed toward their interests. Intervention programs offer initiatives in advising, mentoring, career counseling, and strategizing for success to help warm the chilly climate for women on campus.

Many industrialized nations experience gender stratification in some areas of STEM education and employment. In the United States, women and men earn undergraduate degrees in some fields of science and engineering in nearly equal numbers, with women surpassing men for the first time in 2005, according to NSF’s *Women, Minorities, and Persons with Disabilities 2007*. Women make up more than 50 percent of graduate students in social sciences, psychology, and biology, but they fall short of proportional representation in computing, engineering, and physical sciences. NSF 2006 figures indicate that “46 percent of Ph.D. degrees in the biological sciences are awarded to women (compared with 31 percent two decades ago); 31 percent of the Ph.D. degrees in chemistry go to women (compared with 18 percent 20 years ago).” NSF reports “Women received 46% of all research doctorates awarded in 2008,” while “23% of the U.S. citizens and permanent residents who earned research doctorates . . . are members of racial/ethnic minority groups.”

As faculty in doctoral institutions, women are less likely than men to hold full-time appointments (34 percent in 2005–6), tenure-track appointments (40.9 percent), and tenured appointments (25.8 percent). In STEM fields, the numbers of women faculty are lower; the American Society of Engineering Education cites an average of women faculty in engineering as 11.3 percent in 2006. Christina Hoff Sommers noted in 2008:

> Women comprise just 19 percent of tenure-track professors in math, 11 percent in physics, 10 percent in computer science, and 10 percent in electrical engineering. And the pipeline does not promise statistical parity any time soon: women are now earning 24 percent of the Ph.D's in the physical sciences—way up from the 4 percent of the 1960s, but still far behind the rate they are winning doctorates in other fields.
Yet Sommers, a conservative scholar at the American Enterprise Institute, does not believe that such disparities owe to the organizational environment of science, and she resists proposed efforts to review faculties. She regards the application of Title IX as potentially eroding a successful, merit-based system, arguing that this process would harm science because “[d]epartments of physics, math, chemistry, engineering, and computer science have remained traditional, rigorous, competitive, relatively meritocratic, and under the control of no-nonsense professors dedicated to objective standards.”

Referencing research on genetic differences in intelligence and women’s roles in caregiving, Sommers speculates that persistently low numbers of women in science are more likely related to inherent differences and preferences that account for the different performance outcomes for men and women. She cites a poll in which 1,417 professors were asked “what accounts for the relative scarcity of female professors in math, science, and engineering?” Sociologists Neil Gross of Harvard and Solon Simmons of George Mason University report, according to Sommers, that “1 percent of respondents attributed the scarcity to women’s lack of ability, 24 percent to sexist discrimination, and 74 percent to differences in what characteristically interests men and women.” She concludes from the poll’s results that applying Title IX is a mistake because “[t]hese proposed solutions assume a problem that might not exist.” However, poll responses indicate 24 percent noticed discrimination and 74 percent identify different career interests for men and women, a perception that might be seen as related to socialization (i.e., that men and women are acculturated to choose different career paths).

Formulas connecting gender, science, and technology frequently appear in media. Dorothy Nelkin finds, “The overwhelming message in these popular press accounts is that the successful woman scientist must have the ability to do everything—to be feminine, motherly, and to achieve as well.” Marcel LaFollette considers how students react depictions of scientists:

Studies of U.S. school children, from the 1950s to the 1980s, show that both boys and girls see the “typical” scientist as male. Some of these attitudes simply reflect statistical reality—far fewer women than men work as scientists—but they also indicate continuing, deep-seated bias against science as an appropriate activity for women. It is not just that science is regarded as a masculine occupation. Historical analysis of American culture shows that, throughout this century, the mass media have also purveyed a strongly negative image of women scientists, depicting them as atypical scientists and atypical women.

Since LaFollette’s 1988 article, some national newspapers and general-interest magazines have covered a more equitable balance of female and male scientists.
and inventors. Profiles and interviews of scientists, engineers, and information technology gurus appear with some frequency in major U.S. national newspapers and on television. Achievements such as the 2009 Nobel prizes in medicine and in economics to women are widely reported as notable by national newspapers and television news shows.

National Academy of Sciences and NSF findings indicate that fewer women rise to higher levels in science and engineering. LaFollette’s “deep-seated cultural bias” has become a component of a modern paradox. Scientific and technical discoveries, processes, and products are pervasive and are more likely to be used in the home and workplace. At the same time, many citizens are disinclined to pursue STEM study and work, and scientific and technical institutions remain challenged in recruiting and retaining a diverse workforce.

**Film as Culture**

A number of scholars speak to the cultural power of film as a mirror illustrating social reality while also creating it. Film is known as a medium that can get “inside the head” of viewers. Sociologists Peter Weingart, Claudia Muhl, and Petra Pansegru argue that “the images, clichés, and metaphors used by filmmakers and scriptwriters to portray science and scientists are a reflection of the popular images of science, insofar as their films are a reflection of popular culture. At the same time their films reinforce these images and provide them with imaginative detail and decorum.” Robert Rosenstone acknowledges the power of film images “that run in our head over and over again,” indicating that “such images function deeply within us as memories, and also as metaphors.”

Film scholars emphasize how the medium reports, promotes, and contains social change. Angela Dalle Vacche explicates the early Italian diva film’s concern “with history—namely time—since its primary topic was the change from old to new models of behavior in the domestic sphere and between the sexes.” Feminist film critics Laura Mulvey, Tania Modleski, and Mary Ann Doane argue, respectively, that many Hollywood films objectify the female by “the male gaze”; reveal “male paranoid fears, developed during the war years, about the independence of women on the home front”; and make woman “the subject of a transaction in which her commodification is ultimately the object.”

Contemporary films and television productions set in hospitals and labs include at least a token representation of women, including African Americans, Asians, and other minorities, working in scientific and technical fields. Documentary and fiction films and TV shows offer numerous representations of women who work as professional scientists, usually as medical caregivers and researchers or as forensic pathologists playing minor roles in ensemble dramas.

Glamorous, heroic television depictions of women and men are understood to attract individuals to study and enter certain fields. For example, the scientific knowledge and engineering ingenuity displayed in the U.S. television show *MacGyver* (1985–92) led to a spike in applications to engineering schools. National newspapers report increased interest in college programs in criminal forensics because of television programs such as *CSI*, *Crossing Jordan* (1993–2002), *Bones*, *The X-Files* (1993–2002), and other shows featuring pathologists as criminologists.84 Jay Siegel argues “Women see this [criminal forensics] as a scientific field they can get into and make a difference without worrying about the gender-equity question.”85

As the following chapters illustrate, fictions, television shows, and films that represent women in STEM incorporate characterizations emphasizing stereotypical gendered assumptions about scientific authority, expertise, moral integrity, and professional ethics. Characterizations of scientists and technologists and the plots in which they appear shape practices and cultural conventions of how women and men in science and technology learn and work. Stories of transgression, achievement, success, or failure become salient models that discourage or inspire readers and viewers.

According to sociologists and media scholars, cultural stereotypes in literature and other media affect audience acceptance of which professions are appropriate for women and perceptions of women’s accomplishments. A *Sex Roles* article about female athletes explains:

Thus, the media frame, at least in part, our thoughts, attitudes, and behaviors (Kane et al., 2000). In addition, the mass media, in concert with one’s peers and family members, acts as a socialization agent, in that it shapes the emotional and moral development of youth (Moore, Raymond, Mittelstaedt, and Tanner, 2002). . . . Rintala and Birrell (1984) argued that the media provide girls with possible role models. . . . [I]f girls and women are not represented in an equitable fashion by the media, then girls are not afforded the necessary exemplars to emulate.86
Jocelyn Steinke points out that “[e]xamining images of female scientists in the mass media is an important first step in understanding the role these images may play in shaping adolescent girls’ perceptions of scientists and engineers and their perceptions of careers in SET [science, engineering, and technology].”

Steinke and collaborators argue that “images of scientists in popular culture as depicted by characters and images in books, movies, television programs, magazines, comics, video games, clip art, Web sites, and a variety of other media sources . . . may be considerable sources of influence that shape children’s view of the appearance, characteristics, traits, and lifestyles of scientists.” Steinke and Marilee Long analyze female characters in fictional and nonfictional children’s educational science programs referencing scholarship documenting “the underrepresentation of women in scientific careers and the barriers to educational and professional advancement in science for girls and women.”

Texts representing gendered engagement with science and technology do so in diverse ways. Some narratives discussed in this book show how women’s interest in science and technology identifies their criminal deviance (La Cousine Bette, La Curée) or intersects with feminine motivations in love and marriage (Dracula, Making Mr. Right), while other narratives identify heroic aspects of women subjected to or deploying science (“Hilda Silverling,” Lorenzo’s Oil, Contact) and technology (Christopher Strong). Some works, including Contact and IQ, identify specific structural barriers for women and men working in scientific and technical environments, while even popular television cartoon shows such as The Adventures of Jimmy Neutron, Boy Genius and The Simpsons connect aspects of masculinity and femininity with scientific and technical expertise. The Governess (Dir. Sandra Goldbacher, 1998), a historical film with actors Minnie Driver and Tom Wilkinson, depicts an extramarital affair between a governess hiding her Jewish ancestry and her employer, who is a photographer; after the governess demonstrates her photographic talent, the photographer ignores her contribution to his research and breaks up their relationship, motivating the governess to set up her own successful studio. A number of recent films set in the present similarly illustrate how scientifically and technically minded women resist conforming to social norms set for their gender (Laurel Canyon, Kettle of Fish, and Yes).

Gender Coding in Literature and Film

Gender codes in literature and cinema reflect a cultural imaginary that readers and viewers rarely question. The process of recognizing the connections drawn
among gender, science, and technology allows us to reconsider what appears at first glance to be common sense. Jonathan Culler explains that what we speak of as conventions of a genre . . . are essentially possibilities of meaning, ways of naturalizing the text and giving it a place in the world which our culture defines. To assimilate or interpret something is to bring it within the modes of order which culture makes available, and this is usually done by talking about it in a mode of discourse which a culture takes as natural.90

Cultural codes are apparent in the narrative rules known to authorial audiences. Peter Rabinowitz terms these rules of notice (what we pay attention to in narratives) “signification” (what it means), “configuration” (how pieces of stories fit together), and “coherence” (figuring out the ways the text makes sense). Rules “tell us where to concentrate our attention” and are further reinforced by cultural observation.91 This book explores how fictional and cinematic narratives incorporate gender codes and schemas related to science and technology in narrative elements (characterizations, plots, and settings).

As James Phelan argues, characterization and plot are closely connected in narratives, even those focusing on science and technology.92 Male and female characters in the texts under consideration emulate or transgress cultural codes concerning gender-appropriate identities and behaviors, while narrative plots link characters’ expertise in science and technology to gender norms and schemas.93 Recognizing the dynamics of plot as “a structuring operation,” textual analyses demonstrate that fictional and cinematic plots about science and technology rely on gendered associations to evaluate moral outcomes.94

Feminist critics identify gender codes in narratives ranging from folktales to Hollywood cinema. Marina Warner’s work on fairy tales surveys representations of women, situating Cinderella stories within social historical contexts for different generations of women who were economically and legally dependent on men and forced to get along in the same household.95 In Backlash, Susan Faludi includes chapters on 1980s Hollywood television shows and films that demonstrate how production executives in television networks and film companies resisted positive representations of feminism and colluded in offering media products saturated with conservative depictions of women.96

Susan J. Douglas’s Where the Girls Are provides a cultural history of the 1960s and 1970s, a period when female characters in films and television shows struggled with their limited social roles.97 Douglas updates her analysis of media portrayals of women in her contribution to The Shriver Report (2009), in which she argues, “Women’s professional success and financial status are significantly overrepresented in the mainstream media, suggesting that women
indeed ‘have it all.’ So what much of the media have been giving us, then, are little more than fantasies of power.”

Including female characters in narratives set in scientific, medical, or technological environments highlights gender as a prominent function. Mieke Bal points out that “referential characters . . . act according to the pattern we are familiar with from other sources. Or not.” Popular representations reinforce or resist views of who should study, practice, and apply scientific and technical tools and procedures. Myths, literature, and films frequently portray male scientists and engineers as modern Frankenstein, egocentric, socially deficient, morally flawed, temperamentally eccentric, or power-hungry in seeking to increase their scientific and technical knowledge and fame. James Cameron, writer/director of the Terminator films and a former physics major, produced a science documentary; he claims that Hollywood films “almost never get their facts right. They always show scientists as idiosyncratic nerds or . . . villains.” His film Avatar (2009) offers a corrective, sketching a future in which the U.S. military and corporate executives join forces to exploit natural resources of the planet Pandora only to be defeated by an eco-friendly group of scientists with a highly ethical female leader (Sigourney Weaver) and a subversive Latina pilot (Michelle Rodriguez).

Typologies of scientists offered by scholars cover a range of genres, often presenting characters as mediating between science and the public. Roslynn D. Haynes’s From Faust to Strangelove surveys “representations of the scientist in Western literature,” starting with “evil alchemists” and “Bacon’s new scientists.” Haynes discusses fictional godless and inhuman scientists of the eighteenth and nineteenth centuries such as Frankenstein, and classifies Victorian, post-Romantic scientists as efficient and powerful, adventurous, heroic, dangerous, impersonal, amoral, out of control, and rehabilitated. In 2003, Haynes acknowledged seven stereotypes of fictional portrayals of the male scientist as the “evil alchemist,” the “noble scientist,” the “foolish scientist,” the “inhuman researcher,” the “scientist as adventurer,” the “mad, bad, dangerous scientist,” and the “helpless scientist.” Kristen Shepherd-Barr begins her 2006 survey of drama, Science on Stage, with Faustus, considering plays about physics, mathematics, and thermodynamics and evaluating their appeal for contemporary audiences. Shepherd-Barr’s penultimate chapter discusses eighteenth- and nineteenth-century plays about medical doctors by European and American authors, while her last chapter reviews “the challenge of engaging science on stage,” comparing this task to that of the translator.

Media scholars identify stereotypes related to cultural ideologies of femininity. Myra Macdonald groups representations of women in films and television shows according to qualities identified as “four myths of femininity”: “enigmatic and threatening,” “nurturing and caring,” “sexuality,” and “refash-
ioning the body.” These qualities are incorporated in characterizations and plots in many literary and cinematic works that emphasize gendered aspects of engaging with science and technology. For example, Eva Flicker argues that romantic potentials of the female scientist are incorporated into a film “to develop suspense.”

Many texts identify supernatural, romantic, criminal, and/or natural qualities as essentially feminine aspects of how characters, whether playing major or minor roles in narrative plots, engage with science and technology. As chapter 5 illustrates, sex-typed traits of female scientists are often prominent in films, as these women appear more emotionally sensitive, socially marginalized, and interested in social good than their male peers.

Narrative representations depict, provoke, or resist cultural change, thereby identifying tensions regarding sex roles, scientific and technical expertise, and ethics. Like consumers’ reactions to colors, individual readers’ responses to plot, character, setting, and theme are difficult to predict, given the variety of personal and cultural experiences individuals bring to stories and the abilities of individuals to read narratives for different purposes. Acknowledging that a variety of influences affect interpretation of any text or object, Lori Kenschaft argues:

One cannot rely on a cultural product to be, in itself, subversive or liberatory. Too much occurs during the process of interpretation for a cultural product alone, outside a tradition of critical conversation, to carry such weight. That critical tradition—be it located in a classroom, a newspaper column, a circle of friends, or a parent’s whisper into a child’s ear—crucially affects what people see and hear in any cultural product.

Today’s Hollywood producers survey particular audience reactions to a film and cut it to suit audience preferences, but many interpretive processes remain more elusive.

Identifying cultural narratives of science, technology, and gender reports how ideology assists in determining interpretation. Reader response critics provide a set of principles, methodologies, and theories concerning narrative conventions and strategies, capabilities of readers, and the deeply contextual understanding of text. Agreeing with Hayden White, Peter Rabinowitz notes that narrative “conventions... are one of the grounds on which the politics of art is mapped out; often invisible, they serve as enabling conditions for literature’s ideological structures. Thus, the study of literary conventions can help illuminate the connections between politics on the one hand and interpretation and evaluation, as the academy currently practices them, on the other.”
Feminist theorists interpret cultural proscriptions raised within texts as formative. Patricia Clough claims that “African-American feminists, Third World Feminists, feminist post-colonial critics, and queer theorists are reinventing the literary by making clear how the literary is not merely a matter of fiction. . . . showing how . . . modern narrative form . . . provides the logic or the ideologies by which social relationships are made intelligible.” Narratives incorporating stereotypes could replicate the hostile environments girls and women face in science, mathematics, and engineering, or they could provoke interventions or correctives. Cultural critique opens up representations and their social contexts to reveal ideological claims and suggest counterarguments.

Children’s Viewing

Researchers at the UK Resource Centre for Women in Science, Engineering and Technology investigated what children watch and how they understand and react to nonfictional and fictional representations of female scientists, technologists, engineers, and mathematicians on U.K. children’s television. They found that there was “a substantial amount of STEM on five . . . British TV stations in the two sample weeks” (35); however, the sample of British and U.S. shows produced for children and shown on British TV infrequently include “authentic’ and ‘diverse’ portrayals, in terms of gender (also age, ethnicity and not only those who conform to the slim, attractive, bespectacled emerging image)” (36). The Simpsons (1989–), Futurama (1999–), and Arthur (1996–) were among the U.S. television shows included in this study.

Baby boomers, and their children who watch such shows on the TV Land network or online at Hulu, can easily identify caricatures of scientists in 1960s U.S. situation comedies. For example, Gilligan’s Island (1964–67) and Lost in Space (1965–68) stereotype the nerdy male scientist—the Professor and Dr. Smith, respectively—and showcase women as sex objects (Ginger, Judy Robinson) or nurturers (Mary Ann, Maureen Robinson) who rarely assume authority over science or technology.

Contemporary animated films also incorporate gender stereotypes of science and technology, sometimes to question their force. For example, following in the tradition of science fiction films linking experimentation to apocalypse, Lilo and Stitch (2002) represents the genetic engineer as an “idiot scientist” with aspirations to be an “evil genius” and his alien product Stitch as a rather odd household pet. The film thereby conflates a popular stereotype about science (that it is an esoteric body of knowledge with dangerously inhumane outcomes) with the hopeful sentimentalism of romance (that love can reconcile all). The story of how the seemingly monstrous product of genetic engineering
reveals itself to be more human than the earthlings melds the “orphan” story of the created alien life form with a plot about an orphaned Hawaiian girl left in the care of her older sister. At the end of Lilo and Stitch, the alien scientist, the life form, and the Hawaiians become a wacky and loving family, protected from both the authoritarian alien government and the intrusive social services of Hawaii. Despite this happy ending, the film leaves unreconciled the opposition between the masculine world of science (represented by both the male scientist and his alien product) and the feminine world of “family” that is all too fragile until stamped with approval by government bureaucrats.

The popular children’s books and television program The Magic School Bus (1994–98) center on a teacher who enthusiastically instructs elementary schoolchildren about science. Ms. Frizzle is a rather wacky young woman (her voice on the show is supplied by Lily Tomlin) with a strange way of transporting her charges into mind-blowing situations in which they are miniaturized (cruising through a classmate’s bloodstream or digestive tract, wandering in an old log along with many other organisms usually not visible to the naked eye, traveling inside a storm). This teacher comes across as a bizarre woman with amazing technical expertise and a bent for teaching science, gifted with remarkable powers to reach her audience.

Ms. Frizzle is the rare popular example of a woman who understands science and the scientific method, even if she has rather flaky, and sometimes determinedly feminine, ways of exhibiting her knowledge. Her outfit exemplifies the lesson of the day; in one episode she wears earrings fashioned as rocket ships and a dress with the solar system on it. Her favorite phrases (“Take chances.” “Get messy.” “Make mistakes.”) are uttered as reminders that science is challenging, frustrating, risky, and full of failures that produce knowledge. Her powers are both analytical and magical: she seems to understand intuitively the structure and function of the organism, system, or science studied, without revealing her research. The audience learns, like her budding scientist students, about principles of biology, chemistry, physics, and earth science. But as one cover illustration of a Magic School Bus book about the principles of flight shows, these scientific and technical lessons come packaged in pink, in this case a pink airplane.

Because Ms. Frizzle’s unusual behavior and her wacky way of demonstrating scientific concepts are narrative features appealing to the primary target audience of elementary-school-age children, it might be difficult for viewers to see her as a realistic role model of how a female scientist should act. Rather, her example is iconically inspirational. Adults and children know that real scientists do not have magic buses or humanlike lizards helping them. Ms. Frizzle’s enthusiasm, broad knowledge, and interactive style of teaching motivate her students to pursue scientific investigations. Tim, Keesha, Dorothy Ann,
Arnold, Phoebe, Carlos, Wanda, and Ralphie learn to put their observations of phenomena together with their research and to formulate a testable theory, one which might take into account the ways an old log disintegrates or how an airplane moves. Forming hypotheses that explain how the natural world and machines work, Ms. Frizzle’s class works as a team in combining common sense and skills to analyze scientific ideas and technological products. Students display human frailties and talents. Phoebe and Arnold tentatively engage in adventures but always come up with interesting perspectives on problems that the more gung ho Ralphie and Wanda consider more cautiously. Each day’s scientific adventure has all children participating and contributing to the group’s effort and successful outcome. That the students work together is crucial because they are able to complement each other’s strengths and weaknesses just as real-life collaborators in university classrooms and labs do. Not surprisingly for a production receiving some funding from NSF, the show educates children and adults by framing complicated scientific concepts in logical and entertaining ways.

The Nickelodeon cartoon show *The Wild Thornberrys* (1998–2001), a commercially supported production that includes a film (2002), also educates its audience about science but in a looser way as it concentrates more on entertaining than teaching. The British-American Thornberry family travels through exotically underdeveloped natural landscapes full of strange plants and wild animals so that parents Nigel and Maryann Thornberry can film their nature documentaries. Nigel is a brilliant but absent-minded natural scientist who calmly explains to his wife when they are in deadly danger. He is fascinated by the creatures he observes and comically describes his own physical and mental characteristics using pedantic scientific language. Maryann is the cameraperson, who lugs heavy equipment and superintends her husband to set up the best photo opportunities; her direct language often deflates her husband’s pompous statements. Nigel and Maryann are a good team because they put together their knowledge about a species and combine their talents, consisting of Maryann’s technical camerawork and Nigel’s voice-over scientific analysis.

The three Thornberry children (Debbie, Eliza, and Donnie) and one chimpanzee named Darwin tag along with the grown-ups. The twist in this series is that daughter Eliza develops a magical power to talk with animals, including her chimp friend Darwin, so that even in the most remote locations she can set off on her own adventures while her parents are busy with their work. Unlike her sister Debbie who is primarily concerned with hair, boys, and being left alone, Eliza has strong observational skills, an interest in learning, and a supernatural ability to converse with all creatures—attributes that make her an excellent science student.

Eliza is adventuresome enough to take risks to gain new knowledge, and
she revises her hypotheses according to the new information she develops. Her adoptive brother Donnie helps her out when she does not recognize clues or dangers in the jungle. Found in the bush by the Thornberrys, Donnie has no discernible language and only erratically demonstrates a familiarity with social conventions, but his understanding of nature exceeds his communication skills. This family is composed of idiosyncratic individuals who need each other to survive. As in Ms. Frizzle’s class, everyone has something to contribute.

Unlike The Magic Schoolbus, The Wild Thornberrys does not present explicit lessons about natural phenomena that analyze scientific principles or methodologies. Instead, The Wild Thornberrys concentrates on describing certain aspects of animal behavior discovered by the family. Both shows demonstrate that anyone’s scientific abilities can be improved by experience, even for those of us without magical powers. These cartoons stimulate interest in science while teaching viewers about the construction of scientific hypotheses and conditions that affect how scientists work. In both shows, serendipity affects the scientific process as chance injects creativity into the careful synthesis of facts and evidence on which science relies. Random circumstances initiate the inquiry of the day for Ms. Frizzle’s pupils and force Eliza Thornberry to refine her understanding of her family, her environments, and her abilities. These scientists-in-training learn to cope with chance, seeing it in relation to scientific frameworks that provide a sense of control over what might otherwise seem overwhelmingly dangerous. Science is represented as in the personal and social interest of everyone—experts and nonprofessionals.

This book applies critical theories elaborated by feminist critics, narratologists, and social studies of science scholars to identify particular constellations of narrative references to gender, science, and technology. Each chapter presents a set of fictions and films, organized topically according to various roles enacted by females using science and technology. Chapters 2 through 6 identify science and technology with specific roles assigned to women engaging with science and technology (ethical observer, criminal deviant, mother/caretaker, babe scientist, and technical innovator). The concluding chapter discusses examples of classic adolescent fiction and several recent television shows pitched at children, adolescents, and adults that revive and/or reconfigure stereotypical characterizations of how girls and women engage with science and technology. Characterization, emplotment, and thematics in the narratives replicate, reinforce, or occasionally resist gender stereotypes, as these narratives sketch sex roles at home and at work and portray how scientists interact with others according to familiar stereotypes.114
Chapter One

The argument presented in chapter 2, “The Ethics of Feminist Science,” considers nineteenth-century fictions that rely on classical myths in troping science as a masculine project with dangerous and even deadly outcomes for women, contrasting these with Lydia Maria Child’s short story “Hilda Silfverling,” which identifies science and technology as beneficial to the eponymous woman. Referring to the Pygmalion myth rather than the story of Prometheus, Nathaniel Hawthorne outlines the dangers of scientific ambitions and technological tinkering in stories such as “Rappaccini’s Daughter” and “The Birthmark.”115 Chapter 2 concludes with a discussion of woman’s aptitude for science and technology represented in Herman Melville’s stories about marriage and home and his poem “After the Pleasure Party,” and Sena Jeter Naslund’s modern adaptation of Melville’s Moby-Dick, Ahab’s Wife or, The Stargazer.

Chapter 3, “Female Criminals and Detectives,” compares the representation of technologically adept female criminals in Honoré de Balzac’s La Cousine Bette (1846) and in Emile Zola’s La Curée (1872). In contrast, Mina, a central character in Bram Stoker’s Dracula (1897), patriotically employs communication technologies to protect families and nations, identifying scientific progress with imperialism. Female scientists and detectives in recent television documentaries and dramas face updated versions of Mina’s challenges.

Chapter 4, “Mothers and Medicine,” discusses narratives by Zola, William Dean Howells, Charlotte Perkins Gilman, and the film Lorenzo’s Oil. These texts reference femininity, marriage, maternity, and medicine. Chapter 5, “Babe Scientist: Science and Sex,” details common elements of film romances about female scientists after Mervyn LeRoy’s Madame Curie, looking closely at the protagonists and plots of Contact, IQ, Twister, The Saint, Laurel Canyon, Kettle of Fish, and Yes.

Chapter 6, “Femininity, Feminism, and Technology,” considers Charlotte Perkins Gilman’s fictions about women’s technical innovation and three Katharine Hepburn films that image women’s engagement with technology. Films connect femininity and technology in diverse ways, ranging from representing technology as violent (Eve of Destruction) to showing how technology makes romance possible (Making Mr. Right). The book’s conclusion in chapter 7 considers several U.S. cartoon series (Powerpuff Girls; Dexter’s Laboratory; The Adventures of Jimmy Neutron, Boy Genius; My Life as a Teenage Robot); two novel series for adolescents (Mary Norton’s The Borrowers and The Borrowers Afield and Madeleine L’Engle’s A Wrinkle in Time and A Wind in the Door); and other works that point to improving prospects for girls interested in science.

Time will tell whether these narratives might be responsible for motivating children to study science in elementary, middle, and high schools and at universities, or for raising public awareness of science, but we should not minimize the powerful effects of combining entertaining role models and messages
INTRODUCTION: CULTURAL NARRATIVES AND “THE LEAKY PIPELINE”

(lively young women make good teachers for young children) with educational information meant to increase knowledge, understanding, and confidence.116 Fictions, television shows, and films appeal to general audiences in the United States and have some capacity to affect the need for a diverse workforce in science and technology that developed countries feel most acutely. But these narratives might also speak to audiences elsewhere who are interested in how ideas about science undergird cultural assumptions of gender identity and behavior.

For children and adults who may be tentative about exploring science and technology, critical engagement with cartoons, fictions, and films enhances how we understand science and technology. As my interpretations argue, narratives linking gender, science, and technology explore values of self-reliance, innovation, and inclusive multiculturalism, while often replicating and sometimes resisting gender stereotypes. Although many narratives support perceptions of gender equity by overrepresenting women in STEM professions, they also sketch representations of feminine “intrusion” into the mostly male worlds of science and technology. The following chapter details the ways in which feminine interventions in science and technology often appear in fictions as ethically principled and reasonable, although these views are sometimes cast as signs of weakness or vulnerability. Texts ranging from *Frankenstein* to *Ahab’s Wife* consider feminine motives, opportunities, and outcomes in science and technology.
What influences children’s and students’ perceptions of science and technology? Paula Rayman and Belle Brett note that “social-psychological issues such as self-confidence, perceived ability, and resiliency” are linked to “female persistence in science,” arguing that institutional and cultural perspectives outweigh social-psychological factors and pointing to “structural barriers . . . [that] include informal and formal exclusion: biased admission practices at graduate school, lack of opportunities for training and research, and isolation from professional and collegial networks” (390). Mary Frank Fox, Gerhard Sonnert, and Irina Nikiforova agree that the institutional environment matters; they find university “programs that regard issues, problems, and solutions of women in science and engineering” to be “rooted in ‘institutional/structural-centered,’ as opposed to ‘individual/student-centered’ perspectives are associated with the most positive outcomes in undergraduate degrees awarded to women in science and engineering.”

Parents, teachers, peers, involvement in STEM activities, perceptions of intrinsic value, and media stereotypes affect girls’ interest in STEM fields. Welcoming, unbiased classroom environments and mentoring are also key.

Teachers are important cultural agents who can encourage students to persist in (or leave) STEM disciplines. Liz Whitelegg asserts, “Teachers need to recognize that they themselves are powerful agents of socialization, who also bring their own culturally acquired perspectives with them.” M. Gail Jones, Ann Howe, and Melissa J. Rua agree: “Our findings, as well as data from many other sources, are clear in their implication. Teachers cannot escape the responsibility to present science as equally appropriate for girls and boys, to expect girls
to use the tools of science with facility, and to expect both boys and girls to engage thoughtfully in science activities.”7 “Female-friendly” pedagogies, which are often interactive, assist boys and girls, encourage participation in the classroom, and help determine future interest in STEM.

More girls now choose STEM courses and majors, and there is a smaller achievement gap between girls and boys in mathematics, partly due to increased curricular and extracurricular STEM opportunities for middle school and high school students. Yet, as a 2008 Science report indicates, “[s]tereotypes persist and are widely held by parents and teachers,” and “[s]tandardized tests in the U.S. indicate girls now score just as well as boys in math.”8 Media representations of scientific careers that incorporate gendered stereotypes influence adult and student perceptions of who can become a scientist.

Asserting that popular culture media too often identify women as sex objects, psychologist Mary Pipher recommends that parents track what their daughters view.9 She argues in Reviving Ophelia, “Protective space can be created by books, interests, families, churches and physical or social isolation. . . . Girls who grow up unprotected, adrift in mass culture with little protective coating and no private territory are vulnerable to many kinds of problems” (267). Melissa Milkie interviewed women’s magazine editors to ask “how femininity-defining cultural institutions operate to create and sustain gender stratification.”10 She argues, “A central way women’s disadvantage is maintained is through cultural beliefs and stereotypes that provide narrower, more distorted, or more harmful images about women than about men” (839).

Jocelyn Steinke agrees that “[s]tereotypical representations of scientists and engineers in the mass media can influence girls’ perceptions of scientific, engineering, and technological careers” and notes an “overall paucity of images of female scientists and engineers.”11 Jennifer Gray’s meta-analysis of studies about science television programs asserts that “media mentoring” supplements institutional initiatives by providing positive media role models of women in STEM: “research indicates that the symbolic modeling of positive, non-stereotypical portrayals of women in television such as female scientists, engineers, and other such characters has the potential to expand the range of options young girls deem appropriate for their gender.”12 The analysis of media can also play a critical role in educating parents, teachers, and students to recalibrate cultural norms regarding STEM careers.

Collecting and analyzing media preferences of young people reveals differences that reflect gender norms. In 2000 Dafna Lemish, Tamar Liebes, and Vered Seidmann surveyed boys and girls in 11 European countries and Israel about their media access and interests. They found gendered media preferences in their study population, with girls more interested in music, television soap operas, and reading and boys more interested in computer games, par-
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ticularly violent ones, and cartoons on television; girls expressed interest in narrative computer games rather than in shooter games preferred by boys.13 But such preferences can shift based on consumer options: there is some hope that computer games and Web sites such as Webkinz and Club Penguin aimed at young children can decrease the gender gap in computing by presenting gender-neutral content and activities online. Both boys and girls also enjoy playing Nintendogs, a series of portable Nintendo games about caring for puppies.14 Additionally, Wii Fit, Beatles Games, and Rock Band are games that have crossover appeal for both genders and for different generations.

Seeing more female scientists and technical experts in games, on television, and in films would provide children with role models. Empirical research on media representations of science conducted by the UK Resource Centre for Women in Science, Engineering and Technology indicates that many press officers and other science communicators point to the low proportion of senior researchers who are women as a primary reason why most scientific experts presented in newspapers and on television and radio are “male, grey-haired and of a certain age.”15

Other testimony supports that hiring more women to write and produce media affects how gender, science, and technology are represented. Connecting the number of women employed in the 1990s as producers at the U.S. cable network Nickelodeon to the increased number of female characters on children’s shows, Ellen Seiter and Vicki Mayer consider the question “Does the increased representation of girls follow simply from the increased employment of women?”16 Their historical account of the cable provider Nickelodeon’s 1990s programming identity and mission acknowledges that various forces encourage a diversity of representations on the network, concluding, “The largest gains have been made in increasing the representation and variety of female characters: here the ideological commitments of individuals working at Nickelodeon have dovetailed nicely with market trends toward taking girls more seriously as a media and advertising market” (132).

Ensuring diverse representations should be complemented by a concerted effort to push against prevailing gender stereotypes. Nancy Signorelli’s 1997 study of U.S. media, including television, commercials, and teenage magazines, indicates that female characters were more likely than male to be depicted in media as “talking about romance rather than at a job,” although women were portrayed as “using intelligence.”17 Characterizations and plots referencing science and technology often present scientific and technically adept females as socially marginalized.

Female characters engaging with science and technology and the plots they participate in influence readers and viewers, affecting perceptions of girls’ and women’s opportunities and performance in STEM. Marilee Long and collabora-
tors studied 12 episodes from four reality series (48 total episodes) about science that were aimed at children, acknowledging “that children watching television may learn attitudes, values, and behaviors depicted on screen. . . . Research shows that children are more likely to identify with characters of the same sex, and they can form attachments to recurring characters.”

Steinke and collaborators connect television portrayals of scientists with responses to the Draw-a-Scientist Test (DAST) provided by U.S. middle school students, who drew “a male scientist who looked like the mythic stereotype of the male scientist,” an image they saw on television. Research from the UK Resource Centre for Women in Science, Engineering and Technology on DAST reports that while most girls drew male scientists, some girls (13% of their sample of 45 students between ages 8 and 15) drew female scientists, and all boys drew male scientists.

Fictional books, television series, and films for children illustrate role models, describe STEM careers and educational pathways, reference scientific and technical topics, and teach readers and viewers about sociocultural norms affecting women’s participation and performance in STEM. Children’s television shows, particularly fantasy animation shows featuring superheroes or otherwise ordinary children who perform superhuman deeds, discuss science and technology in ways that often intersect with gender.

Fictional live-action series and films sometimes include children and adolescents with scientific and technical interests and abilities. For example, *Sydney White* (Dir. Joe Nussbaum, 2007) updates certain gendered features of the Snow White story while retaining others to present Sydney (Amanda Bynes) as a technically adept, assertive college freshman defeating an evil sorority sister’s revenge plot. Sydney’s capability with carpentry tools, her sincerity, and her lack of elitism make her more popular on the college campus than anyone else. She becomes an inspirational agent of change who spearheads a movement to ensure that all students (and not just Greeks) benefit from campus funds.

This chapter considers different genres representing gendered aspects of science and technology: animations (*Handy Manny, Powerpuff Girls; Dexter’s Lab; Jimmy Neutron, Boy Genius; SpongeBob Squarepants; My Life as a Teenage Robot*), live-action fiction and reality television shows (*H2O: Just Add Water, Zoey 101, iCarly, Ned’s Declassified School Survival Guide, Design Squad*), two novels for adolescents (*Mary Norton’s The Borrowers* and Madeleine L’Engle’s *A Wrinkle in Time*), and a film, *Ice Princess*. These narratives portray females interested and adept in using science and technology, as plots and characterizations reproduce and revise stereotypes associating certain gendered traits with scientific and technical aptitude. Such texts might encourage girls and women to pursue STEM education and careers.
Girls’ Coming of Age

Two twentieth-century juvenile literature fantasy fiction series describe female adolescents who confront cultural stereotypes about women, science, and technology. Developing technical acumen, these protagonists mature by learning to take care of their families. Arrietty Clock of *The Borrowers* (1952) takes up the traditionally male occupation of borrowing to help her aging parents while they live under the floorboards of a kitchen in a large country house.21 (Borrowers are six-inch or so beings like humans who survive by taking what they need from humans.) In the sequel, *The Borrowers Afield* (1955), Arrietty meets up with a wild young male borrower, Spiller, who assists the Clocks when they escape to a field and helps Arrietty understand that her talents are significant.22 Like Arrietty, who uses every bit of knowledge about the material world that she can muster to survive, Meg Murry in *A Wrinkle in Time* (1962) collaborates with her brother Charles Wallace and their friend Calvin O’Keefe to find the Murrys’ father after he disappears under mysterious circumstances.23 Charles and Calvin contribute to the project of bringing Mr. Murry back to his family, but only Meg can rescue Charles Wallace after he has been inadvertently left behind on a dark planet. She undertakes a similar effort in the sequel, *A Wind in the Door* (1973), when she battles demons who threaten him.24 For these female protagonists, acting heroically means being courageous and summoning up all one’s knowledge and understanding to protect oneself and family and friends.25

Arrietty and Meg exercise technical and scientific skills identified as masculine and feminine in their quests. Resisting social conventions, managing adolescent anxieties, and working to protect their families, these girls access technologies while relying on their love and compassion for others. They resist doing what they are told girls should do because social conventions conflict with the emergency measures required to resolve life-threatening crises. Arrietty’s mother, Homily Clock, aspires to be a high-class borrower, driving her aging husband to attempt feats of derring-do to obtain specific items from their “host’s” home. Homily’s desire to have the right sort of carpet and china fuels her support of Arrietty’s interest in borrowing; the mother insists that since they lack a son to take up borrowing, Pod Clock must train his daughter to take up this traditionally masculine profession. Homily lets Arrietty know that a young girl must demonstrate social decorum by acting and dressing appropriately, but the mother also tells the daughter to take care of herself and her parents, and the second dictum has priority. By the time the Clocks escape from the house to take refuge in a field, Arrietty inspires the more tentative Homily, who relies on her daughter’s courage. Mother and daughter develop a
closer relationship while they work together to find food and shelter, and Arrietty takes pride because she is able to follow her father’s example as resourceful provider.

The fourteen-year-old Arrietty occasionally takes risks that her parents disapprove of and that she sometimes regret. On her first trek to borrow, Arrietty talks to the boy in the big house and does not tell her parents about this interaction, even though it is dangerous for all the Clocks because they could be exterminated by those who fear borrowers or exploited by those wishing to capitalize on their appearance. But her clever hunches also prevent catastrophe. In *The Borrowers*, her talking with the boy encourages him to deliver food and goods to the Clocks, until his pilferage raises the suspicions of the housekeeper. In *The Borrowers Afield*, Arrietty’s friendship with Spiller brings meat and protection to the Clocks, whose abilities to steal items and fashion ingenious tools from their host’s property have not prepared them for coping with wildlife or rural climate. In the natural landscape, Arrietty develops into a strong, brave young woman whose doubts and anxieties fade away as she exercises her pluck, energy, and ingenuity.

Modern science fiction narratives, *A Wrinkle in Time* and *A Wind in the Door* explore imaginative elaborations of scientific principles that involve extraterrestrial travel and mind-reading. L’Engle’s characterizations of Murry family members acknowledge that Meg’s personality traits—anger, stubbornness, and impatience—require moderation so that she can be happier and better protect her family. Meg’s affection for her brother Charles, her growing friendship with the popular Calvin, and her admiration for her parents inspire her as she fights evil forces of the universe. Mr. Murry is a physicist, and Mrs. Murry a biologist whose home laboratory allows her to do cutting-edge research while cooking dinner (39). The Murrys’ scientific research creates new knowledge but leads to Mr. Murry’s imprisonment and threatens Charles Wallace, problems that Meg must resolve.

Like her parents, Meg thinks like a scientist. She is a gifted mathematician who recognizes faulty assumptions and resolves life-or-death situations. The two middle children in the Murry family, the twins Sandy and Dennys, are most interested in getting along with classmates and teachers at school and raising their vegetable garden to make money, but Meg and Charles Wallace reveal extraordinary abilities in mathematics and science that make them weird to their schoolmates and suspicious to the principal, Mr. Jenkins, and to their teachers. Like most adolescents, Meg feels that her family’s eccentricities inspire and weigh her down in her dealings with others. Her father’s absences from home, while he is ostensibly engaged in secret government research projects, cause her embarrassment as she explains to outsiders what her mother chooses not to—that the family is intact in its unique way. Although Meg admires her
mother’s intelligence and beauty, she recognizes that these excellent qualities cause others envy. Meg and her mother must protect the superior Charles Wallace from his peers, who would rather beat him up every day than get to know him, and from the life-threatening disease his mother discovers he has.

Meg learns that she need not sacrifice her strengths to protect herself and her family. Although Mr. Jenkins demands that she recognize her family as dysfunctional and requiring assistance from him and others, Meg is stubborn, impatient, and angry and remains true to her family by resisting his unwanted interventions. Like Arrietty who accepts Spiller’s help even though her mother has turned it down because he seems dirty and wild, Meg relies on others when necessary. In *A Wrinkle in Time*, Meg is advised by a quartet of supernatural beings, imaged as kindly aunts, who teach her that she must learn to trust herself and her ability to find her father and rescue her brother Charles. The solution Meg discovers in *A Wrinkle in Time* is love; her love for brother inspires her to fight the evil forces holding on to him. At the end of *A Wind in the Door*, Meg learns that reflecting on God’s love allows her to fight the Echthroi’s supernatural hold on Charles and enables her to inspire Mr. Jenkins to protect her brother from other students.

Both L’Engle and Norton represent talented young women whose characterizations blend masculine and feminine attributes and technical and scientific expertise. Arrietty and Meg perform traditional feminine tasks related to family and home while demonstrating bravery, willingness to take risks, and scientific expertise, all imaged as heroic, unconventional traits for young women. Arrietty and Meg are fictional role models for young women navigating difficult familial and social landscapes; their stories inspire many adolescents to persevere through tough times. Mary Pipher recommends to parents that media depictions denigrating women’s abilities, sexuality, and intelligence should be counterbalanced by such positive messages empowering young girls to succeed by discovering themselves and establishing their moral compasses. She echoes what Catharine Maria Sedgwick’s teacher in the didactic fiction *Means and Ends, or Self-Training* (1842) taught her charges: “whatever directs and subdues your passions, whatever cultivates your virtues, and whatever improves your manners, is a part of your moral education” (10). Self-improvements increase self-esteem, which helps to buffer the individual from being overwhelmed by external forces and disagreeable persons. Sedgwick’s book explains that everything one does to care for others also benefits the self, since one cannot fail to benefit from the good or goods one brings to those one loves. As old-fashioned and sentimental as this doctrine appears, the ideology of domestic love benefits Arrietty and Meg as well. Meg learns at the end of *A Wind in the Door* that loving her enemies enables her to overcome them. By drawing on better-developed skills and a revised understanding of their families, Arrietty Clock
and Meg Murry battle demons of conformity to gain victory over their worst impulses and to save themselves and their families from disaster.

The film *Ice Princess* (Dir. Tim Fywell, 2005) describes a similar transformation of Casey Carlyle, a teenager about to graduate from high school who adds athletic achievement to her love of science. Casey is a science geek who becomes a top-notch competitive figure skater still interested in science. She builds on her interest in skating and her aptitude in physics to design a science project that uses video and computer programming to analyze the mathematics behind skaters’ jumps, a project she hopes will gain her admission to Harvard University. Casey’s mother, a college professor, encourages her daughter to pursue academics and enter the best university she can. To understand the mechanics of skating and improve her project, Casey secretly takes skating lessons with former champion and coach Tina Harwood. Casey’s feminist, intellectual mother has no affection for Tina or figure skating. But it is skating that excites Casey, and she becomes passionate about competing as a figure skater. Tina’s own daughter Gen gives up competitive skating because she does not want to miss out on dating and socializing with friends, so Tina becomes Casey’s coach. The message of the movie is that mothers should allow their daughters to make their own decisions about education and careers. Tina realizes that she should respect Gen’s decision not to compete, and Casey’s mother recognizes that Casey should pursue what she loves. The film concludes with Casey’s mother and coach negotiating how Casey can compete as a skater while taking two university courses.

Arrietty Clock, Meg Murry, and Casey Carlyle are positive models for young girls; these young women negotiate the difficult divide of conformity and independence by acting reasonably to do what is best for them and eventually convincing their parents to respect their choices. These young women succeed without sacrificing their femininity, individuality, or relationships with their families and friends and demonstrate scientific and technical talents. They mature in appealing ways, encouraging readers to regard mathematical and scientific talents as assets to be retained and enhanced throughout one’s life for intellectual and social purposes.

**Gender, Science, and Technology in Television Animation**

Contemporary television cartoon shows pitched at children and adults represent, resist, or reconfigure gender stereotypes about science and technology. Targeted for young children, *Handy Manny* (2006–) is a Disney animated show about a bilingual handyman who works with male and female tools who are
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characters in the show. Manny Garcia runs a repair shop and is hired for jobs around the town of Sheet Rock. His motto is “You break it, we fix it.” He speaks English and Spanish with the town’s residents and his tools, which have names and personalities: Pat, the bumbling blue hammer; Turner, a grumpy blue screwdriver; Felipe, an ambitious yellow Phillips screwdriver; Dusty, the not-so-dainty red handsaw; Stretch, the nearly perfect pink tape measure; Squeeze, a curious pair of green pliers; and Rusty, a fearful orange monkey wrench. Dusty and Squeeze are female, the rest of the tools male. The tools behave according to the conventions of employees, and sometimes children, in doing their best to follow Manny's directions, but they are also friends who take care of Manny, as in “Manny’s Sick Day.”

The tools—tape measure, hammer, screwdriver, pliers, saw, and wrench—discuss their technical functions and their contributions to Manny’s jobs, helping youngsters learn about building and repair. Manny’s friends also include Kelly, a young woman who runs the hardware store; her brother Sherman, who owns and manages the shoe store; and Mr. Lopart, a middle-aged man who attempts ambitious projects for his candy store and is the least technically adept character on the show. Manny represents masculine technical acumen while Kelly portrays a technically adept female.

The most scientific character on SpongeBob Squarepants (1999–), an animated fantasy show about a sponge and various undersea residents of Bikini Bottom (crab, squid, starfish, puffer fish, etc.), is female: the squirrel Sandy Cheeks. Incorporating some gender stereotypes and resisting others, Sandy is an extremely competitive Texan who is a talented athlete, scientist, and mathematician. In the episode “Sandy’s Rocket” (1999), Sandy takes great pains to tell SpongeBob not to mess with the rocket she has built for a space voyage, but he and Patrick take off in it while Sandy is sleeping. When SpongeBob and Patrick get back to Bikini Bottom, Sandy lets them know she is angry that they turned her “little science experiment into a disaster.” In “Chimps Ahoy” (2006), Sandy’s funders—Dr. Marmalade, Lord Reginald, and Professor Percy—visit Bikini Bottom to check on the progress of her research. SpongeBob and Patrick try to help Sandy by inventing a machine to impress the chimps, but the funders are instead thrilled with Sandy’s invention, a banana peeler, originally designed to be a nutcracker.

Fox’s long-running series The Simpsons (1989–) employs conventions of television situation comedies to poke fun at human foibles, many identified as negative stereotypical masculine characteristics associated with the overeating, couch-potato father Homer or his prankster, subversive son Bart. In the 1998 episode “Lisa the Simpson,” daughter Lisa agonizes because her intellectual capabilities appear limited by heredity, as the official Web site description explains:
When Lisa is unable to figure out a simple brain teaser, she begins to fear that she is losing her gift of intelligence. . . . Grandpa explains to her that all Simpsons started out smart and gradually experienced a “dumbing” that left them thick as bricks. Lisa [begins] emulating Homer and Bart and their brainless ways. But this makes her unhappy, so to cheer her up, Homer gathers all the Simpson relatives he can find and tries to show her that they’re not all idiots. Sadly, Lisa realizes that a lot of them are, in fact, stupid. But when she meets some of her female relatives, she is pleased to discover that many of them are doctors and businesswomen. With renewed confidence in her own intelligence, Lisa looks at the brain teaser again and figures it out immediately.29

In “Girls Just Want to Have Sums” (2006), Lisa disguises herself as a boy to get into the boys-only math class after the elementary school has been sex-segregated; the girls’ math class teaches self-esteem and has nothing to do with numbers.30 In “Funeral for a Fiend” (2007), Lisa installs the family’s TIVO.31 Many episodes of the show illustrate Lisa’s maturity, intelligence, and general superiority and depict her talented mother Marge’s forbearance with Homer’s many idiocies. In “Please Homer Don’t Hammer ’em” (2006), “Marge discovers her gift for carpentry but has to use Homer as a front in order to overcome people’s prejudices against women builders.”32

Four other cartoon shows incorporate and reconfigure gender stereotypes within narratives of scientific authority: Dexter’s Laboratory; Jimmy Neutron, Boy Genius; Powerpuff Girls; and My Life as a Teenage Robot. In some ways, these shows follow in the footsteps of various incarnations of the Scooby-Doo cartoon franchise, which premiered in 1969 and included Daphne and Velma as representing respectively glamorous femininity and logical intelligence. Invoking traditional sex roles and mocking stereotypes by developing some female characters with scientific and technical aptitudes, Dexter’s Laboratory (1996–2003); The Adventures of Jimmy Neutron, Boy Genius (2002–6); Powerpuff Girls (1998–2004); and My Life as a Teenage Robot (2003) associate both males and females with invention and experimentation while caricaturing the nerdiness, absentmindedness, and egocentrism of some scientists. Blending adventure and comedy, these cartoons reconfigure stereotypes in suggesting that some girls and women in comic adventure plots are as capable as or more capable than the boys and men with whom they compete in scientific and technical fields.

Cartoon Network’s Dexter’s Laboratory characterizes twins Dexter and Dee Dee as, respectively, a “European” scientist developing new knowledge and a Valley Girl cheerleader creating havoc in her brother’s lab. Dexter’s Laboratory acknowledges ambivalence about who should have authority over science. The show’s conventionalized themes include representing the male scientist as a nerd who relies on science as a social defense and an ambitious problem solver.
whose best efforts are misdirected. After Dexter gives Dee Dee a larger brain so that she can be his assistant, she questions Dexter and subverts his work. In the first episode of the show “Dee Deemensional,” Dexter sends Dee Dee back in time to save himself, but the plan backfires when the past Dexter does not believe her. In this show, the scientist is a heroic inventor while his sister appears to him to be an enemy of science who destroys his subterranean, secret lab and whatever he produces in it.

Nickelodeon’s film and television show The Adventures of Jimmy Neutron, Boy Genius focuses on James Isaac Neutron as a brilliant boy whose “brain blasts” help solve his friends’ and family’s predicaments. Compared with cool kids such as Nick Dean, Jimmy is a geek, whose archrival Cindy calls him “Nerdtron.” Assisted by his friends Carl Weezer, an asthmatic lover of llamas, and Sheen, who is easily confused and obsessed with the comic figure Ultra-Lord, Jimmy portrays the scientist as a problem solver working out of a backyard laboratory. Annoyed by girls, Jimmy creates the Girl Eating plant. He developed his dog Goddard as a super-companion and in one episode builds a robot to sell cookies. The conventions associated with the mad scientist whose overreaching ambitions create catastrophe are exemplified in the robot who sells cookies as it gives away Jimmy’s gadgets to woo customers.

While Jimmy’s male friends are his allies, his female counterpart, Cindy Vortex, and her girlfriends appear as childishly feminine in plotting against him. When aliens threaten Retroville, Jimmy and Cindy join forces to protect the town. In “Win, Lose, and Kaboom” (2004), the Retroville children are forced to play as a team against other planets in a game hosted by the evil genius Meldar and designed to eliminate all but the winning planet. Although Jimmy initially trusts his intelligence more than others’ to save Retroville, Cindy convinces Jimmy to let other team members respond to the quiz, which results in their shared success and the town’s salvation.

The Cartoon Network’s series The Powerpuff Girls (1998–2004) depicts a team of three superhero sisters. Professor Utonium creates Blossom, Buttercup, and Bubbles out of “sugar, spice, and everything nice,” and “Chemical X,” aided by the professor’s former assistant, the monkey Jojo, who later becomes the evil Mojo Jojo. Chemical X is a factor that changes the Girls into crime fighters with special powers. “Each girl has a distinct personality and color,” but they always end up working as a team.33 The Powerpuff Girls film (Dir. Craig McCracken, 2002) explains the origins and early adventures of the Girls, who discover their superpowers when they play a game of tag that wrecks Townsville. To save themselves, the Girls unknowingly “turn to the evil Mojo Jojo.”34 Spoofing Japanese superhero animation, the Powerpuff Girls are ordinary children with incredible powers, leading to many situations in which their childish traits conflict with their responsibilities as crime fighters. In “Mommy Fearest”
(1998), the Girls save Professor Utonium from Sedusa, who is disguised as “Ima Goodlady.” In “Ice Sore” (1999), Blossom is embarrassed by the effects of her new ice power and refuses to use it for some time even as her sisters plead with her to save Townsville from an incoming gigantic fireball. In “Paste Makes Waste” (1999), Buttercup refuses to apologize to Elmer, a paste-eating schoolmate; her behavior causes him to become a paste monster threatening everyone. Each story ends with the Girls able “to save the world before bedtime.”

The girl robot protagonist (“Global Response Unit XJ9” to her scientist-creator “mom” Dr. Nora Wakeman; Jenny to her friends) of Nickelodeon’s *My Life as a Teenage Robot* was also built to save the world. Each episode reveals how Jenny strives to be a normal teenage girl with feelings, a sense of humor, and the ability to communicate in social situations. For example, in “Love ’em or Lash ’em” Jenny falls in love and wants to go out with Kenny, a robot boy Dr. Wakeman recognizes as a product of her archrival. Unfortunately, Kenny’s “dogginess” becomes evident, Jenny loses any popularity she briefly gained while having a boyfriend. Dr. Wakeman is depicted as a nerd who is more interested in science and fighting evil than in mothering; she is more concerned about preserving XJ9’s superhero capacities than protecting the robot’s feelings. Jenny is never afraid to neutralize attacking supervillains, but she suffers from the abuse of her high school peers Tiff and Britt and endures the attentions of Sheldon, “a budding engineer and a comic book fan.”

**Replicating and Resisting Gender Stereotypes in Live-Action Shows**

Although one might expect cartoon characters to be more idiosyncratic than characters portrayed by actors, *Ned’s Declassified School Survival Guide* presents Ned, his neighbor Jennifer Mosely (Moze), his friend Simon Cook (Cookie), and others in their middle school as a host of eccentrics. Among the “insane” teachers, the science teacher, Mr. Sweeney, wears a white lab coat and glasses and sneers at the insufficiencies of his students. In “Science Fair” (2005), Ned challenges Mr. Sweeney’s theory that Ned will never win a science fair ribbon by borrowing Cookie’s cyberrobotic arm and leg to present as his own project. Unfortunately, the plan goes awry. Cookie’s face swells after he eats walnuts, which he does to impress his girlfriend Vanessa’s grandmother, and the robotic arm and leg he demonstrates as Ned’s project goes wild, making Cookie appear a monster to Vanessa’s grandmother. Meanwhile, Ned, in a white lab coat and with hair made frizzy by the static electricity experiment, appears a mad scientist to the grandmother and viewers. Before chaos erupts, Mr. Sweeney awards
Ned a ribbon for the robotic exhibit, but after the melee Ned loses and Cookie's paper towel experiment wins because it is the only project left to be judged. The science fair episode reproduces the well-known Frankenstein tableau of mad, male scientist and frightening creature as a humorous conceit identifying the dangers of science (and science fairs).

Females as species worthy of study by scientists contribute a significant theme about gender and STEM on television. In the Australian television hit *H2O: Just Add Water* (2006–), three high school girls on the Australian Gold Coast turn into mermaids when they touch water and discover their supernatural powers. Cleo, Emma, and Rikki confide their secret to Cleo’s friend Lewis, who applies his scientific knowledge to learn more about mermaids and their magic. In “The Denman Affair” Lewis interviews to become the research assistant of the accomplished, beautiful, and curious Dr. Denman, a female marine biologist. Because Dr. Denman steals the DNA sample from Cleo that Lewis has brought to the lab’s powerful microscope, he refuses the scientist’s tempting job offer. Lewis turns down the opportunity to travel the world and instead remains with his friends the mermaids as their protector and scientific resource because he realizes that Dr. Denman puts science above everything else, including friends and moral integrity. At the end of the first season, Dr. Denman returns in “Dr. Danger” and “A Twist in the Tail” to hunt down the mermaids. Because the girls temporarily lose their powers due to a lunar eclipse, Dr. Denman’s trap at Mako Island fails to catch the mermaids. Within the narrative world, the mermaids are intuitive subjects whose scientific knowledge is not as extensive as Lewis’s or Dr. Denman’s. Making the female scientist (Dr. Denman) intelligent yet ambitiously selfish, and the budding male scientist (Lewis) morally superior and sympathetic to his scientific subjects, reconfigures stereotypes linking gender and science.

The divide between masculine and feminine areas of expertise extends to television representations of gender and technology. The Nickelodeon television series *iCarly* (2007–) features Freddie, the love-struck boy who lives across the hall from Carly, as the technical producer of the Web TV show of the title, while Carly and her best friend Sam create the show’s content and act as on-camera hosts. The families of the central characters are mostly off-screen, except for Carly’s brother Spencer and Freddy’s mother. Carly’s parents are in the military, and she lives with the flaky Spencer, a sculptor specializing in large pieces such as a giant coffee cup. Freddie and his overprotective mother live next door, while Sam is a school friend from a large, odd family. Sam and Carly have been friends since they were six, bonding after Sam tried to steal Carly’s tuna sandwich and Carly punched her. Many episodes show Carly’s resilience and maturity and focus on Spencer’s shenanigans, making him the butt of many sight gags.
At least two *iCarly* episodes acknowledge that females can be more technically competent than males. In “iStakeout” (2008), Sam wins a bet with Freddie, whom she styles “a geek,” because she knows “MPEG” is a computing acronym for Moving Picture Experts Group. In “iFence” (2008), Spencer fences at home with his robot and then brings Freddie along to his fencing club while Carly is stuck at home making dinner and entertaining their boring cousins the Dorfmans. Carly points out the disparity to her brother and tells him to mend his ways. In the same episode, Freddie’s overprotective mother finally lets him fence and then jumps into the match to defeat his overbearing opponent. Each show includes a video clip, usually a homemade one sent by a viewer, while the iCarly.com Web site includes tips on how to shoot your own Web television show.

Dan Schneider, the producer of *iCarly*, also created the Nickelodeon show *Zoey 101* (2005–8), which focuses on a female title character, her close friends, and her school acquaintances. Zoey and her younger brother Dustin attend Pacific Coast Academy (PCA), a boarding school in Southern California. Formerly an all-boys school, PCA recently began accepting girls. In a first-season episode highlighting how girls acculturate to PCA traditions, Zoey persuades her female friends to join a basketball team and play against the boys’ team, which excludes girls. Zoey is sensitive, artistically talented, and diplomatic; the show’s Web site describes her as combining “brains and beauty” and being “a quick thinker.”

Zoey’s critical decision-making and admirable creativity are often highlighted. In “The Backpack” (2005), she comes to the rescue after her roommate Nicole mistakenly sprays gooey candy on a backpack at the school store and must purchase it; Zoey decorates the backpack and turns it into a fashion accessory. She creates a boys’ version of the backpack at her friend Chase’s request and attracts the attention of another PCA student, Stacey, who steals Zoey’s idea of decorating backpacks. When Stacey is on the verge of making a lucrative deal to sell her backpacks to the school store, Zoey designs an artistically decorated backpack with built-in massage and speakers. The development process for this enhanced backpack takes place off-screen. The viewer sees only the successful outcome of Zoey’s efforts and how she spends her revenue from the bookstore arrangement: on a jukebox for the lounge that everyone can enjoy.

The subplot in “The Backpack” illustrates the idiosyncratic Quinn’s ambition to create a hybrid fruit, a “banapple,” which would blend her two favorite fruits, banana and apple. She combines their molecular structures into one fruit tree and creates a cyberscarecrow modeled on herself to protect the tree. Zoey’s selfless invention succeeds, but Quinn’s self-absorbed project does not, for the resulting fruit is poisonous. Characteristically, Zoey and Chase console Quinn,
who demonstrates the lethal nature of her fruit hybrid on Stacey’s bicycle seat, which withers.

In “Anger Management” (2008), Zoey observes Quinn’s dietary quirkiness (she doesn’t like peanuts, so she just licks the chocolate off them) and her technical abilities (she can fix Zoey’s Jet X scooter). Their dialogue about repairing the scooter distinguishes having tools from being feminine. After Zoey asks for Quinn’s help with the scooter, Quinn says, “I will get my tools.” Zoey allows, “Maybe I should get some tools some day,” but Quinn responds, “No, you are too girly to have tools.” There is a certain amount of irony in this exchange, for Quinn is dressed in an outfit that includes a frilly pink shirt, headband, and sash, while Zoey is wearing a blue sweatshirt.

The show’s Web site describes Quinn as

brilliant in a mad scientist kind of way. Her room doubles as a science lab and her extra-curricular activities include inventing contraptions (a.k.a. ‘Quinnventions’) and then testing them out on unsuspecting classmates. You could say Quinn puts the ‘Q’ in quirky because you never know what she is going to come up with next. Sure Quinn’s a little different from her classmates, but she kind of prefers it that way.

Quinn’s various eccentricities include weird food preferences (for baby food), strange outfits and hairstyle, concern for her pet alpaca, propensity to invent bizarre items, and advanced understanding of science. On the fictional PCA Web site, Quinn’s inventions are named and numbered, but the descriptions have been blacked out as “censored.” Curiously, in “Zoey’s Tutor” (2006), Zoey receives help in science not from Quinn but from Logan Reese, Chase’s roommate who has limited ideas of what girls can do.

In “Robot Wars” (2006), Zoey and her friends enlist Quinn to help them create a warbot to compete against the bot developed by PCA’s award-winning robotics team. The robotics team of geeky boys includes three (Neil, Drew, and Wayne) who would not let Quinn join the science club because “girls and science don’t mix.” The boys’ taunting of Quinn persuades her to overcome her reluctance to compete in a violent game, so she joins Zoey’s team, which includes Lola, Chase, Michael, and Logan. Unfortunately, the narcissistic, rich Logan makes fun of Quinn; she overhears laughter and walks out on the team. Although Zoey apologizes for the teasing, Quinn refuses to return to the team to finish the bot. Zoe’s team is then forced to make a deal with Miles Brody, the PCA student who knows everything. After a close battle, the geeky boys’ bot defeats Zoey’s team’s bot; however, the teams face a rematch because the geeks violated height restrictions. Zoey’s team’s bot as finished by Miles is too crushed to fight again, but Quinn surprises everyone when she brings her
newly designed small, purple and pink bot into the ring, endures taunting from the geeky boys (“This is why girls don't belong in the science club”), and proceeds to shoot her bot’s missile into the geeky boys’ bot and demolish it. After Quinn’s bot wins the competition, Zoey and her friends apologize to Quinn by sending her flowers delivered by bot.

In Zoey 101, Quinn’s character includes stereotypes associating science with wild ideas, frequent failures, and masculine confidence, but she also demonstrates positive feminine traits that transform stereotypes concerning gender and science. She is a generous person who takes Zoey in as a roommate in an early episode when Dana and Nicole are fighting, and, after a computer mix-up with rooms, Quinn later moves in with Zoey and Lola. In other episodes of the show, Quinn dates Mark, a boy in her science class (“Quinn's Date,” 2005), and she helps Logan with his basketball game (“Chase's Girlfriend,” 2006). Quinn and Logan date secretly in “Walk-a-Thon” (2008) and “Dinner for Two Many” (2008). In the 2008 series finale (“Chasing Zoey), they reveal their secret romance to their friends and classmates. That Quinn and the handsome, conceited, rich boy who is patient with her odd preferences are attracted to each other and that she continues her science experiments reworks stereotypes about scientifically adept girls. Similar expectations about Logan based on his wealth and narcissism are countered by his affection for Quinn and his ability to tutor science.

Reality shows such as Top Gear (1978–2001, 2002–) and MythBusters (2003–) showcase science and technology within discussion and demonstrations of technoscientific principles and products at work.37 Aimed at adults and appealing to adolescents, these shows portray men and women doing hands-on STEM work, but men more frequently appear as scientific and technical authorities. The public television reality show Design Squad, which presents engineering challenges within the framework of a competition between two teams of students (high school students and college undergraduates), was created to attract high school students to engineering; it premiered on PBS stations in 2007. The show’s development was based on research from the Extraordinary Women Engineers Project (EWEP), a national initiative receiving corporate and NSF support that looked at how perceptions of parents, peers, teachers, guidance counselors, and the media affected educational and career decisions of young girls. Girls responding to EWEP surveys indicated that they perceive the ideal elements of a career as “enjoyable, good working environment, making a difference, income, and flexibility,” and that they considered engineering to be hard, masculine, and for people who love math and science.38

Recognizing the gap between what girls want and what they perceive, the EWEP report recommends developing messages “that illustrate engineering as
a career that complements and supports community interests, family interests, and self-interests” (19). Co-hosted by Nate Ball and Deanne Bell, each episode of Design Squad follows two teams of students who work to design, build, and test prototypes (cardboard furniture, zero-gravity bike, insect sculpture) that meet the specifications of the weekly competition. Each show also introduces the audience to “engaging young engineers who demonstrate that engineering is a creative career where you get to work with great people, solve interesting problems, and design things that matter.”

The gender balance is studiously even, while competitive elements of the show fit the winner-take-all mentality of reality television—the winner of each season wins a $10,000 scholarship from Intel—rather than the collaborative interests and good working environment mentioned by respondents in the EWEP report.

Recent fictional productions present likable female scientists who struggle against social stereotypes and expectations. Based on the 1978 children's book by Judi and Ron Barrett, the animated film Cloudy with a Chance of Meatballs (Dir. Phil Lord and Chris Miller, 2009) illustrates a plot in which gender, science, and technology reference and reconfigure stereotypes. The film includes a wacky scientist-inventor (he admires Nikola Tesla) and a female meteorologist (she wants to be “a real scientist”) who overcome failure and fear to demonstrate technoscientific and heroic abilities. The Internet Movie Database describes these characters as “Flint Lockwood, a young inventor who dreams of creating something that will improve everyone’s life . . . [and] Sam Sparks, a weathergirl covering the phenomenon who hides her intelligence behind a perky exterior.” Flint and Sam share a mutual attraction to science that encourages their romance, but Sam’s quest to become a scientist generally goes unmentioned in reviews.

The television show The Big Bang Theory (2007–) sketches a narrative arc in which science intersects with heterosexual romance and psychological maturation. This comedy sacrifices elaborate plot to showcase archetypal scientific personalities, represented by variously eccentric male, geeky Cal Tech research scientists and their commonsense, normal pretty, blonde neighbor who works as a waitress at the Cheesecake Factory. Sheldon is a child prodigy and science snob with obsessive-compulsive tendencies; his roommate Leonard is comparatively normal, although in his family he is thought of as an underachiever with a Ph.D. in astrophysics. Rounding out the group are Raj, who can correct the all-knowing Sheldon but can’t speak in front of women; Howard, who shouldn’t speak to women because every sentence he forms comes out as a leering proposition; and their neighbor Penny, the waitress who becomes Leonard’s girlfriend. Penny’s sensibility, sincerity, and sentiment make her the emotional center of most shows. Although Sheldon’s intelligence allows him to
be correct much of the time, his condescending attitude toward others causes him to be out of joint with his society, which takes offense at his claims such as "I'm a physicist. I have a working knowledge of the universe and all it contains." 40

Some episodes of *The Big Bang Theory* develop Howard's romance with Bernadette, a microbiology graduate student who works at the Cheesecake Factory with Penny and who can keep up with the boys when they talk science. Bernadette's interest in Leonard's work prompts Penny to ask Sheldon for a physics tutorial in *The Gorilla Experiment* (2009); the results demonstrate that Penny can understand science but remains most fascinated by a food fact (where Fig Newtons were invented) rather than information about physics. Similarly, Leonard is unable to understand the rules of football or the dynamics of dating, and Sheldon cannot feel empathy. Each major character in *The Big Bang Theory* thus exhibits strengths and weaknesses, reflecting a blend of expected and unexpected gendered traits. The series normalizes the world of science and humanizes scientists while winking at well-known gender stereotypes.

Whether shows depicting female competence and interest in STEM can enhance the appeal of these fields, or whether students, parents, faculty, and professionals are put off by stereotypes that make scientists seem admirable competitors or lovably quirky singles looking for love, only time will tell. Television and film represent science and technology as esoteric, risky, and dangerous and therefore attractive mostly to adventurous males and odd females. After centuries of plots in print and on-screen in which science, technology, and gender are intertwined, we have come to expect, if not accept, stereotypes of femininity and masculinity in many narratives about science and technology. This book is one attempt to unpack such conventions across narrative genres and historical periods, undertaken to better understand how stereotypes are replicated, resisted, or adapted within stories referencing gender, science, and technology.

My readings are set within the context of empirical communication scholarship about viewers and their anecdotal reactions. Further empirical research into viewers' attitudes would shed more light on reactions to recent televised portrayals such as *Design Squad*'s of females and males engaging with science and technology or *The Big Bang Theory*'s romantic plots linking male and female scientists and non-scientists. Predicting what viewers and readers think is a difficult business, for individual and cultural values are diverse and
change over time. The multifarious responses of fans on webzines and blogs demonstrate that consensus might not be possible.\textsuperscript{41} The different reactions of fans when shows such as \textit{Star Trek} or \textit{Dr. Quinn, Medicine Woman} are cancelled or when book series such as \textit{Harry Potter} conclude reveal that opinions differ among peers about what texts are valued and how they are interpreted. One should not assume that everyone exposed to texts representing women and men according to gendered stereotypes develops the same ideas about these texts. After all, where one parent sees a daughter “mothering” a truck and thereby behaving differently from a boy who runs a truck along the floor, another sees a girl who has become more comfortable with the truck because she is incorporating it into her play and asserting control over it.

The preceding chapters outline stereotypical configurations of gender, science, and technology in narratives and remark on the occasional deviations from such stereotypes, doing so to suggest the ways in which representations help form social norms regarding who should study and work in STEM. Viewers recognizing the incorporation of gendered stereotypes are better equipped to withstand the discrimination women face in the STEM workforce and resist such prescriptions. Consumers can avoid purchasing or watching what insults them or their children, and they can explain why they are doing so to providers and to other consumers. Further, negative stereotypes can be unraveled to produce constructive insights that improve STEM environments.

Content producers should resist the urge to replicate discriminatory stereotypes and should instead create new formulas to inspire boys and girls to investigate scientific principles as joyfully as the MythBusters (Adam Savage and Jamie Hyneman), as carefully as television’s many forensic investigators, and as ambitiously as \textit{Design Squad}'s contestants. Producers who develop innovative programming to spark kids’ interest in science or those who commission creative programming such as PBS’s \textit{Sid the Science Guy} (2008–), which aims to teach science content to preschool kids by asking questions without incorporating stereotypes, should be commended.\textsuperscript{42}

This book offers analyses of print and visual media as a means of enhancing the capacities of readers and viewers to identify gender stereotypes, recognize how they shape our consciousness, and work toward disassembling these formulas as natural and essential. In addition to improving interpretive capacities of individuals, media depictions of girls’ and women’s engagement with and authority over science and technology should be increased and given more prominence. Several organizations such as Girl Scouts, Boys & Girls Clubs of America, and FIRST\textsuperscript{*} LEGO\textsuperscript{*} League incorporate fun, hands-on, interactive experiences for students to become more knowledgeable about science and technology. Digital modes of communication—for example, playing computer
games and watching television shows and film on the Internet—offer some opportunities for adolescents to develop their scientific and technical talents, abilities, and skills, regardless of race, class, and gender. Studying media representations of women engaging with science and technology provides opportunities for scientists to adjust their attitudes and environments and for the public to develop greater understanding of these fields.
Notes

Chapter 1


5. Songe-Möller, Philosophy without Women, 10.


7. Ferguson, A Companion to Greek Tragedy, 111–23.

8. Aeschylus, “Prometheus Bound,” 139.

9. Some material in this section is adapted from Colatrella, “Science, Technology, and Literature.”

10. Pollack, “Scientists Seek a New Movie Role.” Also see Frayling, Mad, Bad, and Dangerous, for a survey of film images of scientists.

11. Fontenelle, Conversations on the Plurality of Worlds, advertisement blurb.

12. Mellor, Mary Shelley.


15. See Joyrich, Re-Viewing Reception; Dow, Prime-Time Feminism; Donawerth, Frankenstein’s Daughters; Telotte, Replications; Attebury, Decoding Gender in Science Fiction; and Yaszek, Galactic Suburbia; Sobchak, Screening Space.

16. Both literal and metaphorical uses of the word “stereotype” refer to processes
regarded as progressive for profit-making businesses because they minimize individual variations while maximizing productive output. See Colatrella, “The American Experiment in Criminal Justice and Its European Observers.”


18. Lubinski and Benbow, “Sex Differences in Personal Attributes for the Development of Scientific Expertise,” note greater variation in IQ between boys and girls, citing a Scottish IQ study that shows inverse bell curves for boys and girls. Hines, “Do Sex Differences in Cognition Cause the Shortage of Women in Science?,” asserts that “sex differences in cognitive abilities have not been clearly linked to either organizational or activation effects of hormones” (109). Hyde, “Women in Science,” reports gender differences in problem-solving ability. Also see Committee on Science, Engineering, and Public Policy, Beyond Bias and Barriers, 6.

19. According to COSEPUP’s Beyond Bias and Barriers, “Studies of brain structure and function, of hormonal modulation of performance, of human cognitive development, and of human evolution provide no significant evidence for biological differences between men and women in performing science and mathematics that can account for the lower representation of women in these fields. The dramatic increase in the number of women science and engineering PhDs over the last 30 years clearly refutes long-standing myths that women innately or inherently lack the qualities needed for success; obviously, no changes in innate abilities could occur in so short a time” (25).

20. Belkin, “Diversity Isn’t Rocket Science, Is It?” Other references to Hewlett’s study in the paragraph are also from this article.


22. Rosser, Fox, and Colatrella, “Developing Women’s Studies.”

23. Colatrella, “Feminist Narratives of Science and Technology.”

24. Reports include Kitzinger et al., Gender Stereotypes and Expertise in the Press; Haran et al., Screening Women in SET; Boyce and Kitzinger, Promoting Women in the Media; and Whitelegg et al. (In)visible Witnesses. Online versions of these reports appear at http://www.ukrc4setwomen.org/. Accessed October 29, 2009.

25. Kitzinger et al., Role Models in the Media.


27. Kitzinger et al., Role Models in the Media, 21–22.

28. Dawson, Soldier Heroes, 48. See Pease, “Leslie Fiedler, the Rosenberg Trial, and the Formulation of an American Canon,” 156: “By a Cultural Imaginary I mean, following Cornelius Castoriadis, to designate a realm wherein abide not the images of already existing social materials but the ‘undetermined abstract materiality of society itself.’ In relation to the Cultural Imaginary the things, objects, and individuals that society brings into existence can be said to be themselves only insofar as they are held to be self-evidently true, hence beyond debate.”

29. Peril, Pink Think.


31. The book is Evans’s She Wins, You Win. This anecdote was told during her speech at the Georgia Association for Women in Higher Education Conference, February 2004.

NOTES TO CHAPTER 1

34. “Mattel Dolls Up PCs with Barbie.”
36. Johnson and Learned, Don’t Think Pink.

38. I thank Svend-Erik Larsen and Trina Moenstad for guiding my tour of Legoland operations and their interviews with me in Billund, Denmark, on October 4, 2000. I am also grateful to Karin Sorenson who arranged for me to meet these Lego employees and to Kirsten Gomard, who initiated these contacts for me.

40. Dean Kamen (inventor of the Segway) sponsors FIRST LEGO League (FLL), a robotics competition in the United States, which is targeted at encouraging schoolchildren to persist in studying science and technology. FLL has grown exponentially, but there are disproportionately low numbers of girls involved, although many students are interested in Legos. See FIRST LEGO League.

41. Schwartz, “Turning to Tie-Ins, Lego Thinks beyond the Brick.”
42. I thank students in LCC3304: Science, Technology and Gender, Georgia Tech, fall 2001 and fall 2007, for sharing their comments about these products.

43. Similar scenarios with young children are enacted daily in schools and playgrounds. See Corinne Schiff, “Metropolitan Diary.”

44. Buchanan and Peskowitz, The Daring Book for Girls; Iggulden and Iggulden, The Dangerous Book for Boys.
45. McKellar, Math Doesn’t Suck; Inouye, Fly Girls.
46. Oldenziel, “Man the Maker, Woman the Consumer,” 144.

47. Merchant, The Death of Nature.
49. Rossiter, Women Scientists in America.
50. Keller, A Feeling for the Organism; Russett, Sexual Science.

51. Ehrenreich and English, For Her Own Good.

53. Wajcman, Feminism Confronts Technology and Technofeminisms.
54. Martin, “The Culture of the Telephone.”
55. Scharff, “Femininity and the Electric Car.”
56. Cowan, More Work for Mother; Cockburn and Ormrod, Gender and Technology in the Making.

57. Horowitz, ed., Boys and Their Toys?
58. These issues are salient for women in fields with long working hours and significant managerial responsibilities—positions that require education and the need to collaborate and that pressure employees to be productive, that is, positions such as those in academic science and engineering.

59. OECD, Public Understanding of Science in the OECD Member Countries.
60. Allum et al., “Science Knowledge and Attitudes across Cultures: A Meta-Analysis.”
61. Turner, “School Science and Its Controversies, or Whatever Happened to Scientific Literacy?”
64. Tierney, “Tierney Lab: Male Bias or Female Choice.”
67. Efforts to recruit and retain more girls and women in science, mathematics, engineering, and technical disciplines have preoccupied many researchers in the United States and Europe in the decades since Title IX was enacted in 1972. See Stewart et al., eds., Transforming Science and Engineering, which describes initiatives developed by ADVANCE programs in U.S. universities.
68. Hanson, Swimming against the Tide, 1.
69. Figure C-1 in National Science Foundation, Women, Minorities, and Persons with Disabilities.
70. Figure D-1 in National Science Foundation, Women, Minorities, and Persons with Disabilities.
71. These NSF figures are cited in Belkin, “Diversity Isn’t Rocket Science, Is It?”
73. American Association of University Professors, AAUP Gender Equity Indicators; Handelsman et al., “More Women in Science.”
74. The Virginia Tech ADVANCE newsletter cites ASEE’s national percentage of women faculty in engineering as 11.3 percent in 2006, putting the percentage of VT female faculty in engineering at 12.5, with MIT’s and Georgia Tech’s percentages higher; see “ADVANCING Women at VT”.
75. Sommers, “Why Can’t a Woman Be More like a Man?”
76. Nelkin, Selling Science, 19.
77. LaFollette, “Eyes on the Stars,” 262.
78. For example, see Dean, “Women in Science.”
81. Dalle Vacche, Diva, 2.
83. Science and technology have historically been envisioned in literature and film as mostly male domains, although often symbolized by feminine figures. See Schiebinger, The Mind Has No Sex, 122; and Browner, Profound Science and Elegant Literature, 139.
84. Design News Staff, Engineers Making a Difference; Smallwood, “As Seen on TV,” A8; and Bollag, “Award-Winning Teaching.”
85. See Smallwood, “As Seen on TV.” Kim Loudermilk pointed out to me how some popular television shows such as The X-Files (initially broadcast in 1993) and Buffy the Vampire Slayer (based on a 1992 film and initially broadcast in 1997) depict female characters who
mix rational understanding of science with supernatural beliefs or even powers, particularly Buffy's best friend Willow, who is both computer wizard and witch, and medical doctor Dana Scully of *The X-Files*.

86. Cunningham et al., “Gender Representation in the NCAA News.”
89. Steinke and Long, “A Lab of Her Own?,” 91.
90. Culler, *Structuralist Poetics*, 137.
91. Rabinowitz, *Before Reading*, 53. Mackey, “At Play on the Borders of the Diegetic,” 619, offers a useful summary of Rabinowitz's rules: “Rules of notice help readers decide what they will pay attention to and how they will distinguish between figure and ground. Rules of signification help readers decide how to attend to what they notice: whether a narrator is reliable, for example; whether readers should assume that the physical or social norms of contemporary life apply to the actions of the story; and so forth. Rules of configuration help readers to assemble the different elements of the story to make an overall pattern. Rules of coherence, applied after the reading is concluded, are used to help the reader make the best possible sense of the text. Gaps, for example, may be reinterpreted as significant ellipses and metaphoric explanations may be invoked to establish thematic interpretations.”
92. See Phelan, *Reading People, Reading Plots*, 2–3: “mimetic” aspects of characterizations referencing science and technology have corollaries in specific people who study and practice in these domains. “Synthetic” and “thematic” components of character should not be overlooked, for artificial and representative aspects of character in the narratives under discussion also convey how males and females engage with science and technology in gendered ways.
96. Faludi, *Backlash*, chapters 5 and 6, respectively: “Fatal and Fetal Visions: The Backlash in the Movies” and “Teen Angels and Unwed Witches: The Backlash on TV.”
97. See Douglas, *Where the Girls Are*, for an analysis of 1960s and 70s American television shows; and Watson, “From My Little Margie to Murphy Brown.” Canadian guidelines are considered in Trimble, “Coming Soon to a Station Near You?,” 326.
100. Revkin, “Filmmaker Employs the Arts to Promote Sciences.” Also see Perkowitz, *Hollywood Science*.
101. Haynes, *From Faust to Strangelove*.
102. Haynes, “From Alchemy to Artificial Intelligence,” 244.
105. Flicker, “Representation of Women Scientists in Feature Films,” sees six types of female scientists in films—“old maid,” “male woman,” “naïve expert,” “evil plotter,” “daughter or assistant,” and “lonely heroine.”
106. Gender differences are also apparent in the reactions of viewers to genres, according
to Oliver et al., “The Impact of Sex and Gender Role Self-Perception.”

107. See Colatrella, Literature and Moral Reform, for consideration of nineteenth-century theories of reading.

108. Kenschaft, “Just a Spoonful of Sugar?,” explains Disney’s reconfiguration of Mary Poppins as a story warning upper-class parents about being too committed to work and activism. The lower-class chimney sweep and nanny inspire Mr. and Mrs. Banks to be more involved and responsible parents. Kenschaft notes that her own mother justified her choice “to interrupt graduate work for six years to become a full-time mother” after seeing Mrs. Banks’s exemplary giving up of suffragette activity for her children’s sake, while “another professional woman . . . thought the movie’s portrayal of Mary Poppins’ and Bert’s beneficial relationship with Jane and Michael supported her choice to pay another person to nurture her children during the workweek while she pursued her career.”

109. Paul Newman was shocked that audiences admired Hud—a selfish, suspicious, conniving young man who is eager to get his hands on his ethical father’s legacy and who abuses everyone around him. Apparently the actor’s charisma and attractiveness caused audiences to see past the character’s moral failings. See Lyman, “Film: No Goons in Spats, No Rat-a-Tat Dialogue.”

110. Rabinowitz, Before Reading, 9.

111. Clough, Feminist Thought, 5.


113. See Douglas, Where the Girls Are, chapter 6, “Genies and Witches,” for an analysis of how supernatural abilities affect the characterizations of Jeannie and Samantha on I Dream of Jeannie and Bewitched.

114. Felski, Beyond Feminist Aesthetics, cautions against privileging the aesthetic over the pop culture product.

115. Hawthorne, Selected Tales and Sketches.


Chapter 2


2. Wylie and Nelson, “Coming to Terms with the Values of Science,” 59.


4. For a discussion of maternity in Mary Shelley’s life and work, see Mellor, Mary Shelley.


6. The film Frankenstein Unbound (Dir. Roger Corman, 1990), based on Brian Aldiss’s novel, also explores the analogies of big science with Frankenstein’s project.

7. Hawthorne, “The Birthmark,” Selected Tales and Sketches, 259. All quotations from the story included here are from this text.


9. Ibid., especially chapter 7, “Dominion over Nature.”


12. See Eagleton, *Literary Theory: An Introduction*, 12. The quoted text is preceded by the following: “The fact that we always interpret literary works to some extent in the light of our own concerns—indeed that in one sense of ‘our own concerns’ we are incapable of doing anything else—might be one reason why certain works of literature seem to retain their value across the centuries. It may be, of course, that we still share many preoccupations with the work itself; but it may also be that people have not actually been valuing the ‘same’ work at all, even though they may think they have. ‘Our’ Homer is not identical with the Homer of the Middle Ages, nor ‘our’ Shakespeare with that of his contemporaries; it is rather that different historical periods have constructed a ‘different’ Homer and Shakespeare for their own purposes, and found in these texts elements to value or devalue, though not necessarily the same ones.”


14. My thinking about the Council’s reading of Hawthorne’s story has been shaped by Susan Squier’s talks on related subjects at various meetings of the Society for Literature, Science, and the Arts and by informal discussions with her.


18. Child, *The Children of Mount Ida and Other Stories*, 205. All further references to the story are from this text.


22. Tannen, *You Just Don’t Understand*.

23. My discussion here about Melville’s short fictions is adapted from my argument in *Literature and Moral Reform*, 68–73.

24. For example, see Kellner’s “Slaves and Shrews.”

25. For more information about Melville’s marriage, see the special issue “The New Melville,” especially Elizabeth Renker, “Herman Melville, Wife Beating, and the Written Page,” and Scott Heller, “The ‘New’ Melville,” both of whom work to identify a “New Melville,” one who “was a tyrant at home” and who is presumed to have “beat his wife.” As I note in *Literature and Moral Reform* (264–65), my reading of Elizabeth Shaw Melville’s letters to the Shaw family convinced me that her great admiration and respect for her husband outweighed fears she had about his doing harm to himself or others.

26. Quotations from this story and the others by Melville discussed in this chapter are taken from Melville, *The Piazza Tales and Other Prose Pieces*.

27. As Bickley, *The Method of Melville’s Short Fiction*, 48, notes, “Jimmy was vain and artificial, but Ford could not let himself admit it.”

28. The wife generally displays patient forebearance of her husband: “Now, husband,” said my wife, “I am convinced that, whatever it is that causes this ticking, neither the ticking nor the table can hurt us; for we are all good Christians, I hope. I am determined to find out the cause of it, too, which time and patience will bring to light. I shall breakfast on no other table but this, so long as we live in this house. So, sit down, now that all things are ready.
again, and let us quietly breakfast” (386–87).

29. See Karcher’s consideration of “The Apple-Tree Table” as a satire on supernatural explanations of spiritualism mocking orthodox Christian approaches (“Philanthropy and the Occult in the Fiction of Hawthorne, Brownson, and Melville”).


31. Naslund, *Ahab’s Wife, or The Star-Gazer*, 380. All quotations are from this text.

32. There are literary antecedents in other works by Melville for some challenges Una faces: cannibalism is a preoccupation in *Typee* and *Omoo*; desertion is a theme in these novels, in “The Encantadas,” and in the Agatha story that Melville sent to Hawthorne after hearing it from John Clifford. Melville writes about a parent’s reaction to the death of a child in *Redburn* and *Israel Potter*. Naslund’s novel emulates the form of *Moby-Dick* by beginning with “Extracts,” which cites quotations from *Moby-Dick* and texts contemporary with it. There is also a Melvillean tone in certain episodes: Una’s water breaks in her second pregnancy while she is at the shore; she lets the waters mix (502). Interlaced with Una’s tale are Starbuck’s and Ahab’s meditations, with Starbuck commenting on her unfortunate marriage to Kit (284ff).


37. My details and phrasing are drawn from Kohlstedt’s essay.

38. Una’s turning away from her mother and aunt, and her friend Susan’s refusal to leave her mother in slavery, provide points of contact with Stowe’s *Uncle Tom’s Cabin* and Frances Ellen Watkins Harper’s *Iola Leroy.*

39. Instead of regarding Una as unusual for running away to sea and for marrying Ahab, readers view her as a more moderate version of reformers like Mitchell and Fuller, and her story becomes more authentic in that it stays within the historical compass allowed them.

40. See Norling, *Captain Ahab Had a Wife*, and Blum, *The View from the Masthead*, for consideration of whaling as work.

41. Barlowe, *The Scarlet Mob of Scribblers*, writes, “Women’s scholarship must continue to destabilize and disrupt body(ies) of scholarship so that it presses us all to examine academic and cultural assumptions and practices that objectify, exclude, or nominalize the Other” (123).

42. See Naslund’s claim that her novel is an “epic story of an American woman,” revealed in Allen. Iyer’s and Urquhart’s reviews are excerpted at The Women’s Press (www.the-womens-press.com). For other references to epic qualities, see review of the novel by Adam Dunn.

43. Kirn, “Call Me Mrs.”

44. Cohan and Shires, *Telling Stories*, 79–80. See also pages 78–79: “Although romance is not fixed but, in fact, has changed in response to different historical situations, we can none-
theless offer some generalizations about this genre. Its structure paradigmatically stresses marriage and aligns that event to the story’s closure in order to define a woman’s social choices as personal choices (i.e. love). This transformation keeps her in the domestic sphere of the home, the site of familial relationships. Through the generic traiting of the female character in terms of integrity, emotionality, and insecurity, the domestic sphere establishes a contrast to the public space of money and property dominated by fathers and husbands. The typical traiting of the male character in terms of arrogance, dominance, emotional distance, and social position reinforces this homologous oppo-/sition of public (his)/private (hers) and economic power (his)/emotional knowledge (hers).”

45. In chapter 4 of Literature and Moral Reform, I consider the heterogenous style of Moby-Dick.

Chapter 3

1. Shields, 10.
3. Showalter, The Female Malady, surveys madness as a cultural trope identified with femininity.
5. Foucault, Discipline and Punish, 299–300: “Replacing the adversary of the sovereign, the social enemy was transformed into a deviant, who brought with him the multiple dangers of disorder, crime and madness.” Sections of this chapter are adapted from Colatrella, “At optraevle kniplingen”; Colatrella, “The Significant Silence of Race: La Cousine Bette and ‘Benito Cereno’”; and Colatrella, “Fear of Reproduction and Desire for Replication in Dracula.”
6. Wright, Between the Guillotine and Liberty, describes the reform movement inaugurated by Cesar Beccaria’s Essay on Crime and Punishment as preferring “prevention rather than punishment” (11).
9. For a brief survey of these scientists, see “Histoire de la criminologie.”
10. Gould describes the political bias of such pseudo-scientific study in The Mismeasure of Man.
11. Lavater, Essays on Physiognomy, 38 and 84.
12. Ibid., 226: “Is it not perceptible in each species whether it be warlike, defensive, enduring, weak, enjoying destruction, easy to be crushed, or crushing?”
15. Ibid., 54: “In the inferior classes where instruction is practically nil, the habits of women approach closer to that of men.”
20. “La Bette était . . . d’un entetement du mule” (85); “parfois elle ressemblait aux singes habillés en femmes” (86); she shows “une jalousie de tigre” (109).
22. For a discussion of race in the novel, see Colatrella, “The Significant Silence of Race,” from which this paragraph and the previous one were adapted.
24. The translations of Zola’s novel provided with page numbers in the text are from the English translation published as *The Kill*. Unpaginated translations are mine.
25. Lombroso and Ferrero, *Criminal Woman, the Prostitute, and the Normal Woman*.
28. Ibid.
30. See Barthes, *Michelet*, for a description of Michelet’s fear of blood (120).
31. See Orlík, “Le sang impur,” for an analysis of Lombroso’s obsession with menstruation as a symptom of female deviance.
32. As Kelly points out in *Fictional Genders*, “the undecidability of gender” represents a questioning of “the very nature of masculinity and femininity” (2).
33. Sidonie gave up her child Angelique for adoption and ended her days in a convent. See Zola’s *Le Rêve* and *Le Docteur Pascal*.
35. For a summary of science in two of Stoker’s fictions, see Senf, “Dracula and the Lair of White Worm,” 219.
36. I thank Carol Senf for bringing these points about Van Helsing to my attention.
38. Stoker, *Dracula*.
40. In Dracula’s castle Jonathan remarks that if Dracula had recognized the shorthand journal as being a threat, he would have surely taken it and possibly destroyed it; see *Dracula*, 40.
41. Wicke, “Vampiric Typewriting.”
42. Eisenberg, Murkoff, and Hathaway, *What to Expect When You’re Expecting*, 106.
43. See O’Flinn, “Production and Reproduction in the Case of Frankenstein.”
45. Walton and Jones, *Detective Agency*, consider the politics of female detectives.
46. Haran et al., *Screening Women in SET*, 3.
47. In the series finale of *Monk* (2002–9), the daughter of Monk’s deceased wife Trudy tells him that his police skills, which depend upon his detailed, insightful observation
of crime scenes, are “a blessing” and not “a curse” because they enabled him to solve Trudy’s murder after 12 years and to find the daughter she thought had died shortly after being born. Monk’s obsessive-compulsive disorder is a psychiatric syndrome, and it functions in the show’s diegesis in similar ways as the supernatural abilities of other detectives. Finding Trudy’s daughter provides Monk with someone to love, as his assistant Natalie tells him, and, along with solving the murder, ends his trauma about Trudy’s death.

48. “Biography for Catherine Willows from CSI (Crime Scene Investigation).”
49. Haran et al., Screening Women in SET.

Chapter 4

1. Davis-Floyd, “Birth as an American Rite of Passage,” 158; Lowrey, “Understanding Reproductive Technologies as a Surveillant Assemblage.”
3. Sicko (Dir. Michael Moore, 2007) considers different national health care systems.
7. Zola researched theoretical positions established by Gonnard, Nitti, Bergeret, Canu, and Brochard to support his personal observation; see Baguley, Fécondité d’Emile Zola.
9. Shorto, “No Babies?”
10. Davidson, Revolution and the Word, notes readers’ responses to American sentimental fiction.
12. Michelet, La Femme, 119.
14. Michelet rehabilitated the traditionally feared femme fatale into a “femme malade” whose menstruation wounds and incapacitates her; Moreau, Le Sang de l’histoire, 57, 60, and 92.
15. See Barthes, Michelet (120) for a description of Michelet’s fear of blood.
17. Zola, Oeuvres complètes, 8: 978.
20. Baguley, 179.
21. The Morrill Act in 1860 created land grant colleges, which also opened educational opportunities to women.
23. Pringle, Sex and Medicine, 27.
24. The television series *Dr. Quinn, Medicine Woman* (1993–98) focused on medical cases and social challenges facing the title character, a female doctor from Boston who locates to Colorado in the late nineteenth century.


27. Both Phelps and Gilman address these issues in expository works as well. See Phelps, “What Shall They Do?,” “Why Shall They Do It?,” “What They Are Doing,” “Women and Money,” “A Talk to Girls,” and “A Few Words to the Girls.” Gilman’s ideas are explicated in *Women and Economics* (1898) and *The Man-Made World* (1911), excerpted in Schwartz’s anthology *The Yellow Wallpaper and Other Writings*.

28. “The homeopaths had three central doctrines. They maintained first that diseases could be cured by drugs which produced the same symptoms when given to a healthy person. This was the homeopathic law of similars—like cures like. Second, the effects of drugs could be heightened by administering them in minute doses. The more diluted the dose, the greater the ‘dynamic’ effect. And third, nearly all diseases were the result of a suppressed itch, or ‘psora.’ The rationale for homeopathic treatment was that a patient’s natural disease was somehow displaced after taking a homeopathic medicine by a weaker, but similar, artificial disease that the body could more easily overcome” (Starr, *The Social Transformation of American Medicine*, 96–97). Also see Sartisky, “Afterword,” *Dr. Zay*, 274.


31. For an account of how sectarian domestic medical practices compete with the regulars’ “rounds of bleedings, blisterings, and purgings,” see Numbers, “Do-It-Yourself the Sectarian Way,” 5.


34. This view counters that of Morris, “Professional Ethics,” 150. I argue that the novel is about Waldo’s awakening to profession and Zay’s to love, as each learns to discard preconceptions.

35. Lears, *No Place of Grace*, 221.

36. Masteller, 144.


38. Jewett, *Novels and Stories*.

39. When Joan Bascom ran away from her family as a young girl to attend college, “the whole countryside rocked with gossip” (270), but as a successful medical doctor Joan is “a source of real pride to her sister, and of indefinable satisfaction to her brother-in-law” (271).

40. For examples in English, see Stith’s “The Use of the Movie ‘Lorenzo’s Oil’ as a Teaching Tool”; Gostinger, “Adrenoleukodystrophy (ALD)”; and Burr, “Fortune Favors the Brave.”

42. Ibid., 569.
43. Bosk and Frader apply Lewis Hyde’s formulation of gift exchange to a discussion of shifting medical attitudes and practices, explaining that “AIDS has become what the French anthropologist Marcel Mauss called a ‘total social phenomenon—one whose transactions are at once economic, juridical, moral, aesthetic, religious and mythological, and whose meaning cannot, therefore, be adequately described from the point of view of any single discipline’” (“AIDS and Its Impact on Medical Work,” 150).
44. Goldstein, “The Implicated and the Immune: Responses to AIDS in the Arts and Popular Culture,” indicates that artists and activists share credit for shaping cultural understanding: “Cultural representation, combined with political activism, forged the current consensus on AIDS” (39).
45. Works such as Shilts’s And the Band Played On and Patton’s Inventing AIDS chronicle the history of how medical and political authorities learned to respond to concerns voiced by gays, African Americans, intravenous drug users, and children, all of them demonized by their HIV status. These books describe political struggles in the early 1980s as symptomatic of how medical experts confronted different diseases and how Reagan-era officials reacted too slowly to the medical and political crisis because the disease appeared to affect few, and socially marginal, groups—homosexuals, Haitians, hemophiliacs, and intravenous drug users.
47. Treichler, “How to Have Theory in an Epidemic,” 57 and 64.
49. George Miller, who has a medical degree, indicated he envisions his films as describing mythic journeys (including Mad Max, Lorenzo’s Oil, and Babe, A Pig in the City). Also see Jones, “Medicine and the Movies: Lorenzo’s Oil at Century’s End”; and Crawford’s reference to the quest narrative at the heart of Mervyn LeRoy’s film of Marie Curie in “Glowing Dishes,” 74.
50. Balzac’s Père Goriot and Dickens’s Little Nell are only two of many characters who disappear from fiction because they are too good to exist in a troubled world. Tompkins, Sensational Designs, analyzes little Evà’s death from consumption as a religious parable demonstrating how the innocent suffer, a lesson that can also be applied to the situation of the slaves sacrificed for the sake of their masters’ greed.
51. The notice of Lorenzo’s death appears at the Myelin Project site (http://www.myelin.org/). The obituary indicates he died of aspiration pneumonia; see Weil, “Lorenzo Odone,” 30.
53. See Concar, “Lessons from Lorenzo.” This interview with Augusto Odone includes his comments on studies of transplanting cells into the brain.
56. See Rubin, “Lorenzo’s Oil Brings Hope for the Afflicted.”
Chapter 5

1. I thank Laura Otis for sharing her views of scientific life and her novels and for pointing me to LabLit.com, a thoughtful, entertaining site edited by scientist and science writer Dr. Jennifer Rohn for anyone interested laboratory life and representations of it.

2. FIRST NXT blog of Katie, age 14.

3. Haran et al., *Screening Women in SET*.

4. The Internet Movie Database lists hundreds of film and television shows tagged with “babe scientist” as a keyword. Another term with different resonance is “girl geek.” As “History of Girl Geeks” at GirlGeeks.org explains, “Starting with on-camera interviews and an informational website, the name originally included a question mark—GirlGeeks?—because the filmmakers wanted to explore the stereotype of the word ‘geek,’ meeting women who considered ‘geekiness’ to be an insult and others that considered it a badge of honor. Turns out that Geek was a powerful description and definitely chic, so GirlGeeks dropped the question mark and pioneered the use of rich content, mentored community, and career-enhancement commerce online to gather, train and promote women with technology skills of all kinds into better jobs.”

5. From *Publishers Weekly*’s review of “Self-Experiment.”


7. Hoeg, *Smilla’s Sense of Snow*.

8. Smilla’s difficult relationship with her father also sets her apart.


10. This sentence paraphrases Roberts, “The Woman Scientist in *Star Trek: Voyager*,” 278.


16. As noted in Perkowitz, “Female Scientists on the Big Screen.”

17. According to Flicker, there are six types of female scientists in films—old maid, male woman, naive expert, evil plotter, daughter or assistant, and lonely heroine (“Representation of Women Scientists in Feature Films”). See Haynes, “From Alchemy to Artificial Intelligence”; and Flicker, “Between Brains and Breasts.”


20. See “Center for the Study of Women, Science, and Technology.” Since the 1970s, many U.S. universities have worked to attract and retain more women in science; intervention programs for women in STEM include the Georgia Tech Center for the Study of Women, Science, and Technology (WST). Founded in 1998, WST provides students with information about career development, arranges for mentoring, and enables networking among students and faculty.

21. Newitz and Anders, *She’s Such a Geek*.

22. Flicker, “Representation of Women Scientists in Feature Films.”
23. The Hollywood formula for framing this heterosexual plot as “boy-meets-girl, boy-loses-girl, boy-gets-girl” is well-known as the basis for many movies. Yet the meaning of “meets” is more complicated than one might assume. The mediation of the audience in the romance film is critical regardless of whether the characters share the same film screen. Following in a tradition stretching from Shakespeare’s romances, many romantic film comedies, such as Nora Ephron’s *When Harry Met Sally* (1989), *Sleepless in Seattle* (1993), and *You’ve Got Mail* (1998), promote the audience’s learning about the protagonists more than the films illustrate characters revealing themselves to each other. Romances tend to enforce heterosexuality as normative even if they are also normalizing homosexuality. In Shakespearean comedies, a female lead masquerades as a male before revealing her true identity. In the 2006 film *She’s the Man* based on Shakespeare’s *Twelfth Night*, actress Amanda Bynes plays a girl taking her brother’s place at a boys’ prep school so that she can play soccer after her own girls’ school cuts their team. In disguise as her twin, she ends up falling in love with her roommate, a male soccer player who wonders how he could feel so close to another “guy.”

24. “Q and A with Nell Minow.”

25. Race and ethnicity are sometimes invoked in romances as a challenge to the partners (e.g., *West Side Story*, *Guess Who’s Coming to Dinner*). Socioeconomic class differences separate lovers in Jane Austen’s and other realist novels. Temperamental differences divide male and female protagonists in comedies such as *My Girl Friday* (1940), while depicting the newspaper editor and reporter at odds and also trading witty barbs.


28. Ibid., 72.

29. Much is made of Roxanne’s nudity in comic moments. See Maslin, “Steve Martin.”

30. I thank Rick and Charlie Denton for pointing out the musical intertexts.

31. On the conflict between Ellie and Drumlin, see Steinke, “Women Scientists Role Models on Screen,” 125.

32. Palmer responds to Ellie most ardently when she appears more feminine: nude in bed with him, dressed in a ball gown for an official reception, in pajamas just before the launch.

33. Leslie Charteris’s fictions were the source of a number of films/film series about the character, and there were several television series based on Charteris’s works. See “The Saint.”

34. Students Elizabeth Stowe, Christy Striplin, Trevor Christensen, and Savannah Brown, in my LCC 3304 “Science, Technology, and Gender” course, noted *The Saint’s* emphasis on trust and transformation in their spring 2008 team project.

35. In a featured interview on the DVD of the film, Cholodenko describes *Laurel Canyon* as a comedy-drama about a female record producer based on Joni Mitchell.

36. Potter, *Yes: Screenplay and Notes*.

37. To indicate She’s voiceover narration, this dialogue appears in italics in Potter’s published screenplay.

38. Shafner, “Intuition’ Rings True in World of Science.”


40. For a recent account of Franklin’s life and work, see Maddox, *Rosalind Franklin*.

41. See Kevles, *The Baltimore Case*, 307. In 1992, “[t]he O.S.I. was taken away from the N.I.H. and reconstituted as the Office of Research Integrity (O.R.I.) within the office of the assistant secretary for health.”
42. The novel’s plot concerning a post-doc’s accusation of lab fraud resembles elements of Kevles’s *The Baltimore Case*, a nonfictional account, but Goodman’s novel elaborates a romantic plot and a characterization of the accuser that are distinctly different from Kevles’s account. I thank Jay Labinger for pointing to Kevles’s book as a source for Goodman’s novel.

Chapter 6

1. Sundin, “Gender and Technology.”
2. Cowan’s ideas are referenced in Pursell, “Feminism and the Rethinking of the History of Technology,” 115.
3. Wajcman, *Feminism Confronts Technology* (150) and *Technofeminisms*.
10. From “Pioneers in Improvement and Our Modern Standard of Living.”
11. The more recent *Cheaper by the Dozen* films (Dir. Shawn Levy, 2003, and Dir. Adam Shankman, 2005) are updated to revise sex roles, recasting the Gilbreth parents as a college football coach (Steve Martin) and a homemaker-turned-author (Bonnie Hunt). The first film illustrates how the father has his hands full running a household and coaching a big-league team while the mother takes off on a tour to promote her book about family life; the second shows how the father cannot resist competing with a wealthier neighbor.
15. Horace E. Scudder, the editor of *The Atlantic Monthly*, wrote to Gilman that he could not accept the story, noting, “I could not forgive myself if I made others as miserable as I have made myself.” See Gilman, *The Living of Charlotte Perkins Gilman*.
17. See Knight, *Charlotte Perkins Gilman*, regarding Gilman’s use of the phrase “short sermons” in advertising for *The Forerunner*. Knight’s analyses have significantly contributed to my understanding of Gilman’s work and my argument about the theme of work for women as outlined in her fictions. On Gilman’s ideas about evolution, see Hausman, “Sex before Gender,” and Magner, “Darwinism and the Woman Question.”
18. This section is adapted from Colatrella, “Work for Women.”
21. References to Gilman’s fictions are from Shulman’s Oxford edition.
23. See “50 Greatest Screen Legends.” Google notes that as of December 8, 2009, there were around 1,040,000 Web sites that included information on Hepburn. Bergan, *Katharine Hepburn*, points out that in a 1995 “poll conducted among 50 critics worldwide and the general public by the Guardian newspaper Kate was selected as the greatest woman film star ever, alive or dead. She topped a similar poll among film-makers in Time-Out magazine a few months later” (186). Dougherty, “Katharine Hepburn,” is one example of a fan site.
26. David Selznick reportedly remarked on her “horse face” when he viewed rushes of *A Bill of Divorcement*, and Louis B. Mayer complained about her unnatural crying in rushes for *Sea of Grass*, but Hepburn cared more about how she felt than what they, or anybody else, thought. See Bergan, *Katharine Hepburn*, 31 and 101.
29. Adorno, “The Schema of Mass Culture,” argues that such fusions are the inevitable result of mass culture consumption: “The work of art becomes its own material and forms the technique of reproduction and presentation, actually a technique for the distribution of a real object. Radio broadcasts for children which intentionally play off image and reality against one another for the sake of advertising commodities and in the next moment have a Wild West hero proclaiming the virtues of some breakfast cereal, betraying the domination of image over the programme in the process, are as characteristic as the identification of film stars with their roles which is promoted by the advertising media” (64). Hepburn’s mother was at one time president of the Connecticut Woman’s Suffrage Association and later worked with Planned Parenthood; see Bergan, *Katharine Hepburn*, 15.
30. “Christopher Strong.”
31. “Biography for Katharine Hepburn.”
32. For example, see Bergan, *Katharine Hepburn*, 31.
35. Ibid., 23.
36. Ibid.
38. Based on a novel by Gilbert Frankau, the film was called by one contemporary reviewer “a drawing room tragedy” (excerpt from film review in *Time*, quoted in Dickens, *The Films of Katherine Hepburn*, 44).
40. Dalle Vache, *Diva*, discusses “the airplane fad” among Italian feminists and film stars (121ff.).
41. Martin Scorsese’s 2004 film *The Aviator* represents Howard Hughes teaching
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Hepburn to fly.
42. “A Short History of the National Institutes of Health.”
43. I thank Dirk Vanderbeke for mentioning Grant’s paleontologist to me.
44. See Levine, “Scientific Success”: “Marriage has also been shown to have an adverse impact on the careers of female scientists. Data from the National Science Foundation show that female, doctoral-level scientists, and engineers are less likely to be married than are their male counterparts (66 percent versus 83 percent). Among those married, however, women are more likely to confront problems accommodating a two-career marriage—one reason being that they are as likely as men to have a spouse who works full-time.”
45. This section is based on Colatrella, “From Desk Set to The Net.”
46. In Sleepless in Seattle, the intertext of the 1957 film An Affair to Remember serves as an example of a romance gone awry because of circumstances beyond the lovers’ control.
47. Wajcman, Feminism Confronts Technology, 158.
48. “Key-presser” is a term used for a computer programmer in Rasmussen and Håp-ness, “Excluding Women from Technologies of the Future?”
49. This section is adapted from Colatrella, “Feminist Narratives of Science and Technology.”
51. See Deery, “The Biopolitics of Cyberspace.”
54. Isaac Asimov’s computer scientist in I, Robot, Susan Calvin, might have been a model for the filmmakers. To Roberts, “The Woman Scientist in Star Trek, Voyager,” Calvin appears based on Rosalind Franklin (278–79).
55. This theme and the episodic construction resemble similar features in the popular movie Thelma and Louise (Dir. Ridley Scott, 1991), written by Callie Khouri.
58. Margolis and Fisher, Unlocking the Clubhouse; McIlwee and Robinson, Women in Engineering.
60. Miller, Versions of Pygmalion, 1.

Chapter 7

5. For example, see Rosser, *Re-Engineering Female Friendly Science*.
7. Jones, Howe, and Rua, “Gender Differences in Students’ Experiences, Interests, and Attitudes toward Science and Scientists.”
8. See Hyde et al., “Diversity: Gender Similarities Characterize Math Performance” (120–24), for a consideration of how girls’ achievements are rationalized as the product of hard work.
25. The *Spy Kids* films directed by Robert Rodriguez focus on similar themes: *Spy Kids* (2001); *Spy Kids 2: Island of Lost Dreams* (2002); and *Spy Kids 3-D: Game Over* (2003).
26. See Sedgwick’s *Means and Ends*. As the teacher quoted in the first section, “What Is education?,” outlines, girls should be educated to build on their natural talents: “You are born with certain faculties. Whatever tends to develop and improve these is education. Whatever trains your mental powers, your affections, manners, and habits, is education. Your education is not limited to any period of your life, but is going on as long as you live . . .” (9). An advice manual, *Means and Ends, or Self-Training* establishes a continuing narrative thread about Mary Bond by stringing together examples of how Mary applies the didactic lessons concerning education, social relations, and domestic management. Exemplifying how one young girl enacts principles promulgated by Sedgwick, Mary, like other fictional characters, serves as a representative role model for adolescents reading the work.
28. “Handy Manny, the New Latin Cartoon Hero.”
29. “Lisa the Simpson.”
30. “Girls Just Want to Have Sums.”
31. “Funeral for a Fiend.”
32. “Please Homer Don’t Hammer ‘em.”
33. See Holden, “They Have a Tantrum, Then Save the World”: “Each girl has a distinct
personality (and color). The redheaded Blossom (with the voice of Catherine Cavadini), the trio's levelheaded leader, and the only one whose ears perk up instead of down, is fluent in Chinese. The blond Bubbles (Tara Strong), who likes to draw, is a twitty sweet-natured aesthete, and the green-hued Buttercup (E. G. Daily), whose voice is several pitches lower than those of her sisters, is a combative warrior.”

34. “The Powerpuff Girls.”
35. “Characters,” Zoey 101. I thank Lena Denton for discussing this show and iCarly with me.
36. “Quinnvention Corner.”
39. Design Squad.
41. See Beach, “Research Roundup,” for a consideration of students’ responses.
42. For example, Linda Simensky, director of children’s programming at PBS, says that she “commissioned the Jim Henson Company to create one. I really wanted daily science that you encounter every day in life. And something that models asking questions.” See Blair, “Move Over MacGyver.”


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