how we can make science more awesome

dr jess wade imperial college london 1st june 2017

https://goo.gl/Qiarj1



// why are you here?



Belgium

Belgian university tells female students to wear 'low-cut' tops to graduation ceremony

Email with suggested dress code from the Brussels Free University's medicine faculty condemned as sexist

noi vous 'arrière du Jr à revêtir la tog

panson pour vous under à revêtir la toge (prêtée par l'ULB). Vous êtes nombreux, soyez donc à l'heure.

D'un point de vue esthétique, il est préférable que les jeunes femmes revêtent une robe ou une jupe ainsi qu'un joli décolleté et les hommes, un costume. Bien entendu, mesdames, cette consigne n'est pas obligatoire.

// why am I here?



Juno Committee

The Departmental Juno Transparency and Opportunity Committee was established in 2007 to implement the Institute of Physics' Juno Code of practice which aims to support best practice for all staff with particular attention to putting in place practical actions to address the under representation of women in university physics. The Committee is also guided by the Athena Swan Charter. The Department was awarded Juno Championship status and the Athena Silver Swan award in 2009, this was renewed in 2012. The Head of Department and the Heads of Group have endorsed an ongoing action plan.

















Groups > Women in Physics Group > Group prize

Jocelyn Bell Burnell Medal and Prize (previously the Very Early Career Female Physicist Award)

Institute of Physics Jocelyn Bell Burnell Medal and Prize for the very early career female physicist of the year 2017.



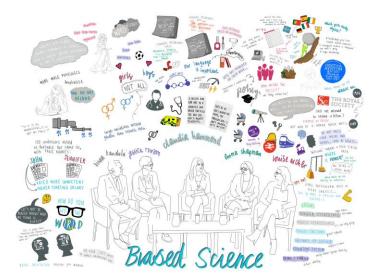


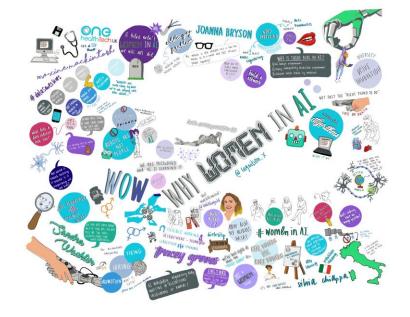
// why am I here?



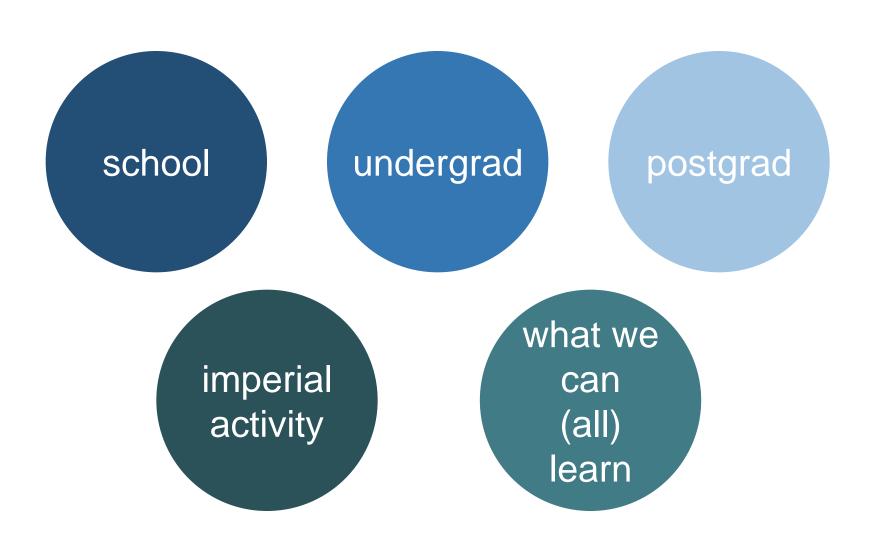




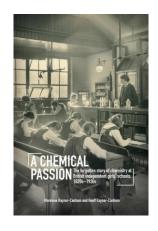




outline



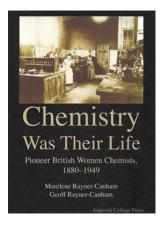
//girls in science + the hadow report



17 men + 4 women

"one of the most important aims of the training, fitting girls for the duties of motherhood and for work in the home, has been unduly observed by the academic trend"

"The materially lessened amount of hæmoglobin in the woman's blood after puberty is significant: hæmoglobin is the agent of internal respiration, the oxygen carrier of the system; and oxygen is the great liberator of energy. It is therefore evident that the male is the better prepared for a more abundant liberation of energy with less exhaustion or fatigue."



"It appears to be generally recognised that girls in general are not so strong physically as boys and are more highly strung and liable to nervous strain. Moreover, medical statistics seem to indicate that there is a higher percentage among girl pupils of cases of anaemia, spinal curvature, defective eyesight, and minor physical defects."

"A special reason is the comparative lack in girls of an attitude of scepticism and curiosity which gives the best approach to Natural Science. Girls have, however, an aptitude for the Biological Sciences, in which they are helped by their greater diligence and neatness; they excel in subjects which require descriptive powers and a capacity for comprehending elaborate classification."

// girls in physics

most important things:





- appoint a **gender champion** in senior leadership
- outline, implement and advertise a plan
- use data and evidence: compare your school to national average, look at different subjects, options, sets
- train teachers in unconscious bias
- language lessons feedback, expectations, careers
- rethink your science clubs
- give guidance on options, careers advice, psche on how to get most out of options evening
- increase students' awareness and engagement in biases around them

least important things:





- stem enrichment activities- 5 years of data from 300 schools - https://phys.org/news/2016-12-stem-enrichment-impact-results.html
 - % on fsm
- say conventional physics isn't for girls / make physics 'girly'
 - i.e. engineering degrees are not requiring a-level physics (!)
 - "change their course entry requirements rather than "begging" schoolgirls to study physics"

Reports

The Institute has published several reports investigating the gender imbalance of physics A-level and on issues around equality of education.



Improving Gender Balance - Reflections on the impact of interventions in schools (2017) Findings from the Improving Gender Balance and Drayson pilot projects and recommendations for good practice

Improving Gender Balance - Results and recommendations from the IOP's work in schools (2017) A summary of the Improving Gender Balance and Drayson pilot projects, ahead of the full report launch in March 2017

Opening Doors: A guide to good practice in countering gender stereotyping in schools (2015) Case studies and key recommendations of how schools can explore equality issues across the whole school.

Closing Doors: Exploring gender and subject choice in schools (2013) An exploration of national data on progression to A-level in selected subjects, including physics. The report draws attention to the gender imbalances that exist on A-level courses.

It's Different for Girls: The influence of schools (2012) uses data from the National Pupil Database to explore how uptake by girls onto A level physics courses varies in different types of schools.

Girls into Physics: Action research (2009) is the evaluation report from our 2008 school-based action research programme, including recommendations for classroom practice.

Girls in the Physics Classroom: A review of the research on girls' participation in physics (2006) a summary of the existing research on girls' participation in physics, highlighting common threads and suggesting effective strategies.

// language stereotyping

Give me three words you would associate with boys



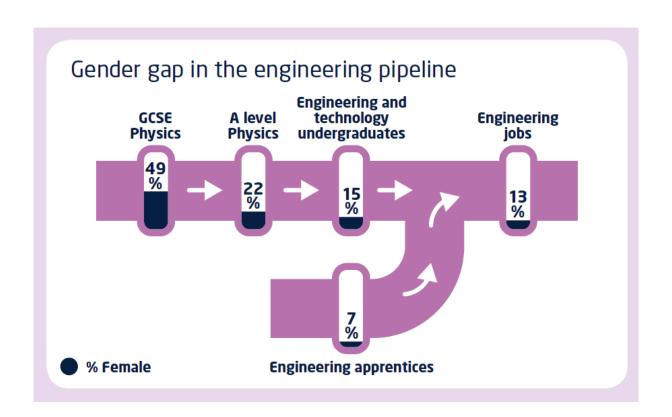
Give me three words you would associate with girls







http://www.iop.org/publications/iop/2017/file
_69171.pdf



// what do we do to the 'pipeline'?

// undergraduate

surveys

science degrees are 'hard' exam stress casual sexism nss

Mental health

Number of university dropouts due to mental health problems trebles

Data shows record 1,180 students who experienced mental ill health left courses early in 2014-15, up 210% from 2009-10

News > UK > Home News

Young women 'significantly more likely' to report symptoms of anxiety and depression than young men

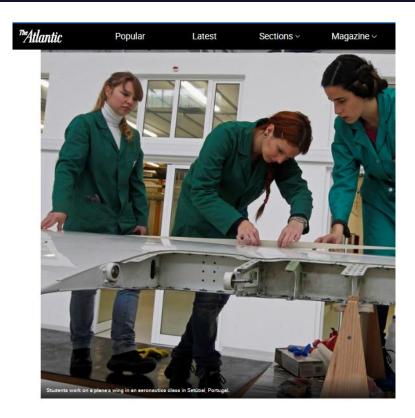
Charities warn high number of young women working in low-paid and insecure jobs having 'terrible impact' on their wellbeing

May Bulman | @maybulman | Friday 14 April 2017 22:38 BST | Q 4 comments

http://www.independent.co.uk/news/uk/home-news/young-women-anxious-depression-mental-health-ons-young-womens-trust-a7683861.html

https://www.theguardian.com/society/2017/may/23/number-university-dropouts-due-to-mental-health-problems-trebles

// mentors matter



How Women Mentors Make a Difference in **Engineering**

They act as a "social vaccine" that protects female students against negative stereotypes and gives them a sense of belonging.

ED YONG MAY 22, 2017 ON THE SHOULDERS OF GIANTS



Female peer mentors early in college increase women's positive academic experiences and retention in engineering

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Scientific and engineering innovation is vital for American competitiveness, quality of life, and national security. However, too few American students, especially women, pursue these fields. Although this problem has attracted enormous attention, rigorously tested interventions outside artificial laboratory settings are quite rare. To address this gap, we conducted a longitudinal field experiment investigating the effect of peer mentoring on women's experiences and retention in engineering during college transition, assessing its impact for 1 y while mentoring was active, and an additional 1 y after mentoring had ended. Incoming women engineering students (n = 150) were randomly assigned to female or male peer mentors or no mentors for 1 y. Their experiences were assessed multiple times during the intervention year and 1-v postintervention, Female (but not male) mentors protected women's belonging in engineering, self-efficacy, motivation, retention in engineering majors, and postcollege engineering aspirations. Counter to common assumptions, better engineering grades were not associated with more retention or career aspirations in engineering in the first year of college. Notably, increased belonging and self-efficacy were significantly associated with more retention and career aspirations. The benefits of peer mentoring endured long after the intervention had ended, inoculating women for the first 2 y of college—the window of greatest attrition from science, technology, engineering, and mathematics (STEM) majors. Thus, same-gender peer mentoring for a short period during developmental transition points promotes women's success and retention in engineering, yielding dividends over time.

mentoring | stereotypes | gender | STEM education | diversity

The odds do not favor women in most physical sciences, en-gineering, and computing. Despite educational advances, women, who constitute 56% of university students in the United States (1), hold only 13-33% of bachelor's and master's degrees and 11-21% of doctoral degrees in these fields (2). Even among degree holders in engineering, computing, and physical sciences, women are less likely than men to hold jobs related to science, technology, engineering, and mathematics (STEM) degrees (2). Overall, the proportion of women in physical sciences, engineering, and computer science is very small relative to men and gets smaller still with every level of advancement (3). Engineering is notable for having one of the lowest proportions of women among all sciences (2) and is the focus of our research.

Attempts to explain the relative scarcity of women engineers as due to women's "free choice" to pursue alternate career paths (4), or lower aptitude and intrinsic motivation (5), neglect widespread structural and psychological contributors to this phenomenon (6, 7). Many engineering environments are subtly unfriendly or sometimes overtly hostile for women (8, 9). The numeric scarcity of women (10, 11), nonverbal behavior from male colleagues that excludes women from professional conversations (12), use of masculine pronouns to refer to all scientists and engineers (12, 13), and the prevalence of sexist jokes (14) all signal to women that they are outsiders who do not belong in engineering (6, 15,

16). Even in organizations that prioritize diversity, the ideal engineer is implicitly assumed to be male (17), eroding women's belonging and self-efficacy, leading to burnout and attrition (18).

A number of interventions aim to counter negative effects of STEM stereotypes on women (19), but few have been tested in naturally existing field settings (cf. refs. 20 and 21). One real-world exception, aimed at increasing diversity, is mentoring, which is in widespread use in the academy (22), government (23), and industry (24), and commonly assumed to work because it is correlated with positive health, attitudes, motivation, and behaviors (25). Despite its popularity, however, evidence supporting mentoring is shaky because serious methodological flaws make it impossible to separate benefits of mentoring from confounds (see refs. 25-28 for meta-analyses). Most studies used correlational surveys, case studies, pretest-posttest studies of a single mentored group with no comparison group or nonequivalent comparison groups. Participants opted in knowing these studies were on mentoring and self-reported how mentors affected them, raising concerns about sampling bias and self-report bias, which could have inflated positive results. Mentees and mentors often chose each other, raising doubts as to whether mentoring in general, or a unique connection between mentor-mentee, produced the benefits. Randomized controlled experiments are rare in mentoring research, making it impossible to determine whether having a mentor (vs. no mentor) produced any benefits.

The scarcity of women in the American science and engineering workforce is a well-recognized problem. However, field-tested interventions outside artificial laboratory settings are few. We provide evidence from a multiyear field experiment demon strating that women in engineering who were assigned a female (but not male) peer mentor experienced more belonging motivation, and confidence in engineering, better retention in engineering majors, and greater engineering career aspirations. Female mentors promoted aspirations to pursue engineering careers by protecting women's belonging and confidence. Greater belonging and confidence were also associated with more engineering retention. Notably, grades were not associated with year 1 retention. The benefits of mentoring endured beyond the intervention, for 2 y of college, the time of greatest attrition from science, technology, engineering, and mathematics (STEM) majors.

Author contributions; N.D. designed research; T.C.D. performed research; T.C.D. analyzed data; and T.C.D. and N.D. wrote the paper

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www.pnas.org/cgi/doi/10.1073/pnas.1613117114

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// develop resilience

Resilience Toolkit

A Physicist's Guide to Building and Maintaining Wellbeing

Your working life becomes more challenging despite improved income or progression

Some career
paths in physics are
competitive to follow, so
you are likely to
face rejection

You might face uncertainty working on a fixed contract You work in a discipline that is demanding and contains many unknowns

Why might you need to think about your resilience and wellbeing?

> You worry that you aren't good enough to pursue your career or qualification

Your ambition to do well means pushing yourself hard and developing new skills

> You may encounter difficult people who are stressful to work with

You're uncertain about what comes next in your career

IOP Institute of Physics

// it's a very real problem



For Female Astronomers, Sexual Harassment Is a Constant Nightmare



Earlier this year, famous Berkeley astronomer Geoff Marcy was found to have sexually harassed his students for years

https://broadly.vice.com/en_us/article/youre-targeted-sexually-how-female-astronomers-are-being-hounded-out-of-work

// leaving after PhD

- 1. the characteristics of academic careers are unappealing
- 2. the impediments they will encounter are disproportionate
- 3. the sacrifices they will have to make are great

all consuming nature of academia

- "women more than men see great sacrifice as a prerequisite for success" (2012)
- nature of role models- masculine characteristics, such as aggression and competitiveness, without families/ children
- spend longer on admin activities (less likely to say no, institutional norms) (2017)

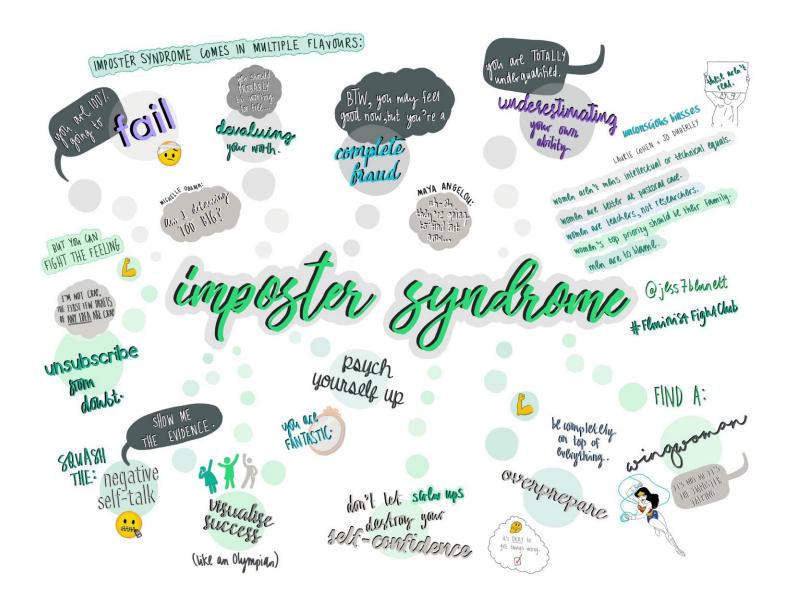
https://www.theguardian.com/higher-education-network/blog/2012/may/24/why-women-leave-academia

http://physicsworld.com/cws/article/news/2017/may/23/female-academics-do-more-admin-than-their-male-colleagues

Five unconscious biases that hold back female researchers

- 1. Women aren't men's intellectual or technical equals
- 2. Women are better at pastoral care
- 3. Women are teachers, not researchers
- 4. Women's top priority is or should be family
- 5. Men are to blame

https://goo.gl/tCtQ9p



// what do we do at imperial

athena swan:

- founding member in 2005
- first institutional award in 2006
- first departmental awards in 2009
- all 21 departments applied in 2017

recruitment:

- know your pool
- targeting job adverts
- awareness of language http://gender-decoder.katmatfield.com/

ongoing activity:

- annual women @ imperial week
- have your say harassment & bullying reporting
- annual athena lecture
- unconscious bias training
- research around bias in student surveys/ nss
- research around experience of bme staff and students

training

- for postdocs & pgr students
- women development courses, springboard

parents & maternity

- parents networks
- nurseries on all main campuses
- childcare vouchers for all volunteers
- return to work plan pre-maternity leave
- short-term funding to accommodate for grants that overlap with maternity leave

// what can we learn

- look at history (waterloo bridge, chemistry)
- this is not unique to science
- you are not alone
- shouting loudly will not solve anything
- everyone is biased (+ science is biased + the people who write the rules are biased)
- machines and robots are learning our biases
- this will not be solved by women alone #menasallies
- women (> men) benefit from mentors
- women do not all benefit from high-achieving role models
- recognise all contributions (REF, TEF, pastoral, admin)
- get women talking about science, not about gender
- collect data (mckinsey)
- re-consider stem enrichment activities
- do not exhaust yourself reinventing the wheel https://goo.gl/Qiarj1

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