TOYS and TOOLS

Cultural Narratives of Gender,
Science, and Technology

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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.[3]

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?"[4] 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."[5] 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."[6]

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.[7] 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."[8] Whereas Prometheus' heroic rationality resists Zeus and preserves the mortal race, Pandora exemplifies transgressive, destructive aspects of female curiosity about technology.[9] The feminine story is cautionary and neither heroic nor redeeming, for Pandora's actions inhibit human progress instead of encouraging innovation and invention.

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.[10]

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."[11] 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.[12] Victor's 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.[13]

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."[14] 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.[15] 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.[16] Empirical research in social science and science provides a context for discussions of gender, science, and technology in fictions and films.

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"

often hold sway in interpretation of data (319).[17] 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.[18] 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.[19]

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."[20] 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."[21] Unpacking narrative representations of women scientists, mathematicians, and engineers offers a potent means of confronting climate issues and transforming environments.[22] Feminist intepretation 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.[23]

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.[24] 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.[25] 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.'"[26] 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."[27] 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.

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."[28] 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.

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."[29] 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.[30] 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.[31] 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."[32]

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.[33] 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 1995 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.[34] 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.[35] 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.[36] 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.[37] 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 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 Clik 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."[38] 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.[39] Some speculate that girls might want a different kind of Legos, in more attractive colors, easier to put together, and more useful.[40]

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.[41]

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.[42] 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.[43]

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.[44] 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.[45] 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.

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.[46] Carolyn Merchant's *The Death of Nature* was path-breaking in categorizing science as a male pursuit that "managed" nature, itself identified with women.[47] David Noble describes early modern science as "a world without women" in his book of that title.[48] 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.[49] 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.[50] 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.[51] 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.[52]

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.[53] Michèle Martin explains how early developers of the telephone discounted women's preferences for informal conversation as a trivial use of the new technology.[54] 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.⁵⁵ 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

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.⁶² 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.⁶³ 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.⁶⁴

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.⁶⁵ 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.⁶⁶ 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.⁶⁷

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."[68] 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*.[69] 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.[70] 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)."[71] 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."[72]

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).[73] 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.[74] 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.[75]

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."[76] 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.[77]

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.[78] 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.

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."[79] 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."[80]

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."[81] 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."[82]

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

as on *ER* (1994–), *Grey's Anatomy* (2005–), the *Law & Order* franchise—*Law & Order* (1990–2010), *Law & Order: Special Victims Unit* (1999–), *Law & Order: Criminal Intent* (2001–)—and the *CSI* group—*CSI* (2000–), *CSI: Miami* (2002–), *CSI: NY* (2004–). Productions such as *Bones* (2005–) and *Hawthorne* (2009) focus, respectively, on a forensic anthropologist in a research institute and a head nurse in a hospital. Female characters appear as exceptional in comparison with male peers and with women in other professions. Women adept in the use of science and technology appear anomalous in their upbringing or outlook and sometimes socially trangressive in their sexual, social, and political attitudes.[83]

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* (2001–7), *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]."[87]

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."[88] 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."[89]

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 Silverfling," *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 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."[98]

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."[99] 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 Frankensteins, 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."[100] 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."[101] 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."[102] 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."[103]

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."[104] 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."[105]

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.[106]

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.[107] 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.[108]

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.[109]

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."[110]

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."[11] 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.

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, technolologists, 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.[12]

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.[13] 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.[14]

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."⁵ 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

(lively young women make good teachers for young children) with educational information meant to increase knowledge, understanding, and confidence.¹⁰ 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.

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.
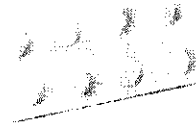
Chapter 1

1. U.S. Senator Ron Wyden, Press Release: "Wyden Convenes Hearing on Enforcing Title IX." U.S. House Committee on Science and Technology, Press Releases: "Subcommittee Examines Ways to Break Down Barriers"; "The Science of Gender and Science."

2. Spelke and Grace, "Sex, Math, and Science"; Summers, "Remarks at NBER Conference."

3. American Sociological Association, "Statement of the American Sociological Association Council on the Causes of Gender Differences in Science and Math Career Achievement."

4. "Women and Science."

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

6. Millett, *Sexual Politics*, 51.

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*.

13. Kolodny, "Dancing through the Minefield," 185.

14. Warhol, "Physiology, Gender, and Feeling: On Cheering Up," 226.

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."

17. Birke, "In Pursuit of Difference."

18. Lubinksi 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 activational 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.

21. Fox, "Institutional Transformation and the Advancement of Women Faculty," 77.

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.*

26. Steinke, "Connecting Theory and Practice," 145.

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

28. Dawson, *Soldier Heroes*, 48. See Pease, "Leslie Fiedler, the Rosenberg Trial, and 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 be said to be themselves only insofar as they are held to be self-evidently true, beyond debate."

29. Peril, *Pink Think.*

30. Henley, "The Power of Pink," describes the "PinkStinks" campaign of British Abi and Emma Moore.

31. The book is Evans's *She Wins, You Win.* This anecdote was told during her the Georgia Association for Women in Higher Education Conference, February 2008.

32. Colman, "Just a Few Favorite Indulgences"; Green, "Books: Girls Gone Old Style."

33. Fraser-Abder and Mehta, "Literacy for All," 210–11.

34. "Mattel Dolls Up PCs with Barbie."

35. Klugman, "A Bad Hair Day for G.I. Joe."

36. Johnson and Learned, *Don't Think Pink.*

37. Leo, "The Indignation of Barbie," "Mattel Says It Erred"; and Dowd, "Barbie Loves Math."

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.

39. Margolis and Fisher, *Unlocking the Clubhouse*; Gary Cross, *Kids' Stuff.*

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.*

48. Noble, *A World without Women.*

49. Rossiter, *Women Scientists in America.*

50. Keller, *A Feeling for the Organism*; Russett, *Sexual Science.*

51. Ehrenreich and English, *For Her Own Good.*

52. Baym, *American Women of Letters and the Nineteenth-Century Sciences.*

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 Making.*

57. Horowitz, ed., *Boys and Their Toys?*

58. These issues are salient for women in fields with long working hours and significant material responsibilities—positions that require education and the need to collaborate 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?"

62. Tierney, "A New Frontier for Title IX: Science."

63. Merton, "The Matthew Effect in Science"; Rossiter, "The Matilda Effect in Science."

64. Tierney, "Tierney Lab: Male Bias or Female Choice."

65. See the Georgia Tech Center for the Study of Women, Science, and Technology (www.wst.gatech.edu) and the ADVANCE program (www.advance.gatech.edu). Virginia Tech hosts the portal to all NSF ADVANCE sites at www.advance.vt.edu. Accessed July 17, 2008.

66. Fox, "Institutional Transformation and the Advancement of Women Faculty"; Sonnert, Fox, and Adkins, "Undergraduate Women in Science and Engineering"; Fox and Mohapatra, "Social-Organizational Characteristics"; and Etzkowitz et al., *Athena Unbound*.

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?"

72. Division of Science Resources Statistics, NSF, *Key Findings 2008*.

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 "ADVANCE 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."

79. Weingart et al., "Of Power Maniacs and Unethical Geniuses," 281.

80. Rosenstone, "Comments on Science in the Visual Media," 336.

81. Dalle Vacche, *Diva*, 2.

82. Mulvey, "Visual Pleasure and Narrative Cinema"; Modleski, *Loving with a Vengeance*, 12; Doane, *The Desire to Desire*, 30.

83. Science and technology have historically been envisioned in literature as mostly male domains, although often symbolized by feminine figures. See Schiebinger, *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"; and Bollag, "Award-Winning Teaching."

85. See Smallwood, "As Seen on TV." Kim Loudermilk pointed out to me how 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 Sculley of *The X-Files*.

86. Cunningham et al., "Gender Representation in the NCAA News."

87. Steinke, "Cultural Representations of Gender and Science," 30.

88. Steinke et al., "Assessing Media Influences," 36–37.

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 characterization 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.

93. Valian, *Why So Slow?*

94. Brooks, *Reading for the Plot*, 10. On the influence of narrator on reader, see Zunshine, *Why We Read Fiction*, 76.

95. Warner, *From the Beast to the Blonde*, 238–39.

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 and Watson, "From *My Little Margie* to *Murphy Brown*." Canadian guidelines are considered in Trimble, "Coming Soon to a Station Near You?," 326.

98. Douglas, "Where Have You Gone, Roseanne Barr?"

99. Bal, *Narratology*, 83.

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.

103. Shepherd-Barr, *Science on Stage*, 205.

104. Macdonald, *Representing Women*.

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

NOTES TO CHAPTER 2

to Oliver et al., "The Impact of Sex and Gender Role Self-Perception."

107. See Colatrella, *Literature and Moral Reform*, for consideration of nineteenth-cen-
tury 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 movies 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, con-
niving 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.

112. Cole, Bracken, and Degan, *Magic School Bus Taking Flight*.

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*.

116. Steinke and Long, "A Lab of Her Own."

Chapter 2

1. Harding, "Just Add Women and Stir?" 306-7.

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

3. Levine, *The Realistic Imagination*, 28.

4. For a discussion of maternity in Mary Shelley's life and work, see Mellor, *Mary Shel-
ley*.

5. Warhol identifies sentimentalism as "effeminate" in "Preface," *Having a Good Cry*,
ix-xvii.

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.

8. Merchant, *The Death of Nature*.

9. Ibid., especially chapter 7, "Dominion over Nature."

10. Easton, *The Making of the Hawthorne Subject*, 143.

NOTES TO CHAPTER 2

11. Weinstein, *The Literature of Labor and the Labor of Literature*, 74.

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 dif-
ferent 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."

13. Stolberg, "Bush's Advisers on Ethics Discuss Human Cloning," A19.

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, Sci-
ence, and the Arts and by informal discussions with her.

15. Brainard, "Divided Bioethics Panel Recommends Moratorium on Research Clon-
ing."

16. Annas, "Cloning and the U.S. Congress," *New England Journal of Medicine*, 1599.

17. Collingwood, *The Idea of History*, 117.

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

19. Karcher, "Lydia Maria Child," 51. Also see Samuels, *The Culture of Sentiment*.

20. Woolrich, "The History of Refrigeration," 32.

21. Cixous, "The Laugh of the Medusa," 284.

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 Mel-
ville," 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 *Litera-
ture 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 forbearance 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."