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Gender and Technology

The centuries since Europeans began settling the New World have been characterized by both enormous technological change and significant transformation of gender roles. These two phenomena have also shaped each other in a myriad of ways, large and small. Over time, Americans built ideas about gender into the material fabric of their lives. In turn, the interaction of people and things has often reinforced (or sometimes subverted) norms of gendered behavior. Thus gender has been a pervasive element of American technological history and, at the same time, technology has functioned to express, enforce, and sometimes redefine categories of gender.

Despite the ubiquity of gender-technology interactions, historians have chosen to give most of their attention to exploring a few large and not-so-large themes. Histories of reproductive technologies, housework, sexual division of paid labor, and consumption have well-developed literatures (Lerman, et. al. 2003). Despite a flurry of interest in early American technology during the 1980s, most scholars have also tended to concentrate their research on more recent time periods (McGaw 1996). As a consequence, historians of technology interested in this earlier period have often relied on scholarship from other historical sub-fields, particularly material culture studies and American social history. A strong feminist tradition among STS scholars has also produced a very large body of ethnographies and sociological studies, some of which document the role of gender in the recent history of technologies such as the internet (Hopkins 1998, Wajcman 2004).

This article is divided into two parts. The first section describes the development of gender analysis from its origins in clinical psychology through its gradual incorporation into the history and sociology of technology, beginning in the 1980s. It also explains some of the ways scholars have conceptualized how gender functions as a form of identity and structuring force within society. The second section draws on existing scholarship to suggest a narrative of American history with gender and technology at its center.

Gender Analysis and the History of Technology

The relationship between social ideas of maleness and femaleness and “ways of making and doing things,” to use historian Melvin Kranzberg’s definition of technology (1959), is likely as old as human culture. But the constructs “gender” and “technology” are much newer. The term “technology” can be traced back to nineteenth century Europe where it initially described the study of useful arts. Usage only expanded to include material things in the early twentieth century (Oldenziel 1999). The term “gender” is even newer. Historians did not coin the term. Beginning in the mid-1980s, they adopted it from the social sciences.

Clinical psychologists first imported the word gender from linguistics in the early 1960s as they struggled to explain transexuality: the phenomenon of individuals who had the biological attributes of one sex but a psychological identification with the other (Meyerowitz 2002). Gender, in this context, was understood to be a form of *identity*, psychological and social, signaled most immediately through the symbolic use of clothing and gender-appropriate personal grooming. At this early date, psychologists also recognized that gender identity could be *performative*: meaning that maleness or femaleness is communicated through behaviors ranging from subtle inflections of voice or gesture to choice of profession or leisure activities. Though

they would not have put it this way at the time, establishment of a believable gender identity requires transgendered people to deftly deploy a wide range of everyday technologies.

Psychologists' efforts to distinguish between biological sex and gender coincided with a growing women's movement intent on questioning claims about women's supposedly inherent roles and limitations. By the 1970s, feminist scholars had built up a body of empirical research demonstrating that many "sex-roles" and "sex-types" were social constructs, often used to further patriarchal or capitalist ends. Historically grounded studies of women's paid and unpaid labor growing out of Marxist feminism proved particularly influential, not only on feminist discourse of the time, but also on a later generation of scholars interested in the history of technology. At this early juncture, feminist scholars struggled not only to understand how patriarchy had shaped what was then termed "sex roles," but also to find an appropriate language with which to express their ideas.

Following in the path of psychologists, anthropologists and some sociologists began to adopt the term "gender," while broadening its meanings to suit the concerns of their disciplines. They recognized that gender could be used not only as noun, but also as a verb. Thus gendering can be analyzed as a social process through which qualities of maleness and femaleness are assigned to people, things, or processes. Gender, these social scientists pointed out, is often *relational*, meaning that maleness and femaleness define each other. In fact, all human societies seem to make distinctions between men's activities and women's activities. Physical objects are not only designated as belonging to a particular gender, but also sometimes considered to have gender in and of themselves (Nelson, 1997). For instance, in western Europe, ships were traditionally gendered female but assigned to the management and care of a male-gendered profession: sailors.

Meanwhile, sociologists interested in social structures added yet another analytical dimension to the use of gender analysis. They observed that gender is often literally and figuratively built into social institutions such as schools and professions. These institutions serve a powerful function in reinforcing gender norms. But they can also be used as a tool for social restructuring.

Many historians of technology first encountered gender analysis in the 1980s when Joan Scott presented it to the historical profession as a “useful category of historical analysis.” A pioneering generation of feminist scholars had already called attention to the challenges of writing women’s stories into the master narrative of technological history. Their guiding analytical insight was that patriarchy had historically functioned to exclude most women from the technological activities considered particularly valuable by their cultures (and historians of technology) such as engineering, while devaluing activities designated as feminine. Much of this early work fell into the category of “recovery history” consisting of efforts to identify female engineers and inventors. Ruth Cowan’s landmark history of housework, *More Work for Mother*, suggested a different way forward. Scholars might look for technology in women’s domains, rather than looking for women where male-gendered technological activities were already taking place. Cowan’s book appeared in 1983, just before the language and methods of gender analysis began to really take hold in feminist scholarship.

For the generation of scholars who followed, gender analysis, coupled with Cowan’s insight that historians should be looking beyond the machine shop and engineering firm, offered a powerful means for reimagining history of technology as a field that went far beyond a critique of patriarchy or recovery history. Instead, widening the scope of historically significant technologies, activities, and actors could open the way for a significant broadening of the overall

scope of the field. Coupled with the concept of “social construction,” coming into use in the sociology of science and technology, gender analysis suggested a variety of powerful historical questions. If for instance, technology is indeed socially constructed, how are cultural ideas about masculinity and femininity literally designed into the size, shape, color, and function of various objects and technological systems? How does gender figure into the creation, transmission, and valuation of technological knowledge or “skill”? And most importantly, how does gender affect the historical process of “mutual shaping” between technology and society?

Up until this point, the close association of gender analysis with feminism had meant that, in practice, gendered history was often synonymous with women’s history. Attending to the ways men had historically claimed technological activities such as engineering to be inherently masculine, allowed a smaller group of scholars to profitably reimagine some of the most traditional parts of the field. Others stretched conventional definitions of technology and technological activities to make visible a much wider range of actors. Most importantly, they peopled what Ruth Schwartz Cowan described as the “consumption junction” (1987) with a rich array of consumers, users, and mediators, while showing how each of those roles was powerfully gendered.

The growing visibility of gender analysis has not been without controversy, even among scholars who might seem like natural advocates. Some feminist historians, who worked hard to document struggles of female pioneers in male technical fields and the more pervasive effect of patriarchy in shaping technology, have worried that gender analysis, with its inclusion of both masculinity and femininity, might become yet another means for excluding women from technology’s history. Others have pointed out that gender is indeed a category of historical analysis, but far from the being the only one. Attention to race, class, and to the inside of

technology's "black box" also have a place. Over-eager gender scholars have also lent some credence to the saying "when all you have is a hammer, everything looks like a nail." More often, gender remains an under-utilized as a category of analysis. While feminist and gender-based critiques of the scope and focus of the field helped open the door to a wider range of topics, much remains to be done.

Gender and Technology in American History

In early America, the word "technology" did not exist. Instead European colonists (and their native American neighbors) thought about their efforts to measure and manipulate their physical environment in terms of a set of smaller categories such as tools, industries, and useful knowledge. With no self-consciousness, they attached gendered meanings to nearly all the material things and activities in their daily lives. In their passage across the Atlantic, Europeans brought with them not only habits and assumptions about gender, but also ideologies. They viewed distinctive roles for men and women as natural, immutable, and as befits a profoundly religious society, sanctioned by God.

Looking backwards, historians have often described gender relations in early America as patriarchal. In the simplest sense, this meant that men had more social and political power than women. Patriarchy had many negative consequences. Some men abused their power. Many women lived in a chronic state of uncertainty because their society allowed them little say over their own property and labor, and even over their own bodies. However, because patriarchy involves a form of cultural hegemony, our ancestors were more likely to view the gendered divisions of their lives not in negative terms, but rather as representing a kind of bargain in which men and women both had responsibilities toward each other and, in turn, benefitted what was

owed them. Moreover, in practice early America's gender system included a degree of flexibility and negotiation. Particularly under duress, gendered conventions gave way to necessity: men cooked and sewed; women plowed and fought. It is therefore perhaps not surprising that both men and women worked hard to construct and police boundaries surrounding the gendering of both technological knowledge and material objects. This process began in childhood and continued until death.

In our own post-Freudian world, the deployment of technology to ensure appropriate gender socialization begins soon after birth, as parents, family members, and friends choose clothing and toys deemed culturally appropriate for a particular baby's biological sex. Early Americans made almost no effort to visually signal whether infants were male or female. Even toddlers of both sexes wore dresses and sported long curls—a practice that continued through the Victorian era. The serious business of teaching a child to be male or female began when he or she became self-aware and was deemed old enough to have some capacity to reason. In this patriarchal society, this transition was signaled by “breeching” boys, that is, putting them into long pants (Calvert 1992).

Small children learned appropriate social behavior and the rudiments of adult skills by observation and informal imitation. Those lessons included nearly constant reinforcement of gender norms. Toys and books—the didactic technologies of a later age—were seldom in evidence before 1750 and still absent in many early nineteenth century households. A growing number of children did enjoy some form of schooling, particularly if they were free, white, and lived in the Northeastern states. However, even in the New England colonies where free schooling was most available, a striking gendered difference is apparent in levels of literacy and numeracy. Girls often received instruction only in reading. Boys were more likely to be taught

to both read and write—skills that not only prepared them for the world of commerce, but also empowered them to share information with a wide range of people beyond their immediate community. In the nineteenth century, the literacy gap between men and women gradually closed, but at the same time numeracy—the language of commerce and technological innovation—increasingly came to be gendered male.

By adolescence, the divide between masculine and feminine technological domains was firmly established. Enslaved girls might be sent out into the fields to work alongside their brothers. But free white girls of every social class remained in the same kinds of spaces where they had spent their earliest years, gradually learning the techniques of running a household. Boys followed their fathers out into the fields or, in urban settings, the streets and workshops. Some parents bound their sons (or very rarely, daughters) out as apprentices, usually at the age of twelve or thirteen. The practice of apprenticeship not only functioned as a means of passing on specialized skills from generation to generation, but also allowed parents to choose an appropriate male role model for their adolescent sons.

As children became adults, they gradually acquired an increasingly complex and subtle understanding of the gendered conventions of their society as expressed in technical skill and material culture. Journeymen learned to impress prospective employers with appropriate verbal expressions of manly competence to open the door to employment. Newly married husbands and wives negotiated the overlapping spaces between male and female spheres, often following the example of family and community in deciding which invisible boundaries mattered and which did not. Young men who found themselves in all-male environments such as ships and prisons (or even workshops) also learned more complicated lessons. Cooking, sewing, and laundering—technological skills firmly gendered female in domestic settings, became the

responsibility of men. But mastery of feminine tasks did not necessarily correlate with feminization. Instead, the youngest and least skilled found themselves treated as symbolically, and sometimes sexually, female.

Until the late eighteenth century, the knowledge and techniques associated with reproduction remained the most sacrosanct area of female technical expertise. Midwives played a particularly important role, not only assisting in births, but also providing remedies and advice about everything from unwanted pregnancies to infected breasts. However, in the latter part of the eighteenth century, the availability of forceps to ease the birth process as well as the growing authority of the medical profession opened the door to regendering expertise around reproduction. Male physicians rather than female midwives attended an increasing number of births. We now know that their invasive techniques spread infection, resulting higher mortality rates for both mothers and infants.

The intimate struggle between midwives and male doctors signaled a much broader destabilization of early America's gender system. Until the late eighteenth century, both gender roles and the tools and material contexts for everyday life changed very slowly. Ideologies born of the Enlightenment and the American Revolution, an emerging market economy, and the social and technological dislocations of industrialization, all worked to undermine the status quo. While a few enlightened voices argued for a radical rethinking of gender roles, more often, capitalists and patriarchs repurposed existing gender conventions justify new arrangements; to explain, for example why women should be paid less for their wage labor than men. Middle class women's unpaid labor in the household also underwrote the growth of a male managerial class (Boydston 1990).

New Ideologies, first *republican motherhood* and then *separate spheres*, reified a somewhat different patriarchal gender bargain. Both recast women as inherently virtuous as long as they kept to their proper roles as wives, mothers, and keepers of the home. At the same time, a spirit of critical reasoning born of the Enlightenment opened the door for critics of existing gender relations and experiments in alternatives. Ideologies often do not describe historical realities, but the idea of separate spheres did reflect a growing divide between the home and outside world as sites of gendered technological activity.

The Industrialization of Everything

Although industrialization is often identified with the invention and spread of the factory system, it was, in fact, a far more pervasive economic, social, and technological process that transformed nearly every aspect of everyday life. Gender informed what processes and places were industrialized first, who had control over the process, how men and women participated; even the size and shape of machines and the nature of goods produced.

Many historians have observed that the spatial, ideological, and economic separation of domestic work from wage labor constitutes a distinctive and particularly important characteristic of industrialization. The growing middle class prescribed the creation of domestic spaces as refuges from an increasingly impersonal, immoral, and ruthlessly capitalistic outside world. Aided by a growing number of labor saving devices as well as domestic servants, women could focus on overseeing and maintaining a haven for children and male family members. The reality proved more complicated. New domestic technologies and manufactured products, such as cookstoves and milled grain, often saved labor previously done by men as unpaid labor for their families. Meanwhile, rising standards of cleanliness and consumption resulted in an overall

pattern of “more work for mother.” For middle and upper class women, more work often involved cooking, sewing, cleaning, or supervising servants carrying out those tasks.

Working class women confronted a harsher dilemma. Family economies often depended upon wages from all family members capable of work. But gender conventions determined that women would be responsible for cooking, cleaning, and childcare. In a further irony, labor-saving services such as steam laundries, lauded for saving middle class women’s energies for more noble pursuits, largely employed working class women who might spend ten hours a day over a tub or mangle before going home to their own families. At the end of the nineteenth century, urban reformers occasionally remarked on the sad squeak of a clothesline pulley as women who had worked all day to ease another woman’s labor, hung out their own laundry.

Should women work for wages and, if so, what tasks were appropriate for their skills and domestic responsibilities? The earliest factories let the market decide, employing entire families. But this strategy, used by Samuel Slater and others in the textile mills of New England resonated poorly with idealists worried that a childhood spent piecing threads would not prepare citizens of a republic for their civic responsibilities. The Lowell Mills was America’s most famous response to the challenge of creating wealth while preserving democracy. In the heyday of the experiment, young women were engaged to toil at loom and spindle. The experience would prepare them for republican motherhood, advocates rationalized, by teaching them the habits of industry. Their wages could subsidize fathers and brothers who could thereby remain on the land as yeomen farmers. The Lowell Associates made a virtue of necessity—justifying the employment of low-paid female labor in ideological terms.

Where they could, factory owners utilized technological innovation to replace skilled, difficult-to-control, white men with machines and inexpensive female workers. They justified

what scholars would later call the “sex-typing” of labor with a series of gendered stereotypes: women were more tolerant of tedious, repetitive tasks but had no aptitude for the complexities of building or repairing machinery. Machinery was designed and constructed to reinforce the gendering of specific tasks, typically by scaling machines and tools to fit larger male bodies.

However, the story of masculinity, industrialization, and technological change is more complicated than just a steady litany of deskilling. Men were quick to claim that understanding and operation of the most prestigious technologies of the age—the railroad, the steamboat, and the machine shop—were beyond the capabilities of women. Competition for well-paying jobs associated with these technologies came mostly from other men, not women, because replacing a man with a woman at the wheel of a ship or the throttle of a locomotive was unthinkable for even the greediest of capitalists. Instead, male workers delineated very different forms of masculinity in association with different kinds of technological work. At the bottom of the hierarchy was the “rough” masculinity of canal diggers, track layers, and lumberjacks—men whose principle skills involved hard physical labor and indifference to constant risk. Craftsmen, operators of complicated machines such as locomotives, and a vaguer category of “skilled labor” occupied a vast middle ground (Horowitz 2001).

Increasingly, a third category of men earned their livelihood in occupations that required them to know *about* complex, modern technologies without necessarily having the full skillset necessary to actually do or make something using that technology. In the nineteenth century, engineering in all its various forms emerged as the quintessential masculine technical profession. While apprenticeship on the shopfloor remained a pathway to the profession into the twentieth century, it was the command of abstract knowledge, particularly mathematics that set engineers apart from other men (Oldenziel 1999).

As the century wore on, various kinds of institutions and organizations played an expanding role in gendering technological knowledge. Gender ideologies that emphasized women's prescribed social role as caregivers and mothers rationalized their exclusion from scientific, medical, and technological education. Pseudo-scientific arguments that postulated a biological difference between male and female brains or claimed that too much thinking would render women unfit to bear children provided further justification. Particularly determined middle class women fought back by creating all-female centers of higher education or by disguising scientific and technological education in the language of domesticity. Beginning in the late 1880s, the social movement of progressivism gave this first cohort of college-trained women an opportunity to apply newly acquired skills. Some turned their attention to the social and environmental ills caused by unfettered industrialization. Female chemists and engineers created the fields of home economics. Female architects designed spaces for collective living that would free their middle-class peers from domestic drudgery.

Cultures of Consumption and other Negotiations

For many people living in late nineteenth century America, the physical presence of new technologies in their lives—streetcars, gaslight, electricity—made the rapid pace of technological change obvious. Gender ideologies and gender conflicts were also more likely to be expressed in material form—whether different kinds of bicycles for men and women or the introduction of public restrooms clearly marked and segregated by gender. As the next century began to take shape, a new element became increasingly important in the continuing discourse over the gendering of technology and technological knowledge. For the first time in human history, large numbers of people could directly access a range of sophisticated “personal” technologies through

the marketplace (Corn 2011). Consumer devices ranging from telephones and automobiles to elective surgery gave individuals the unprecedented ability to challenge and manipulate existing gender norms. Most people did not consciously seize the opportunity. Rather, they were gradually (and sometimes reluctantly) swept along by the market, the prescriptions of experts, and the trend-setting example of a few individuals. Adults, settled in their existing lives, were most likely to cling to existing gender norms. Instead, outside forces forced open an already-widening rupture in the process whereby children and adolescents learned how to be male or female primarily by observing and modeling themselves on parents and other adults with whom they had day-to-day interaction.

Mass communications technologies provided an important means through which both children and adults could obtain information, both prescriptive and descriptive, about the gendering of technology and the use of technology to construct gender. The extraordinary expansion of print culture in the late nineteenth century created a first wave, followed in the 1910s and 1920s by cinema and radio. While it has proved extraordinarily difficult to document exactly how audiences received and acted upon the messages embedded in advertisements, popular novels, radio soap operas, and films, it is clear that they are part of a larger cultural phenomenon that washed away the last vestiges of isolated communities where people learned everything they needed to know about the relationship between gender and technology from their immediate communities and surroundings.

In the first half of the twentieth, automobility became a particularly conspicuous site for negotiation, experimentation, and public demonstration of the relationship between technology and gender. Wealthy men were the first to realize the new technology's possibilities as a means of public displays of courage and technological competence. They rapidly abandoned fast

driving horses, the preferred means through which the previous generation exhibited masculine skill and bravado, for the motor car. Almost as quickly, the automobile press began to assert (contrary to a growing body of data) that women were inherently dangerous and incompetent drivers. Various groups of feminists also seized on the automobile as a symbol of the “new woman” –liberated by technology and her own enlightenment from dependence on men.

While these public contests over technology and gender attracted much publicity, in everyday life, a more complicated scenario emerged. A wide range of people from farmers to suburbanites adopted the automobile as a tool for facilitating everyday tasks. Many of those uses were gendered along the lines set down in earlier eras such as childcare, maintenance of the household, and planting and harvesting cash crops. Necessity and convenience overruled essentialist arguments about why women should not be allowed behind the wheel. Driving rapidly became an accepted part of being a farmwife or a housewife, though most women quickly learned to slide over into the passenger seat if an adult male was in the car.

Bent on reaching as wide a market as possible, car manufacturers created vehicles that were gender-neutral in terms of accommodating male and female bodies. Nearly everyone appreciated an automobile that was easy to drive, even if innovations such as electrical starters were sometimes portrayed as particularly beneficial for women. At the same time, automobile manufacturers constructed advertising and marketing strategies involving a variety of gender stereotypes. “Motor Cars that match Milady’s mode—yes, her every mood! The Paige Motor Car Company told readers of *The Ladies’ Home Journal* in 1927.

In the nineteenth century, competence in operating, maintaining, and repairing machinery was identified with working class masculinity. Combined with formal education and abstract knowledge, mechanical skills provided a path to mobility into the middle class for the

engineering profession, but no one expected even the mostly manly of middle class men to know much about machines, let alone get his hands dirty (Gelber 1998). The proliferation of consumer machines, beginning with the automobile shifted this expectation. This new definition of middle class masculinity required male consumers to at least know how to kick the tires and talk knowledgeably about carburetors, transmissions, and the differences between Fords and Cadillacs even if they could barely find the dipstick to measure the oil. In a neat example of social construction, manufacturers added “features” to a whole wide array of consumer technologies to give male consumers something to talk about (Horowitz and Mohun 1998).

It would be misleading, however, to suggest that consumer culture was the only or even the most important site of negotiation about the relationship between gender and technology in the twentieth century. As we have already seen, technological innovation had long functioned to destabilize gendered job categories involving paid labor. The proliferation of novel technologies in twentieth century workplaces forced continual decision-making about whether these devices should be assigned to men or women. Was a type-writer a man or a woman? What about a computer? Sometimes, economics drove the process as capitalists replaced well-paid, “skilled” male labor with poorly paid, “unskilled” female labor. In other industries, such as steel manufacturing and railroads, economics and culture coincided in decisions to continue relying on more expensive male labor.

The century’s two world wars also played an important role in undermining assumptions and rationalizations about which kinds of work naturally belonged to men or women. The all-male environments of armies and navies had long offered men an exemption from stigma of engaging in female-gendered work. But the total mobilization characteristic of industrialized warfare also required the lifting of at least some gendered barriers that had kept women out of

male-gendered jobs. Since policymakers and most of the public found the idea of female soldiers anathema, employing women civilian in jobs previously gendered male offered the only alternative. Consequently, women gained access technologies and technological knowledge previously barred to them. They also found out that the skills needed to rivet a ship or drive a truck were actually not that difficult to learn. Demobilization after both wars was consequently characterized by a sudden, often wrenching, and ultimately incomplete return to previous gender norms. Eventually, equal employment opportunity legislation was required to permanently wedge open the door that had been unlocked in World War II.

The twentieth century relationship between technology and gender was also characterized by the ways technology has been deployed to modify the appearance and function of gendered bodies. Historically, many cultures have employed technology to make individual bodies conform to gendered ideals of beauty, ranging from the use of lead to whiten women's complexions in Ancient Greece to the insertion of a lip plate among the Suri people of East Africa. Twentieth century America differs from these examples in the extent and commodification of bodily modification as well as the use of science-based technologies. Hair removal by x-ray, surgical breast enhancements, and the use of steroids and electrical stimulation by male body-builders to achieve a hyper-masculine body-type are only a few examples. However, medical interventions in fertility and childbearing have arguably had a much more profound effect on gendered social roles, especially for women (Tone 2001). As noted at the beginning of this essay, it was the growing success of sex-reassignment surgery in the 1960s that prompted clinical psychologist to find a way to describe the difference between biological sex and socially or psychologically based ideas of maleness and femaleness.

Technology Shapes a Gender-free Future?

In 1991, historian of science Donna Haraway published a deliberately provocative essay entitled “A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century.” Haraway suggested that at century’s end, inhabitants of post-industrial nations had all become “cyborgs”—“hybrids of machine and organism.” Rather than critique and push away technological innovation as a tool of patriarchy, Haraway suggested that feminist should embrace becoming cyborgs in order to usher in a “post-gender world” (Hopkins 1998). This utopian vision confirms how powerful the relationship between gender and technology has been in the United States and, in fact, every society. But the historical evidence overwhelmingly suggests that technological change does not result in the erasure of gender. Rather, it becomes part of the redefinition of gender. Nowhere is this more apparent than in the proliferation of on-line worlds where video game characters and second-life avatars often manifest exaggerated biological, behavioral, and sartorial markers of gender difference. People who enter these worlds may engage in a bit of technological cross-dressing, but they rarely choose an ungendered identity. Moreover, as social psychologist Sherry Turkle has shown, digital technologies are just as likely as sailing ships and butter churns to be socially constructed in gendered ways (Turkle 2005).

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