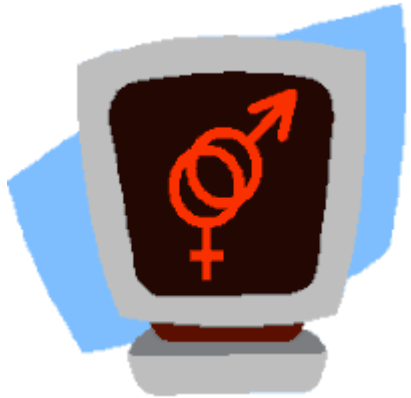
ICTs, Computer Science, and Gender

ENCS 393 – Social and Ethical Dimensions of ICTs

Day 6 – May 25, 2020



Today

- Why Study Gender and Technology?
- The Gendered History of Computer Programming

Some Big Questions

- How can technologies themselves relate to gender?
- How is gender important to the historical development of computer science as a field and profession?
- How is gender relevant to computer scientists' professional identities?

Some Big Questions

- How can technologies themselves relate to gender?
  - This question relates to our previous discussions about technology and values, as well as to our upcoming conversation on algorithmic justice.

- How is gender important to the historical development of computer science as a field and profession? both of the texts that I asked you to read for today, our historical texts written by people trained as historians. They're both discussing some kind of change over time
  - What can history tell us about current trends, demographics, and ways of thinking in computer science?

- How is gender relevant to computer scientists' professional identities?
  - How do the metaphors and approaches that we use to talk about gender and computer science affect the way that we think about this subject, and the people who are encouraged to enter the field?

隐喻

Some Big Questions

- **How can technologies themselves relate to gender?**
- How is gender important to the historical development of computer science as a field and profession?
- How is gender relevant to computer scientists' professional identities?

Gender and Technology

we can construct about ways in which we use technologies. how we use tools defining ourselves as people , the ways which we can use technologies to alter our environments to fit our desires and wants and needs.

Technology…

- …is part of our identities and the ways in which we understand the world
- …embeds and reflects our values
- …is an evolving, and sometimes contested, term

technology is closely related to the ways in which we understand the world, the ways in which we understand ourselves.

That technology has values embedded in it .It is going to look different depending on the values of the person or team that created it. And might be used in different ways depending on the values of its deserts.

嵌入　　反应

有争议的

So Technologies can have values embedded in them and can reflect values that exist in their creators or values that exist in the environment in which they were created. And use of technologies can reflect the values of its users.

technology has changed over time. People's concept of what technology is and what it's for is not the same now as it's always been.

Technology这个词本身是contested term， Paul named Gail himself didn't end up giving us a simple definition of what this term was. He gave us six different ways in which he thought it was valuable for us to understand technology.

Gender and Technology

Technology…

- …is part of our identities and the ways in which we understand the world
- …embeds and reflects our values
- …is an evolving, and sometimes contested, term

Different cultures don't all understand gender in the same way. Different people don't all understand gender in the same way. And we tend to have an innate sense of our own gender我们往往对自己的性别有一种天生的感觉

Gender…

- …is part of our identities and the ways in which we understand the world
- …embeds and reflects our values
- …is an evolving, and sometimes, contested, idea
- …interacts with technology in ways that also evolve and are contested

the interaction happens in ways that also evolve, also change, and can also be contested

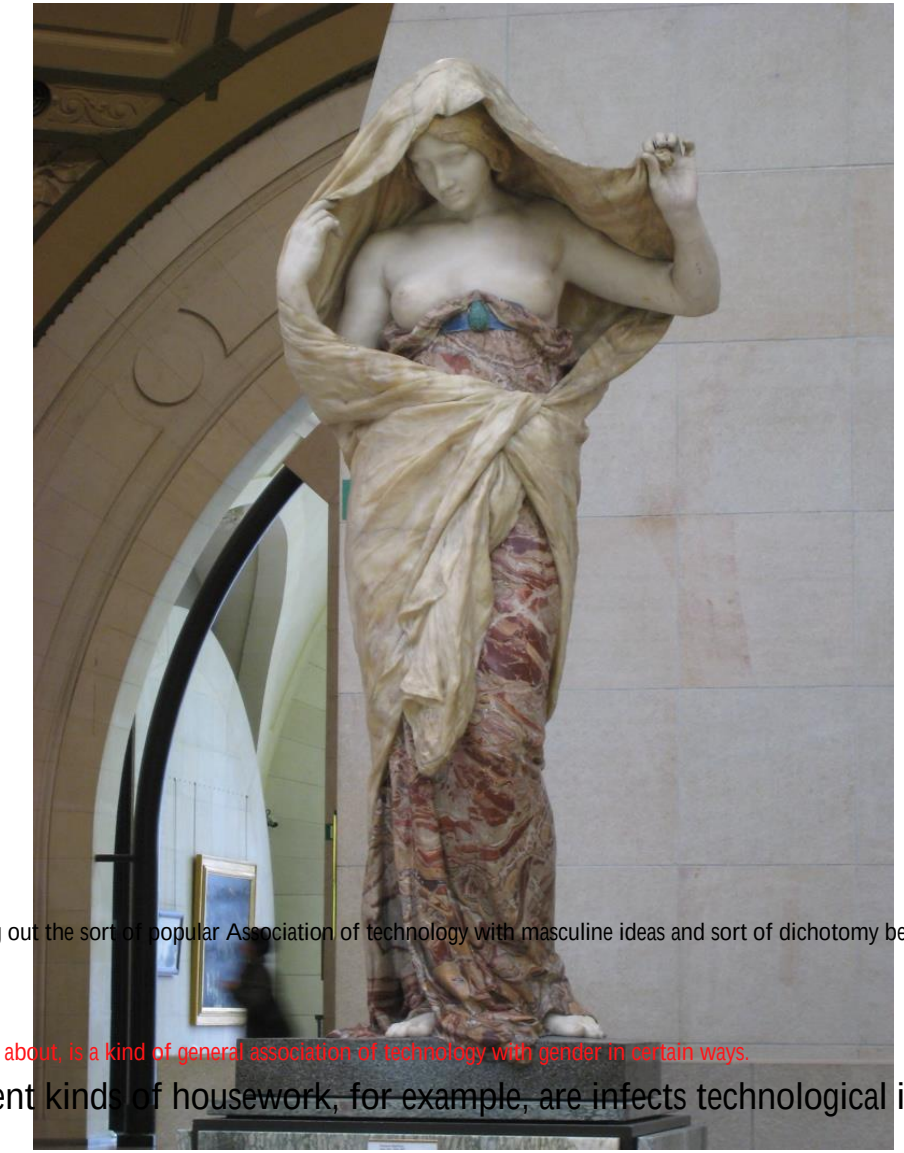
That gender and technology in a broad sense, can be related four different relationships.

Technologies' association with gender

The first way of the interaction of these two terms, he just calls it Technologies association with gender

要从一个宽泛的角度理解talking about this in a broad sense

19分钟左右讲雕塑



"The very concept of technology, as well as its practices, may be more or less strongly embedded in a gender framework itself…In Western culture men have historically been associated with technology, while women are more typically associated with "nature," perceived (incorrectly, I would argue) as the opposite of technology. Layering these dichotomies on top of one another – man/woman, nature/technology, nature/culture – tends to influence assessments of technology and gender in particular and often contrary ways."

被认为是 对立面 二分法 评价，评估 特别是 相反的

Hopkins doesn't agree with this sort of polarization of nature and technology.

But he's saying that this is a very common way to view the world.

这只是一个流行的观点，他并没有说好不，Hes not saying that necessarily better for men and worse for women that we think about things this way. But he's pointing out the sort of popular Association of technology with masculine ideas and sort of dichotomy between that end up kind of fit feminized nature.

Patrick D. Hopkins, "The Intersection of Culture, Gender, and Technology," 2009

这一段主要是指出非常流行的讲性别与科技联系在一起的现象，观点， important to think about, is a kind of general association of technology with gender in certain ways.

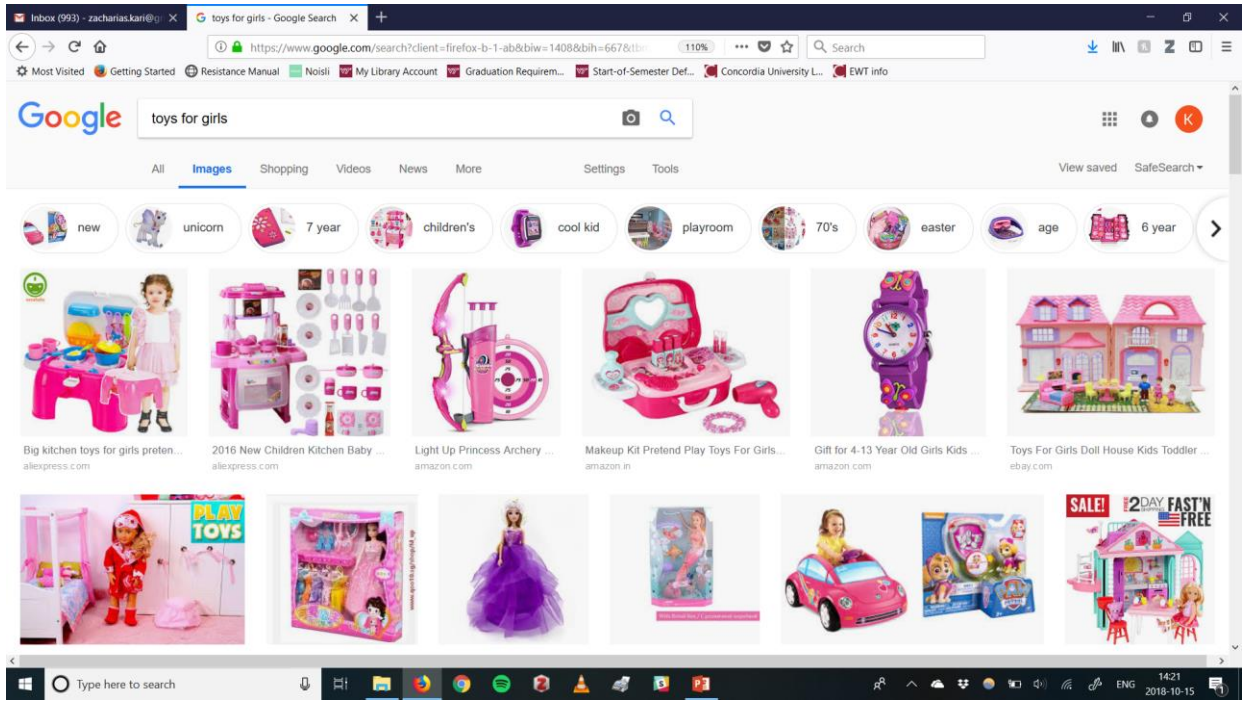
He also says that this way of viewing the world ignores how a lot of traditionally feminine activities, like different kinds of housework, for example, are infects technological in significant ways

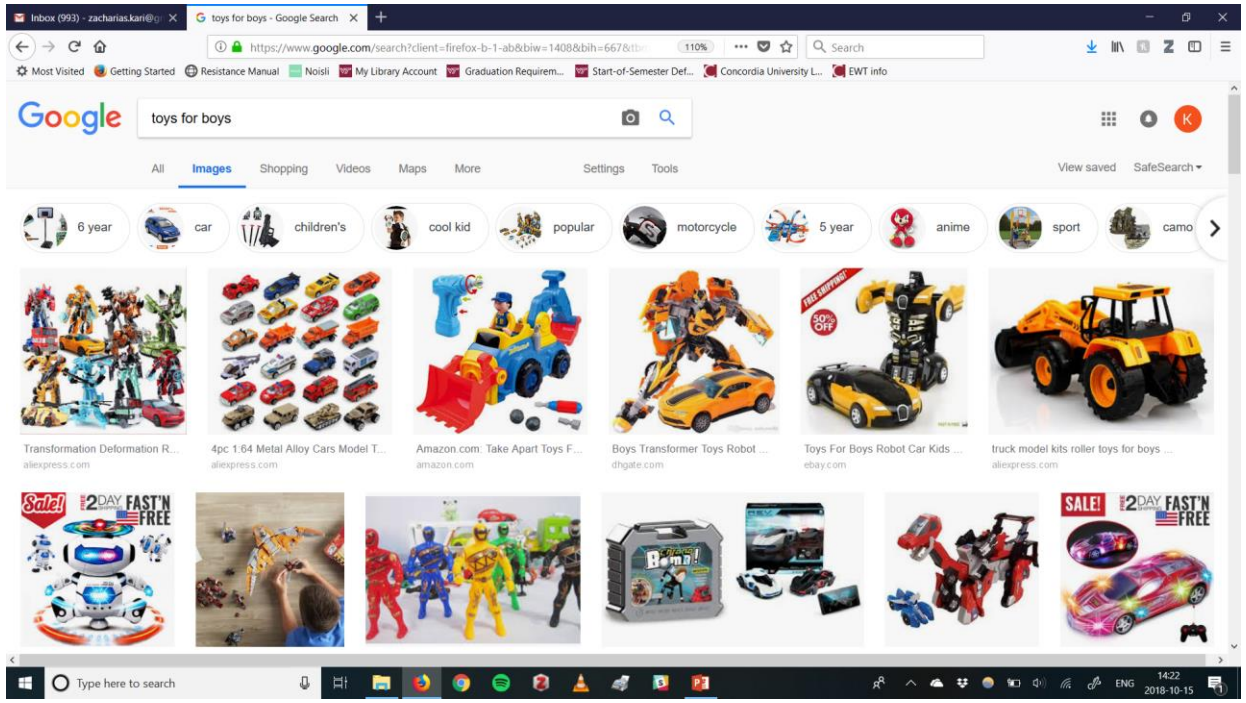
Second way

Technologies can reinforce gender systems

加强，固化

Marketing of certain technologies can reinforce sort of existing gender roles and existing gender stereotypes that already exist in our society is so technologies that are built in an environment that has sort of gender bias and gender stereotypes within it tend to reproduce those same stereotypes and gender biases and can in fact have an exacerbating effects, can reinforce those biases or stereotypes or norms that already exist sort of through dissemination and use of those technologies.





But another way that technology reinforcing gender systems at Hopkins talks about is how the way that we think about how people of different genders use technology can also reinforce or reproduced stereotypes.

Technologies can reinforce gender systems

女性想要
These are all emphasizing comfort and ease of use.

男性想要
the aspect of this car that are meant to appeal to men are sort of more traditionally technological or they're kind of, they're more techie.

Advertisement for that technology trying to appeal to people of different genders by emphasizing very different aspects of the same thing

Same idea though of sort of taking a technology that's used by everyone or by, you know, lots of different people have different genders and trying to emphasize certain aspects of it that are meant to sort of appeal to a stereotypical female user

Another sense in which technologies might reinforce gender systems is when the environment that the technology was designed in, the standards upon which it was based, had a kind of unintentional and unidentified gender bias to them that resulted in a product, which in turn reflected that bias somehow.

Technologies can reinforce gender systems

女的比男的更晕，因为两眼距离不一样，
而一开始默认的是男性平均眼距
You couldn't sort of change the way that the machine read or to continue took into account the distance between the eyes. And that this distance had been calibrated based on an intended user base that were reflected sort of male average I distances.

this design was created based on a set of standards, of biased set of norms. And that this internal resulted in some unintentional gender bias in the way this product on its user base.

DESIGN FLAWS

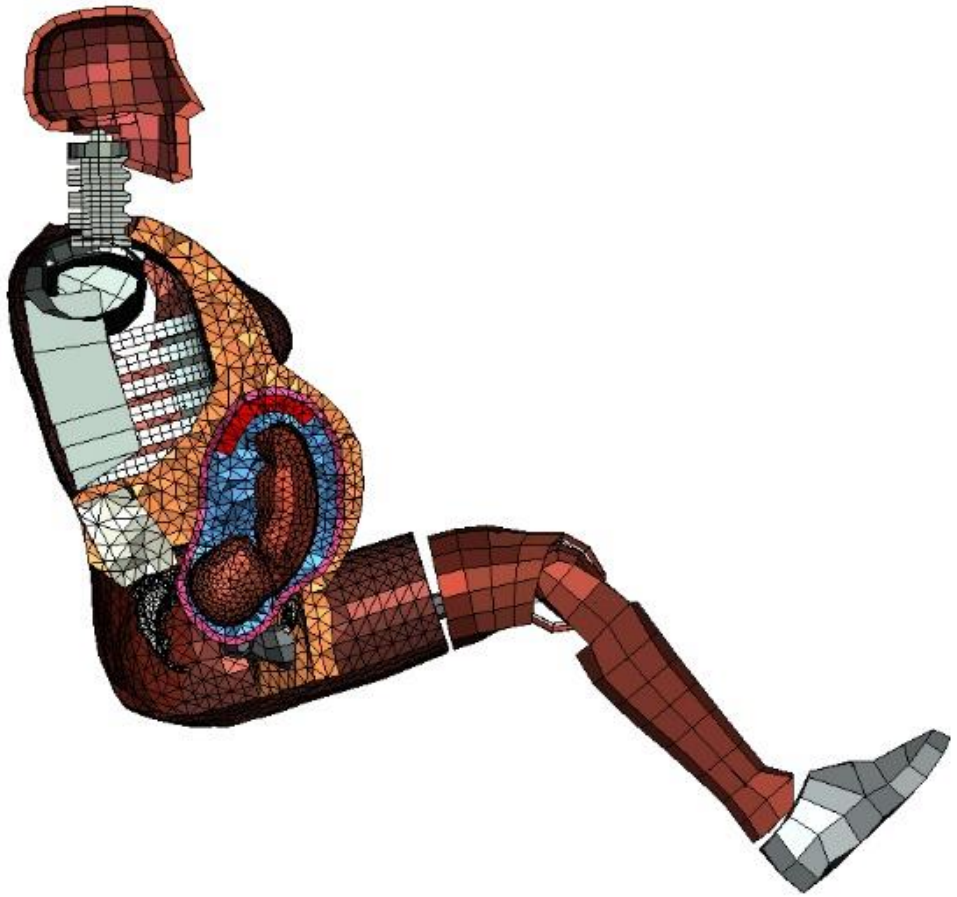
Is the Oculus Rift sexist?

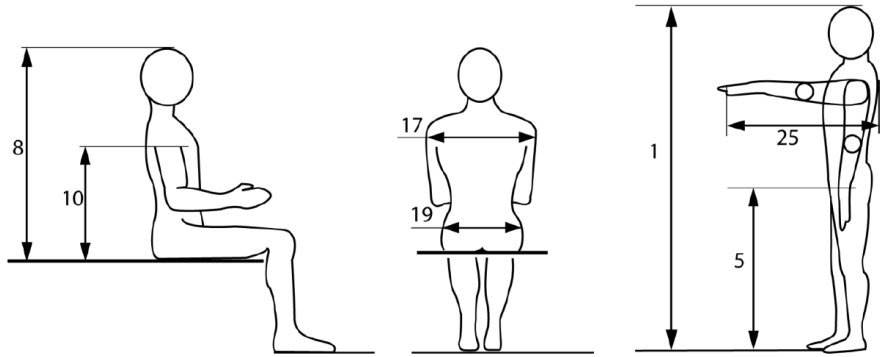
By danah boyd • March 28, 2014
Researcher, NYU

P PHOTO/JEFF CHIU

Technologies can reinforce gender systems

So again, an example of unintentional gender bias resulting from a technology being produced within, within a bias environments or on the basis of a bias norms that in turn had detrimental effects for eventual users of that technology





Dimension #	Dimension	Measurements			
		95th Percentile Male		5 th Percentile Female	
		Metric	Imperial	Metric	Imperial
	Weight	102 kgs	225 #	49 kgs	108 #
1	Standing Height	186.5 cms	73.4 ins	151.5 cms	59.6 ins
5	Hip Height	100.0 cms	39.4 ins	74.0 cms	29.1 ins
8	Erect Sitting Height	97.0 cms	38.2 ins	79.5 cms	31.3 ins
10	Sitting Shoulder Height	64.5 cms	25.4 ins	50.5 cms	19.9 ins
17	Sitting Shoulder Width	50.5 cms	19.9 ins	37.5 cms	14.8 ins
19	Hip Width	40.5 cms	15.9 ins	31.0 cms	12.2 ins
25	Shoulder Grip Length	71.5 cms	28.1 ins	55.5 cms	21.9 ins
30	Foot Length - bare	28.5 cms	11.2 ins	22.0 cms	8.7 ins
31	Foot Width - bare	11.0 cms	4.3 ins	8.5 cms	3.3 ins

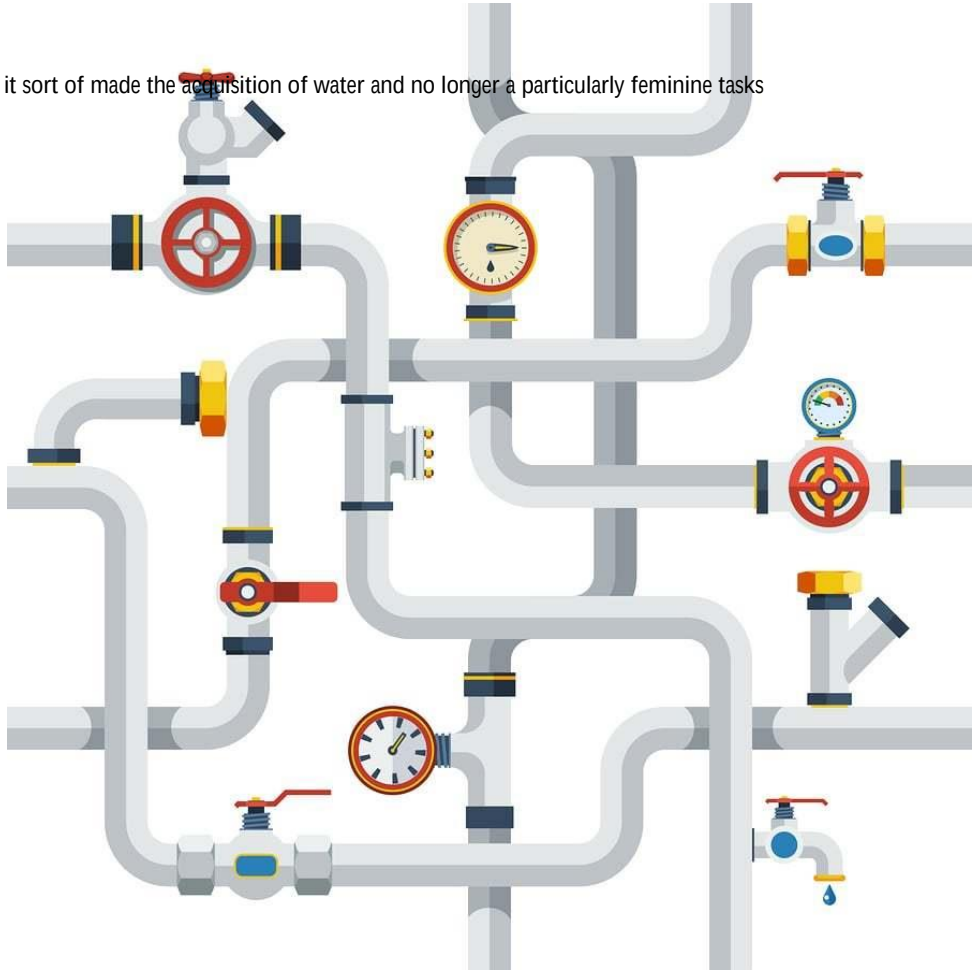
颠覆

Technologies can subvert gender systems

Technologies can have beneficial effects. Technologies can open new ways of thinking about gender, can open sort of new social or cultural pathways for people of different genders to in the world.

water gathering in many cultures has tended to be a feminine endeavor

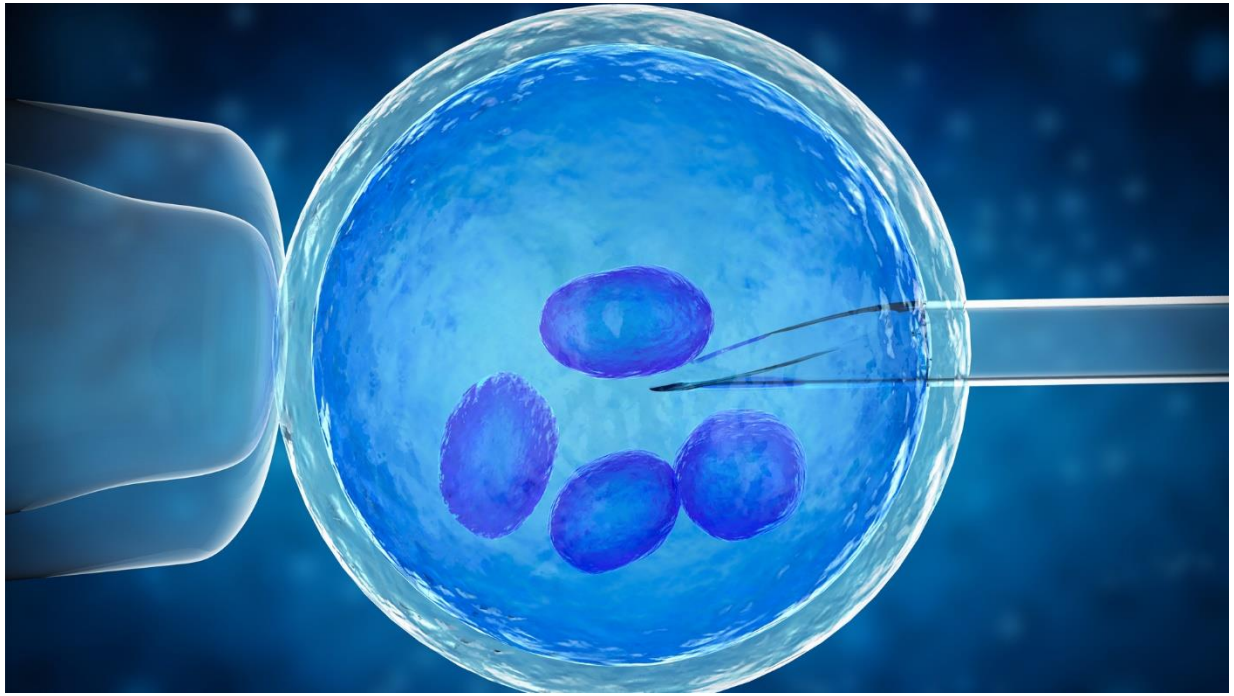
Hopkins writes about how the addition of indoor plumbing to households rendered this particular task unnecessary. And it changed our ideas of it sort of made the acquisition of water and no longer a particularly feminine tasks

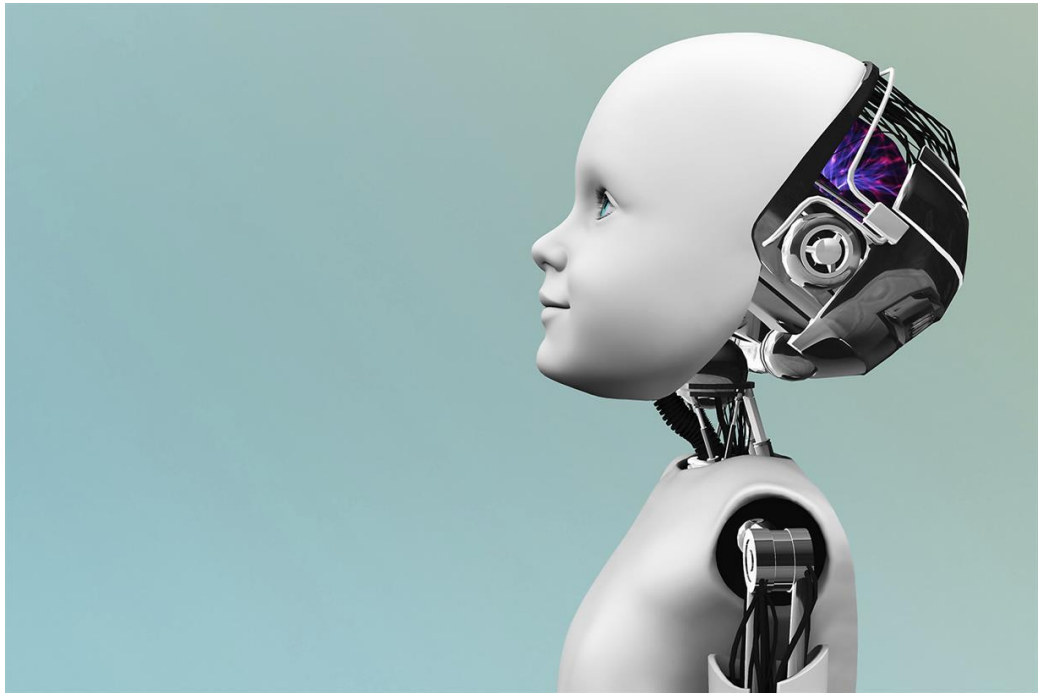


Technologies can alter our understandings of gender and sex

He writes that new technologies can allow us to alter our bodies and to change our biological characteristics in ways that challenge our current understandings of gender

1.So he starts off by talking about a very basic level, about how our understandings of technology had been mediated by the gendered world that we live in.
2.He talks about, I think, something that we hear a lot about, the ways in which technologies can reinforce or reflect existing norms or existing gender biases that exists in the world.
3.He also talks about the potential for technologies to help subvert those biases and norms.
4. And he talks about in a current sense and a future forward-looking sense about how technologies can change or helped to change our understandings of what gender and sex are and how they work





Some Big Questions

- How can technologies themselves relate to gender?
- **How is gender important to the historical development of computer science as a field and profession?**
- **How is gender relevant to computer scientists' professional identities?**

Some (Slightly) Smaller Questions

- What makes a good computer scientist? A good programmer?
- What stereotypes about computer science, computer scientists, or programmers have you encountered?
- How might these stereotypes relate to our perceptions of what it means to be an effective computing professional? And what does all of this have to do with gender?

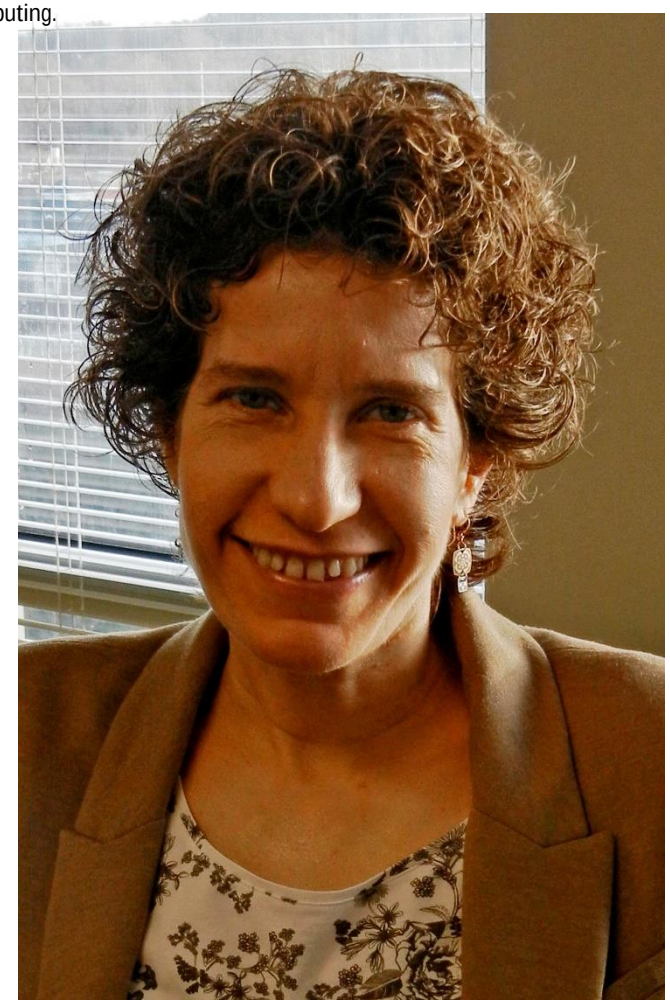
. They both start by talking about the 19 sixties and seventies era where programming skills were very undefined with a computing profession was still undefined. Well, lots of ways, but by the ends of their, of their texts, they end up in quite different places

Abbate, “Seeking the Perfect Programmer”
Ensmenger, “Beards, Sandals, and Other Signs of Rugged Individualism”

women's changing participation in computing.

, throughout the book she charts on historical shifts in the participation of women in computing

what the trends have been throughout the 20th and the beginning of the 21st century

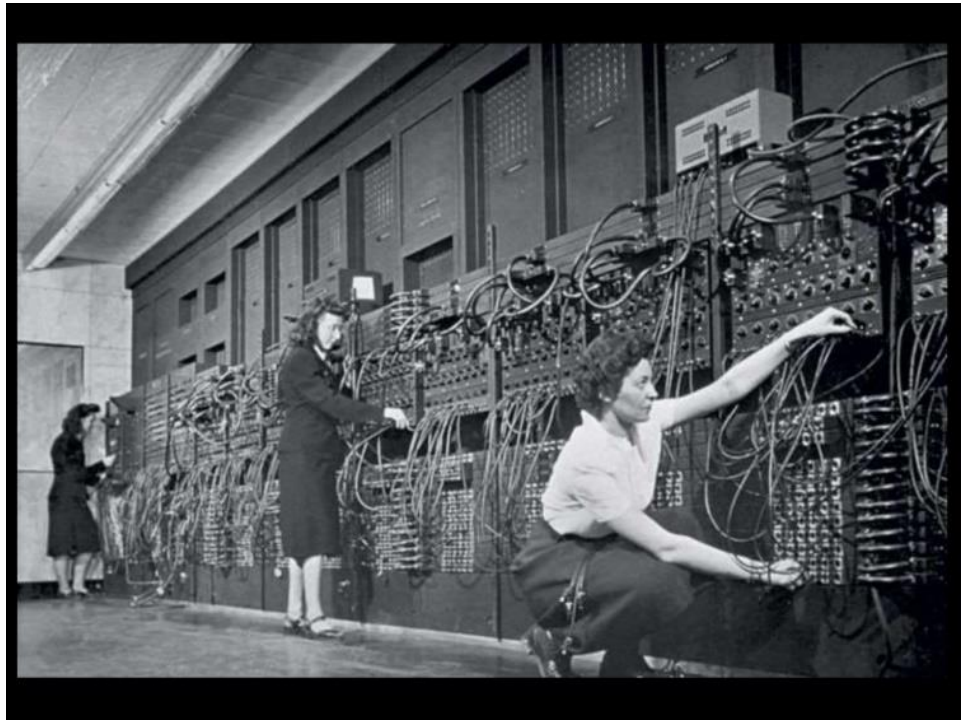


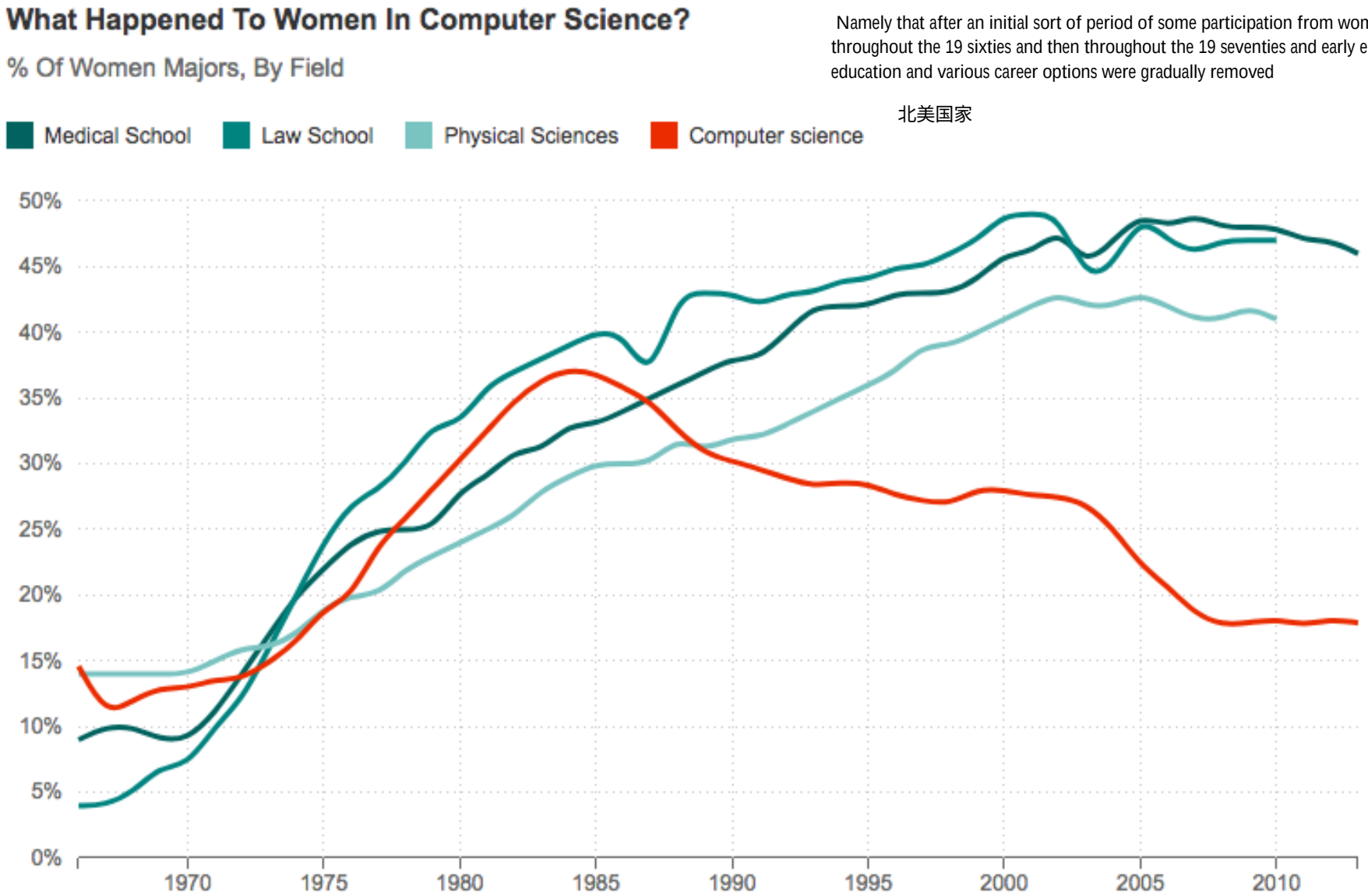
how the masculine identity of the computer programmer or the computer hacker or the competing professional was established throughout the 19 seventies and 19 eighties

the beginning of sort of pre-history and early history of digital computing. Very significant involvement by women as well.

So a person could be a computer, a computer with someone who performs complex mathematical calculations. And this was seen at the time was kind of not high-valued academic work, but as relatively lowly clerical work. That was maybe certainly difficult and couldn't be done by everyone. But it was something that was mechanical, wrote something that was not a particularly high-status or particularly well-paid job. And as such, this kind of work with often done by women.

So the term computer originally referred to a person who performed these complex calculations by hand.

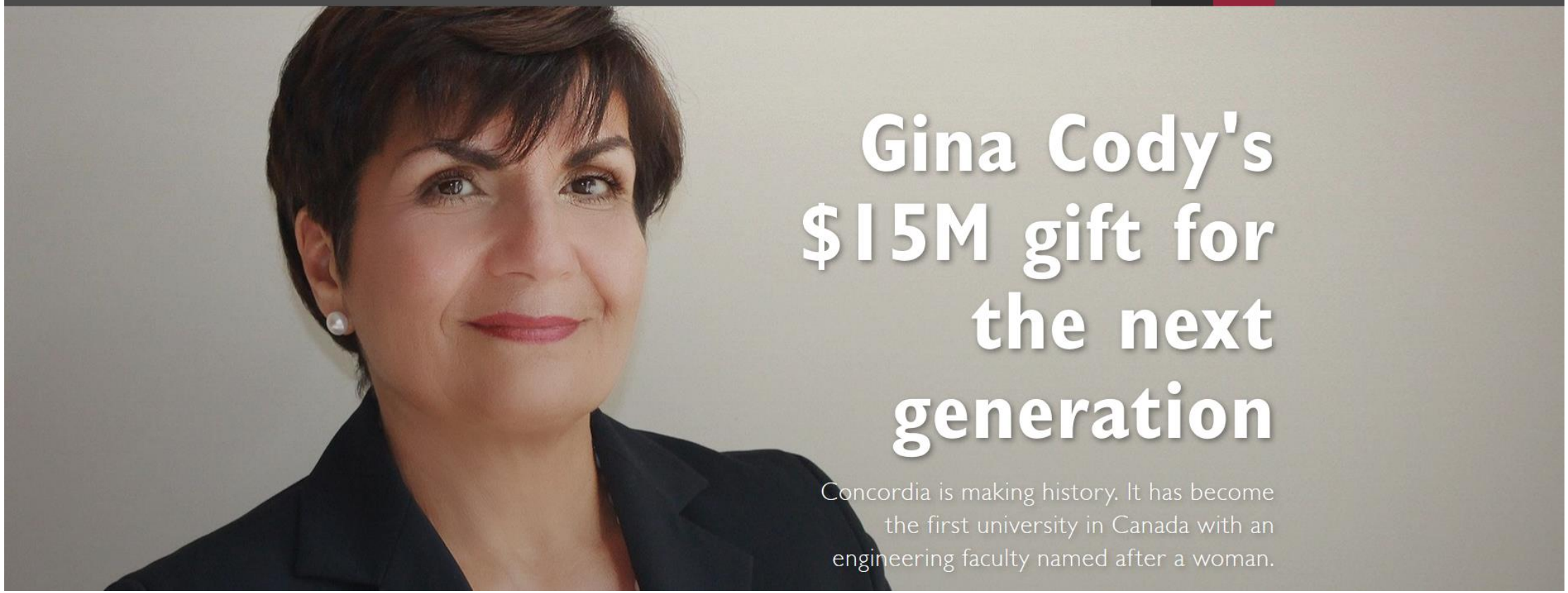




Namely that after an initial sort of period of some participation from women in computing fields, we see this decline throughout the 19 sixties and then throughout the 19 seventies and early eighties as legal and social barriers to women's education and various career options were gradually removed

北美国家

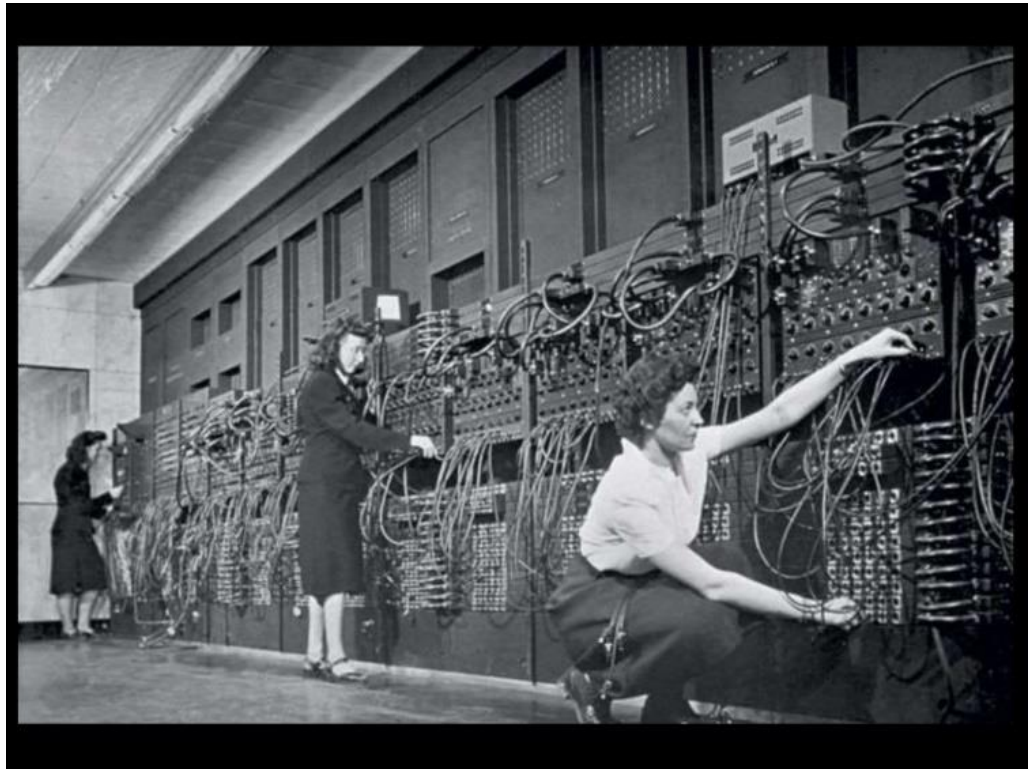
So both authors, however, that you read for today, are in one sense interested in explaining this graph that we've just seen. But they are not only interested in doing that, they're also interested in sort of explaining the shift in our understanding of what a computer programmer looks like, right? How a computer programmer and the popular image of such went from somewhere around the picture on the left to somewhere around the picture on the rate throughout the 20th and early 21st century



Gina Cody's $15M gift for the next generation

Concordia is making history. It has become the first university in Canada with an engineering faculty named after a woman.

Countries like India and Malaysia, as well as many other places are countries where computer science and computing careers are seen as very normal and suitable and unsurprising for women. And where the percentages of women who were involved in them are also very difference. Now, in some cases, because computing and careers can involve being indoors and away from physical labor, which of course comes with its own set of gender assumptions about what kind of person ought to be performing different professions. But I do want to emphasize that a particular set of trends is not a worldwide or a universal phenomenon.



Abbate, “Seeking the Perfect Programmer”

结构 拥有

“Skill is a social construct: neither the skills required to do a job nor the skill possessed by an individual can be defined in purely objective terms.”

用纯粹客观的术语来定义

Neither the skills required to do a job nor the skill possessed by an individual can be defined in purely objective terms.

there's no one way to define the skills that are required to do a certain job. Nor is there any one objective way to sort of measure the skill that any individual had

demonstrate how our ideas about what someone means to be a good programmer. We're, we're influenced by various factors

Abbate, “Seeking the Perfect Programmer”

No real degree programs that were intended to train programmers or few of them. There was a need for companies to define the skills of the people they were going to hire to do programming work. But no kind of approved set of credentials that people could be coming in with, that would be an automatic qualification. So in the, in the absence of a widespread Computer Science degree programs or sort of official computer programming training courses. How it was an employer to decide whether they were, how to find a good programmer to hire.

“Skill is a social construct: neither the skills required to do a job nor the skill possessed by an individual can be defined in purely objective terms.”

- Systems analysis vs. programming
- Hardware vs. software
- How to measure programming skill?
  - College degrees demonstrate a capacity for some kind of critical thinking, some kind of problem-solving skills, some kind of attitude that would be somehow applicable in a programming environment
  - Work experience once somebody who had had an initial degree of work experience in a programming job that was sort of sufficient as a proxy measure for them to get future programming
  - Aptitude tests The idea that you could come up with some kind of logic tests that you wouldn't have necessarily needed any particular education to rate, which would be in some sense a measure of how good a programmer you would be

none of them are perfect

Abbate, “Seeking the Perfect Programmer”

“Another way of uncovering the social basis of skill assessments is to look at how employers drew connections between programming and more familiar occupations…depending on the comparison chosen, programming might appear high or low status, abstract or concrete, creative or routine.”

. So again, she's saying that really the type of metaphor that companies and, and, and advertisers and people chose to about what programming was and what kind of skills they wanted from their employees could represent this task or this profession in very different ways.

Abbate, “Seeking the Perfect Programmer”

“Another way of uncovering the social basis of skill assessments is to look at how employers drew connections between programming and more familiar occupations…depending on the comparison chosen, programming might appear high or low status, abstract or concrete, creative or routine.”

- **Mathematics**: programming as mathematical problem solving sort of high logical attitude. Maybe a degree in mathematics, sort of very advanced theoretical capabilities
- **Engineering**: programming as managing an engineered device (hardware and software expertise necessary) manages both hardware and software. Someone who doesn't just need your medical expertise, but it needs some understanding of machinery. Also someone who's going to be managing the entire device of a computer and not just creating code for it, not only writing software.
- **Business**: programming as an evolution in business technology

you could sort of have higher status, more abstract, more creative representations of what programming was. Or you could have more low status, more concrete, more routine and more sort of not mechanized, but yeah, more routine, more more, more clerical understandings of what programming was.

these different metaphors sort of allowed or restricted women's participation in computing in different ways.

“The characterization of computers as an engineering tool, a mathematical device, or a business machine mattered greatly in constructing females as possessing the skills necessary for programming.”

So if you were imagining a programmer is someone who's going to manage both hardware and software. You might imagine a very different set of skills that would be necessary for that job. And you might have different gendered assumptions about the type of person who was going to be most capable of turning out that job. That would in turn be different if you were imagining programming as inherently mathematical or as sort of management, some kind of business practice.

The Computer Girls

BY LOIS MANDEL

A trainee gets $8,000 a year ...a girl "senior systems analyst" gets $20,000—and up! Maybe it's time to investigate....

Ann Richardson, IBM systems engineer, designs a bridge via computer. Above (left) she checks her facts with fellow systems engineer, Marvin V. Fuchs. Right, she feeds facts into the computer. Below, Ann demonstrates on a viewing screen how her facts designed the bridge, and makes changes with a "light pen."

Twenty years ago, a girl could be a secretary, a school teacher . . . maybe a librarian, a social worker or a nurse. If she was really ambitious, she could go into the professions and compete with men . . . usually working harder and longer to earn less pay for the same job.

Now have come the big, dazzling computers—and a whole new kind of work for women: programming. Telling the miracle machines what to do and how to do it. Anything from predicting the weather to sending out billing notices from the local department store.

And if it doesn't sound like woman's work—well, it just is.

("I had this idea I'd be standing at a big machine and pressing buttons all day long," says a girl who programs for a Los Angeles bank. I couldn't have been further off the track. I figure out how the computer can solve a problem, and then instruct the machine to do it."

"It's just like planning a dinner," explains Dr. Grace Hopper, now a staff scientist in systems programming for Univac. (She helped develop the first electronic digital computer, the Eniac, in 1946.) "You have to plan ahead and schedule everything so it's ready when you need it. Programming requires patience and the ability to handle detail. Women are 'naturals' at computer programming."

What she's talking about is *aptitude*—the one most important quality a girl needs to become a programmer. She also needs a keen, logical mind. And if that zeroes out the old Billie Burke-Gracie Allen image of femininity, it's about time, because this is the age of the Computer Girls. There are twenty thousand of them in the United *(cont. on page 54)*

Photos by Henry Grossman. Dress by Gino Charles.

So Abbate is really not interested in making sort of simplistic statements about this metaphor was better for women, or this one was more sexist. That's not really what she's doing. She's showing how these different ways of representing computing work could intersect with gender in different ways.

there were many cases where women could ended successfully entered into computing professions. But there are also lots of environments， women can it be excluded from sometimes in very explicit, obvious ways and sometimes in much more subtle ways.

promotional pamphlets that were created by IBM. This is not from the pamphlet in particular that she talks about, but this is the profile of women who worked in different computing fields. Themes like this could sort of showcase the ability of women seed in various different competing professions.

because kind of the nature of academia at the time, because this kind of sort of scientific laboratory atmosphere was a very masculine IS space. And the fact that the fact that the laboratory was chaotic computer science research didn't change that kind of fundamental masculine identity of what a scientific laboratory did and who were the people who participated in it

She also talks about how the kind of engineering metaphor, the idea of could have mastery of the computing machine also tended to have this sort of masculine bias to it.

These are also adds meant to encourage people to apply for computing positions very, very different from this o

left is demonstrating the power of this typist to control your invoicing stuff, records and sales statistics, statistics all at once electronically with the help of her computer. So again, this is demonstrating a computing profession. It's demonstrating a certain kind of gendered participation in computing. It's demonstrating kind of feminized skillset and the representation of computing professions as something that are open to a particular type of person

This one is an ad for a technological system rather than a computing job. But again, it's sort of representing computing work or programming work as a clerical task, something that is easily done, something that is necessary to the function of an office, into the function of a certain bureaucracy, but isn't necessarily high-status or creative or abstract.

visit an advertisement for a computer itself and not for, not for a job. But you can see sort of similar themes of ease, ease of use, and sort of gendered representation of the person who was going to be operating this simple machine and the kind of tasks that that person would be conducting with it as composed to this kind of representation of what computing work was

“In the programming field, the conceptual categories of skilled work and women’s work were not mutually exclusive but rather existed in ambiguous tension. Domestic metaphors took advantage of this ambiguity to invite, explain, or justify women’s participation.”

some different metaphors of alternative metaphors for computing skill and that were maybe more welcoming to women, although not as dominant as the kinda mean.

“The dominant interpretations of skill privileged a few aspects of a complex and varied job. The high-status skills of math and engineering seem to have been overemphasized compared to their utility in programming, and skills that proved important in actual programming practice – such as teamwork, courtesy, communication, and passion – were not emphasized in the usual hiring criteria.”

she's contrasting the kind of three metaphors that she identifies as dominant, namely mathematics and engineering, and business. With these sorts of other more feminine or more domestic metaphors that she doesn't mention. She's saying that these three dominant ones that she's I identify it on privilege. Only a few parts of a very complicated job, math and engineering in particular, were viewed as sort of high-status skills. And she argues at the very end of the chapter that these sorts of high status skills had been over emphasized compared to how useful they actually were for programmers.

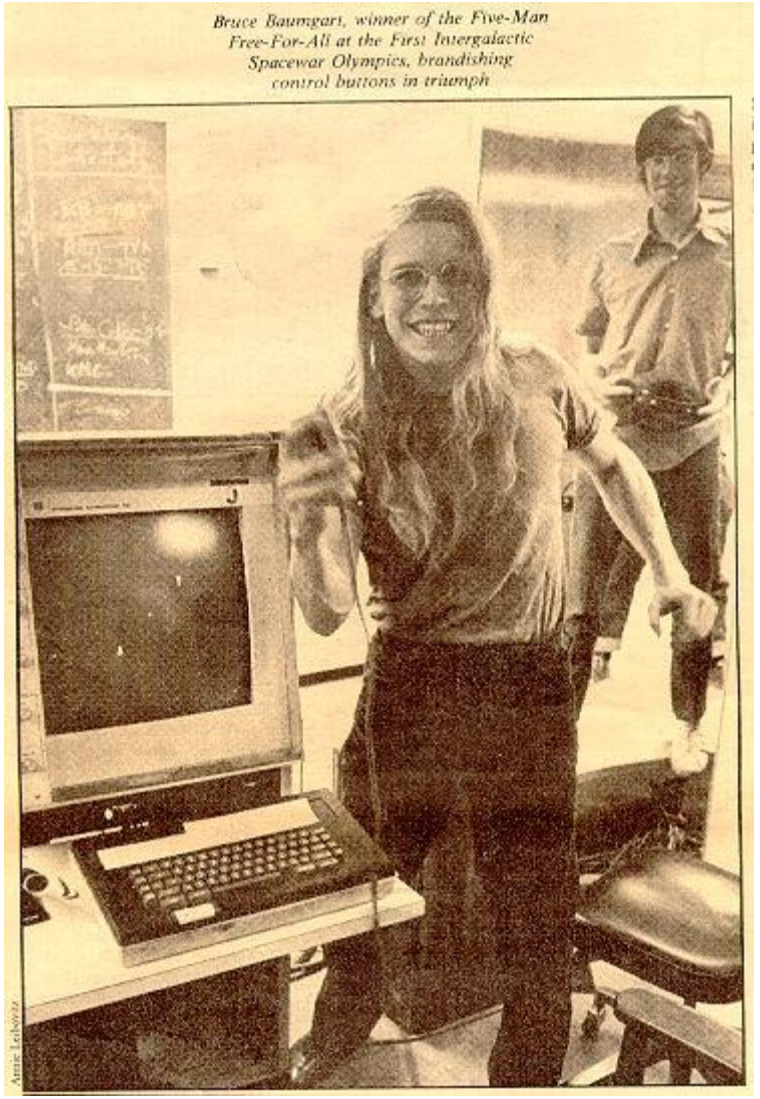
While other skills, more sort of skills that were seen as traditionally feminine, that were also very important, are also very important. She's saying an actual programming practice. Skills like teamwork, courtesy, communication, and passion tended not to be emphasized in usual hiring criteria was, and we'll come back to it

在computer center 两个记着不同的报道

Ensmenger, “Beards, Sandals, and Other Signs…”

Weizenbaum: “Their rumpled clothes, their unwashed and unshaven faces, and their uncombed hair all testify that they are oblivious to their bodies and to the world in which they move. They exist, at least when so engaged, only through and for the computers.”

He's looking at these people as socially isolated in a very negative sense, only interested in their machines, totally cut off from the rest of the world



Brand: “a kind of fanaticism,” but this was fanaticism of the artist, the inventor, and the explorer. “Magnificent men in their flying machines,” “scouting a leading edge of technology.” “Brilliant,” “revolutionary,” “servants in the human interest.”

Ensmenger, “Beards, Sandals, and Other Signs…”

“In the case of computer programming…the dominant assumption is that there are certain intellectual and emotional characteristics that are associated with computer programming ability – logical, detached, narrowly focused – that also just happen to be more prevalent in males.”

他并不同意

Ensmenger ***disputes*** this explanation for the gender gap in computer science, arguing that our perception of the field and the skills necessary to succeed in it are ***socially constructed***.

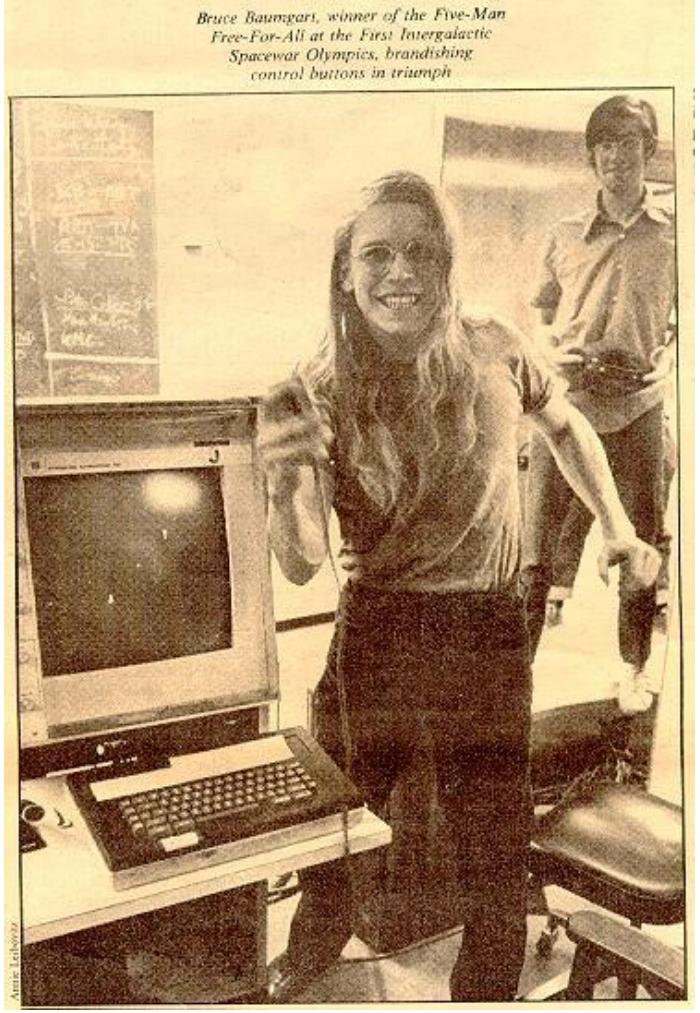
Ensmenger, “Beards, Sandals, and Other Signs…”

“The institutionalization of computer science as an academic discipline was well under way by the late 1960s and it involved a turn toward the theoretical, the mathematical, and the abstract.”

“It is important to note that although the academic discipline of computer science was indeed masculine, it was masculine in ways that were typical of most of academia in this period.”

Ensmenger, “Beards, Sandals, and Other Signs…”

“The norms, ethos, and practices established in the university computer centers of the 1970s formed the basis for the emergent computer hobbyist culture of the 1980s (and beyond) and would be perpetuated and re-created in…the similarly informal work spaces/playgrounds of corporate campuses.”



What was special about 1970s computer centers?

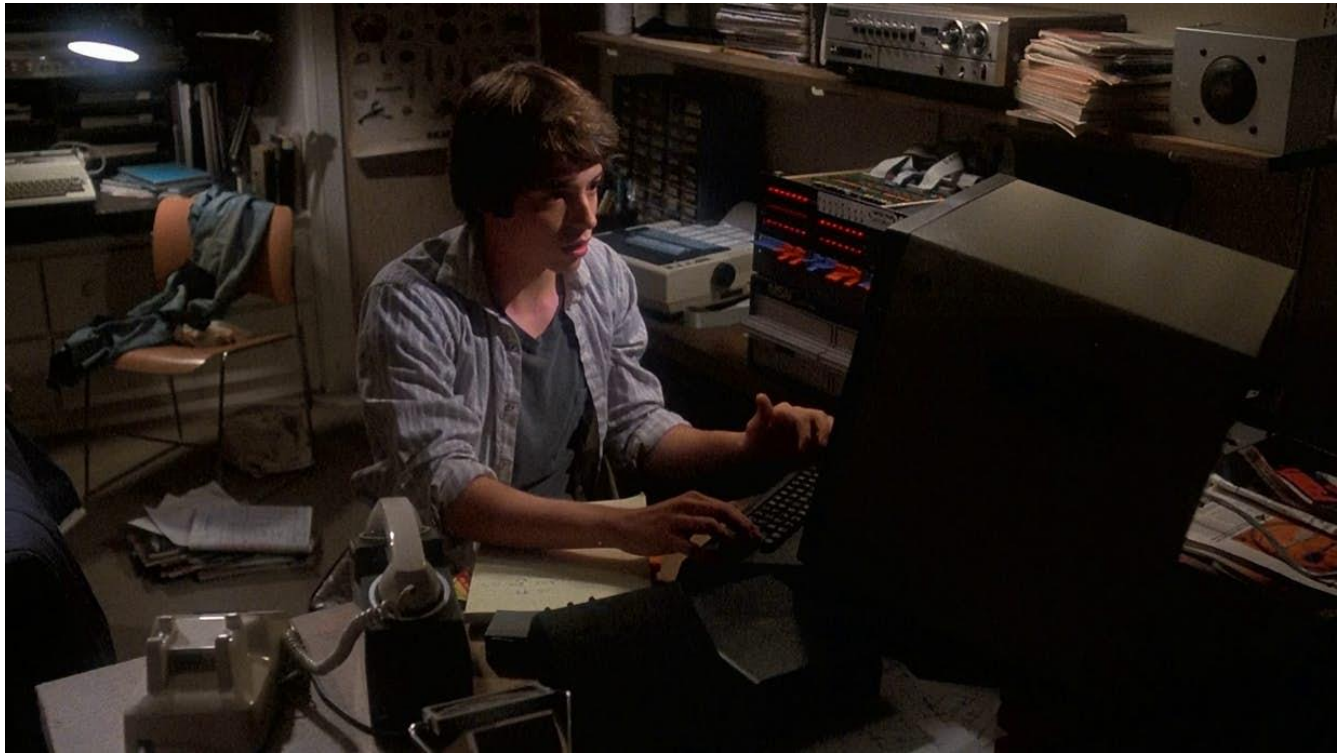
1. Computer centers were isolated, and therefore unsupervised -> practically unlimited access.

2. Users of the computer center were sheltered from economic realities and consequences -> users could tinker, and solve trivial puzzles.

3. Computer centers were “profoundly social,” in masculinized ways.

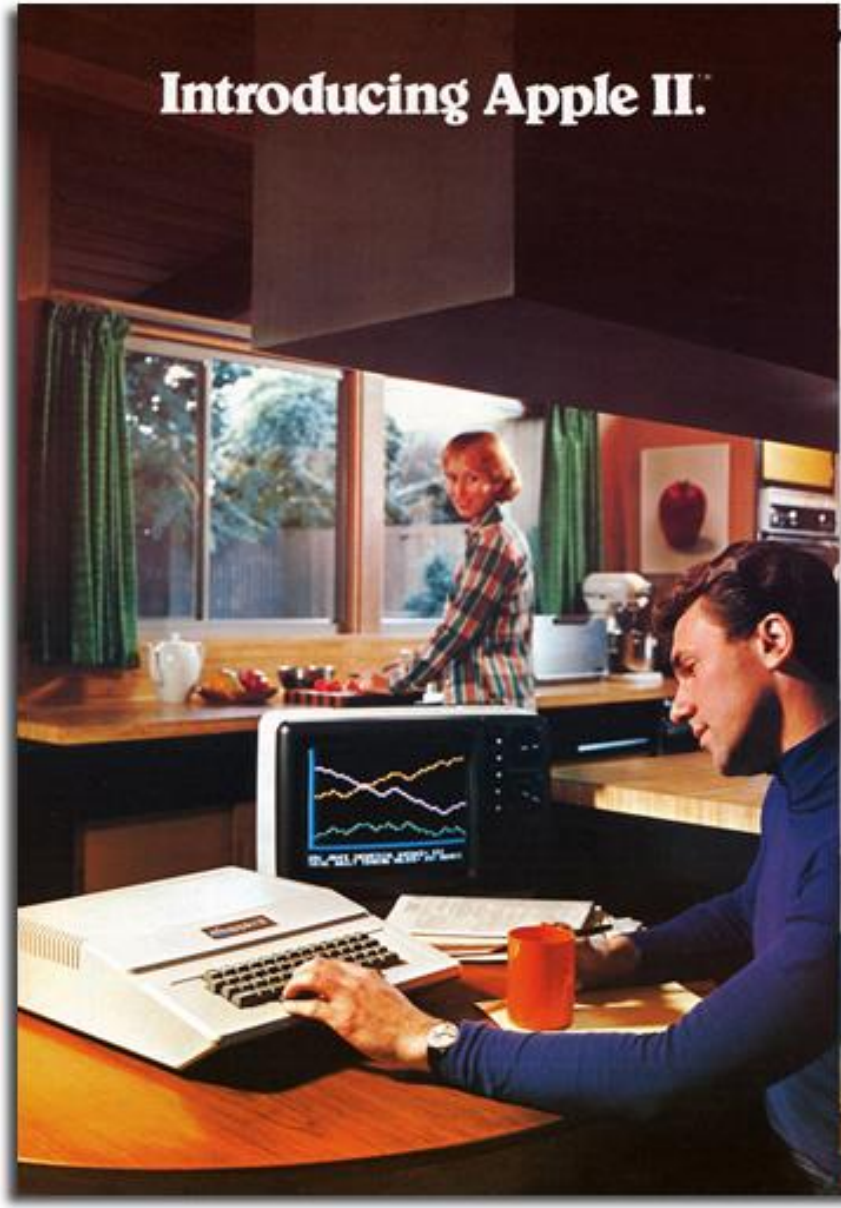
You saying that the culture of the 19 seventies computer centers is what led to the hackers stereotypes of the 19 eighties. And that these sort of stereotypes around hacking and personal computing of the eighties and turn birth. The societal perception of a computer genius is someone who tinkers with technologies in his garage, and he relates to the world in a certain way so What was special about these 19 seventies computer centers, how were a sort of scattered on a group of laboratories on isolated university campuses.

that there were some things about the centers that were very particular, that were very special, that led to the development of a certain kind of culture, a certain kind of idea about what computing was. Uh, who engages in computing?



. This sort of succession of computer center on computer bomb to 19 eighties hacker ends mayor. Arguments of this in turn give rise to the societal perceptions of a computer genius as someone who spends time in his garage tinkering with technologies at all hours of the day and night and sort of engaging in particular social rituals. As we heard some talk about this transition a lot. He sort of mentions it, but most of his evidence is centered around sort of describing the culture of the computing centers themselves. And then he sort of more briefly describes this transition into 19 eighties hacker culture or hacker stereotypes and subsequent sort of popular perceptions of what a computing professional does. He does show some sort of crystal computer advertisements from the 19 seventies and 19 eighties to try and demonstrate this, the development of this identity or the development of this stereotype. And I wanted to add a couple.

The ones that he has already shown you. So as the era of personal computers began in the late 19 seventies and 19 eighties. We do see personal computers being marketed primarily towards men. Sometimes overtly gendered advertisements like the ones that you are, the one that you're seeing here, which has a more direct connection to the computer center masculine culture, that ends manner it's talking about and sometimes in less strikingly obvious ads like this one.



The home computer that's ready to work, play and grow with you.

Clear the kitchen table. Bring in the color T.V. Plug in your new Apple II* and connect any standard cassette recorder/player. Now you're ready for an evening of discovery in the new world of personal computers.

Only Apple II makes it that easy. It's a complete, ready to use computer—not a kit. At $1298, it includes features you won't find on other personal computers costing twice as much.

Features such as video graphics in 15 colors. And a built-in memory capacity of 8K bytes ROM and 4K bytes RAM—with room for lots more. But you don't even need to know a RAM from a ROM to use and enjoy Apple II. It's the first personal computer with a fast version of BASIC—the English-like programming language—permanently built in. That means you can begin running your Apple II the first evening, entering your own instructions and watching them work, even if you've had no previous computer experience.

The familiar typewriter-style keyboard makes communication easy. And your programs and data can be stored on (and retrieved from) audio cassettes, using the built-in cassette interface, so you can swap with other Apple II users. This and other peripherals—optional equipment on most personal computers, at hundreds of dollars extra cost—are *built into* Apple II. And it's designed to keep up with changing technology, to expand easily whenever you need it to.

As an educational tool, Apple II is a sound investment. You can program it to tutor your children in most any subject, such as spelling, history or math. But the biggest benefit—no matter *how* you use Apple II—is that you and your family increase your familiarity with the computer itself. The more you experiment with it, the more you discover about its potential.

Start by playing PONG. Then invent your own games using the input keyboard, game paddles and built-in speaker. As you experiment you'll acquire new programming skills which will open up new ways to use your Apple II. You'll learn to "paint" dazzling color displays using the unique color graphics commands in Apple BASIC, and write programs to create beautiful kaleidoscopic designs.

As you master Apple BASIC, you'll be able to organize, index and store data on household finances, income tax, recipes, and record collections. You can learn to chart your biorhythms, balance your checking account, even control your home environment. Apple II will go as far as your imagination can take it.

Best of all, Apple II is designed to grow with you. As your skill and experience with computing increase, you may want to add new Apple peripherals. For example, a refined, more sophisticated BASIC language is being developed for advanced scientific and mathematical applications.

And in addition to the built-in audio, video and game interfaces, there's room for eight plug-in options such as a prototyping board for experimenting with interfaces to other equipment; a serial board for connecting teletype, printer and other terminals; a parallel interface for communicating with a printer or another computer; an EPROM board for storing programs permanently; and a modem board communications interface. A floppy disk interface with software and complete operating systems will be available at the end of 1977. And there are many more options to come, because Apple II was designed from the beginning to accommodate increased power and capability as your requirements change.

If you'd like to see for yourself how easy it is to use and enjoy Apple II, visit your local dealer for a demonstration and a copy of our detailed brochure. Or write Apple Computer Inc., 20863 Stevens Creek Blvd., Cupertino, California 95014.

Apple II™ is a completely self contained computer system with BASIC in ROM, color graphics, ASCII keyboard, light-weight, efficient switching power supply and molded case. It is supplied with BASIC in ROM, up to 48K bytes of RAM, and with cassette tape, video and game I/O interfaces built-in. Also included are two game paddles and a demonstration cassette.

SPECIFICATIONS

- **Microprocessor:** 6502 (1 MHz).
- **Video Display:** Memory mapped, 5 modes—all Software-selectable:
  - Text—40 characters/line, 24 lines upper case.
  - Color graphics—40h x 48v, 15 colors
  - High-resolution graphics—280h x 192v; black, white, violet, green (16K RAM minimum required)
  - Both graphics modes can be selected to include 4 lines of text at the bottom of the display area.
  - Completely transparent memory access. All color generation done digitally.
- **Memory:** up to 48K bytes on-board RAM (4K supplied)
  - Uses either 4K or new 16K dynamic memory chips
  - Up to 12K ROM (8K supplied)
- **Software**
  - Fast extended Integer BASIC in ROM with color graphics commands
  - Extensive monitor in ROM
- **I/O**
  - 1500 bps cassette interface
  - 8-slot motherboard
  - Apple game I/O connector
  - ASCII keyboard port
  - Speaker
  - Composite video output

Apple II is also available in board-only form for the do-it-yourself hobbyist. Has all of the features of the Apple II system, but does not include case, keyboard, power supply or game paddles. $598.

PONG is a trademark of Atari Inc.

*Apple II plugs into any standard TV using an inexpensive modulator (not supplied).

apple computer inc.

Mini-Assignment #5: Computing Skills

Describe a set of skills or traits that *you* think is particularly important for a successful computer scientist or computer programmer to possess. Then, compare and contrast the skillset that you have described with an argument made by Abbate or Ensmenger.

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For example, does the skillset you describe reflect one of the metaphors – computer programming as mathematical, engineering-focused, or business-related – that Abbate discusses? Is it opposed to one or more of these ideas? Alternatively, is your skillset related to the stereotypical computer geek identity that Ensmenger describes?

Post both your description of the skillset and your discussion of it in the Moodle forum before class on Wednesday.

Reading Hints for Next Class

Privacy and Surveillance

- *Required: Andrej Zwitter, "Big Data Ethics"*
  - A short read. Try to connect Zwitter's arguments with Moor and Johnson's work on computer ethics.
- *Optional but recommended: The Great Hack (film) OR news articles on the Cambridge Analytica case*
  - On Wednesday we'll discuss a range of privacy and surveillance issues related to the specific case of Facebook and Cambridge Analytica. I'm recommending – but not requiring – that you familiarize yourself a bit with this story before class. The movie The Great Hack (available on Netflix) covers the story in some detail. I've also posted a link on Moodle to a selection of short journalistic articles. The aim is simply to get a sense of the Cambridge Analytica/Facebook story and its connections to Zwitter's arguments.