**Lynn’s final edits of captions for her NSF Pride presentation:**<https://www.dropbox.com/s/87gf08e5e1cqr93/LGBT%20Pride%20Event-MP4%20file_CC.mp4>

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**Note:** Edits in the captions are shown using words in **Bold Red**.

**Note:** Captions time-stamped with RED numbers help visualize audio cutting in/out between 7:33 and 8:27.

7:33 **Thank you folks for the very generous introductions.**

7:37 **It’s great to be here with you today, and**

7:40 **share in this NSF celebration of LGBT Pride Month.**

7:45 **Today, I’m going to first read some reflections**

7:53 **on a special Pride event I attended a couple of years ago, in the White House**

7:59 **It was a special time for me, and for my husband.**

8:02 **Then what I’m going to do is I’m going to very quickly go through**

8:06 **the question of the historical erasure of women’s contributions to science and technology.**

8:10 **We’ll then go through a case study that I’m familiar with,**

8:13 **and conjecture about what might be going on here.**

8:19 **Um, and then, we’ll hopefully leave time for questions and answers,**

8:22 **and some time for discussion.**

8:25 **That’s how we’ll go, now**

8:29 there’**s gonna** be quite a montage of slides

8:57 **I’d** just like to read that to you.

12:57 of the many shades **of out** down through time.

13:32and ideas **and crosscurrents run** through all this.

13:59 We talk about **Steve Jobs**.

14:22 Joanna Hoffman who was **the** product manager

14:26 And Susan **Kare, who did all the graphics and user interface and art design**

14:43 to have their history almost erased or **uncalled**.

15:03 Katherine Johnson, an African American **woman**

15:20 **Because** if you know your past, as we were discussing,

15:30 **So . . . it’s n**ot just **that** women have a harder time

15:35 It’s **that** the many contributions they do make, aren’t celebrated.

15:53 of such historical **erasure** over **many,** many years

16:05 and denial **of women’s** contributions

16:09 **whose work is often attributed** to **male** colleagues

16:15 Describing how eminent **scientists** often get more credit

16:18 than **lesser** known researchers even if their work is similar

16:30 So, let’s go **through** a case study

16:36 And **then we’ll** make some conjectures about it.

16:48 When numbers of transistors **and** their wiring **could** be printed

16:50 **onto chips of silicon.**

16:55 by the early 70’s revolution **in personal** computing and networking.

17:03 mouse-controlled **personal computer**

17:26 **with the introduction of the Intel 4004,**

17:51 that the number of transistors reliably **printable**

17:54 on commercial chips was roughly **doubling** every two years

18:13 **Yeah, that was a good move by Mead when you think of it.**

18:29 In 1976, this set off **a collaborative** push

18:35 and **Mead and some** students at Caltech to figure out how

18:44 **And we** **were** really fired up because,

18:48 if you look at the far right point up there, 1,000,000 **by** 1990,

19:02 **Now, if** you really believed that

19:42 even through **waves** of density improvement.

19:50 of simplified and **restructured** design level abstractions

19:58 **this was done on my Alto at PARC**

20:02 And so began using **the Alto**

20:12 And **that** computer-edited evolving book

20:30 So you have this iconic **book** and some names on it

20:51 and colleagues **via** the ARPANET.

21:05 his revolutionary AC electricity **methods** at Union **College**

22:15 **Here’s** a map and photomicrograph

22:18 of the 19 student **projects**

22:22 Mostly masters-level students in **EECS**

22:31 Guy Steele, designed a **LISP** microprocessor

22:34 A **LISP** microprocessor, **as** his first design.

22:38 **You see,** there **was** some power in these methods.

22:48 **Now**, this course stunned top folks in Silicon Valley.

22:51 And many other top research universities **wanted** to offer

23:06 using **the** lecture notes **I’d** created **at** MIT to keep all

23:37 to be remotely submitted **via** the Arpanet to a server

23:44 into the multiproject chip files**, somewhat** like composing

23:55 **We’d then** make **masks** from those

24:01 **had run them** the year before

24:08 **Now,** I don’t know if you are noticing all through this,

24:15 There is nobody **sort-of** funding this.

24:21 **Kind of bootleg.** Can you envision that?

24:39 called MPC79**, it ended up involving**

24:49 we **built up** the little core

24:52 of the e-commerce **system**

25:03 operation, and validation of the design **methods**

25:33 It wasn’t just one bootstrap, **like a self-compiling compiler,**

25:37 So, this shows the **“thing”:** going from code to chips.

25:44 and what **are** the **systems.**

25:50And here is this **nested** series

26:09 but the ideas moving **through the heads of** people

26:26 **So,** when you look at this now,

26:31 you start to envision**, “My** goodness

26:33 What is going on out there?**”**

26:44 By 1982-83, these courses are being offered

27:02 in what is now termed **“**social physics**”**

27:05 **the sort of thing that Sandy Pentland is doing** at MIT and folks **that know about his work**

27:17 how to **cope** with the complexity

27:27 and other methods of structuring the **abstraction levels**

27:29 **of** digital design

27:33 And **in** ’78, I **launched the** course at MIT.

27:42 And in 1979, I launched the **VLSI courses**

27:50 **And over the past 40 years**

27:51 **Moore’s Law** stayed on track the whole way.

27:55 **Now,** there always are S curves

28:05 **That’s** another story**, about entropy and a bunch of other things, but**

28:11 the number of **transistors** on a chip

28:26 Everything getting **noodled** finer and finer.

28:28 **By increasing casts** of thousands

28:43 because it’s about cultural evolution**,** and **it’s about** exponentiation,

28:45 **it’s about** compounding **the** techno-social **interest** **that accumulates**,

28:59 **And** follow the high tech **community’s** reactions

29:12 **It never does;** this is just another process.

29:16 **Key** people said something significant has happened

29:21 receiving major **recognition** right away, right in the 80’s.

29:30 This was the key **trade** magazine back in the day.

29:34 And also largely in computing.

29:37 And it developed **this** award for electronics

29:41 and it’s considered really prestigious

29:56 We both got the **Wetherill** Medal **of the** Franklin Institute**,** **and both got elected to the NAE.**

30:19 while my **role** just disappeared

30:27 **G**ot the Phil Kaufman award for EDA in **’96**.

30:34 That one’s interesting**, a device physicist,**

30:35 I don’t remember him **. . . , but anyway**

30:45 **Boy,** I could have used some of that!

30:55 **that’s** a big one **in the Valley**

30:57 That is huge **in the Valley**.

31:03 He got the National Medal of Technology in 2002. **Hmm…**

31:05 And **the NAE Founders** Award **in ‘03**.

31:15 **Now** the interesting things is,

31:24 **if you find** what the innovations were, **wait a minute,** those were mine.

31:39 **You know,** a woman, and now a trans woman?

31:54 **There’s this** great event.

32:02 And 15 **men were** honored

32:56 I didn’t even know **this thing** was happening in 2009.

33:08 But, **I** actually **am** a human being

33:10 **and actually have** feelings and emotions.

33:14 I **actually** started to get **pretty** serious PTS

33:21 were doing in San Francisco **back in the ‘60s**.

33:23 None of that. I **just** went forward.

33:27 **But this** stuff really got to me.

33:30 So I began investigating and doing research, **scientist that I am,**

33:36 Trying to figure out **“What** is going on**?”**

33:40 And **then** I actually got excited by what I was learning.

33:43 I started getting really weird **counter-intuitive** insights

33:47 and **I’ve begun** writing about a lot of this.

34:15 **in this** special issue **of the** Solid-State Circuits **Magazine**

34:28 And **there’s** a lot more that **I’ve begun** to write.

34:36 But since 2012, **some** things have started to happen.

34:43 I got elected as a **Fellow of** the Computer History Museum.

34:48 And I am going to receive one of the **top medals**

34:50 from **the IEEE** and **the Royal Society of Edinburgh** next week.

35:09 of the **process** of **assigning credit**

33:18 **Although** this is sort of connected

35:31 Throughout this **case**, you can observe

35:35 you could observe and do **observe** **the** repression

35:41 **That’s active, as though** something **active is** happening to stop it. **But is that really right?**

35:51 And I was very junior in **respect to**

35:54 **reputation when the work started,** **compared to Mead, a full** professor at Caltech.

36:15 Thinking of them as**, and** using logic, **as** self-fulfilling prophecies

36:30 The **specious** validity of the self-fulfilling prophecy

36:37 I **think you can sort of** see that happening.

36:38 So the **prophet** will cite the actual course

36:44 **Of course Mead** did the work**,** because he got all the credit.

37:02 I began to sense something more subliminal **and fundamental** occurring

37:14 Here is the conjecture**:**

37:16 Almost all people are **blind** to innovations**,**

37:19 especially ones made by **“**those**”**

37:35 For most people, **”those”** equals almost all people.

37:37 So very few people ever **witness**

37:39 or **visualize** innovations.

38:14 **Think of the science to be done here.**

38:22 of this conjectured**, social-level, “Conway Effect”**.

38:29 Let’s visualize this effect in action in this past story.

38:40 **But see a**ctually, I had been a student at MIT back in the 50s

39:15 And they gradually reverse engineer how you did it.

39:45 and I was **really** tremendously affected

39:22 The **key** thing is **without** them **ever** knowing actually

39:40 among Silicon Valley cognoscenti **then** led to intense interest

39:45 Remember**,** how **“MIT** was doing **this”.** You see?

39:51 **Causing** other research universities

39:52 to immediately **want to** offer such courses.

39:57 **Similarly, f**olks using MPC79 that I announced the next year…

40:00 I’d said**, “**if you have these courses going

40:04 send us your design **files** and we’ll print them for you.”

40:08 Well, everybody signed up**!**

**40:10 At 12 research universities! And no one realized that MPC79**

40:18 **plus** silicon foundries,

40:24 **So, w**hat were the MPC79 participants thinking?

40:29 I’m talking**, you know, a lot of people who got their careers really launched** by all of this.

40:32 Hennessy, Patterson, all of those guys.

40:38 that this was something that was cooked up and was a hack.

40:42 some thought DARPA **“did it.”**

40:48 like **Stoner’s** M16 and all of that.

40:52 **You’ve got** to get money from Congress **so, so “you did it.” Right?**

40:56 Google is doing that with their ATAP now, they’ve got their own **“DARPA”**, so

41:03 **all these cool things they’re doing, you know, they contract out to professors here and there who are getting the ideas**

41:08 **So, when DARPA funded** and transferred the MPC70 technology to USC-ISI

41:27 **Now, y**ou see how this is being orchestrated?

41:30 The VLSI revolution **thus** swept through the high-tech community

41:36 without anyone realizing that it had been deliberately generated

41:44 **Now,** although the **“**VLSI Book by Mead**”** became iconically connected

41:55 **That’s why u**ntil I wrote that article

41:58 **no** one kind of **began** to understand, and

42:04 **I’m now** reframing it in this more open manner

42:20 **and** explain what had happened,

42:25 we were in a really different **and** emerging time.

42:35 This was **really,** really a huge change.

42:40 and I just felt**, I’m gonna** just tell this story **now**

42:44 because I think some people will understand it **now.**

42:48 **So,** The Conway Effect**:**

42:51 especially ones made

42:57 **So, as a** result, innovations diffuse via social processes

43:19 **via social** tokening processes modulated by

43:35 thus maintaining **the** underlying blindness to innovations.

43:38 **An important** corollary to all this is that **it’s** possible

44:01 **So now** I would like to enter a little Q&A

44:38 And if we have **a little** time, **I’ll** just **do** a couple of thought experiments.

45:28 What is your relationship to Mead now

45:33 **Oh, yes, actually you know,** it’s interesting

45:46 This is **the** way **societies, cultures work and** evolve

45:56 **It’s** been a long time since **I’ve** seen **Mead**

46:01 we **really** parted our way very early in the process.

46:01 that **this** story is out there

46:11 **It’s really a**bout the issue of taking the things that I did

46:28 **So, you know, b**ecause of that kind of chaos,

46:44 because**, you know,** his reputation **in the Valley is absolutely** cemented.

46:49 will begin to **change not** my situation

47:13 Right now**, at a time** when the government is trying

47:16 to shut down research **in social science**

47:24 **and** labyrinth of social physics.

47:29 **e**specially involving computer **scientists**

47:32 and data and all sorts of modern methods.

47:59 didn’t even notice the innovations **being** made

48:13 because young faculty members **saw it as a** way to get tenure.

48:32 **. . . and nowadays,** Special Ops.

48:42 **it’s** very difficult to go back

48:50 Especially if they **don’t** tell the story.

50:28 Some of these reframings, **erasures,**

50:33 **insertions** have happened

50:36 because other **larger social forces**…

50:54 And many different things going on in this **labyrinth.**

50:58 **Some** of which are discoverable by new methods.

51:14 that as history is written by the **writers.**

52:21 And do it in a way that we are always leaving **tracks**.

53:11 **and we’ll** actually start uncovering

53:16 in the VLSI **Revolution**

53:20 **of** very important innovations made in retrospect

53:25 **by** young students, some of whom **didn’t** realize

53:32 **that’d** become foundational things.

53:41 And, **in** the case **where** a student **is just** at the right point

53:48 new and fresh from various **fields**

54:17 because if they were **your** ideas,

54:19 they **will be,** be known.

54:22 **Now,** we’re going to run out of time here pretty quick.

54:28 I **actually would** like to leave you with these two ideas.

54:45 First, is the story about the blue tit birds in England

54:50 a **tit** bird managed to find a milk bottle,

54:56 the top of which was either busted**, or it happened to peck on it**

54:58 **and** got it open and got the cream.

55:00 And maybe this kind of event **happened**

55:08 they are flocking, they happen to be flocking birds.

55:18 another bird saw a bird do this, and **just** started doing it.

55:20 And **voilà! It** got the cream**!**

55:29 from an area**,** because birdwatchers watch bird behaviors,

55:42 It was **clearly noticed** this was within a certain region

55:48 **And it just** was an epidemic.

55:50 And just kept on going on down through time **as long as milk bottles were being delivered.**

55:58 does the **tit** bird know **it’s** made an innovation?

56:37 **By methods** mainly of observation and imitation and diffusion.

56:58 of **a** particular female,

56:59 the female genius of the **macaques**,

57:09 **They spread out food for these things;** they just watched what they did.

57:28 She found a way of **separating** wheat from sand

57:33 and skimming the **wheat** off the surface

57:34 **Now, t**hese discoveries actually did spread through the community.

57:41 They **watch** each other.

57:43 If someone’s doing something, they might try it **too.**

57:46 **Although t**he older individuals

57:55 **usually you better** think of the younger generation.

57:58 **not always, but sometimes. So, again,** what was **Imo** thinking?

**END OF LYNN’s CAPTION-EDITS**