Do photons show gender bias? *

Ursula Keller

Department of Physics, Institute for Quantum Electronics, ETH Zurich, Switzerland

Keynote Talk at ESLW 2021, 17. Sep. 2021

European Semiconductor Laser Workshop 2021

*NOTE: THIS IS AN UNUSUAL KEYNOTE TALK INVITATION:

Explicitly invited by conference committee to talk about both science and gender issues!

Why a “gender” topic during this keynote?

- This talk will give an update on my ultrafast laser research *with my experience as a woman scientist and my career choices.*
- My journey in ultrafast lasers started almost 40 years ago
- *As a child of the 60’s and 70’s, I was convinced that discrimination was not an issue anymore and that I could achieve anything based on my performance.*
- **Why have I changed my mind?**
- **Why do I think that the situation can be more serious for women in leadership today?**
- **Why is it better for <u>both</u> men and women to improve on these issues?**

Why a “gender bias” topic during this keynote?

- Throughout this talk I bring examples from my own life and make some recommendations to better resolve the issues (very often backed up with published references)

- **Many key gender issues summarized in one reference:**
  Great way to jump into the topic. But – warning – message maybe disturbing for newcomers.

  “Sexism in Academy”, Troy Vettese, 2019, published in Issue 34: n+1, Head Case
  https://www.nplusonemag.com/magazine/ and about the author

- **This talk addresses my peers (both men and women).**
  I have just recently given a talk for the next generation of scientists and their mentors with some recommendations how to cope with a potential bad working culture and how to learn to help each other.
  Slides and video of that talk you can find here:
  http://www.nccr-must.ch/nccr_must/news_4.html?5020

Thank you to Stanford, Bell Labs and ETH Zurich

- I was guided and rewarded for performance
- I turned “anger based on perceived injustice” into more work to show them that I can do it.

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

ETH Zurich

1984 Diplom in Physics
(equivalent to a Masters)

Graduated top of the class

Motivated by winning a fellowship to study abroad (Fulbright fellowship)

Stanford University

Ph.D. student

1985-1989

Rotation principle for PhD advisor in the first year

Visiting woman professor helped to find “the right professor” for me

Bell Labs, Holmdel

MTS (member of technical staff)

1989-1993

started my independent research lab right after my PhD

Formal mentor for women MTS
Women MTS lunch meetings
(Bell Labs just went through an expensive lawsuit with a former woman scientist)

Thank you to Stanford, Bell Labs and ETH Zurich

ories

Stanfo

Ph.D.

1985-1

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

ETH Zurich

tenured Professor in Physics

since 1993

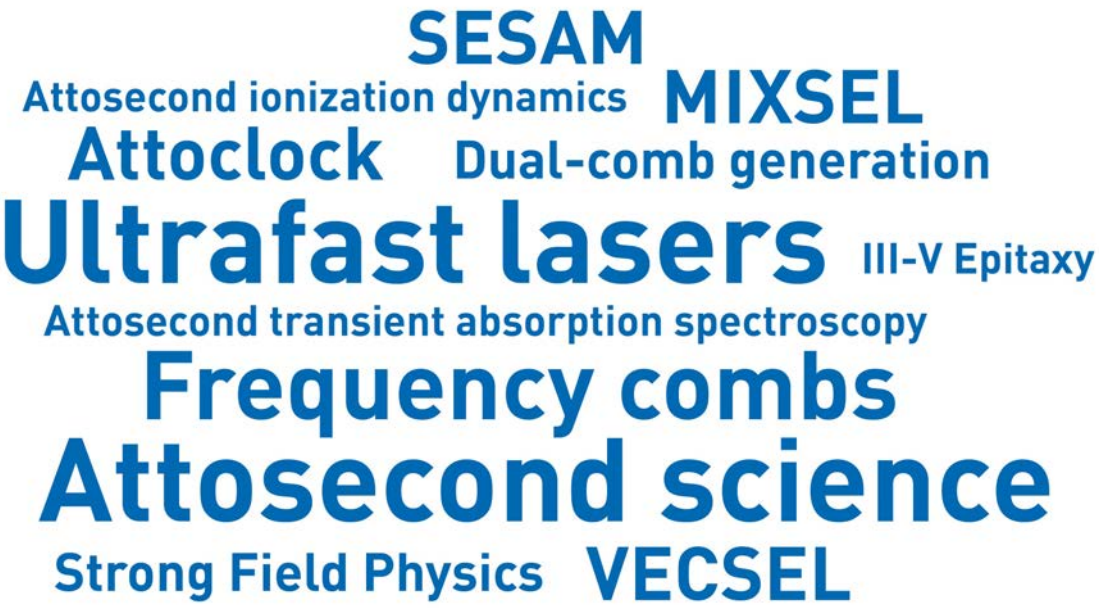
There was political pressure
to hire women at ETH Zurich with
direct appointment

1991 Swiss national women demonstration

- All my role models were men, I learned from the best and I worked goal and result oriented …
- As a professor at ETH I was not anymore rewarded for performance
- I believe that I was “sidelined” by my male colleagues for pushing for success and resources like a man

Foto from “We Shape Tech” Newsletter in Switzerland,
a global platform and movement for greater diversity in tech and innovation

I was hired into a
”woman position”
Anthony Johnson
encouraged me
to take it!



How does it all connect?

Why did I do it all?

What was driving the innovation?

Next I will give an overview with the main concepts and how they connect.
Research details beyond the scope of this talk.

Thank you to Stanford, Bell Labs and ETH Zurich

Stanford University

Ph.D. student

1985-1989

laser physics

ultrafast measurement techniques

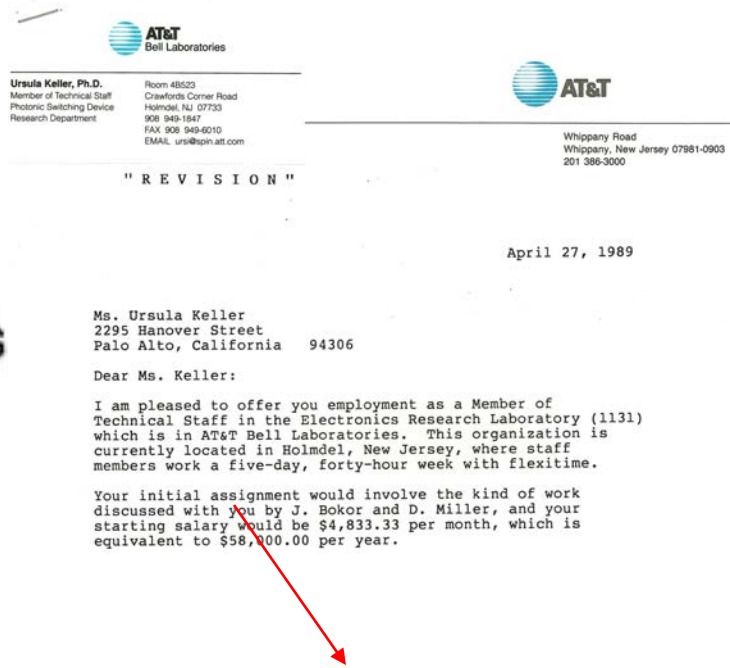
microwave measurement tools

Bell Labs, Holmdel

MTS

1989-1993

+ access to state-of-the-art semiconductor materials (MBE)



AT&T Bell Laboratories

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Whippany Road
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"REVISION"

April 27, 1989

Ms. Ursula Keller
2295 Hanover Street
Palo Alto, California 94306

Dear Ms. Keller:

I am pleased to offer you employment as a Member of Technical Staff in the Electronics Research Laboratory (1131) which is in AT&T Bell Laboratories. This organization is currently located in Holmdel, New Jersey, where staff members work a five-day, forty-hour week with flexitime.

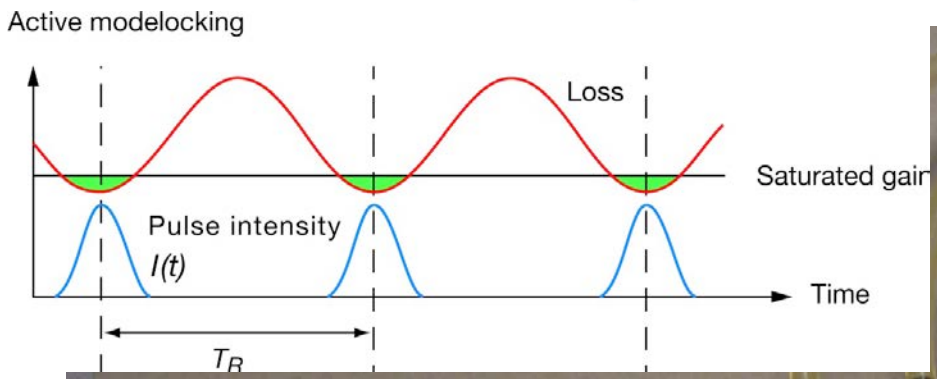
Your initial assignment would involve the kind of work discussed with you by J. Bokor and D. Miller, and your starting salary would be $4,833.33 per month, which is equivalent to $58,000.00 per year.

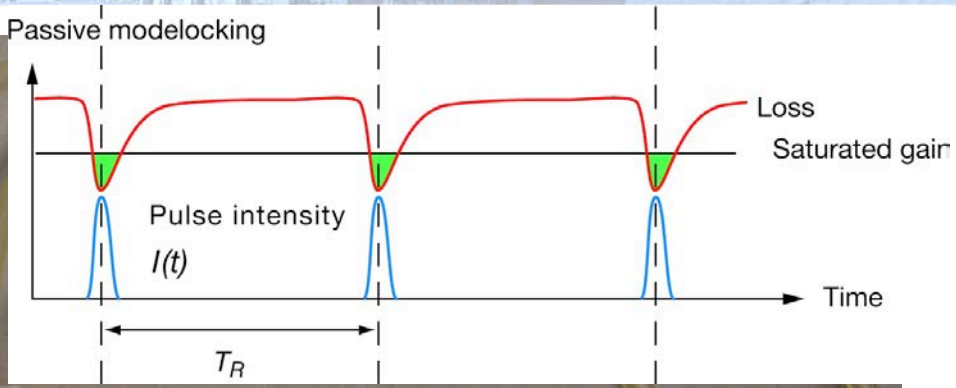
My initial job assignment:
"Do something different than anybody else, but it better be good"

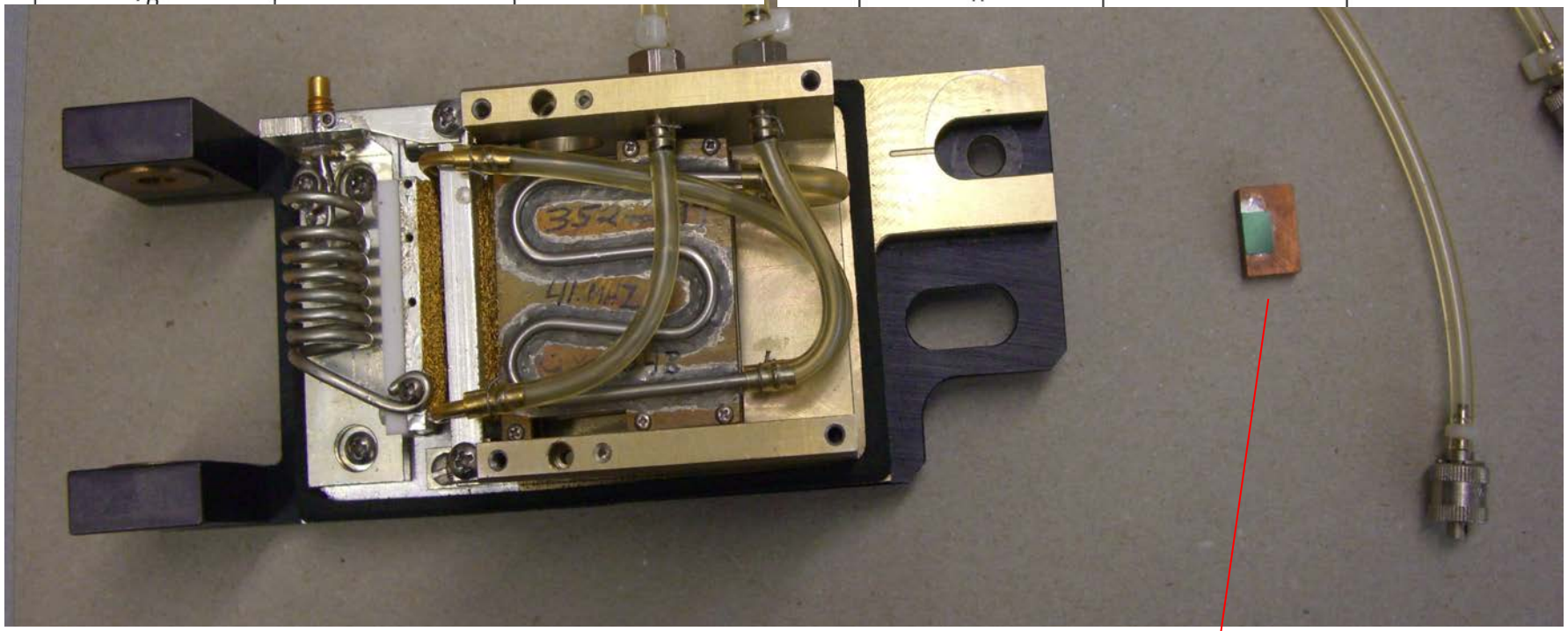
The outcome:
I did it – invented the SESAM!

Enabled interdisciplinary approach with the combination of solid-state lasers, semiconductor physics, and microwave measurement techniques.

SESAM innovation: before and after







acousto-optic modelocker
needs RF power and water cooling

SESAM modelocker
1992 at Bell Labs

Q-switching instabilities a problem until 1992

IEEE JOURNAL OF QUANTUM ELECTRONICS, VOL. QE-12, NO. 3, MARCH 1976

Parameter Ranges for CW Passive Mode Locking

HERMANN A. HAUS, FELLOW, IEEE

Abstract—CW passive mode locking of a homogeneously broadened laser is considered. In the coordinate plane, whose abscissa is proportional to the small-signal saturable absorber loading, and whose ordinate is proportional to the small-signal gain, the following regimes are laid out:

1) steady-state single-pulse mode-locking solutions;
2) stability against relaxation oscillations;
3) self-starting of mode locking.

The assumption is made that CW mode locking can be obtained only for a choice of parameters for which all three regimes overlap. We require further that the overlap regime be reached by a monotonic increase of small-signal gain (pumping), without passing outside regime 2). Under these conditions one may state requirements on the system parameters for the obtainment of single-pulse mode locking by a saturable absorber. The analysis explains why it has been impossible to mode lock passively the CW Nd:YAG laser, but passive mode locking of the CW dye-laser system is possible.

Early attempts to passively modelock solid-state lasers with small gain cross-sections such as Nd:glass, Nd:YAG …

- Used dye saturable absorbers (>1966)
- Resulted in Q-switching instabilities

The theoretical model by Haus in 1976 predicted that:

- “stable [passive] modelocking is unachievable [for solid-state lasers]”
- “steady-state [passive] modelocking is prevented by relaxation oscillations

From SESAM to attoscience: a 30-year ultrafast journey

Applied Research

SESAM modelocking

Spin-off Companies
Industrial transfer
IEEE JSTQE **2**, 435, 1996
Nature **424**, 831, 2003

Moving to ETH Zurich
1993

Pushing ultrafast laser performance

- **Q-switched microchip lasers**
  Last review: *JOSA B* **16**, 376 (1999)
- **Average power scaling** based on thin-disk laser oscillators. Currently 350 W
  Opt. Express **27**, 31465 (2019)
- **Pulse repetition rate scaling** in ps regime for opical clocking and optical communication
  New J. of Physics **6**, 174 (2004), *Appl. Phys. B* **99**, 53 (2010)
- Anne Tropper collaboration started **SESAM modelocked VECSELs** (2000)
  Physics Reports **429**, 67-120 (2006)
- **MIXSEL**: *Appl. Phys. B* **88**, 493 (2007) &
  Recent review: *Light Sci Appl* **4**, e310 (2015)

Challenge:

- No shared clean-room facility
- No MBE
  (and not sufficient start-up funds)
- Initially access to IBM Rüschlikon and EPFL

Solution: more young professors needed clean-room facilities

- Joint proposal with 6 professors from 3 departments in 1997
- **FIRST lab** started operation 2002
  https://first.ethz.ch/

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Fundamental Research

Moving to ETH Zurich

SESAM modelocking

Spin-off Companies
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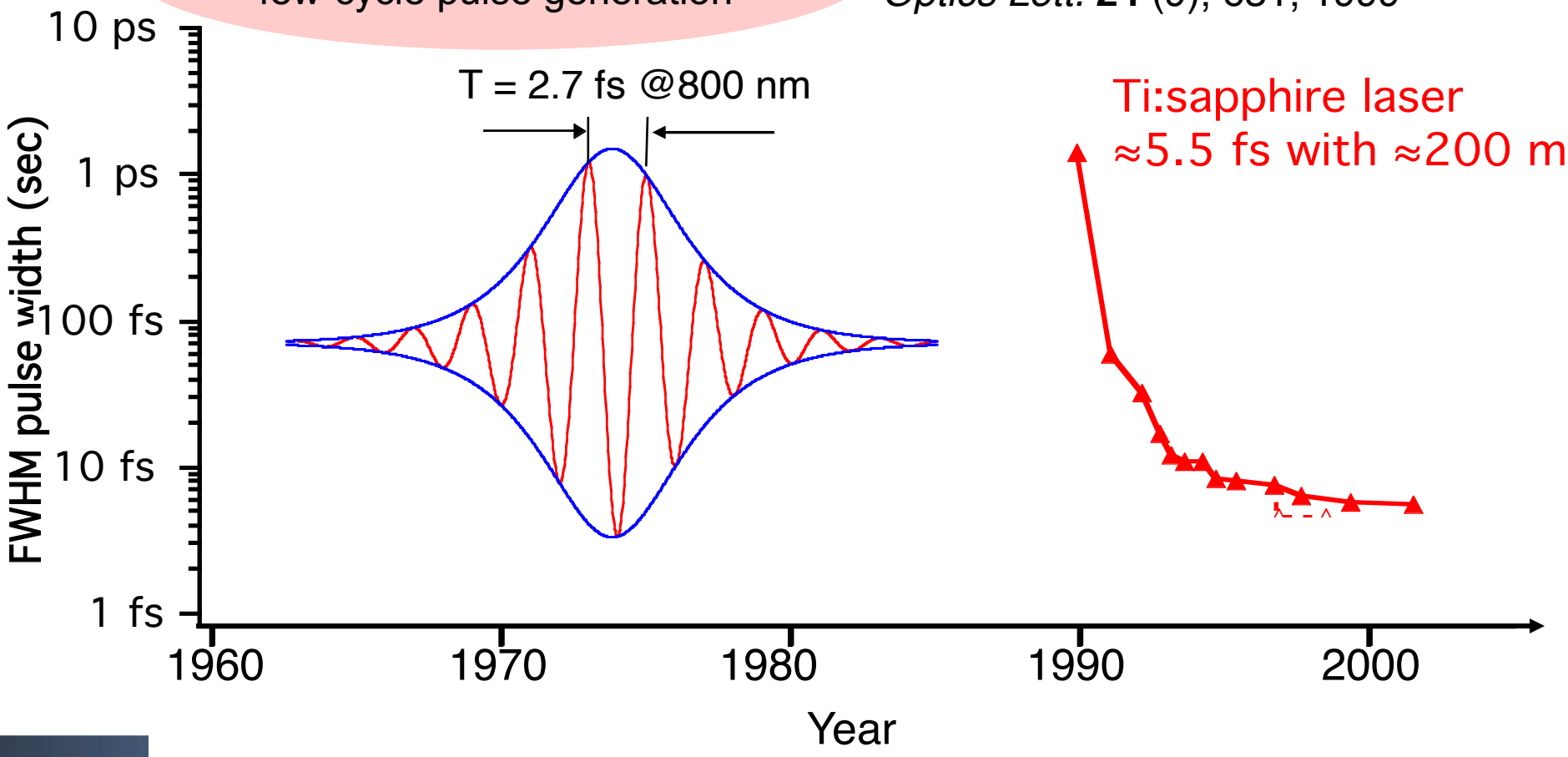
Shorter pulses
few-cycle pulse generation

Science **286**, 1507, 1999
Optics Lett. **24** (9), 631, 1999



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Applied Research

Fundamental Research

SESAM modelocking → Spin-off Companies, Industrial transfer

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Nature **424**, 831, 2003

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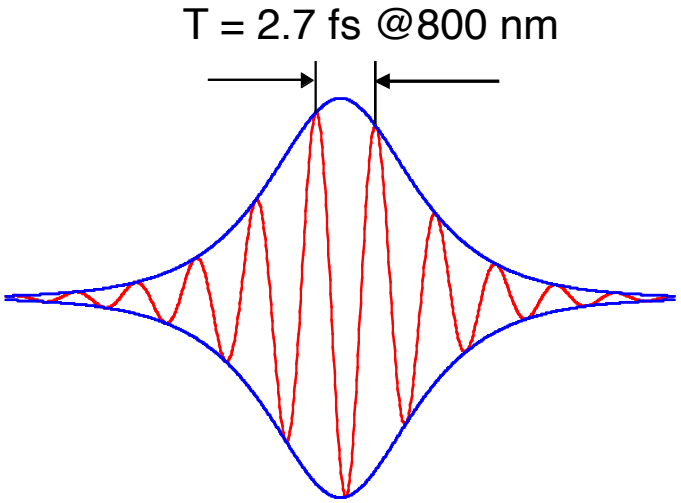
Pushing the frontier → Attosecond pulse generation driven by short femtosecond near-IR pulses



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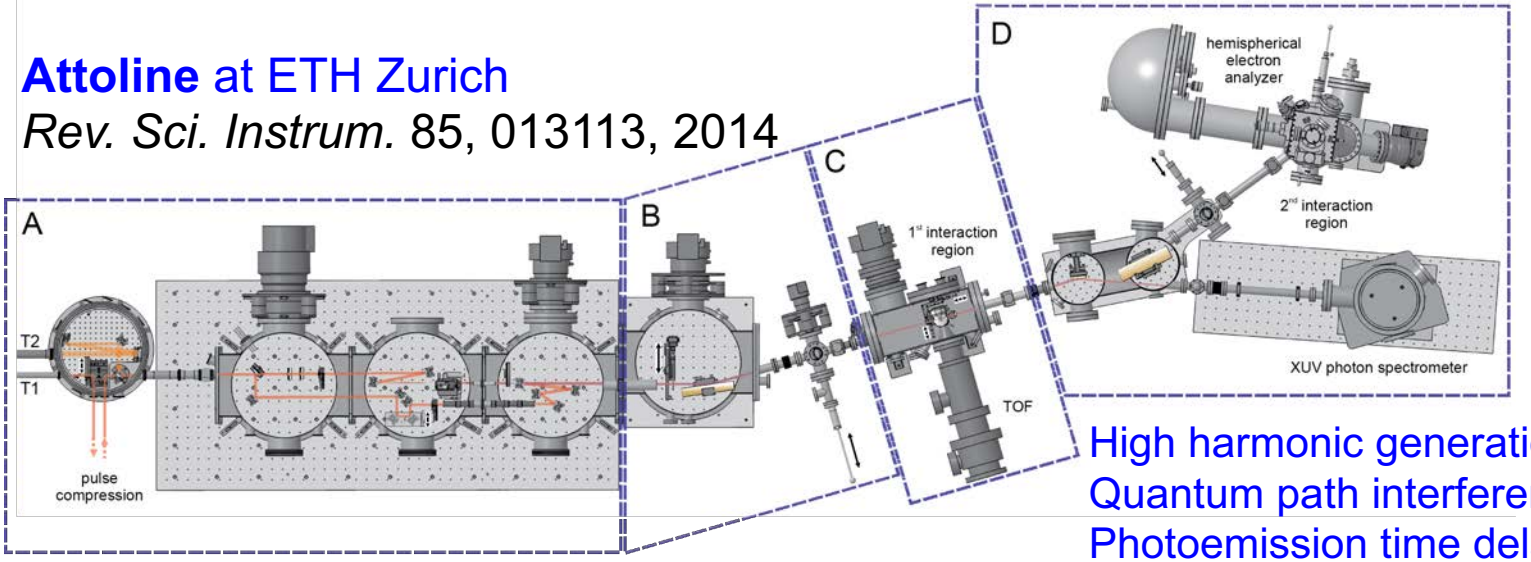
Pushing the frontier → Attosecond pulse generation driven by short femtosecond near-IR pulses

Attoline at ETH Zurich

Rev. Sci. Instrum. 85, 013113, 2014



High harmonic generation (HHG)

Quantum path interference in HHG (2008)

Photoemission time delays

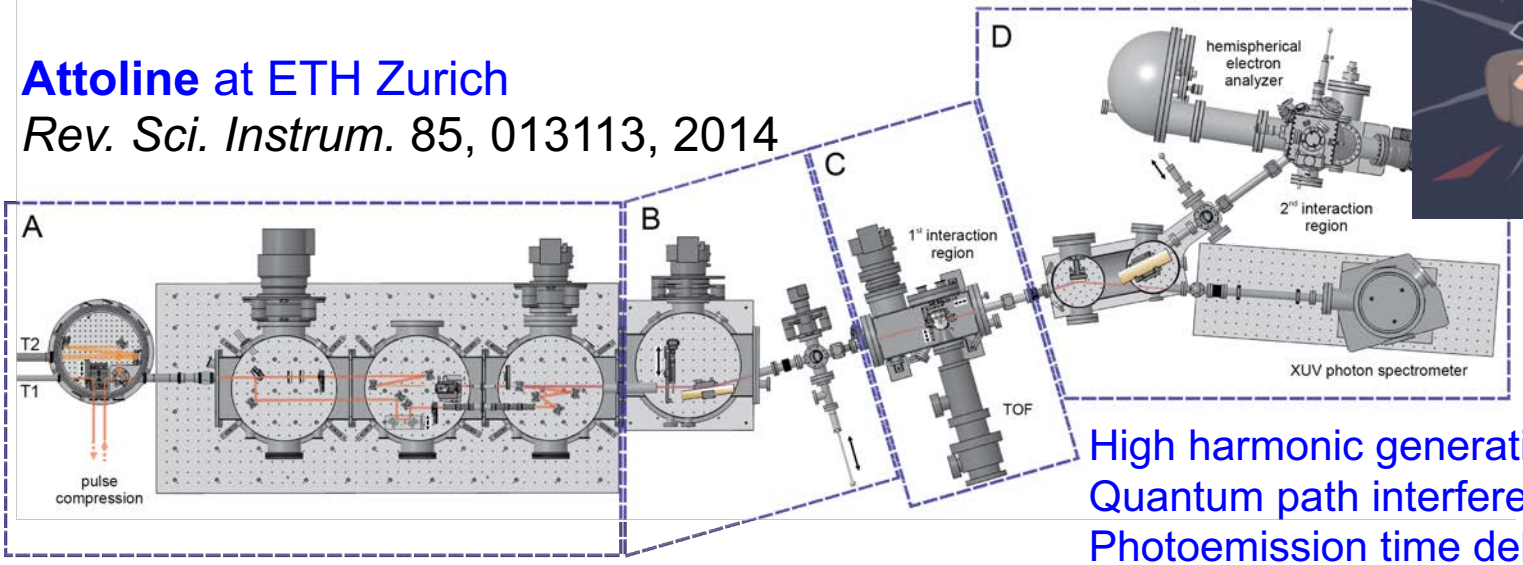
Petahertz electronics

From SESAM to attoscience: a 30-year ultrafast journey

- Learning about HHG, sabbatical in Lund in 2001 with Prof. Anne L'Huillier
- Attoline at ETH with HHG "took longer than anticipated" because it was not easy
- Needed much more resources than SESAM modelocking
- Enabled by Swiss National Science Funding programs (NCCRs) first as a PI then stepping up into a leadership position as the director of NCCR MUST in 2010
- **Today I have more than "my fair share of lab space" within the physics department**
  It has even been suggested by some colleagues that I had accumulated to much power!

Pushing the frontier → Attosecond pulse generation

Attoline at ETH Zurich
Rev. Sci. Instrum. 85, 013113, 2014



High harmonic generation (HHG)
Quantum path interference in HHG (2008)
Photoemission time delays
Petahertz electronics

From SESAM to attoscience: a 30-year ultrafast journey

Applied Research

Fundamental Research

SESAM modelocking

Spin-off Companies
Industrial transfer
IEEE JSTQE **2**, 435, 1996
Nature **424**, 831, 2003

Shorter pulses
few-cycle pulse generation

Attosecond science

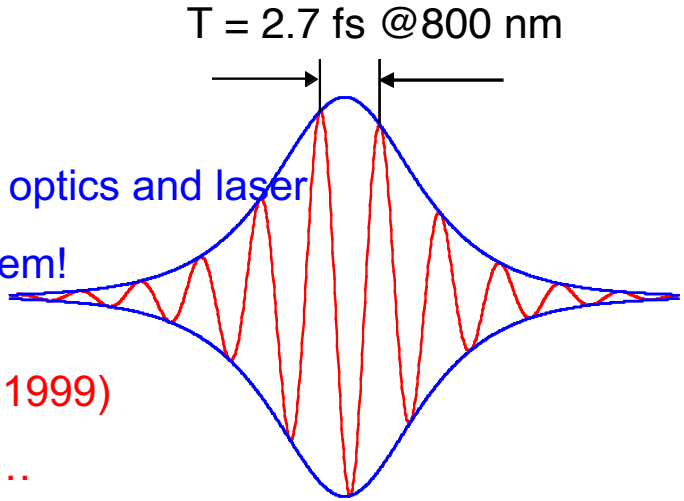
A new problem

"the holy grail in ultrafast lasers"
1995 Gordon conference on nolinear optics and laser

Everybody wanted to solve this problem!

We did it in collaboration with
Telle in 1999: *Appl. Phys.* B 69, 327 (1999)

We did not receive the proper credit …
There was a power mismatch between Max Planck Institute/NIST and us. Nobel prize in 2005 (J. L. Hall and T. W. Hänsch)



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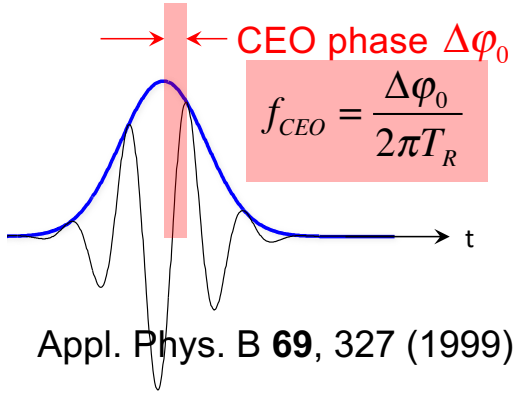
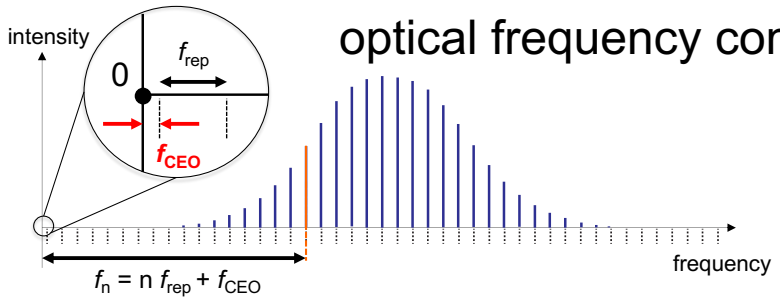
A new problem solved



Appl. Phys. B **69**, 327 (1999)

Frequency Metrology

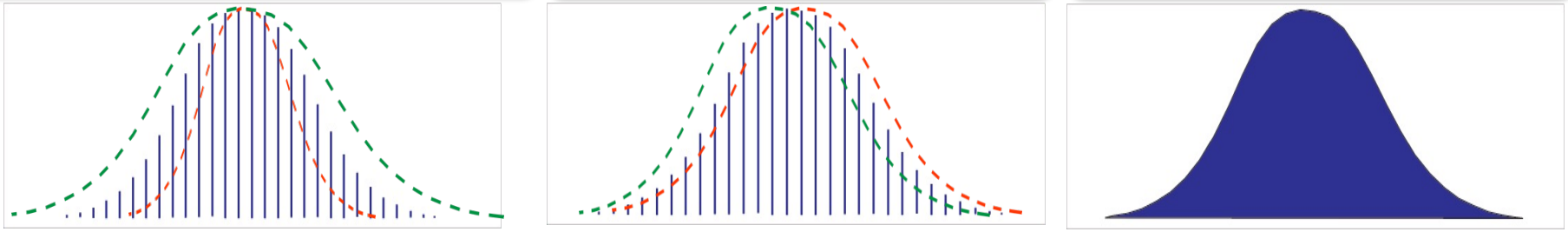


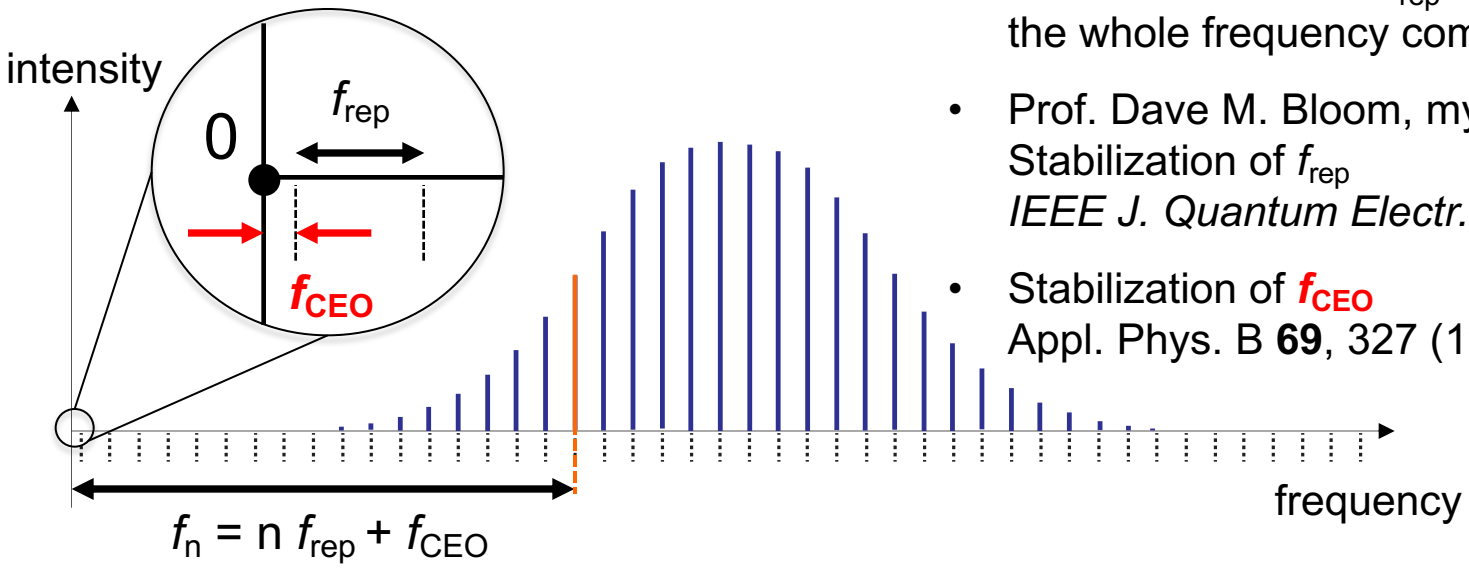
optical frequency comb

Frequency combs from modelocked lasers

free-running passively modelocked laser

unlocked repetition rate: f_{rep}	unlocked CEO: f_{CEO}	time average





- With stabilization of f_{rep} and f_{CEO}, the whole frequency comb is locked!
- Prof. Dave M. Bloom, my PhD adviser
  Stabilization of f_{rep}
  IEEE J. Quantum Electr. **25**, 817 (1989)
- Stabilization of f_{CEO}
  Appl. Phys. B **69**, 327 (1999)

[1] comb self-referencing: H.R. Telle, G. Steinmeyer, A.E. Dunlop, J. Stenger, D.H. Sutter and U. Keller, Appl. Phys. B 69, 327 (1999)

From SESAM to attoscience: a 30-year ultrafast journey

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SESAM modelocking

Spin-off Companies
Industrial transfer
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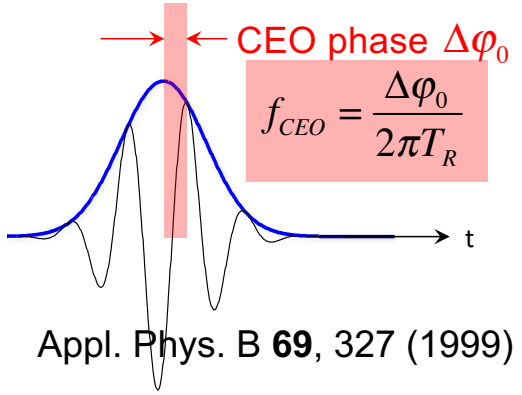
Shorter pulses
few-cycle pulse generation

Attosecond Science

A new problem solved



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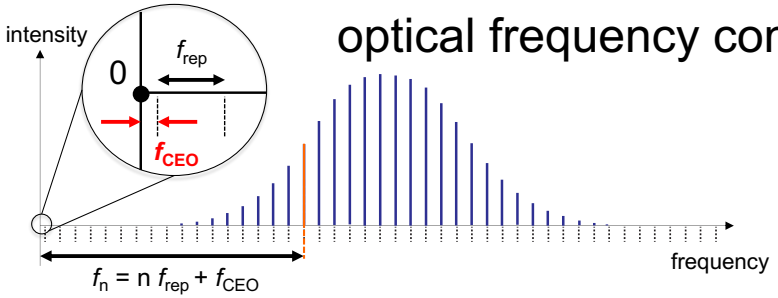
Attoclock

Frequency Metrology

optical frequency comb



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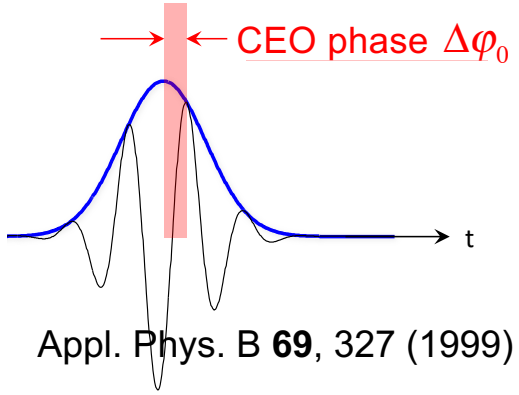


Appl. Phys. B **69**, 327 (1999)

Attosecond Science

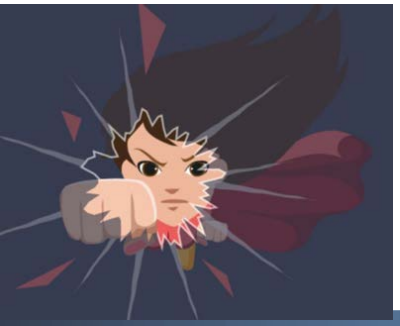
A new problem solved

European Research Council
Established by the European Commission
Supporting top researchers from anywhere in the world

Attoclock

Frequency Metrology

ERC adv. Grant 2012



- I kept expanding my research efforts
- Motivated by new cool problems and justified by excellent results
- My group grew, required more lab space, resources … I became a serious competition (and "problem") for my colleagues at ETH

From SESAM to attoscience: a 30-year ultrafast journey

Applied Research

Fundamental Research

SESAM modelocking

Spin-off Companies
Industrial transfer
IEEE JSTQE **2**, 435, 1996
Nature **424**, 831, 2003

Pushing ultrafast laser performance

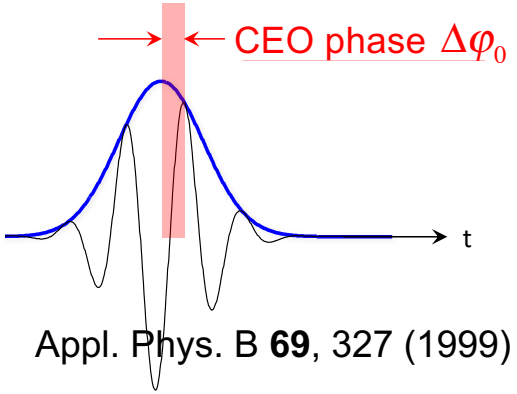
GHz & fs solid-state lasers

Dual-comb modelocking

FIRST lab starting 2002

A new problem solved

- **Q-switched microchip lasers**
  Last review: *JOSA B* **16**, 376 (1999)
- **Average power scaling** based on thin-disk laser oscillators. Currently 350 W
  Opt. Express **27**, 31465 (2019)
- **Pulse repetition rate scaling** in ps regime for opical clocking and optical communication
  New J. of Physics **6**, 174 (2004) & *Appl. Phys. B* **99**, 53 (2010)
- **100 kHz, few-cycle OPCPA** for attosecond science
  Optica **7**, 168 (2020) at 2.2 µm & *Opt. Express* **28**, 30275 (2020)
- Anne Tropper collaboration started
  SESAM modelocked VECSELs (2000)
  Physics Reports **429**, 67-120 (2006)
- **MIXSEL**: *Appl. Phys. B* **88**, 493 (2007) & Recent review: *Light Sci Appl* **4**, e310 (2015)

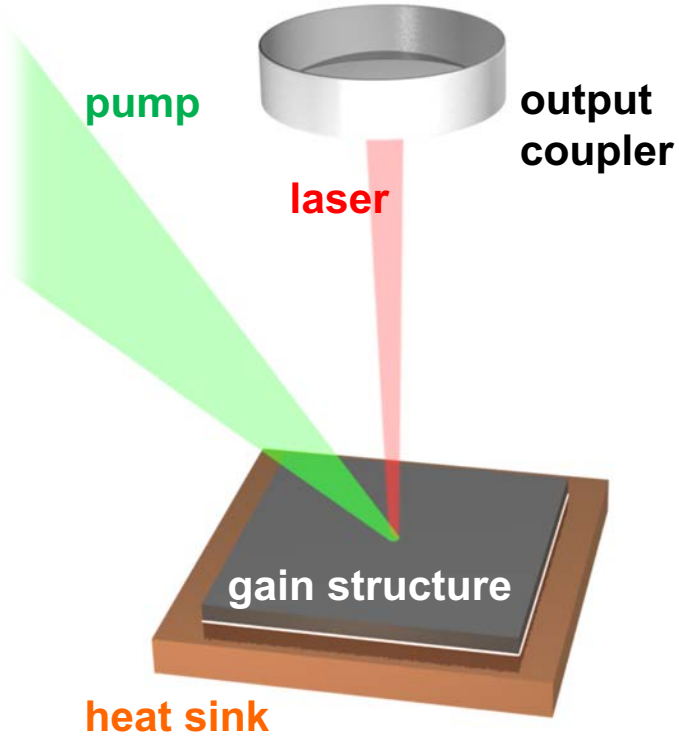


Appl. Phys. B **69**, 327 (1999)

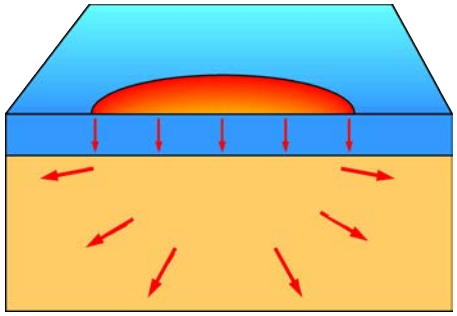
cw optically pumped VECSEL

OP-VECSEL = **O**ptically **P**umped **V**ertical-**E**xternal-**C**avity **S**urface-**E**mitting Semiconductor **L**aser

M. Kuznetsov et al., *IEEE Photon. Technol. Lett.* **9**, 1063 (1997)



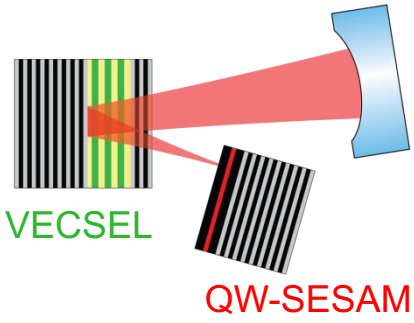
- Semiconductor gain structure with reduced thickness (≈ 10 µm)



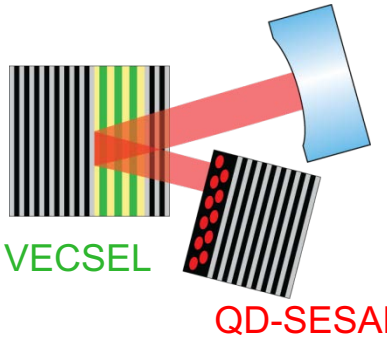
IEEE JQE 38, 1268 (2002)

SDLs = semiconductor disk lasers

Development to the MIXSEL

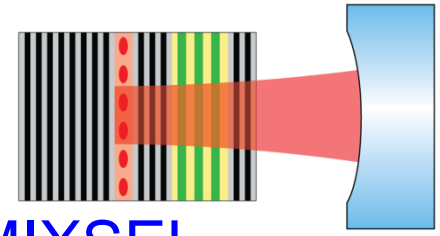


focusing on SESAM



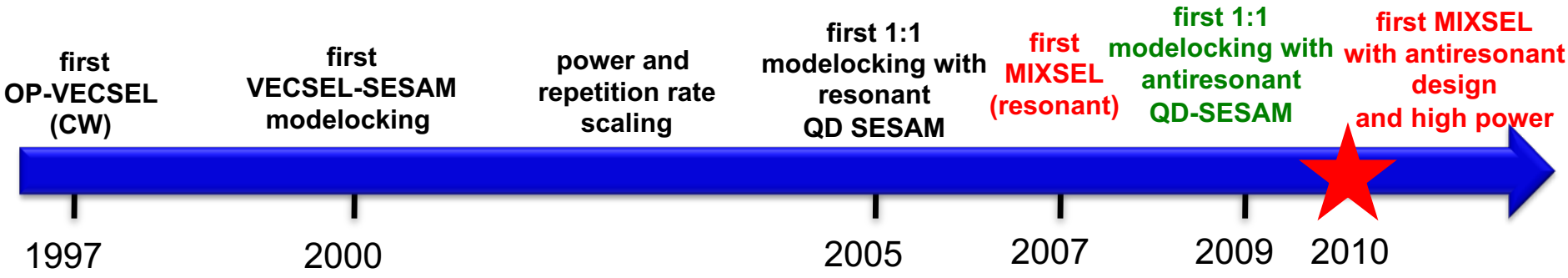
no focusing required
stronger saturation
1:1 modelocking

integration of absorber



MIXSEL

Modelocked Integrated External-Cavity
Surface Emitting Laser



VECSEL CW
>0.5 W
M. Kuznetsov et al., *IEEE PTL* 9, 1063 (1997)
not ETH Zurich

Quantum-Well SESAM
4 GHz, **2.1 W,** 4.7 ps
A. Aschwanden et al., *Opt. Lett.* 30, 272 (2005)

Quantum-Dot SESAM
50 GHz, 102 mW, 3.3 ps
D. Lorenser et al., *IEEE JQE,* 42, 838 (2006)

(Antiresonant) MIXSEL
2.5 GHz, **6.4 W,** 28 ps
March 2010
B. Rudin et al., *Opt. Express* in prep.

Optically pumped MIXSEL

2015 Review: B. W. Tilma *et al.,* "Recent advances in ultrafast semiconductor disk lasers", *Light Sci Appl* **4**, e310 (2015)

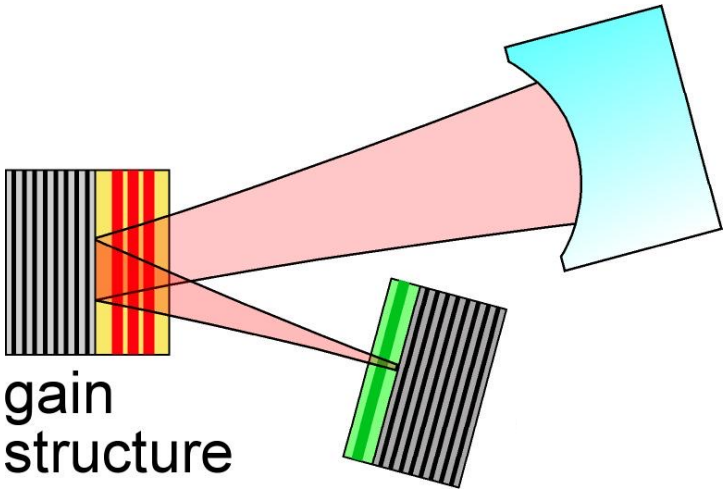
3-GHz pulse repetition rate: cavity length of ≈ 5 cm

Passively modelocked VECSEL

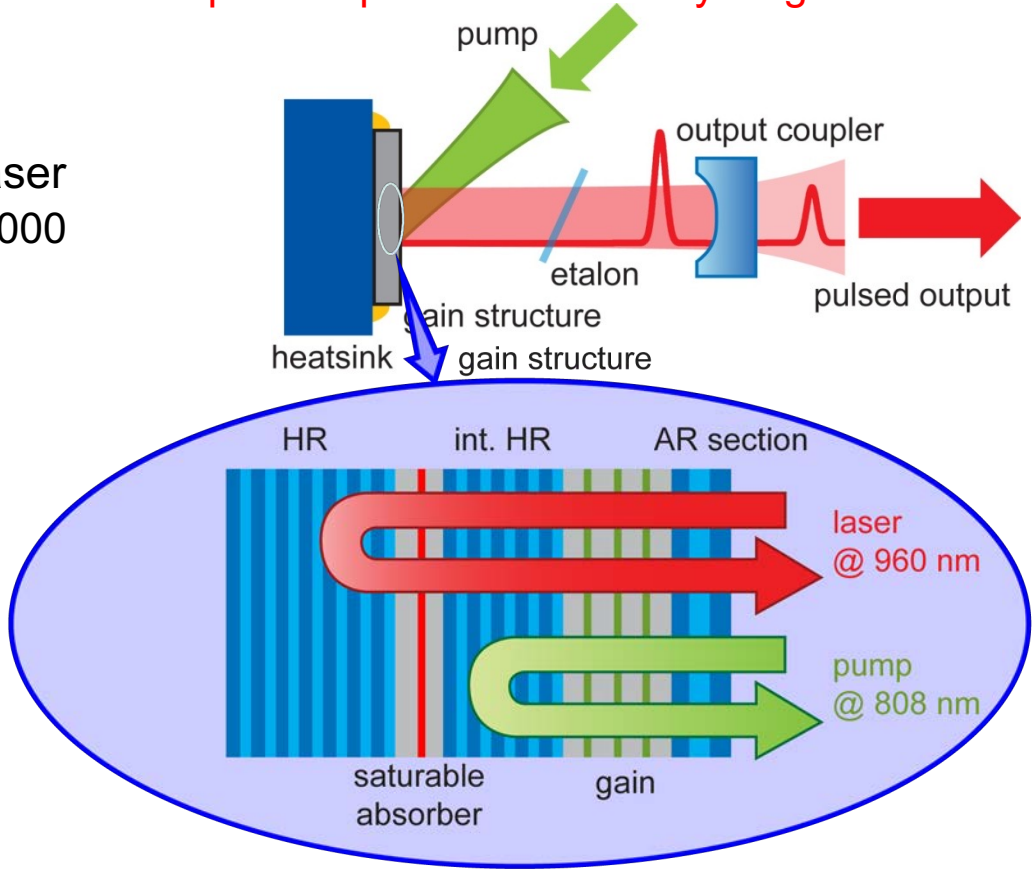
vertical **e**xternal-**c**avity **s**urface-**e**mitting **l**aser

S. Hoogland et al., *IEEE PTL* **12** (9), 1135, 2000

2006 Review with Anne Tropper:
Physics Reports **429**, 67-120, 2006



SESAM

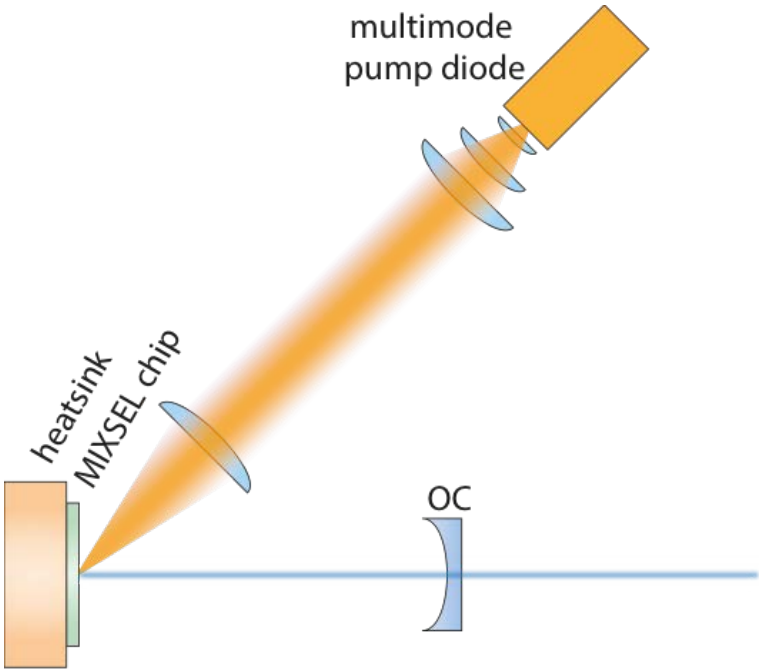


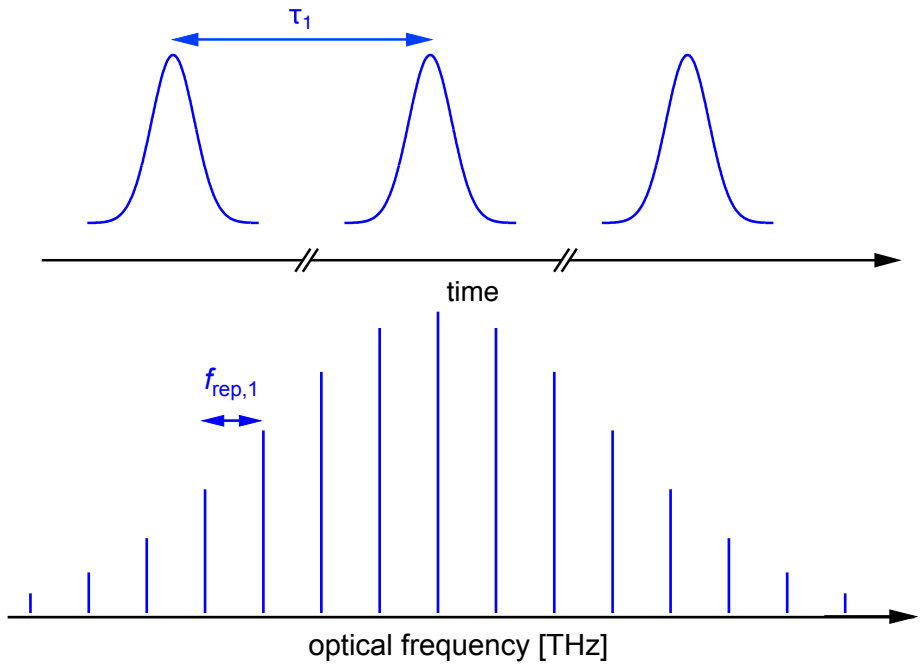
MIXSEL

modelocked **i**ntegrated e**x**ternal-cavity **s**urface **e**mitting **l**aser

D. J. H. C. Maas et al., *Appl. Phys. B* **88**, 493, 2007

Dual-Comb MIXSEL



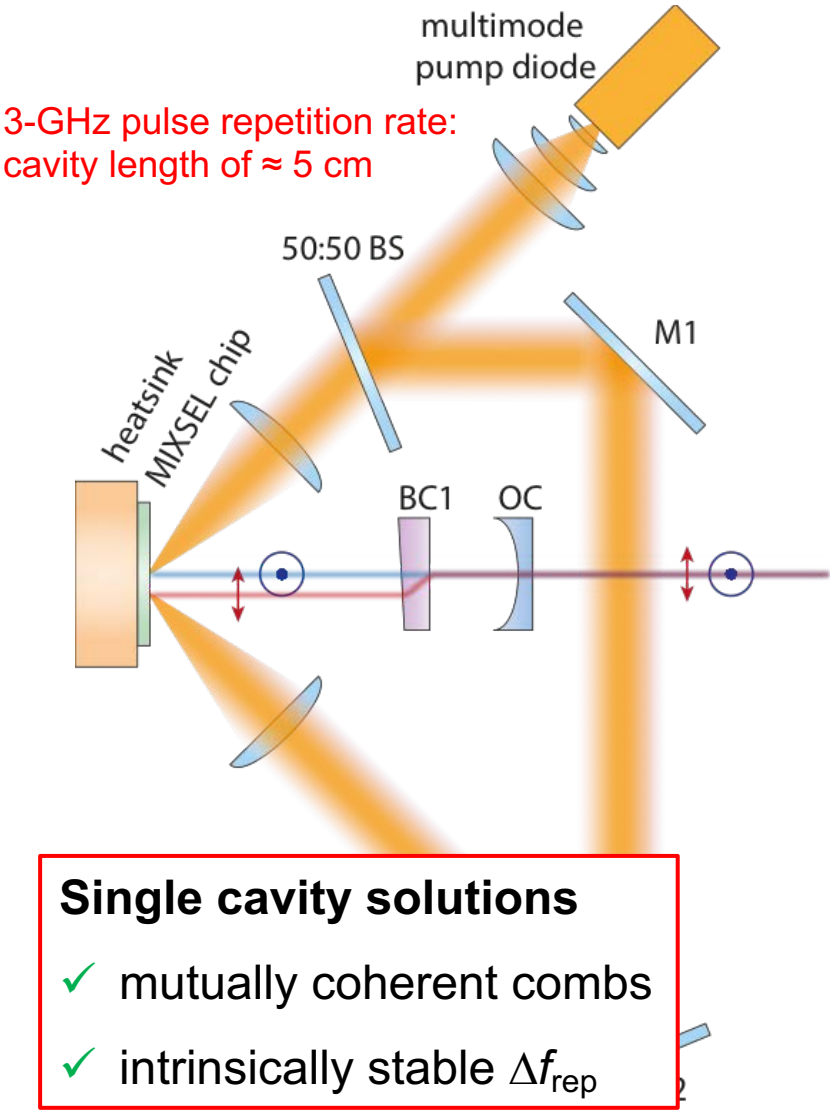


3-GHz pulse repetition rate:
cavity length of ≈ 5 cm

S. M. Link, A. Klenner, M. Mangold, C. A. Zaugg, M. Golling, B. W. Tilma, and U. Keller, *Opt. Express* **23**, 5521 (2015).

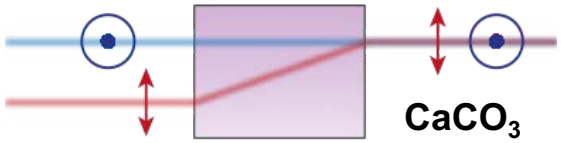
S. M. Link, D. J. H. C. Maas, D. Waldburger, U. Keller, *Science* **356**, 1164 (2017).

Dual-Comb MIXSEL



Single cavity solutions

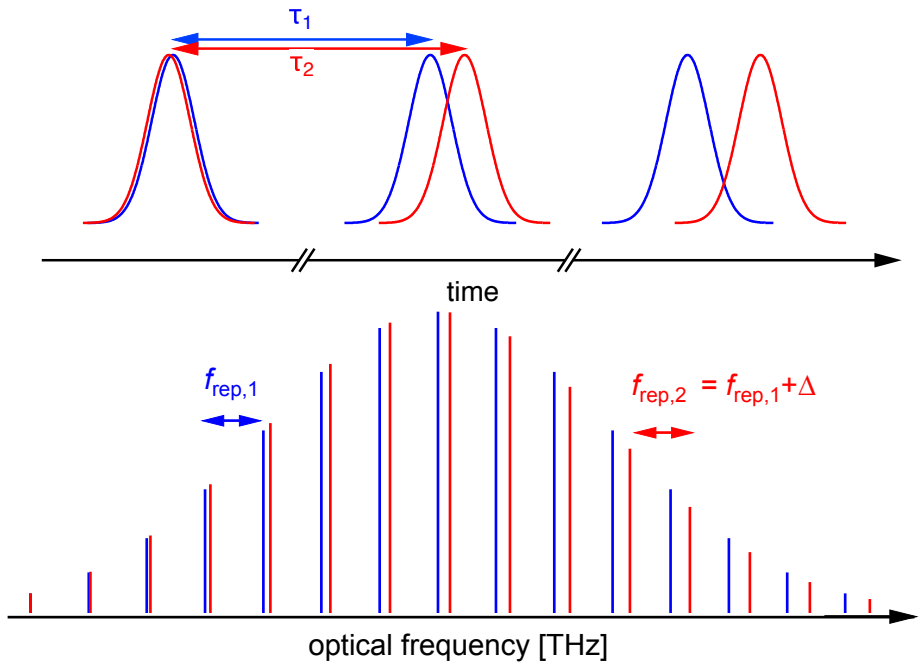
- ✓ mutually coherent combs
- ✓ intrinsically stable Δf_{rep}



Intracavity birefringent crystal (BC)

- Two spatially separated beams
- Orthogonal polarizations
- Different optical path length

Sandro Link (2017)

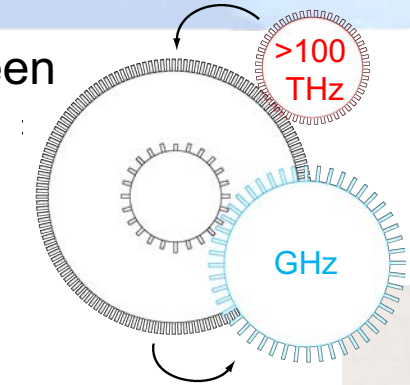


S. M. Link, A. Klenner, M. Mangold, C. A. Zaugg, M. Golling, B. W. Tilma, U. Keller, *Opt. Express* **23**, 5521 (2015).
S. M. Link, A. Klenner, U. Keller , *Opt. Express* **24**, 1889 (2016): SESAM decouples noise stabilization

Dual-comb spectroscopy

direct link between

THz and MHz

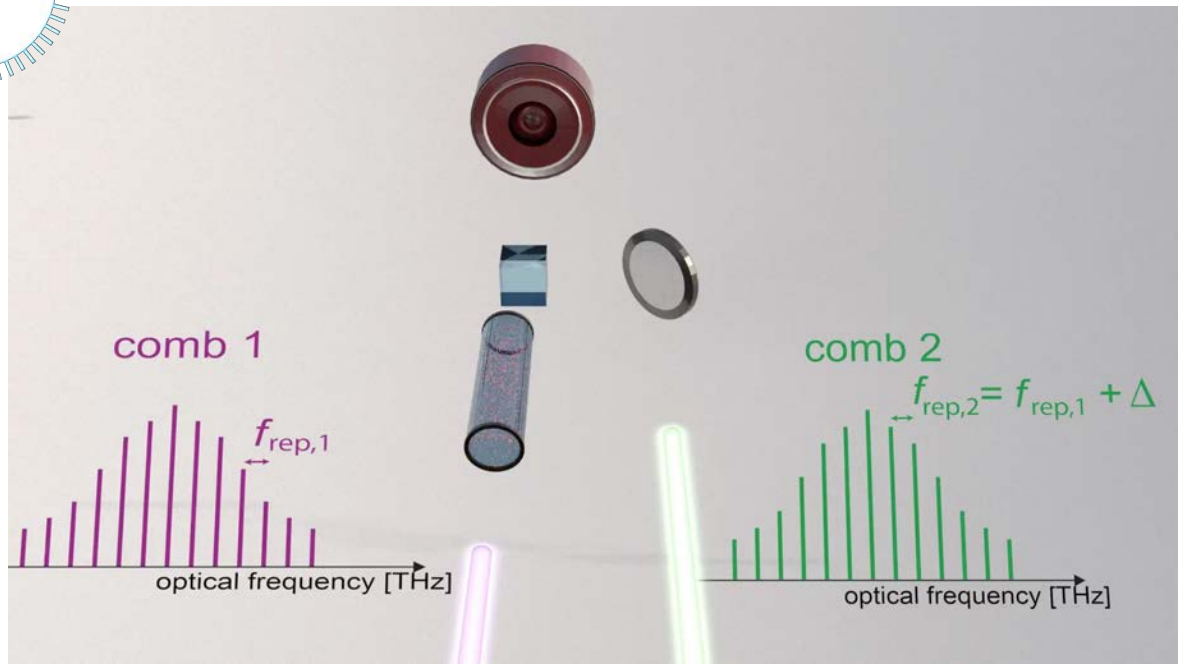


S. Schiller, Opt. Lett. 27 (9), 766–768 (2002)

I. Coddington, N. Newbury, and W. Swann, Optica 3 (4), 414-426 (2016)

Sandro
Link (2017)

Intensity photodetector
(resolves beat signal in microwave regime)



Dual-comb MIXSEL:

comb 1: $f_{rep,1}$

comb 2: $f_{rep,1} + \Delta f_{rep}$

Allows for dual-comb spectroscopy with **one unstabilized** semiconductor laser

Science **356**, 1164-1168, 2017

\+ high precision

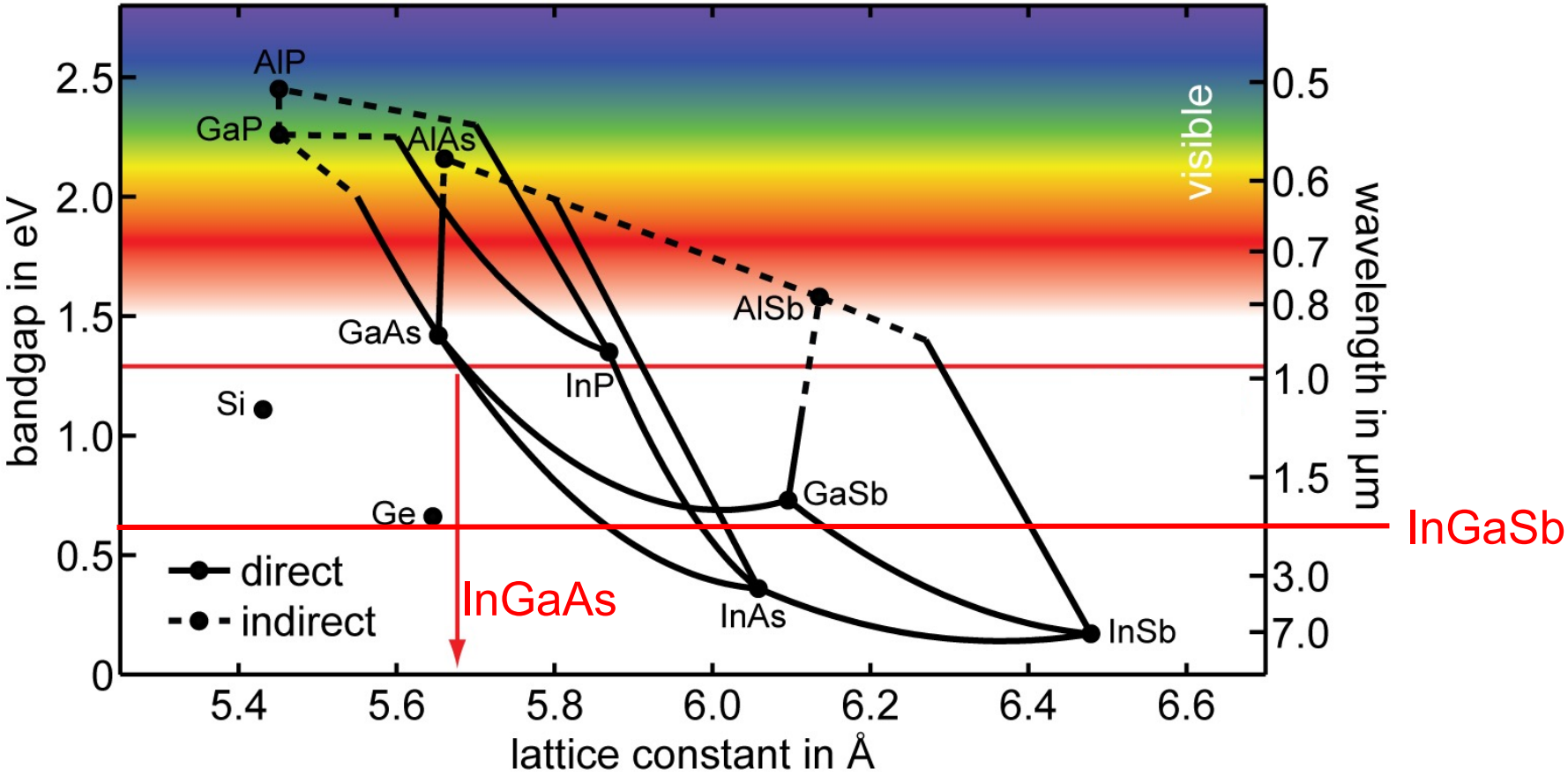
\+ very fast data acquisition: 1 ms for Δf_{rep} = 1 kHz

\- two frequency combs → complex & expensive

Online lecture, Stanford, 2021: Dual-comb modelocking and applications

https://ulp.ethz.ch/news/ulp-news/2021/05/dual-comb-modelocking-and-applications.html

Semiconductor bandgap engineering



- **Near-IR**: GaAs substrate, GaAs/AlAs DBR, InGaAs SESAMs and gain structures
- **Long-wavelength effort (>2 µm), started Jan. 2019 (ERC adv. grant):**
  GaSb Substrate, GaSb/AlAsSb DBR, InGaSb saturable absorbers
  (exploring both type I and type II structures)
  Plenary talk CSW21 online:

Compound Semiconductor Week, CSW-2021

15:00 - 16:00

Plenary presentation - Ursula Keller, ETH, Switzerland

Chairperson: Jan Linnros, KTH, Sweden

Prof. Ursula Keller, ETH, Switzerland
Semiconductor disk lasers and SESAMs: material and design optimization

Online Plenary Talk available here:
https://ulp.ethz.ch/videos/csw_2021_keller.html

InGaSb effort for longer wavelength >2 µm

Jonas Heidrich

Marco Gaulke

Dr. Ajanta Barh

Dr. Matthias Golling

Dr. Özgür Alaydin

FIRST

Center for Micro- and Nanoscience

This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme grant agreement No 787097

FIRST cleanroom facility at ETH Zurich

InGaSb effort for longer wavelength >2 µm


Jonas Heidrich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FIRST
Center for Micro- and Nanoscience

This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme grant agreement No 787097

First Key milestones achieved:

- SESAMs at 2 µm and 2.4 µm with full characterization
  Optics Express **29**, 6647 (2021)
- SESAM modelocked Cr:ZnSe lasers at around 2.4 µm
  250 MHz, 120 fs (1 W), 79 fs (0.8 W)
  Optics Express **29**, 5934 (2021)
  2 GHz, 155 fs, 0.8 W
  Photonics West (PW) 2022, submitted
- 800 mW cw InGaSb VECSEL at 2 µm with full characterization
  Optics Express & PW 2022 submitted
- First SESAM-modelocked VECSEL at 2 µm without intracavity heatspreader:
  2 GHz, 2.7 ps pulses, 89 mW
  Photonics West 2022, submitted

SESAM
Attosecond ionization dynamics MIXSEL
Attoclock Dual-comb generation
Ultrafast lasers III-V Epitaxy
Attosecond transient absorption spectroscopy
Frequency combs
Attosecond science
Strong Field Physics VECSEL

- Many international awards, high citation track record, many peer-reviewed journal papers (>480), book chapters (14), graduate textbook for ultrafast lasers (to be published, 750 pages), inventor on 21 patents and patent applications, …
- High citation results: Google scholar h-index 112, >48’000 citations
- Typically a group of 25 PhD students and postdocs
- Graduated and supervised 87 PhD students (will reach >100 by retirement)

How can I speak about my experience of gender bias and discrimination?

Gender issues are escalating for excellent women (CH, D, AU)

Need to take and present data, interviews (e.g. MIT report 1999)

Need to open a path for a solution with everybody engaged

Challenges and Barriers to Progress

- Hostile/Unwelcoming working culture
- Family and Care commitments
- We need resources to be successful and access to resources based on defined excellence criteria and performance
- Implicit and explicit bias – in peer review and grievance processes
- We need additional measures and political/leadership pressure for change

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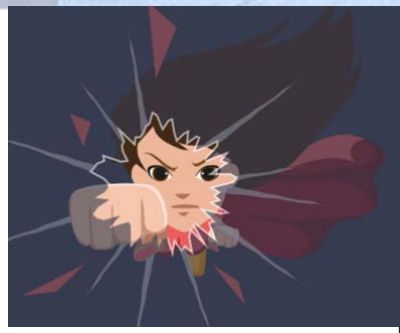
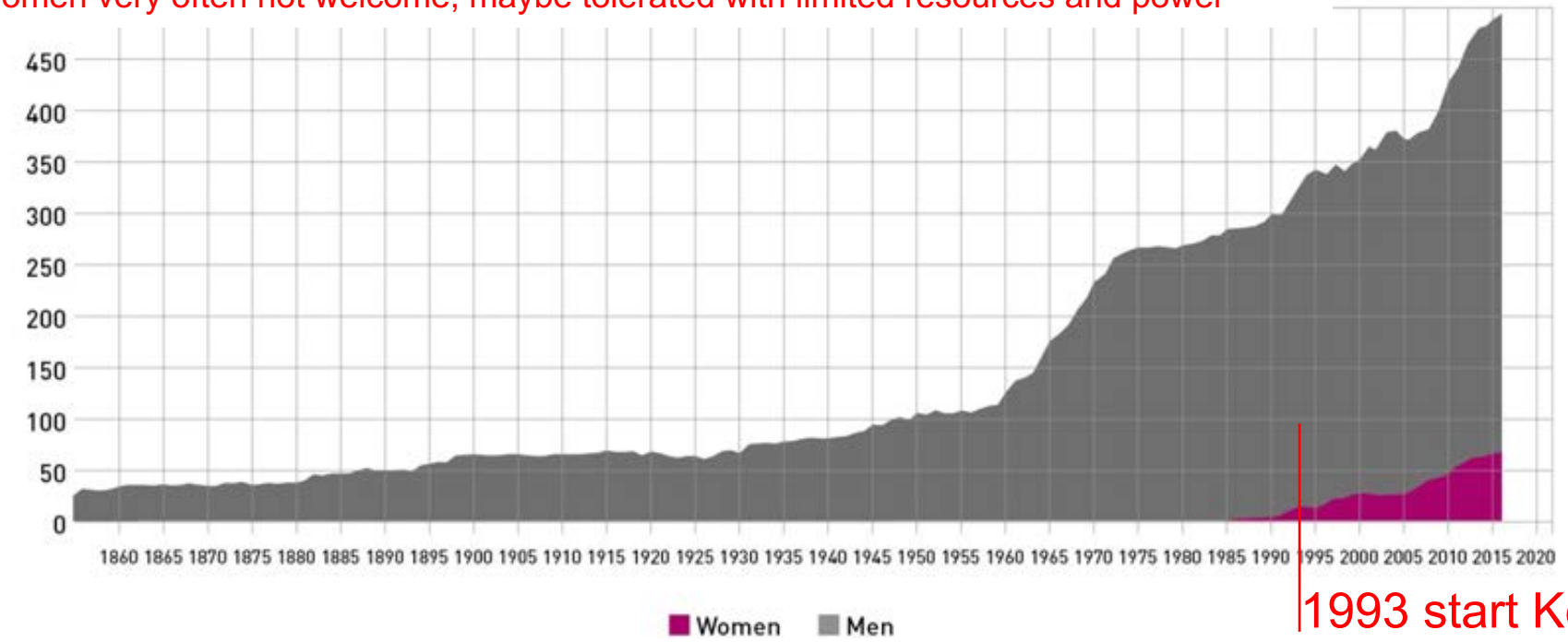
Professors at ETH Zurich, 1855-2016

- There is political pressure to increase women in science (required and justified)
- Increasing number of excellent women question many established privileges for our male colleagues
- Male dominated management culture and informal male networks affect current working culture
- Women very often not welcome, maybe tolerated with limited resources and power





1993 start Keller

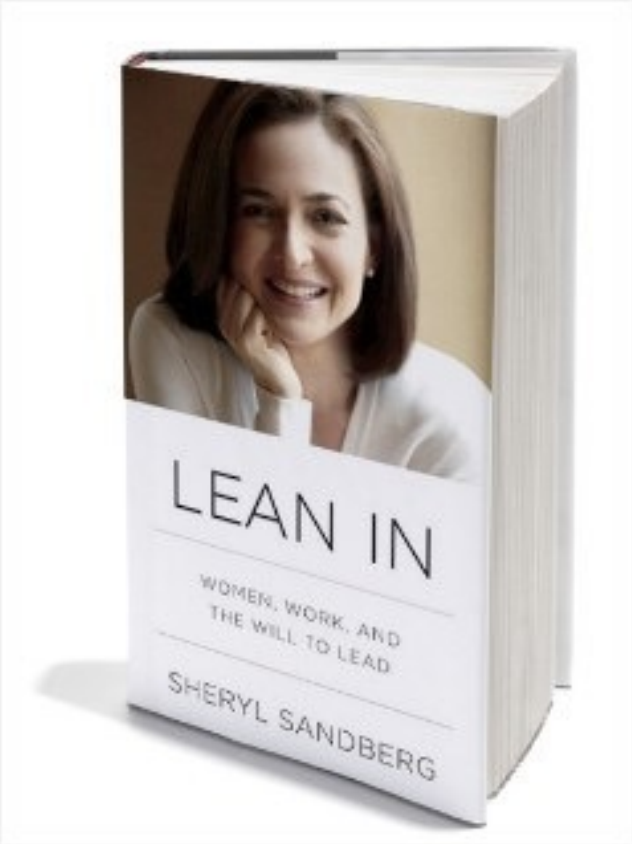
End of 2018 (2019)
13.3% (14.3%) female full professors: 53 (58) female, 346 male
21.9% (24.7%) female assistant professors (not all tenure track):
20 (24) female, 71 (74) male

equal!
Equal Opportunities for Women and Men

https://ethz.ch/services/en/employment-and-work/working-environment/equal-opportunities/strategie-und-zahlen/gender-monitoring.html

Women in leadership positions

Recommended for reading:



"When a woman excels at her job, ***both male and female co-workers*** *will remark that she may be accomplishing a lot but is 'not as well-liked by her peers' .*

She is probably also 'too aggressive', 'not a team player', 'a bit political', 'can't be trusted' or 'difficult'."

In a hostile working culture this can result in:
character assassination ("Rufmord")

… because in this case women do not get the normal benefit of doubt

Manager Magazin 2020

“Mission: Character Assassination”

MISSION: RUFMORD

ARBEITSRECHT Kantige Führungskräfte werden zunehmend Opfer anonymer Vorwürfe. Vor allem an Universitäten und den höchsten deutschen Forschungseinrichtungen verrohen die Sitten.

Foto: Evelyn Dragan für manager magazin

Prof. Heike Egner

TRENDS ARBEITSRECHT

DEGRADIERT
Die Neurowissenschaftlerin **Tania Singer** war ein Star der Max-Planck-Gesellschaft. Nach anonymen Vorwürfen musste sie ihr Direktorenamt niederlegen.

Prof. Tania Singer

RAUSGEWORFEN
Die Astrophysikerin **Marcella Carollo** von der ETH Zürich sah sich anonymer Kritik an ihrem Führungsstil ausgesetzt. Sie musste die Uni verlassen.

Prof. Marcella Carollo

Accusation

“significant misconduct in management or inappropriate leadership”

The accusers remained anonymous …

The allegations were aimed at their personal integrity

Poor governance without independent grievance procedures

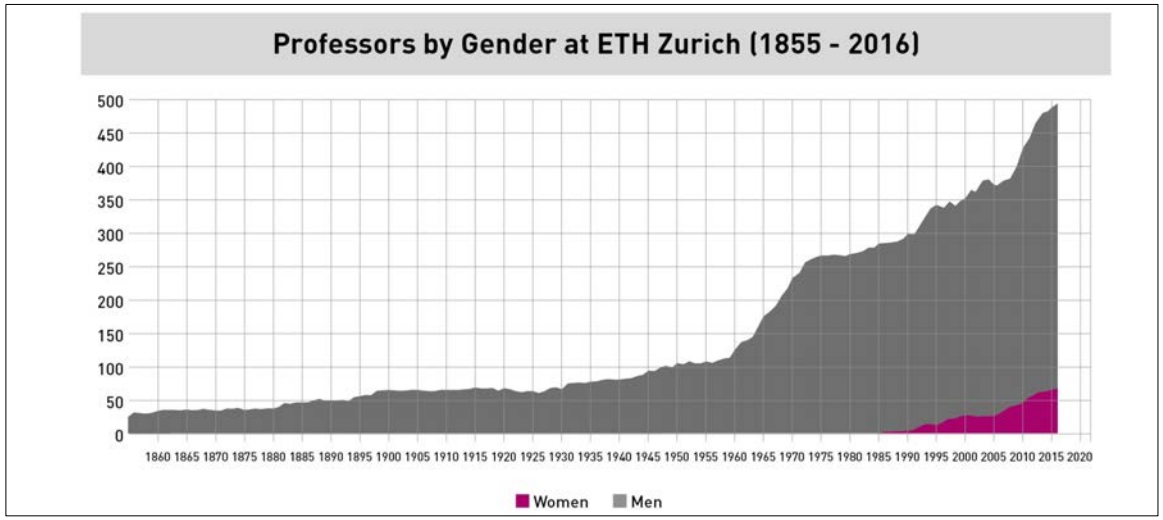
Thomas Sattelberger:

“This is a career risk, especially for women”

Escalation of hostility against women

- We experience an escalation of hostility against women, partially triggered by the political pressure to hire more women
- This partially results from a perceived feeling of injustice and a feeling of “reverse discrimination” of many male colleagues.
- There is a lack of understanding of current gender issues and problems and requires broader education

In the beginning, equal treatment may feel like “reverse discrimination” – but it’s not!



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Example of a broader education effort:
The Juno*-type project maybe a possible approach for a culture change that will benefit not only women, but will improve science for all.

* https://www.iop.org/about/IOP-diversity-inclusion/project-juno - gref

The “Keller case” in physics department at ETH Zurich:

- 1992 hired into a tenured professor position (i.e. associate professor) within the Institute of Quantum Electronics (IQE)
- March 1993 start at ETH, after Swiss national woman demonstration in 1991, approached for a direct hire in 1992 for a “woman position”
- First tenured woman professor in physics at ETH Zürich
- Significantly less resources than average in IQE (at that time no transparency of resource distributions within department)
- … BUT the written promise for more with good performance and retirement of older professors
- … and the promise that there will be a daycare in case I will consider having children

pretty much ignored by my male colleagues, with some help from Prof. Melchior (IQE)

My independent research at Bell Labs got me well prepared
… just moving forward again focusing on performance and results

Measurable results: current status physics at ETH

Lets consider the hiring statistics in my department:

1991 Swiss national woman demonstration: increased political pressure for more women at ETH

1992-1993
Direct hire (i.e. “Direktberufung” – no selection committee) of two women professors:
Ursula Keller, tenured associate professor
Felicitas Pauss, assistant professor

1994 – 2016 (i.e. for 22 years)
All professor selection committees resulted in hiring a male professor with **24:0**
On the level of permanent senior-scientist **≈33:1** (not dual-career)
One dual-career appointment into a tenured professor position: Marcella Carollo (2002)
Two dual career appointment as senior scientist (Chitra Ramasubramanian, Aude Gehrmann-de Ridder)

2017
Prof. Simon Lilly initiated an emergency program to appoint female tenure-track faculty (supported also by Prof. Keller, his wife Prof. Carollo and ETH WPF efforts)

2019 Prof. Carollo terminated, “Carollo case” very controversially discussed in the media, currently at Swiss Federal Administrative Court

2018-2020: The “Carollo case” at ETH made this possible
5 tenure-track women assistant professors hired (even more without tenure track)

Challenges and Barriers to Progress

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1996 Prof and motherhood not considered possible

- My promotion from associate (“ausserordentlich”) professor to full professor stopped during first pregnancy in 1996:

  questioned if I could do my job with children!

- ... big mess until promotion in Oct. 1997

  4.5 years after my start as an associate professor in March 1993

  Peers were promoted from associate to full professor without much efforts all within about 3 years after start at ETH (year of start):
  Pescia (1992), Blatter (1993), Ensslin (1995): all had young children!

Yes you can do it!

Dual Career both working full-time
Kids initially in daycare 5 days a week (Foto 2004)

- **Need special measures. Having children is not "business as usual"**
- Need reliable daycare, and additional support in case of sickness, important work deadlines etc.
- Focus on essential tasks and receive additional help:
  - Postdoc program in physics department ETH Zurich (add an additional PhD student)
    https://www.phys.ethz.ch/research/research-promotion.html
    OPN column Dec. 2016: http://www.nccr-must.ch/libraries.files/opnreflectionsdiversitydec2016
  - ERC starting grant (within 7 years after PhD + one more year per child)
  - Professor: no teaching for one year around birth of child (job flexibility is actually an advantage)
  - …

Challenges and Barriers to Progress

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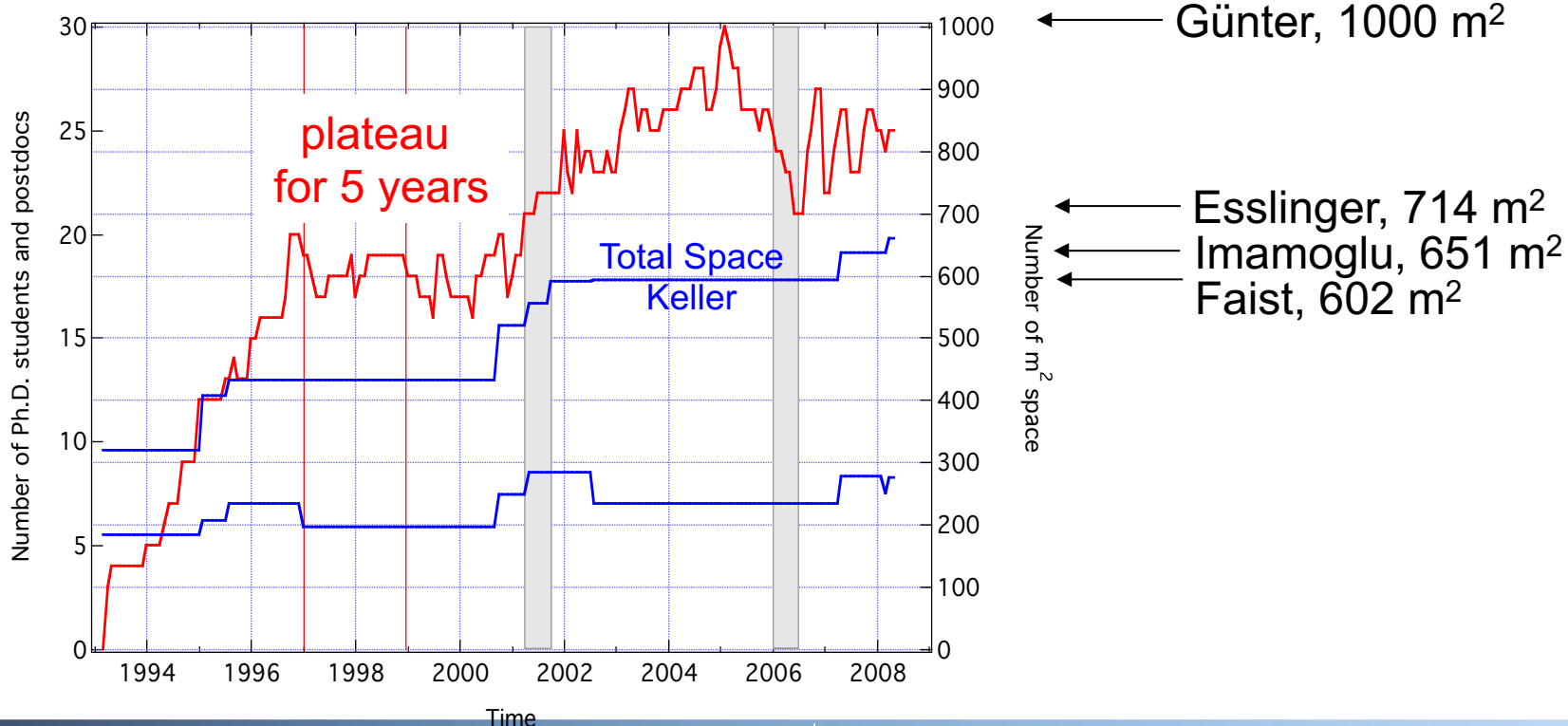
Losing goodwill in department in 1997

- **Insufficient accountability & transparency in resource distribution**
  - Promise when hired in 1992: “get more with good performance and when needed”
- **After promotion dispute 1997**, marginalized within physics department
  - considered a trouble maker, no space increase, no info, no leadership positions, Keller personally threatened losing goodwill by head of institute
  - It took about 10 years to have a comparable level of space as newly hired colleagues had from the start (Esslinger 2001, Imamoglu 2002, Faist 2007)



Losing goodwill from ETH leadership

- **Losing goodwill from ETH president:**
  - Suffering from “lost goodwill” in my department during promotion dispute 1997
  - Right after the birth of my 2nd son (end of 1998) – problems with promised access to ETH daycare – asked again for help from the new president
  - The new president was also unsupportive of my requests for more resources as promised in my employment contract

“I should keep quiet or else I will lose his goodwill, the goodwill of the full leadership of ETH, and many other people in Switzerland!”

- This was the first time in my life I was actually scared:
  two young children, a husband who just started a company, and with me being responsible for the family income ….
- This was in principle against the law of equal rights, but there was nowhere to go and ask for help (legal grievance process takes many years, costs around 300 to 500 kCHF and pretty much kills your career) …. 1999 I considered leaving

MIT Report 1999

- During same time period. Senior women professors at MIT got organized and reported discrimination in resource distributions and culture to president
- MIT President started a more detailed survey
- MIT report published, acknowledging gender discrimination and announced additional measures

MIT Faculty Newsletter Vol. XI No. 4

Introductory Comments

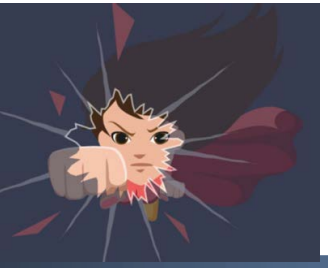
President Charles M. Vest

I commend this study of Women Faculty in Science to all of my faculty colleagues. Please read it, contemplate its messages and information, and act upon it personally and collectively.

I learned two particularly important lessons from this report and from discussions while it was being crafted. First, I have always believed that contemporary gender discrimination within universities is part reality and part perception. True, but I now understand that reality is by far the greater part of the balance. Second, I, like most of my male colleagues, believe that we are highly supportive of our junior women faculty members. This also is true. They generally are content and well supported in many, though not all dimensions. However, I sat bolt upright in my chair when a senior woman, who has felt unfairly treated for some time, said "I also felt very positive when I was young."

We can take pride in the candor of dialog that these women have brought to this issue and in the progress that we have made, but much remains to be done. Our remarkably diverse student body must be matched by an equally diverse faculty. Through our institutional commitment and policies we must redouble our efforts to make this a reality.✣

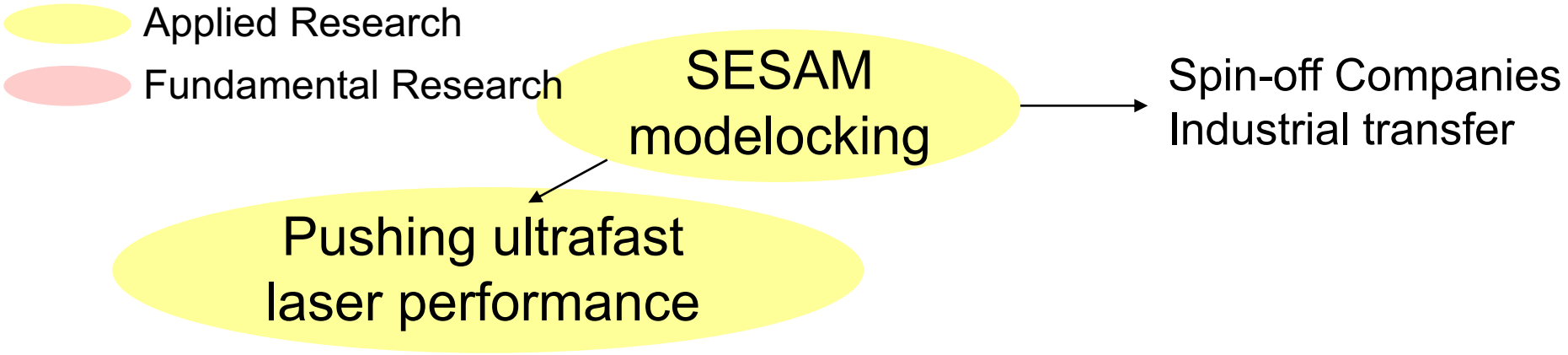
[Charles M. Vest can be reached at cmvest@mit.edu]



This helped me to stay in academia, after I just had two children in 1997-1998

- *"I am not alone and it is not my fault …"*
- *"the best I can do is to be successful ...*
  then one day my colleagues will treat me with more respect"

Do photons show gender bias?



In hindsight I was lucky that I started my career in applied research:

- SESAM modelocking was **a success story with real "customers" (not peers!)**
- **High impact** results with industrial relevance and high citation track record
- Building better lasers with **measurable results reduces gender bias in peer review**
- **Good funding base with high acceptance rate reduces gender bias:**
  Swiss National Science Foundation (SNF) grants (acceptance rate 80%-50%), additional industry related grants, SNF program funds: ultrafast lasers have many applications.

Photons do not show gender bias!

Challenges and Barriers to Progress

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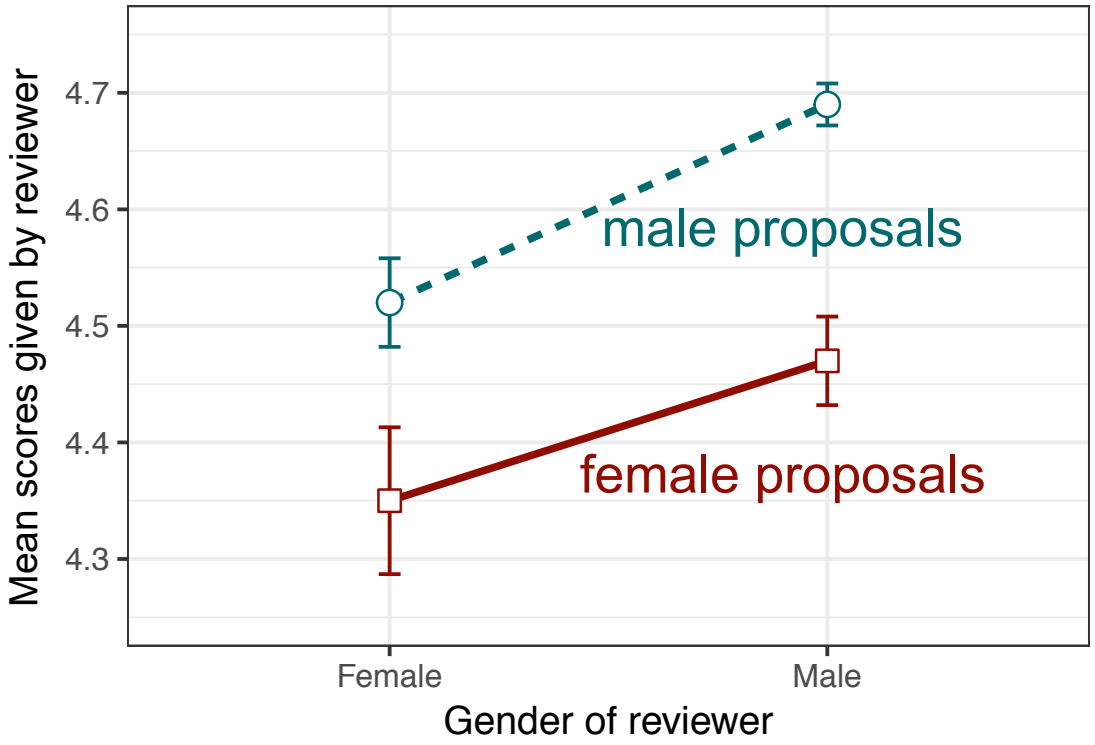
Swiss National Science Foundation (SNF)

Peer-review is not gender blind



40’000 reviewers in project funding 2009-2015

Gender of applicant

Female

Male

Women are rated lower (by men and women)

Rating of female reviewers lower (of men and women)

Solution for such problems:

- Get gender data first
- Well defined evaluation criteria and reduce conflict of interest in peer review
- Correction of scores for potential gender bias (becomes easier with more women)
- Limit number of funded grants per PI (currently done at SNF, ERC grants, …)

How a postdoc can hurt a woman professor

2006 I was declared
"incompetent" in attoscience
by my colleagues

ordered in writing to stop spending
by new director of NCCR QP
on my funded project
(SNF president was copied!)

because Postdoc is leaving!

My key success (after Postdoc left in 2006) was the invention of Attoclock in 2008

Science AAAS

Attosecond Ionization and Tunneling Delay Time Measurements in Helium
P. Eckle, *et al.*
Science **322**, 1525 (2008);
DOI: 10.1126/science.1163439

erc
European Research Council
Established by the European Commission
Supporting top researchers from anywhere in the world

ERC adv. Grant 2012

Situation in Nov. 2006:

What is different
compared to my male colleagues?

- Postdocs are coming and going: business as usual.
- Every professor is expected to be competent to organize personnel
- I did not know of a single case of a male prof who was told to stop spending money because a postdoc is leaving
  ... this even without ever talking to the Prof
  This is not business as usual!
  Especially not with my track record!
- No apologies and funding cut by 100 kCHF (10%) for Phase III, starting July 2009
- **An overly ambitious postdoc** could convince my colleagues that I do not understand anything about physics and it is best to transfer part of my lab to his new lab

How a postdoc can hurt a woman professor

Why did I survive?

- **Postdoc made a mistake:**
  He treated my PhD students badly
- HR investigation based on request of PhD students and myself:
  very poor evaluation for Postdoc
- Department head in 2006 helped after HR report (to protect students … not me)
- Generally a professor position was still a power position and professors were in principle better protected

This happens to women even today, 10 years later, very similar to this case, but with much worse outcomes!

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2010 Director NCCR MUST: Time to try harder

VIEWPOINT

Courtesy of Ursula Keller

Retaining Talented Women Scientists: **Time to Try Harder**

Ursula Keller

VIEWPOINT

When I began my career 30 years ago, I was convinced that all I had to do in order to become a successful scientist was to be very good at my job and to excel in my scientific expertise. I believed that there was no longer discrimination against women in science, and I was positive that I wanted to build a career and, if I chose to, have a family. Now, as a tenured female professor with a spouse and children, I look back on my career and find that the issue of women in science is much more complicated than I had initially thought.

Don't get me wrong: I have an exciting, exhilarating and fulfilling job. Yet I still find myself hesitating to characterize the experience as wholly positive. While I've engaged in many wonderful research collaborations with my colleagues, I have also experienced a number of incidents that have led me to conclude that there is something systematic going on in science. Women and some men are experiencing discouraging behavior and attitudes that provide disincentives for them to remain in academic science.

In my early career at Stanford University and Bell Laboratories, one of the most motivating pieces of advice I received from a scientific colleague and mentor was: "No one said it would be easy; just try harder." That powerful statement became a mantra for me. I kept it in mind as I built up a large research group, raised two children, and established a scientific track record. I have now been a tenured professor for 17 years, and I currently serve as the director of a multi-collaborative Swiss National Science Foundation project. I became a successful science professor. However, my adviser was right. It has not been easy.

My experience as a woman scientist has been much more complicated than the scientific reputation I have established. I have had to deal with challenging issues and attitudes related to starting a family, organizing my laboratory space, and building up my research group. To gain a wider perspective on my experience, I turned to numerous research reports on the absence of women in science, and the evidence is there, cited again and again: Within the scientific culture, women face discriminatory attitudes that often lead them to be excluded, along with minorities. An article about subtle discrimination published in the *Washington Post* by physics professor Meg Urry highlighted experiences that were analogous to mine (see link in the references).

There are many special programs geared toward encouraging women scientists to remain in academia. They advise women on how to fit better within the academic environment. You will succeed if you are excellent in your work, if you find a mentor, if you choose a supportive life partner, if you improve your confidence, and if you make sure that you speak out so that you do not seem invisible. These tips are surely helpful, but why is the responsibility for change always put on these talented people? My experience shows that this is too simple a solution. The scientific community must make greater efforts within individual disciplines to identify and change the factors prohibiting women and others from staying in science.

> As a tenured female professor with a spouse and children, I look back on my career and find that the issue of women in science is much more complicated than I had initially thought.

The 2009 gender statistics for the physics department at ETH Zurich in Switzerland show the representation of women as follows: 16.5 percent of undergraduates are women; 17.7 percent of Ph.D. students are women; and 13.3 percent of postdocs are female. I am one of two tenured women professors; overall, women comprise 9.5 percent of the faculty.

I feel very positively about my life choices, but I am aware that retaining

OSA, The Optical Society
www.osa.org

OSA viewpoint, Feb. 2011:

"At this point in my career, I have earned the respect of my colleagues. I have put in the work to establish a long career. If I as a senior female science professor cannot speak up strongly for change ... who can?"

OPN Optics & Photonics News

www.osa-opn.org

Started a new column
with Prof. Anthony Johnson, former president of OSA and Dr. Anna Garry Sept. 2011

Reflections on Diversity

http://www.nccr-must.ch/equal_opportunities/opn_column_reflections_in_diversity/opn_viewpoint_february_2011.html

Moving into a leadership position 2010

- **National Centers of competence in Research (NCCRs)** in Switzerland from Swiss National Science Foundation (SNF) SNF info
  - Goal is long-term research (12 years!) on a theme of strategic importance http://www.nccr-must.ch/research.html
  - empower new or old research structures:
    FastLab a shared ultrafast laser technology platform
    http://www.nccr-must.ch/fastlab_ethz_unibe_lacus_epfl.html
  - educational and industrial outreach
    http://www.nccr-must.ch/education_training.html
  - advancement of women and equal opportunities
    http://www.nccr-must.ch/equal_opportunities.html

- **Took leadership: director NCCR MUST 2010-2022** (12 year program)
  http://www.nccr-must.ch/home.html
  First woman director of any NCCR in Switzerland
  Co-leading with Prof. Thomas Feurer, University in Bern
- Additional research resources when taking leadership (to compensate for additional work)
  Essential for maintaining both SESAM modelocking efforts and attosecond science
- We received excellent reviews for our management and PI satisfaction …
- Our advancement for women efforts considered an outstanding role model for all NCCRs

ETH Women Professors Forum (ETH WPF)

ETH WPF Executive Board (Elected during first assembly meeting, 7 March 2012):

Ursula Keller, Physics, **President**
Janet Hering, EAWAG Director, **Vice President**
Marcella Carollo, Physics
Silvia Dorn, Environmental Systems Science
Gudela Grote, Management Sciences
Renate Schubert, Delegate for Equal Opportunities to ETH President, Humanities, Social and Political Sciences
Viola Vogel, Health Sciences and Technology

With financial support from
Swiss National Science Foundation
(with NCCR MUST)
Following the MIT role model!

ETH Zurich
61 women Prof.

as of Feb. 2013

75% are members
(i.e. 45 Profs.)

History: http://www.nccr-must.ch/equal_opportunities/eth_women_professors_forum.html

ETH WPF webpage: https://eth-wpf.ch/

Gender issues are systemic at ETHZ/EPFL …

With efforts from the Women Professors Forum (WPF) we could get three professor surveys published in **2019-2020**:

- **At least 23% female professors felt discriminated** within the previous two years at ETH Zurich
- **Male dominated management culture and predominance of men in numbers and in leadership positions affects women disproportionally**
- **Not sufficient accountability and transparency** with regards to resource and space allocation, committee work, teaching load, and most importantly, the decision making process
- **Grievance processes** considered generally (by both men and women) not good enough, but "women in particular rated the complaints process for discrimination as rather negative to very negative"
- Duration of the grievance procedures is a source of undue stress (and potentially a substantial financial burden with additional academic mobbing)
- Conflicts of interest for professors involved in the process
- **Lack of protection of professors from frivolous* accusations (still ongoing …)**

  **What does frivolous mean?*
  weaponizing scientific misconduct and unequal treatment of different cases
  weaponizing administrative investigations

References and weblinks

2019 Survey of Issues Important to women Professors at EPFL/ETHZ:

https://eth-wpf.ch/

And then use link: https://eth-wpf.ch/category/publications/

Or directly: https://eth-wpf.ch/survey-of-issues-important-to-women-professors-at-epfl-and-ethz-2019/

19. May 2020: ETH Zurich professor survey published

https://ethz.ch/services/en/news-and-events/internal-news/archive/2020/05/checking-in-on-our-professors.html

And more details:

https://ethz.ch/services/en/news-and-events/internal-news/archive/2020/05/checking-in-on-our-professors.html

You can also find some interesting ETH gender statistics here:

https://ethz.ch/services/en/employment-and-work/working-environment/equal-opportunities/strategie-und-zahlen/gender-monitoring.html

July 2020: Report of the commission on the Status of Women Faculty at EPFL

https://actu.epfl.ch/news/new-recommendations-to-improve-the-status-of-wom-4/

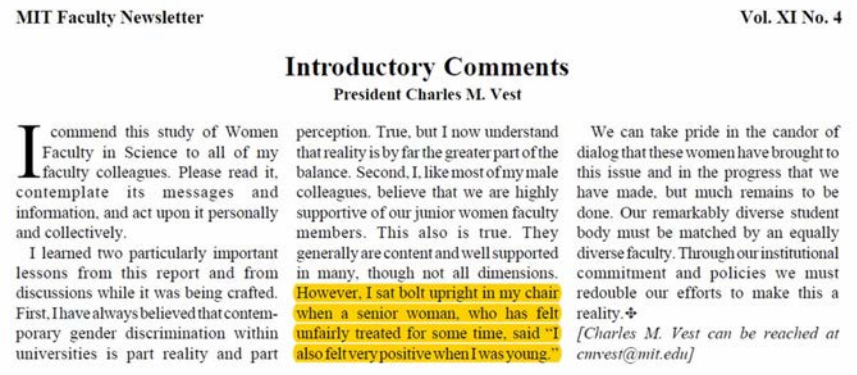
This 2020 EPFL report is similar to the 1999 MIT report.

There is a more detailed report for EPFL internal use and unfortunately confidential.

There is a lot of learning material that would help the broader community to better understand the problems.

Role model MIT leadership in 1999

- MIT report 1999 published, acknowledging gender discrimination and announced additional measures



MIT Faculty Newsletter Vol. XI No. 4

Introductory Comments

President Charles M. Vest

I commend this study of Women Faculty in Science to all of my faculty colleagues. Please read it, contemplate its messages and information, and act upon it personally and collectively.

I learned two particularly important lessons from this report and from discussions while it was being crafted. First, I have always believed that contemporary gender discrimination within universities is part reality and part perception. True, but I now understand that reality is by far the greater part of the balance. Second, I, like most of my male colleagues, believe that we are highly supportive of our junior women faculty members. This also is true. They generally are content and well supported in many, though not all dimensions. However, I sat bolt upright in my chair when a senior woman, who has felt unfairly treated for some time, said "I also felt very positive when I was young."

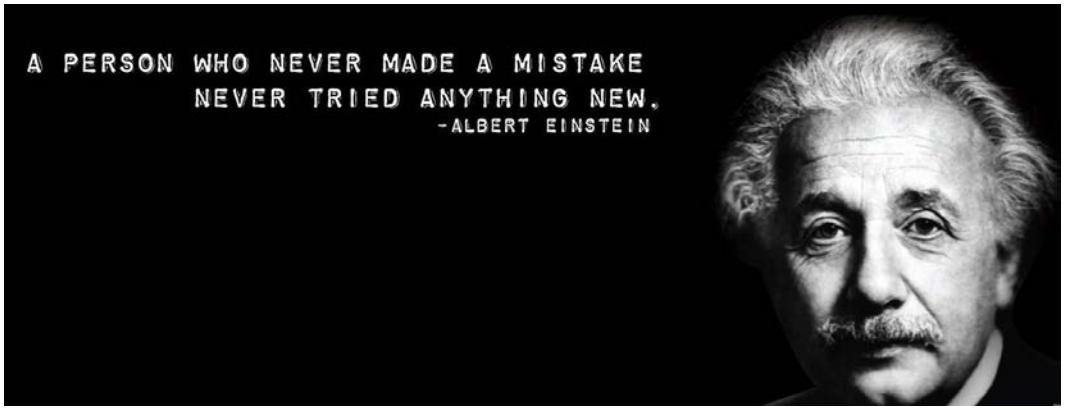
We can take pride in the candor of dialog that these women have brought to this issue and in the progress that we have made, but much remains to be done. Our remarkably diverse student body must be matched by an equally diverse faculty. Through our institutional commitment and policies we must redouble our efforts to make this a reality.✣

[Charles M. Vest can be reached at cmvest@mit.edu]

- Current challenge with leadership at many European universities and institutions
  - *More concerned about a potential reputational damage rather than fixing the problem*
  - *Example MIT 1999 showed no reputational damage – MIT is still number one.*
  - *In the contrary it made MIT look strong, president received respect for his reaction and it changed the culture for many women*
  - *I am very concerned that our current leadership tends to use their power to keep the women quiet and even punish women who dare to stand up for change*
  - *Stepping up for a culture change since 2010 and stepping up in protection for many women (and some male) professor colleagues suffering from escalating and problematic grievance procedures since 2017 (e.g. Carollo case) resulted in personal penalities for me within ETH Zurich (and Swiss funding sources)*

Examples of a bad working culture for women

- Women and other outsider groups often have **lower mistake tolerance** and are **punished more strongly** for them
- **Lack of independent grievance procedures**: minor mistakes or even made-up issues can become weaponized, supports **a management culture of intimidation**
- **Unequal treatment** depending on “how many friends” one has in leadership
  This does not support excellence and wastes resources. Also affects male professors …



Would be nice if this also applies for women scientists

- **Examples of a hostile culture and a culture of intimidation:**
  - Weaponizing disgruntled group members
  - Weaponizing administrative investigations
  - Weaponizing scientific misconduct
  - Punish women who stand up for change

Weaponizing a “disgruntled” group member

- The “Carollo case” escalating in 2017 was only one of many …
- With our WPF network: We heard of many cases where “disgruntled” or “frustrated” PhD students or “overly ambitious” post-docs have been used (“instrumentalized”) to increase pressure on “unwanted” professors
- This happened to both senior women and young assistant professors
- “undesirable/unwanted” professors become mobbing targets by colleagues and/or leadership.
- This also can happen to male colleagues!
- Example as summarized by a medical doctor (translated into English):
  “I was intrigued by the succession of women professors of the same profile coming to consult me for the same reasons … for a state of physical and mental exhaustion linked to a work environment that is both hostile and threatening to them. They describe a climate in which the slightest action on their part triggers an investigation … [from their ETH domain institute]. They are then asked to justify themselves on a whole series of points. These strangely repetitive investigations endanger their academic careers.

  … that such ambitious women are arriving in such a state of health for my consultation, both dismay and worry me. It is not a distress that can be explained by the psychology of the specific individual. It is indeed a small epidemic in an internationally recognized school. I find this both sad and disillusioning …”

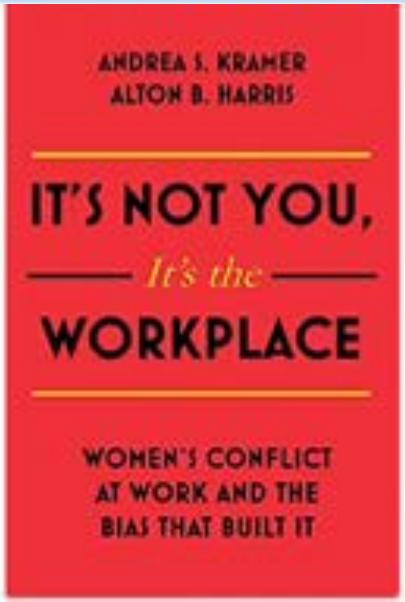
Weaponizing Administrative Investigations

- Administrative Investigations (“Administrationsuntersuchungen” = AUs) are normally used to collect the facts
- However many AUs have been used as an effective disciplinary investigation against certain professors. AUs limit the rights of the individual under investigation (the target) in comparison to real disciplinary investigations
- The large power – and economic – mismatch between the university and the individual is also indicative of mobbing the target
- Examples: published examples Rüssli AU and BDO AU (many more not yet published). I have personal experience with AUs both as a witness and a target
  - **Rüssli AU** with the final report of October 3, 2018, which was later heavily criticized on February 12, 2019 by the “Commission for Reviewing the Appropriateness of Dismissal”. Both documents were published by the ETH in a media release dated April 10, 2019 and posted on https://ethz.ch/de/news-und-veranstaltungen/eth-news/news/2019/04/untersuchungsbericht.html
  - **BDO AU:** My supervision complaint (“Aufsichtsbeschwerde”) to the ETH Board with regards to insufficient governance at ETH from 11. Oct. 2018, got selectively converted into an AU against me which was published on 11. July 2019. I certainly felt that I became a target in this case. https://www.ethrat.ch/de/medien/medienmitteilungen/eth-zurich-von-Vorwürfen-entlastet
  - **EFK Report**: “Luckily” for myself, an independent investigation from EFK (“Eidgenössische Finanzkontrolle”) on 24. Jun 2019 came to different conclusions and recommendations than the BDO AU. https://www.efk.admin.ch/de/publikationen/bildung-soziales/bildung-und-forschung/3637-nachvollziehbarkeit-der-mittelzuteilung-an-die-professorinnen-und-professoren-der-eth-zuerich-und-der-epfl.html

Weaponizing scientific misconduct

- Unwanted professors are pressured to leave university and sign NDAs
- Often an additional accusation of scientific misconduct follows AUs, further increasing pressure
- This happened at both ETH and EPFL, and also at other European universities
- Example Prof. Marcella Carollo:
  - Accusation based on some information from a group member of Prof. Carollo about image manipulation (figure in question never published, was simply used to illustrate a well-known fact)
  - A formal investigation was started after a preliminary evaluation by confidant (retired professor) (with some additional charges added by confidant such as conflict of interest in SNF evaluation, authorship, and supervision: the confidant now also became an accuser!)
  - The start of this formal investigation was publicly announced (ETH News 17. Jan. 2018): https://ethz.ch/en/news-and-events/eth-news/news/2018/01/untersuchung-eingeleitet.html
    "…after a preliminary evaluation … corroborated these suspicions, an investigation committee has now been set up."
    "The professor ... will be relieved of her duties until both investigations have been completed"
    by this point "Rufmord" (i.e. character assassination) accomplished …
  - After 5 months: Prof. Carollo receives draft of confidant report with however insufficient details for proper response (e.g. discussing authorship requires identifying the actuals papers in question)
  - After 10 months: updated report with sufficient information to respond
    deadline to respond within 11 days – and no possible extension
  - A detailed 70-page response was submitted on time by Prof. Carollo
  - **After about one year**: investigation committee submitted to ETH leadership
    "there had been no scientific misconduct"
  - ETH Zurich president requested to terminate Prof. Carollo (ETH News, 14. March 2019)

Punished for efforts to change culture

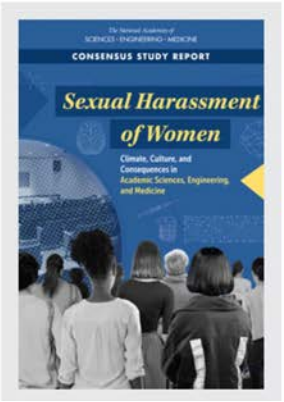


- Many highly educated and talented women are opting out of their careers because they are rejecting the workplace: **2017 Forbes report: women leave the tech field at a rate that is 45% higher than men**
- Unfortunately, when women actively promote other women, they often face career penalities
- Not even white male executives received any career-related advantage for actually working to create diversity

Keller case: Increased academic mobbing against me started in 2017

- Watched my only senior woman professor colleague being fired … tried to help for 2 years internally … then accepted a public interview (Republik article published 22. March 2019)
- Lost more ”goodwill” with current leadership: received official first notice before termination 2019
- ETH internal investigations against me: finances over 10 years, target of an administrative investigation (BDO AU), attempted accusations of scientific misconduct, …
- Attempts to cancel research funding both ETH internally and at Swiss National Science Foundation
- 2010: “If I as senior female science professor cannot speak up strongly for change … who can?”

Recommended additional reading



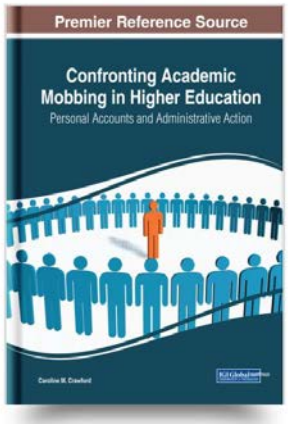
Sexual Harassment of Women: Climate, Culture, and Consequences in Academic Sciences, Engineering, and Medicine

Published 1999

DETAILS

312 pages | 6 x 9 | PAPERBACK

ISBN 978-0-309-47087-2 | DOI 10.17226/24994



Confronting Academic Mobbing in Higher Education

Personal Accounts and Administrative Action

Published 2020

specially recommended: Chapter 3,
“The role of passive evil in perpetuating downward academic mobbing”
on page 57: “One of the most disheartening findings in many published studies on downward academic mobbing is that university HR departments, in particular, are not only unhelpful to victims (either by failing to recognize the mobbing or mismanaging the cases brought before them) but in many cases actually protect and assist unethical administrators in their framing and abuse of targets."

Can we solve these challenges?

VIEWPOINT

Courtesy of Ursula Keller

Retaining Talented Women Scientists: **Time to Try Harder**

Ursula Keller

VIEWPOINT

When I began my career 30 years ago, I was convinced that all I had to do in order to become a successful scientist was to be very good at my job and to excel in my scientific expertise. I believed that there was no longer discrimination against women in science, and I was positive that I wanted to build a career and, if I chose to, have a family. Now, as a tenured female professor with a spouse and children, I look back on my career and find that the issue of women in science is much more complicated than I had initially thought.

Don't get me wrong: I have an exciting, exhilarating and fulfilling job. Yet I still find myself hesitating to characterize the experience as wholly positive. While I've engaged in many wonderful research collaborations with my colleagues, I have also experienced a number of incidents that have led me to conclude that there is something systematic going on in science. Women and some men are experiencing discouraging behavior and attitudes that provide disincentives for them to remain in academic science.

In my early career at Stanford University and Bell Laboratories, one of the most motivating pieces of advice I received from a scientific colleague and mentor was: "No one said it would be easy; just try harder." That powerful statement became a mantra for me. I kept it in mind as I built up a large research group, raised two children, and established a scientific track record. I have now been a tenured professor for 17 years, and I currently serve as the director of a multi-collaborative Swiss National Science Foundation project. I became a successful science professor. However, my adviser was right. It has not been easy.

My experience as a woman scientist has been much more complicated than the scientific reputation I have established. I have had to deal with challenging issues and attitudes related to starting a family, organizing my laboratory space, and building up my research group. To gain a wider perspective on my experience, I turned to numerous research reports on the absence of women in science, and the evidence is there, cited again and again: Within the scientific culture, women face discriminatory attitudes that often lead them to be excluded, along with minorities. An article about subtle discrimination published in the *Washington Post* by physics professor Meg Urry highlighted experiences that were analogous to mine (see link in the references).

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I feel very positively about my life choices, but I am aware that retaining

I believed it in 2010 …

I still believe it now …

Let me give few enabling steps …

http://www.nccr-must.ch/equal_opportunities/opn_column_reflections_in_diversity/opn_viewpoint_february_2011.html

Steps to improve current situation

- Independent checks and independent grievance procedures are necessary for sufficient oversight – and ultimately credibility – in the existing university culture.
- **Increase number of women,** using special measures as needed, target >30%
- **Need more efforts on retention, performance, promotion and culture change**
- **Additional efforts to achieve real culture change.**
  Set up structures and real benefits **…** rather than negative feedback for engaging on these issues, for men and women
- **Increase motivation: access to more funding with better governance**
- **Better governance to weaken informal networks**.
  Such networks, when unchecked, tend to hurt overall excellence, waste resources and hurt the science community in general.
- **For the benefit of us all and good science:**
  More male colleagues can help and would be welcome (see 2019 article from Troy Vettese)
- **When we try harder we can do better**:
  e.g. for 22 years 24:0, within two years 5 tenure-track women assistant professors
- **Requires clear commitment from our leadership with measurable results**
- **These are not expensive measures and this will benefit everybody!**

Additional material

American Physical Society (APS)

14 recommendations for …

Effective Practices for Faculty Recruitment and Retention

1. Consider what steps you will take to ensure faculty retention. Since universities make a tremendous investment in faculty, often recruiting and hiring them at great expense, it is important to think long term from the beginning. Look at the startup packages offered—if faculty seem unaware of what is often included, do you offer a list of standard elements you usually provide? Do you expect them to negotiate and make a case for what they will need to succeed, and do you communicate these expectations? Given that faculty have highly specialized talents, ensure they don't waste time struggling in a bad environment by making sure they know who to come to for advice before they are on campus.
2. Enable the hiring of the best available candidates by paying attention to the application process, selection of short list, faculty visit experience and by working to minimize the impact of unconscious biases.
3. Set a high standard in treating all faculty with respect, and promote a positive environment for everyone. If you cannot achieve this, seek guidance from within the university, schedule a site visit, or appoint

https://www.aps.org/programs/women/reports/cswppractices/faculty.cfm

Assessing equality in physics departments

The Juno*-type project maybe a possible approach for the long-term:

- It is recognized that there are gender issues in physics departments internationally. An approach that is used in the UK is a ‘Juno’ award.
- Juno addresses gender equality in physics and encourages best practice for all staff
- A similar approach could be carried out in other countries, building on the experience that has been acquired by Juno. These are the 6 principles. An external review panel can help guide and assess the department.
  - A robust organisational framework to deliver equality of opportunity and reward
  - Appointment and selection processes and procedures that encourage men and women to apply for academic posts at all levels
  - Departmental structures and systems which support and encourage the career progression and promotion of all staff and enable men and women to progress and continue in their careers
  - Departmental organisation, structure, management arrangements and culture that are open, inclusive and transparent and encourage the participation of all staff
  - Flexible approaches and provisions that enable individuals, at all career and life stages, to optimise their contribution to their department, institution and to set an environment where professional conduct is embedded into departmental culture and behaviour

* https://www.iop.org/about/IOP-diversity-inclusion/project-juno - gref