"Going for Gold"

Val Gibson

The Cavendish Laboratory

University of Cambridge

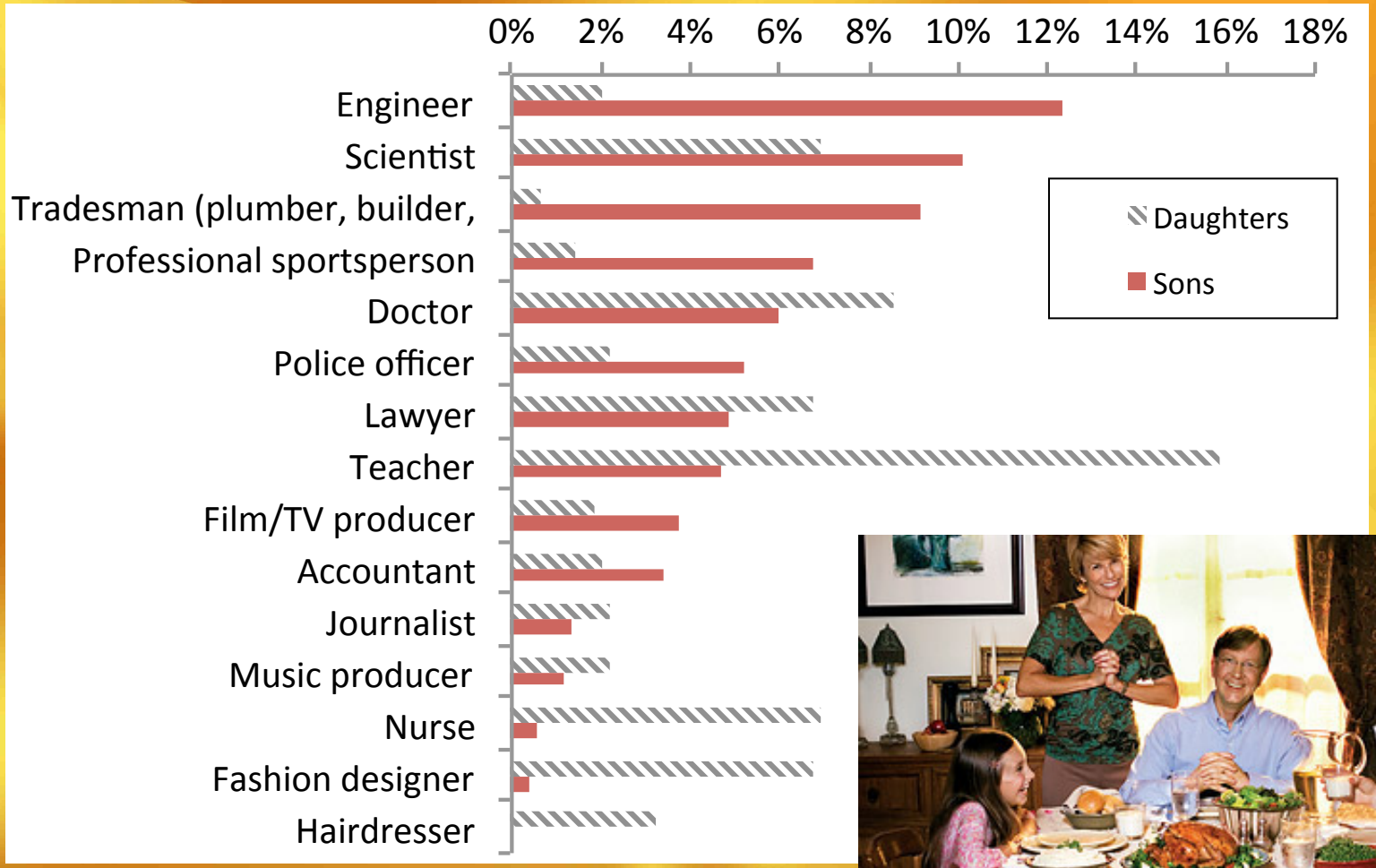
Athena SWAN Gold Award

Lancaster, 29th September 2015

IOP | Institute of Physics
Juno Champion

Gender Bias at Home

"What type of job would you most like your child to pursue when they finish their education?"



"Improving Diversity in STEM", CaSE 2014

Gender Bias at School

"Which subjects are you most likely to study at University?"

Male	
Subject	**%**
Natural Science	25%
Business/Economics	22%
Engineering	21%
Computer Science/IT	20%
Social Sciences/Humanities	17%
Mathematics/Statistics	17%
Law	13%
Languages/Literature	11%
Arts	11%
Health Science	10%
Architecture	7%
Education/Teaching	6%

Female	
Subject	**%**
Health Science	29%
Social Sciences/Humanities	27%
Arts	23%
Natural Science	22%
Languages/Literature	15%
Business/Economics	14%
Education/Teaching	13%
Law	13%
Mathematics/Statistics	10%
Architecture	4%
Computer Science/IT	3%
Engineering	3%

"School Leaver Barometer", Trendence 2014

Only 20% A2-level (& equiv.) physics students are girls.

Gender Bias in the Media

Daily Mail
1933

WEDNESDAY. The Daily Mail SEPTEMBER 13,

PSYCHOLOGY.
Dr. William Brown, Wilde Reader in Mental Philosophy, Oxford University.

PHYSICS.
Lord Rutherford, Cavendish Professor of Experimental Physics, Cambridge.

BIO-CHEMISTRY.
Sir Frederick G. Hopkins, president of the B.A.

COSMIC SCIENCE.
Sir A. S. Eddington, the famous astronomer-mathematician, of Cambridge.

PEDIGREES
Lord Raglan, president of the Anthropology Section of the B.A.

WHY WE WOMEN FEAR THOSE SCIENTISTS

By SYLVIA BROOK

ITS official title is the British Association for the Advancement of Science. Irreverent members of the public briefly call it "the British Ass." How right are they? For over week—ending, thank goodness, today—at Leicester the distinguished apostles of the "British Ass" have sat

anything at all to stem the flow of the river of fear which is continually running in our minds—the fear of another war — and soon?

The scientists this year have given us a few really practical and interesting ideas; for example, the psychology of the small child (every parent is interested in scientific aids to recognising and developing the instincts and abilities of the child).

Then there was a paper on the qualities that make great leaders—something every man and every woman is interested in knowing, even if it is not vital to his or her existence.

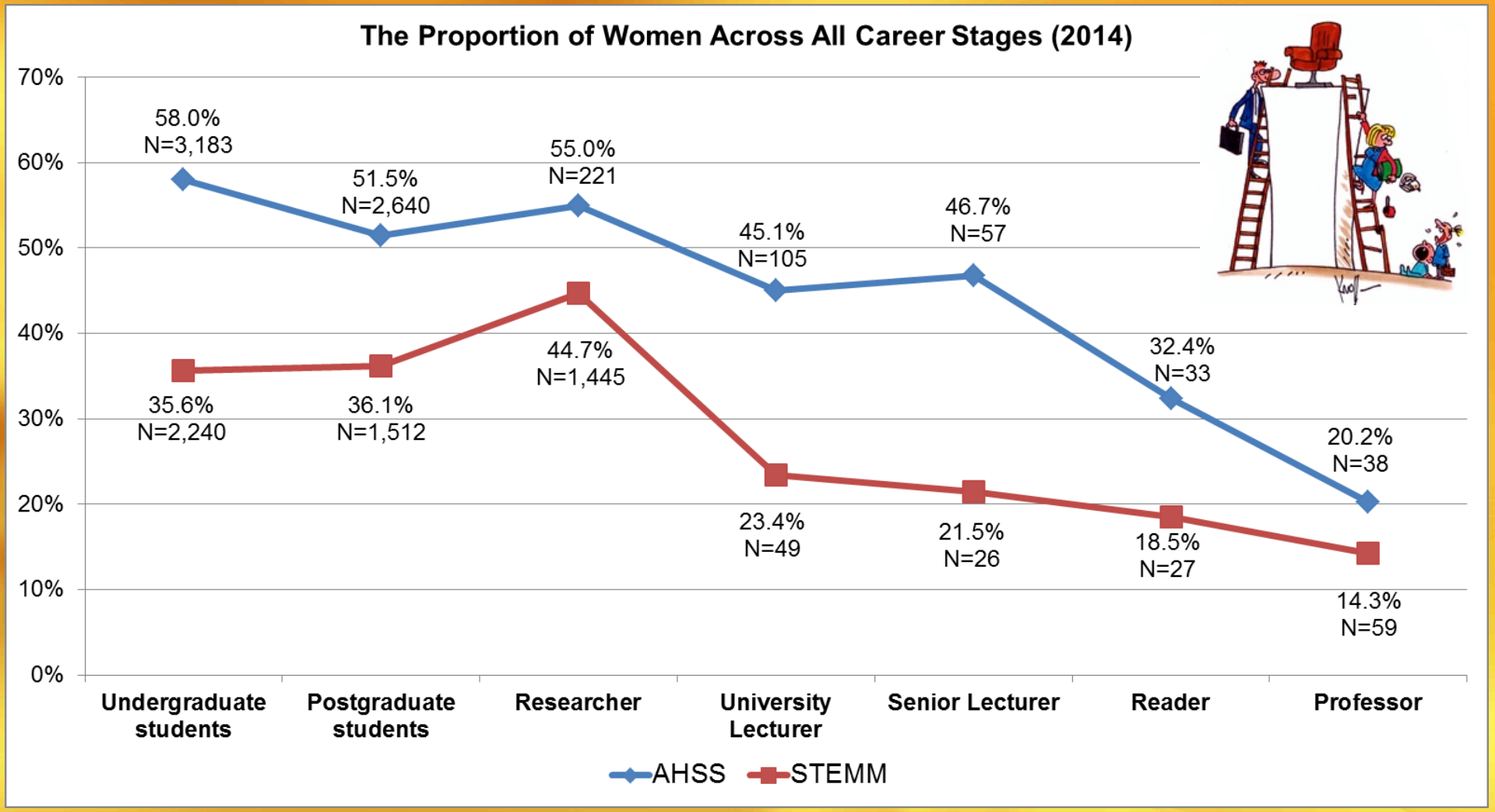
Professor Valentine exposed the

childbirth safe and comparatively painless drive away fear from the minds of pective mothers. This is a vital and question which should have been answered scientists ago.

Why have they given some helpful formation, to about the use and abuses sunlight? seems to me th despite o brilliant summ we are still the dark on t increasin popular qu tion.

Great numb

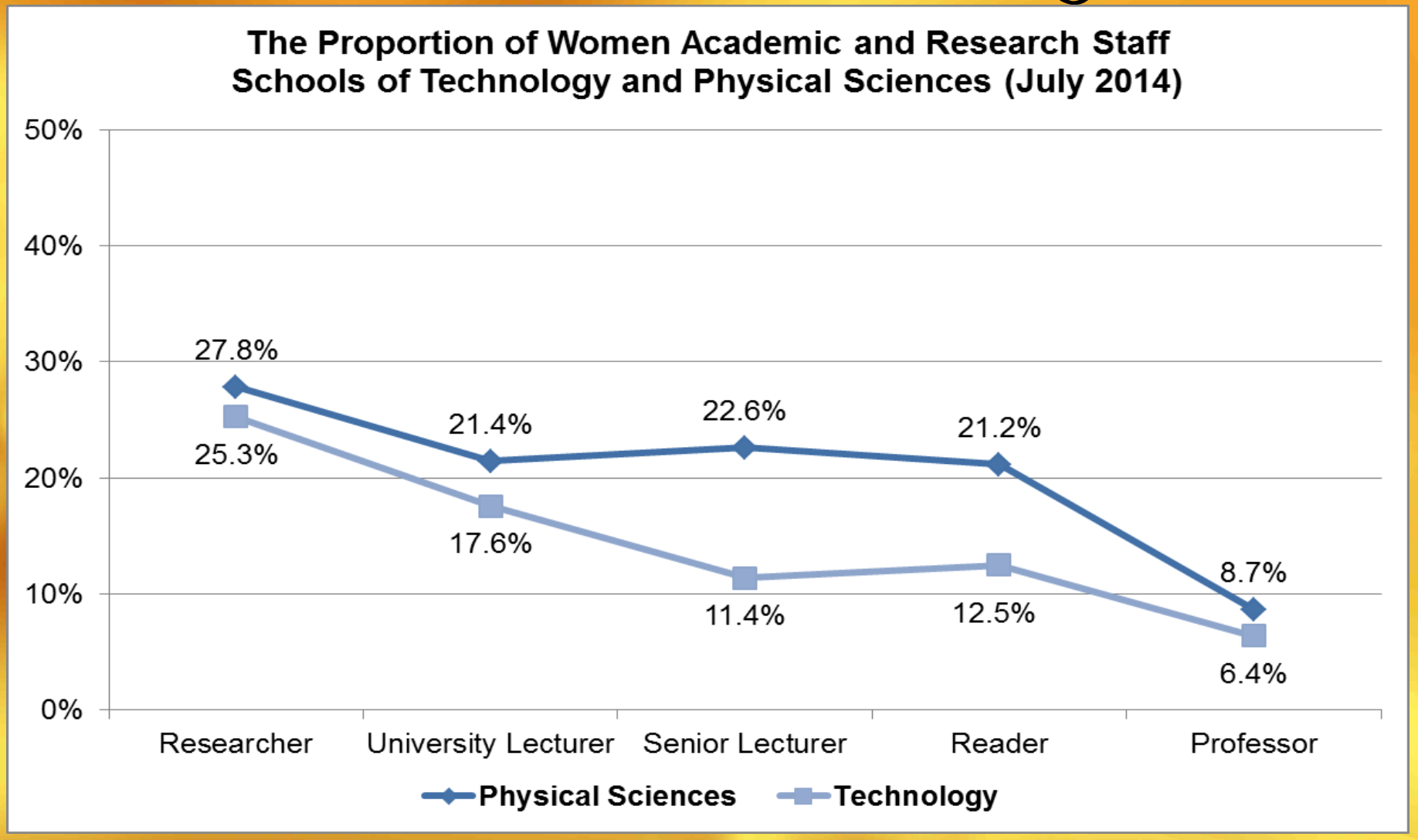
University of Cambridge



UNIVERSITY OF CAMBRIDGE

NB: Researchers includes researchers, research fellows and DoRs
NB: Professors does not count DoRs who are also professors
DoRs who are professors in AHSS (16M, 3F) and in STEMM (24M, 2F)

University of Cambridge



UNIVERSITY OF CAMBRIDGE

Gender Equality Milestones at Cambridge

1999
WiSETI established

2006
University Bronze Athena SWAN Award

2008
E&D Section and Committee established, First Equal Pay Review

2009
1st Gender Equality Champion, Prof. Dame Athene Donald

2010
UK Equality Act, University Combined Equality Scheme,

VC, Prof. Sir Leszek Borysiewicz

2011
PVC Prof. Jeremy Sanders, 1st Cambridge IWD lecture,

2012
Equality Objectives published, SGEN launched, Athena SWAN Bronze Renewal

2013
SGEN Gender Action Plan, Athena SWAN Network

2014
Book and website launch, University Silver and Physics Gold Athena SWAN Awards

2015
WoW Cambridge,

Senior Support & Champions

Vice-Chancellor

Pro-Vice-Chancellor for Institutional Affairs

Gender Equality Champions

Biological Sciences	Clinical Medicine	Arts and Humanities	Non-School Institutions
Technology	Physical Sciences	Humanities and Social Sciences	

14 School SGEN Champions

Senior Gender Equality Network (launched 2012)
170 members (62% women),
developed Gender Action Plan in 2013

Athena SWAN NETWORK
University of Cambridge

Key University Actions

Resources and Support

~£500k p.a.

Athena
SWAN team

Key University Actions

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~£500k p.a.

Athena SWAN team

Senior Academic Promotions

Candidates must pass a threshold score in **all three categories** (Research/ Scholarship, Teaching and General Contribution) to be considered for promotion.

Key University Actions

Resources and Support

~£500k p.a.

Athena SWAN team

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Candidates must pass a threshold score in **all three categories** (Research/ Scholarship, Teaching and General Contribution) to be considered for promotion.

Returning Carers Scheme

Funds to assist returning carers in building up research profiles and academic activity after a period away from work

www.admin.cam.ac.uk/offices/hr/policy/carer/

~200 awards since 2012/13

Key University Actions

Resources and Support

~£500k p.a.

Athena SWAN team

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Office of Postdoc Affairs (est. 2013)

Addresses issues across whole postdoc lifecycle from before arrival, through their time at Cambridge and beyond.

http://www.opda.cam.ac.uk

National Engagement

Call for academia to do more to support female progression

More than 50 senior members of staff at the University of Cambridge have called for a rethink on how success is valued and measured in academia so that women are not disadvantaged in academic appointments and promotions.

The Meaning of Success

Insights from Women at Cambridge

Letter to the Times Higher Education stimulated debate to ensure that gender progression remains a priority at the highest levels within the HE sector.

"A broader definition of success within the sector will bring benefits not only to women – and indeed men – working in universities, but also to society as a whole"

30% Club

GROWTH THROUGH DIVERSITY

First University to join the 30% club

View from an Athena SWAN Gold Department

View from an Athena SWAN Gold Department

Our journey

Mar 2003 Senior women discussions

Nov 2003 IoP "Women in Physics" site visit

2004 Cavendish Personnel Committee established

2008 Join Project Juno & Athena SWAN schemes

2010 Juno Champion (2 applications)

Athena SWAN Silver

Jun 2013 Juno Champion renewal

Nov 2013 Athena SWAN Gold (2 applications)

Critical friends (e.g. IoP Juno panel) have been key to our success…

Golden Highlights

64% increase in number of women academics

All female academics, eligible for promotion, promoted at least once

Mandatory for all staff to undergo E&D training

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Research Staff Committee formed (very active); and significant expansion of career advice

Demonstrated positive impact from re-design of 1st year UG physics course; and action plan to address performance

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Workload Model (adopted by other departments)

Cavendish Social Committee

Influential engagement with Athena SWAN activities at University & national levels

Changing Culture...

The Cavendish Chairs

The Cavendish Laboratory (Department of Physics) at the University of Cambridge has 2 endowed chairs….

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The Jacksonian Chair (est. 1782)

Isaac Milner

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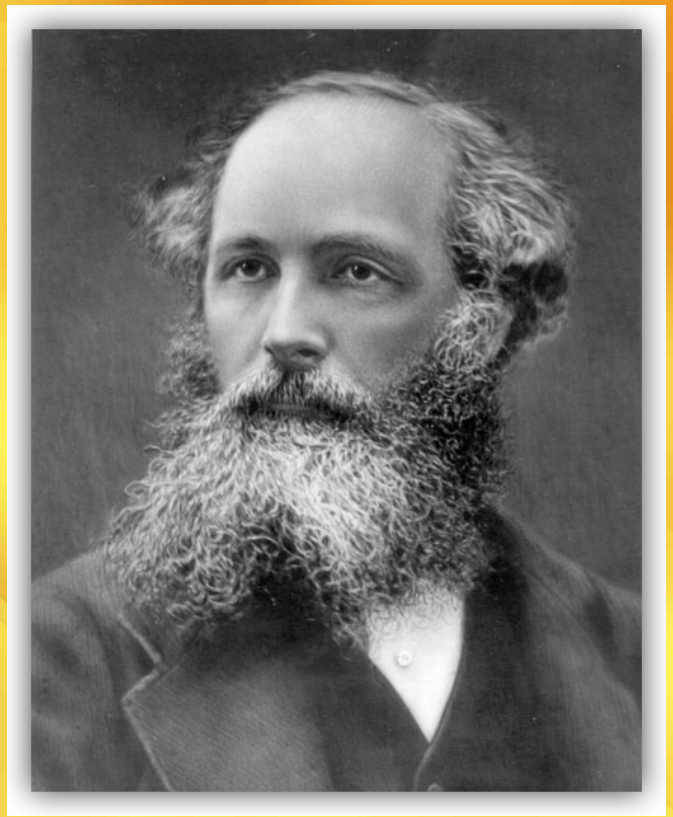

The Cavendish Chair (est. 1871)

James Clerk Maxwell

The Cavendish Chairs

The Cavendish Laboratory (Department of Physics) at the University of Cambridge has bought 2 chairs….

The Cavendish High Chairs (est. 2012)

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The Cavendish high chairs (& baby-changing facilities) established a culture that is accepting of life beyond work.

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Challenge: Child policy within department

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Challenge: Child policy within department

Other developments:

- Maternity/paternity mentoring (pre & post leave).
- Provision of childcare during appointment interviews.
- Workload reduction on return to work.
- University Returning Carers scheme.

Challenges Overcome

- Recognising the demographic trend towards increasing numbers of EU & overseas students and post-docs.

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  - Open & fair appointment processes
  - Workload model
- Culture & Communication

What next?

- New Chair of Cavendish Personnel Committee appointed
  - Follow through Action Plan
  - Athena SWAN Gold renewal 2017
- School of Physical Sciences E&D Champion
  - Act as champion and critical friend to 8 departments
- Chair of IoP Juno panel (from Jan 2016)
- Other IoP/national/international E&D initiatives

IMPROVING GENDER BALANCE
Part of the Stimulating Physics Network

isaac Physics. You work it out.

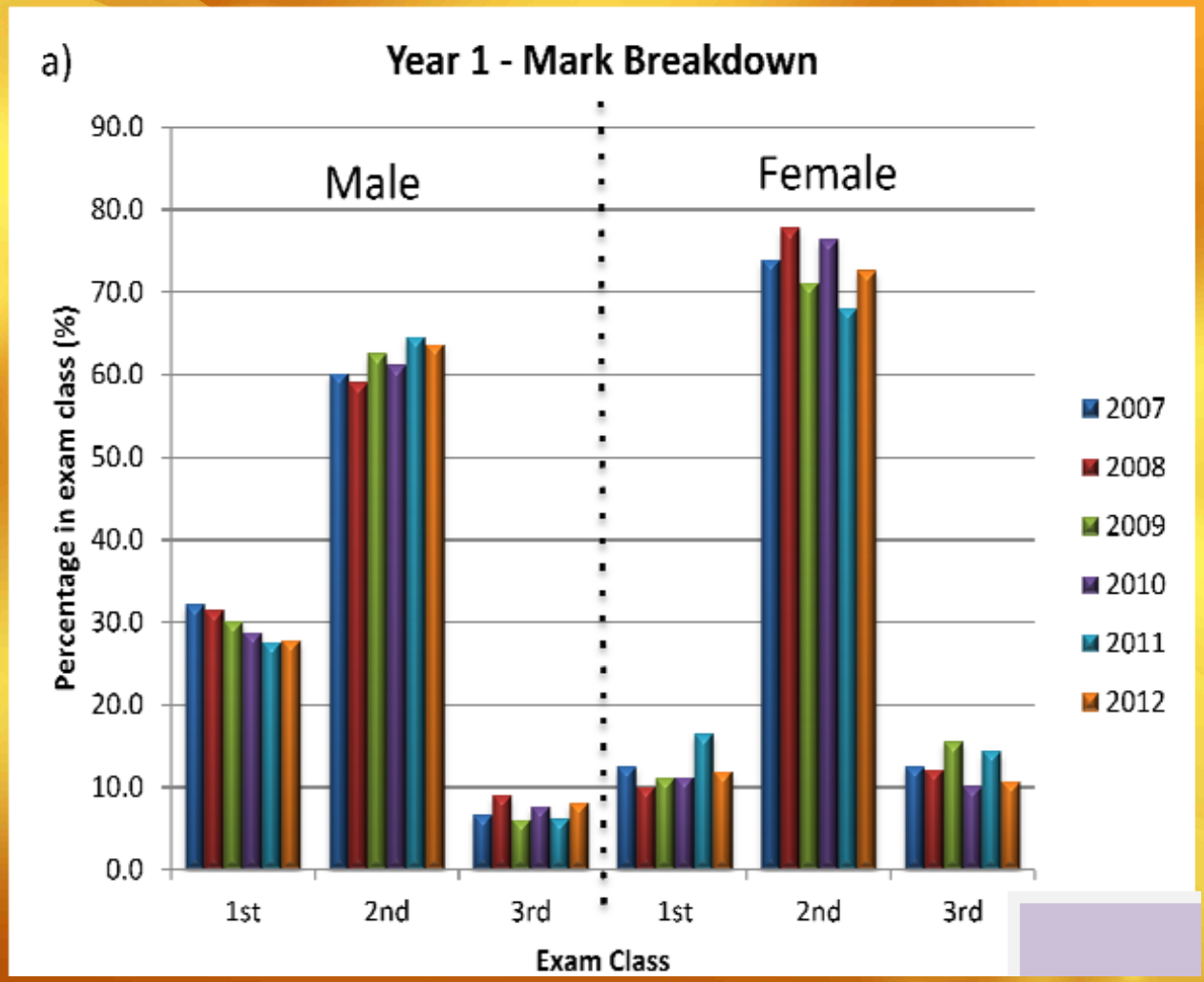
CERN

Questions?

Physics Exam Project

Cambridge Natural Sciences course

End of 1st year results: Physics



Physics Exam Project

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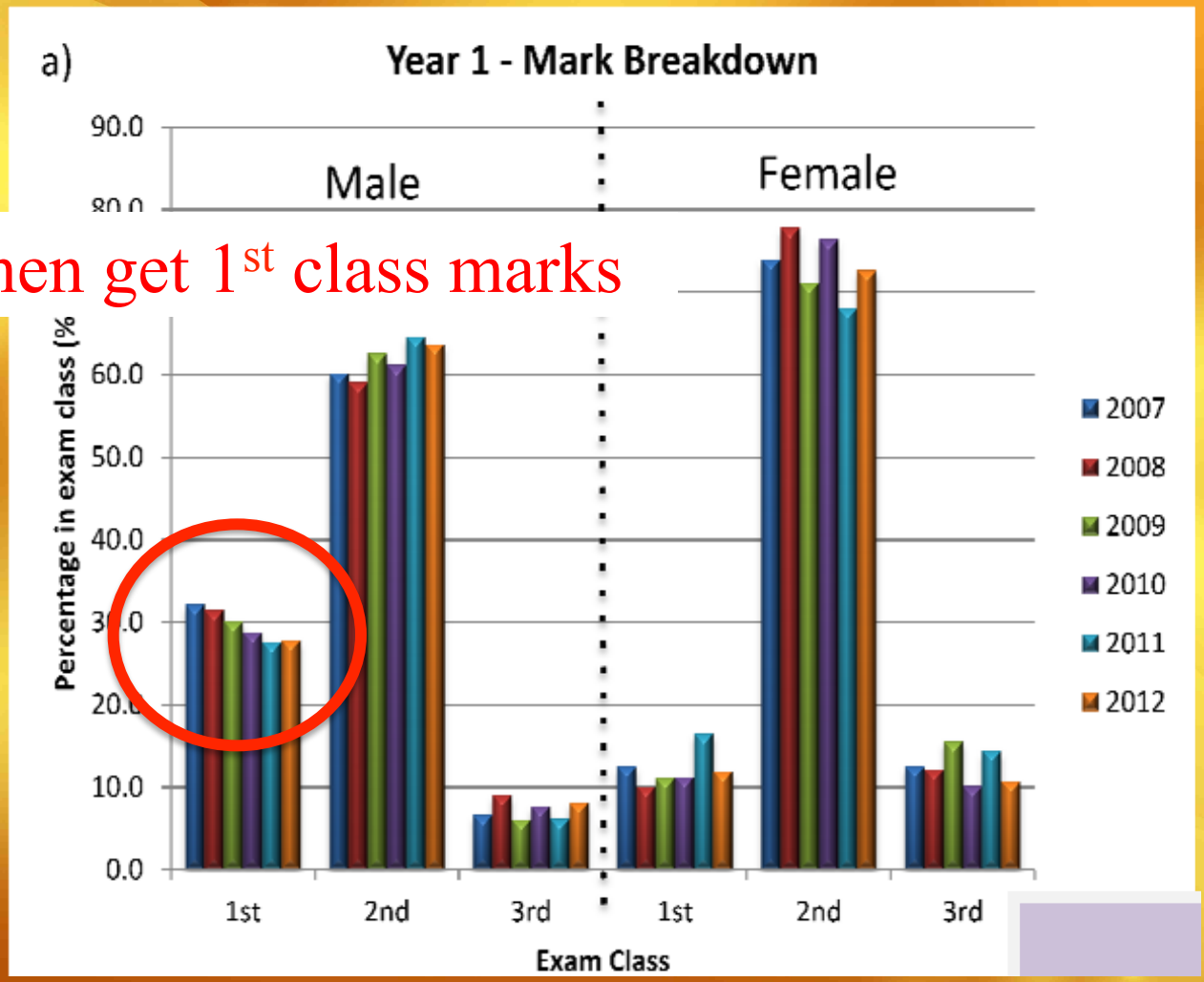

30% men get 1st class marks

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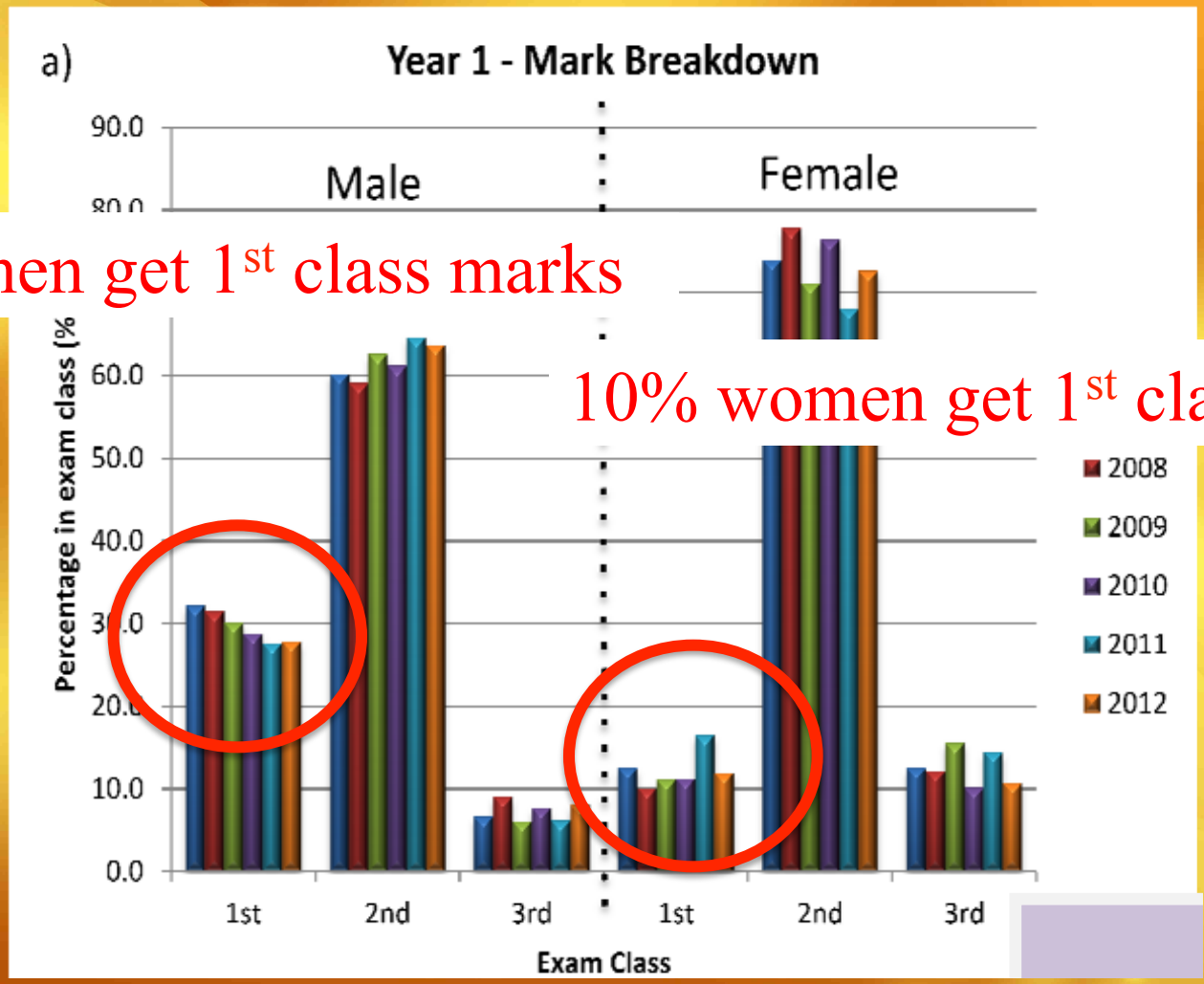

30% men get 1st class marks

10% women get 1st class marks

Physics Exam Project

April 2014: Year 1 mock physics exam (funded by IoP)

An Investigation into the Impact of Question Structure on the Performance of First Year Physics Undergraduate Students at the University of Cambridge.

Prof. Valerie Gibson, Dr. Lisa Jardine-Wright* & Elizabeth Bateman
University of Cambridge, Cavendish Laboratory, J J Thomson Avenue, CB3 0HE

Published in Eur. J. of Physics 36 (2015) 045014.

Physics Exam Project

Exam held start of Easter term (voluntary with strong steer from DoS's)

Scripts marked by a team of markers within 2 days

Information	Option or Choices
Gender	Female/Male/Rather not say
CRSID (unique identifier)	
College	
College tutor	
Pre-University education	
Country of education	UK/Overseas
School type	Independent/State/Academy/Other (describe)
School pupil type	Single Sex/Mixed
Final year school exam results	
Exam type	A-Levels/IB/Scottish highers/Pre-U/Other (describe)
Maths mark	? out of ?
Physics mark	? out of ?
Further maths mark	? out of ?
Other subjects	? out of ?

Physics Exam Project

- Exam held start of Easter term (voluntary with strong steer from DoS's)
- Scripts marked by a team of markers within 2 days

Examination type	Male	Female
A2-levels	189	61
IB	15	5
Scottish Highers	7	1
Pre-U	3	0
Other	21	10

Physics Exam Project

Paper: Section A: 4 short questions

Section B: 2 longer questions

Candidates required to answer all questions.

TWO versions of the same paper contained the SAME physics questions but with alternate styles:

"University" and "Scaffolded"

Students randomly selected to sit one of the two papers

Physics Exam Project

Paper 1

Section A

U 1. A potential difference of 2.1±0.1 V is applied across a resistor of resistance 4.7±0.1 Ω for 55±1s. Calculate the energy dissipated, together with its uncertainty. [5]

S 2. In a poorly maintained train, the thin cavity of a double glazed window is partially filled with rain water. As the train decelerates along a horizontal track, a passenger notices that the water surface is at an angle of 15 degrees to the horizontal.

(a) Draw a labelled diagram of the forces on a single water molecule. [3]

(b) Find the deceleration of the train. [2]

U 3. Why does the front end of a car dip upon braking? [5]

S 4. The wave function for an electron is split by a barrier into two parts which follow paths differing in length by 1 μm before they merge again. When the electron energy is 10 MeV the interference is constructive.

(a) Write down the requirements for constructive and destructive interference. [1]

(b) What is the wavelength of the electron of energy 10 MeV? [1]

(c) By how much must the energy be increased for the interference to become destructive? [3]

Physics Exam Project

Paper 2

Section A

S 1. (a) Write down an expression for the power dissipated in a resistor when a voltage is applied across it. [1]

(b) A potential difference of 2.1±0.1 V is applied across a resistor of resistance 4.7±0.1 Ω for 55±1 s. Calculate the energy dissipated. [2]

(c) Find an expression for the fractional uncertainty in the energy dissipated and hence calculate the uncertainty in your previous result. [2]

U 2. In a poorly maintained train, the thin cavity of a double glazed window is partially filled with rain water. As the train decelerates along a horizontal track, a passenger notices that the water surface is at an angle of 15 degrees to the horizontal. What is the deceleration of the train? [5]

S 3. (a) A car slows down by braking. Draw a diagram of the car, indicating all the forces present whilst braking. [2]

(b) Which force slows the car down? [1]

(c) Why does the front end of the car dip upon braking? [2]

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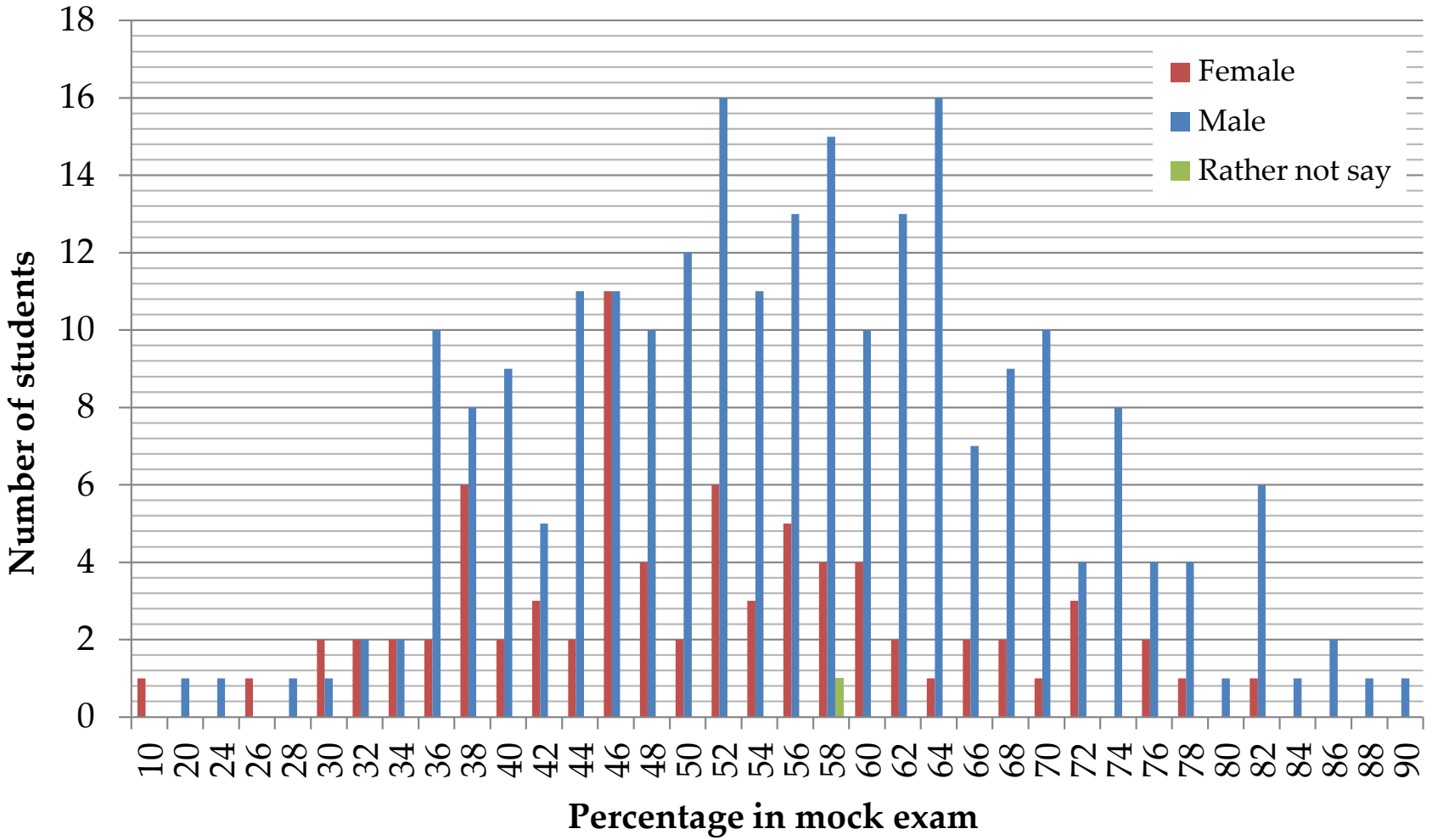
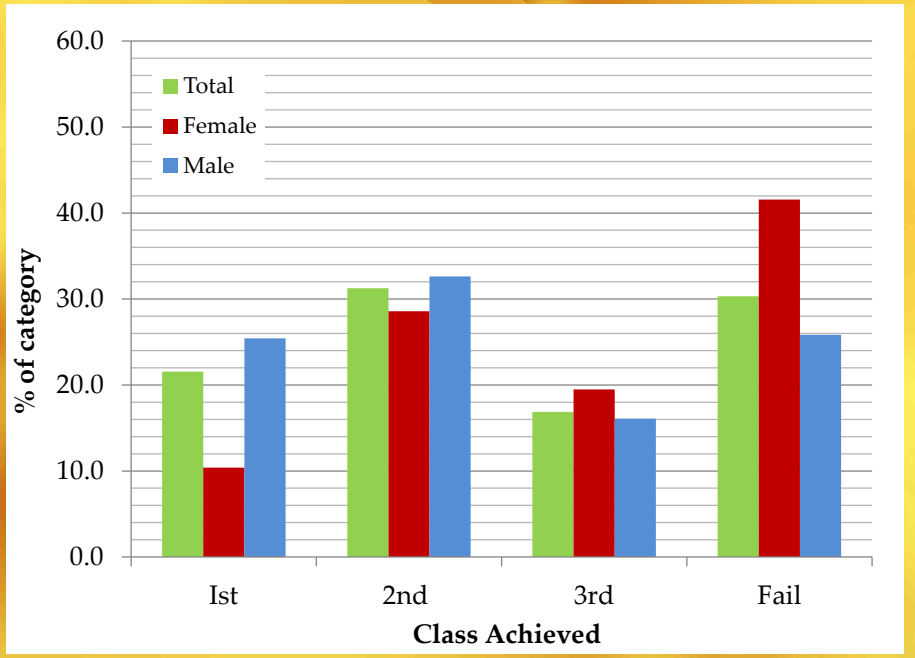
Physics Exam Project



(a) Marks by gender.

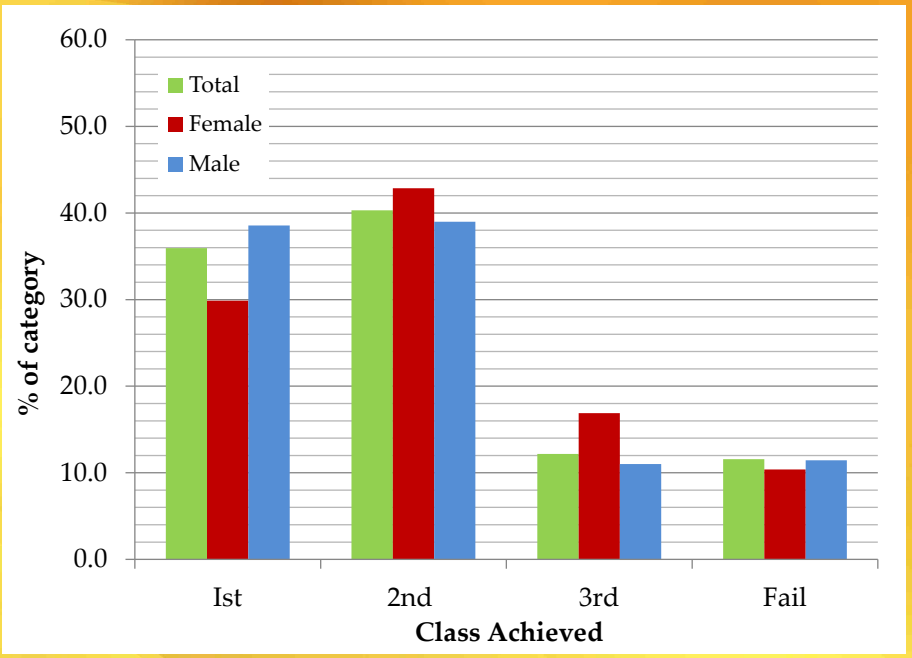
Physics Exam Project

"University" style



(a) University style.

"Scaffolded" style

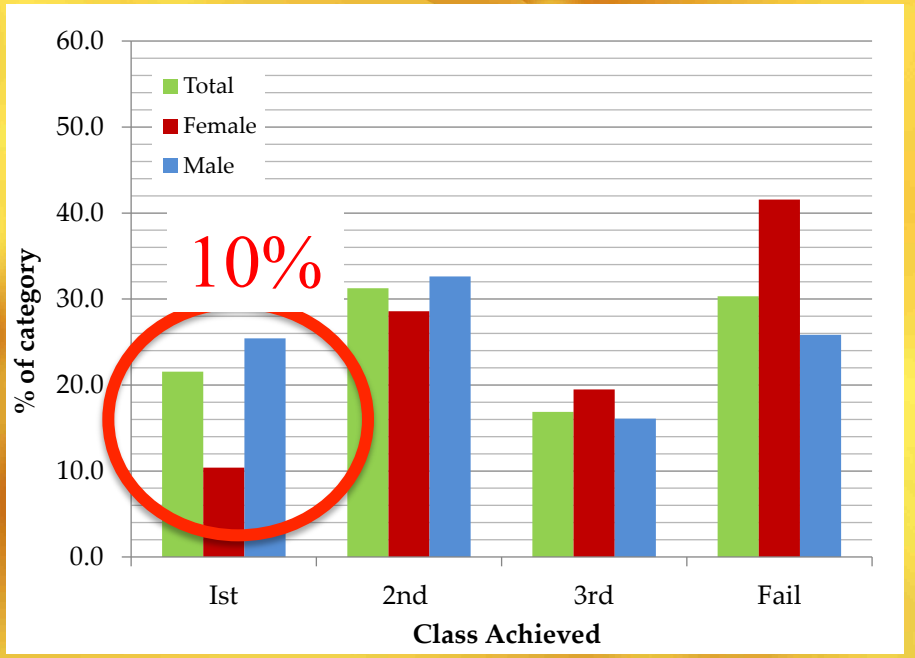


(b) Scaffolded style.

All students benefit; women preferentially.

Physics Exam Project

"University" style



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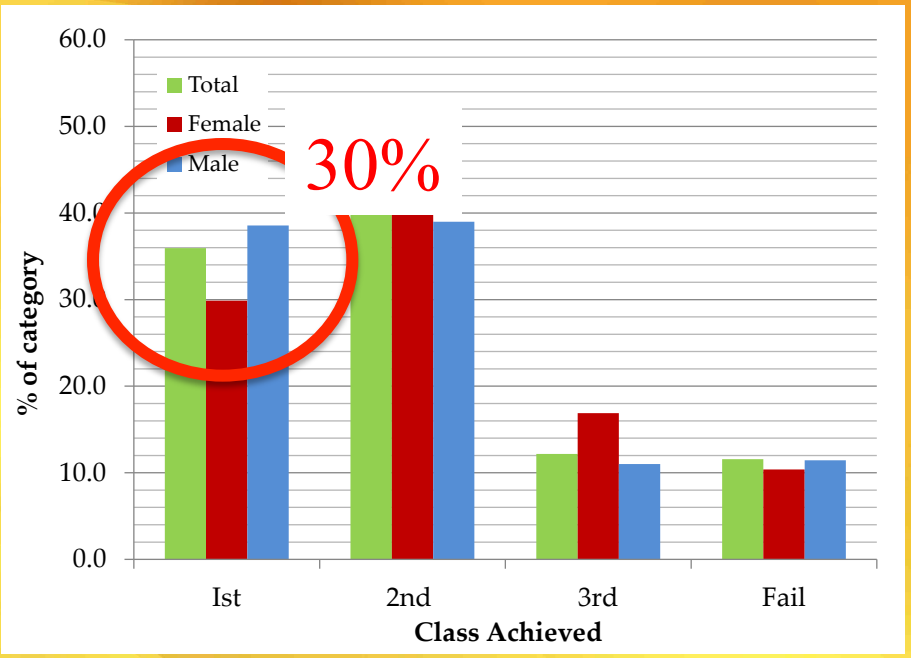

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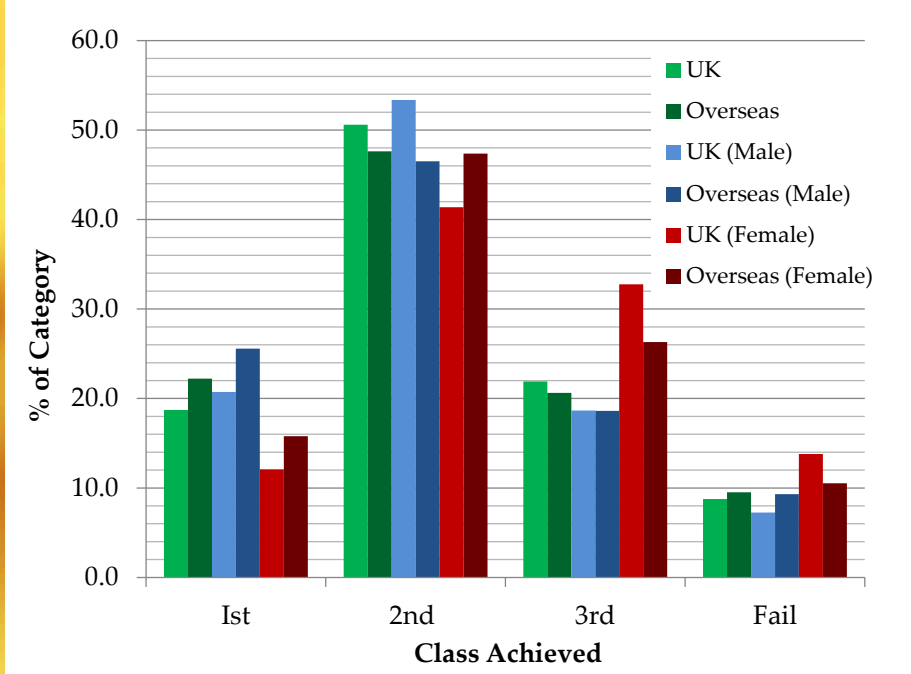
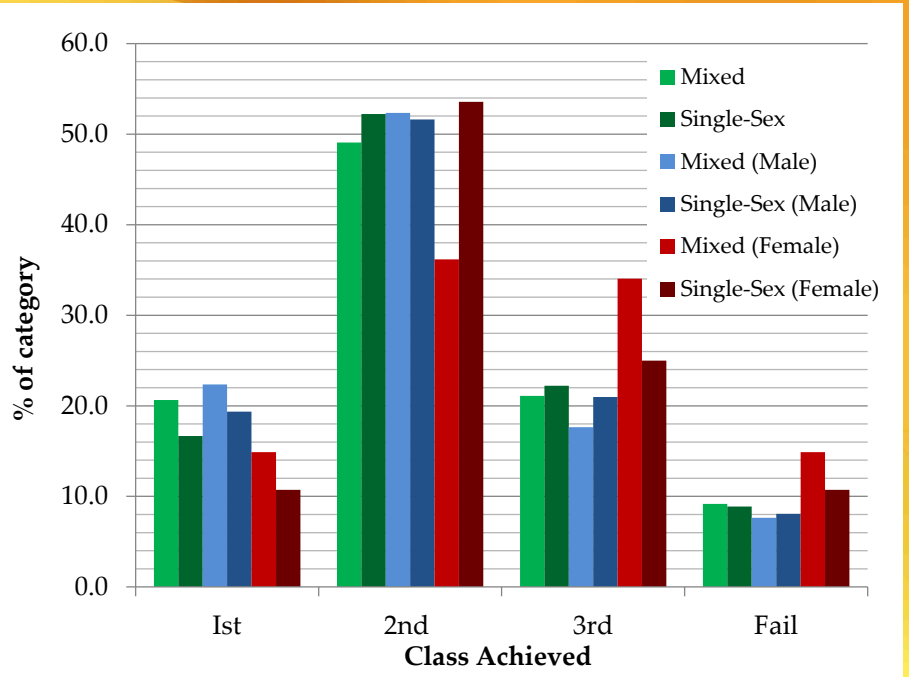
Physics Exam Project

UK and Overseas



(a) UK and overseas.

Single-sex and Mixed

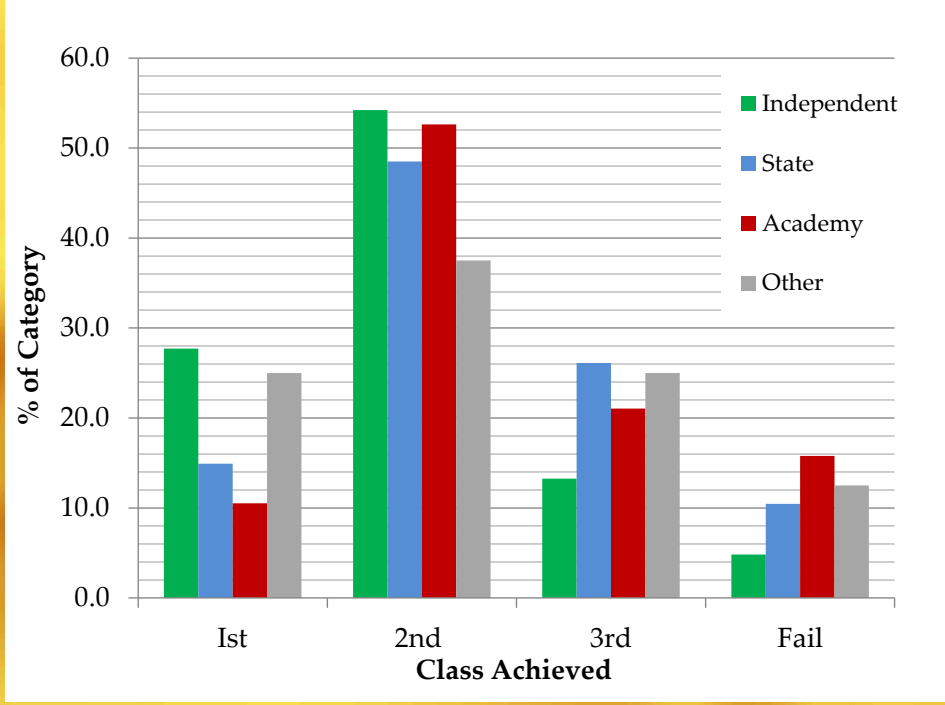


(b) Single-sex or mixed.

Overseas or mixed gender education perform better

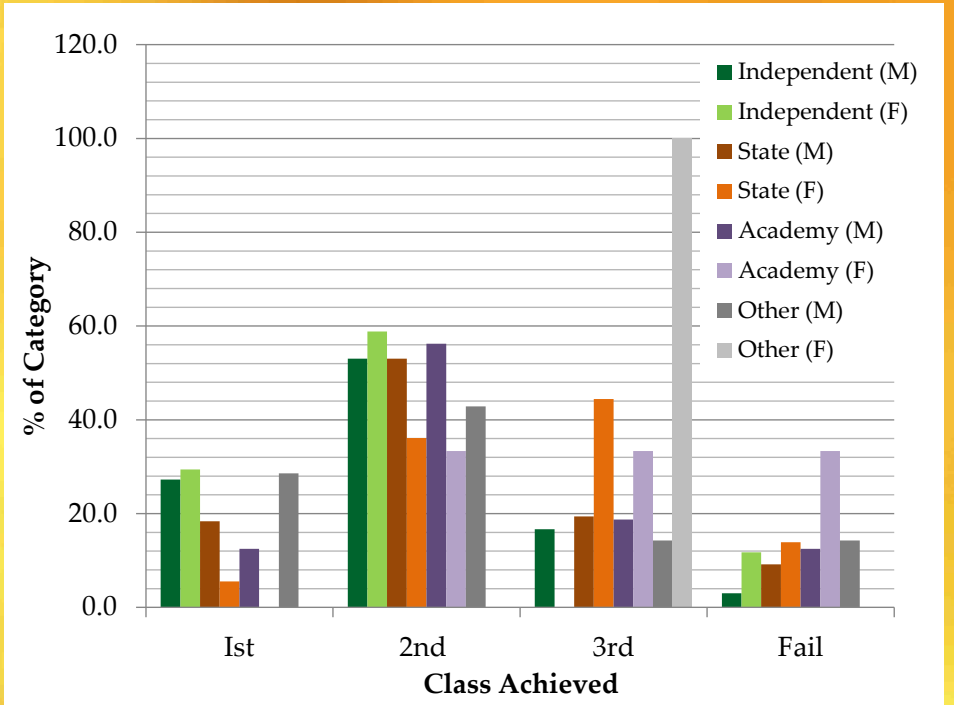
Physics Exam Project

School type



(c) School type.

School type & gender



(d) School type and gender.

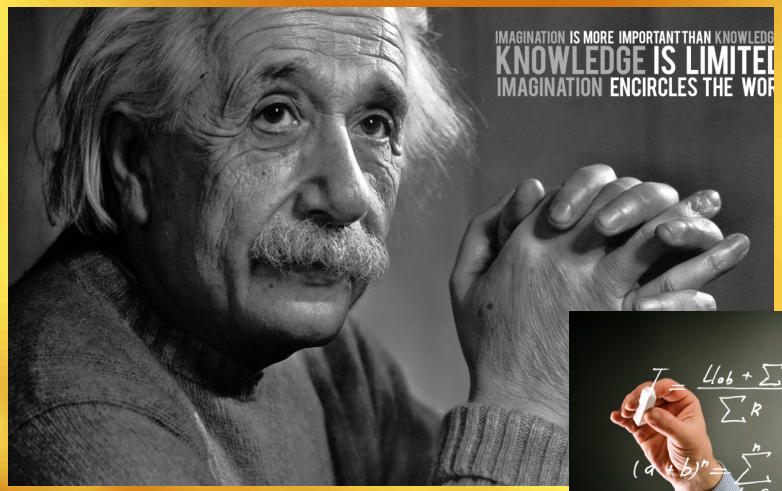
UK independent school (irrespective of gender) better prepared for physics at Cambridge

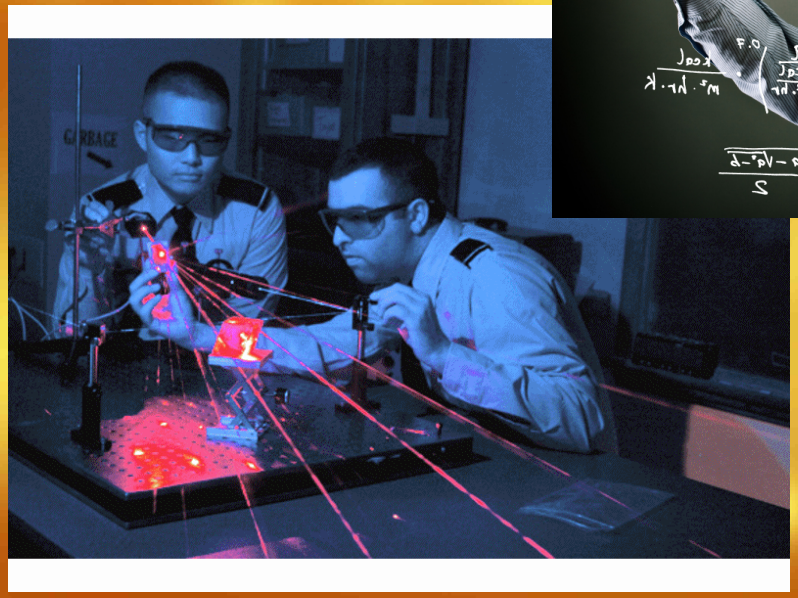
Key findings

- No gender bias in performance at A2-level.
- Mock exam mark distribution confirms trend seen in end of year exams.
- “Scaffolded” questions improve performance of both genders from all school backgrounds, women benefitting preferentially.
- Correlation between A2-level and mock exam results reduced for scaffolded questions.
- Students with overseas, mixed environment and independent school education more likely to receive a first class mark in Year 1 (irrespective of gender).

The Image of Physics

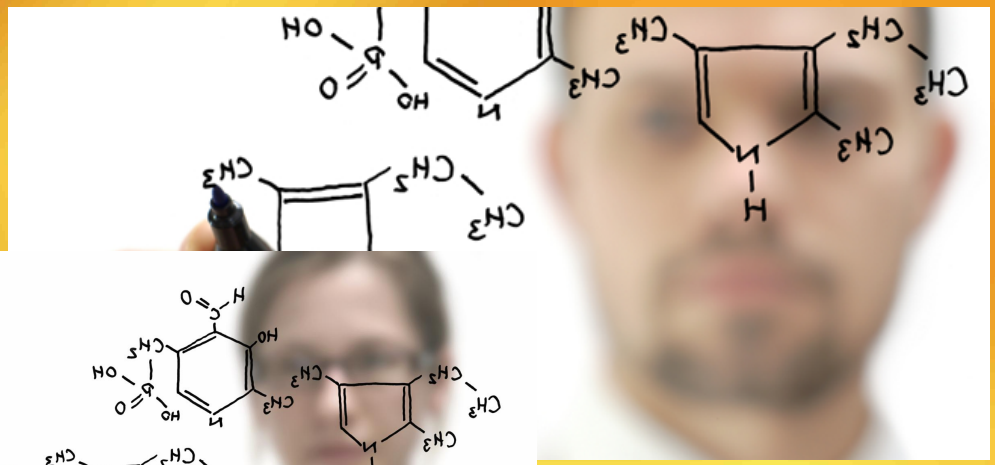
Top 5 images on Google: (“Physics images”)

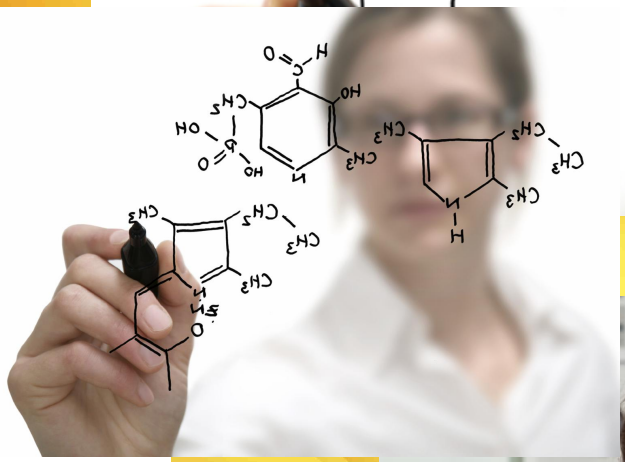




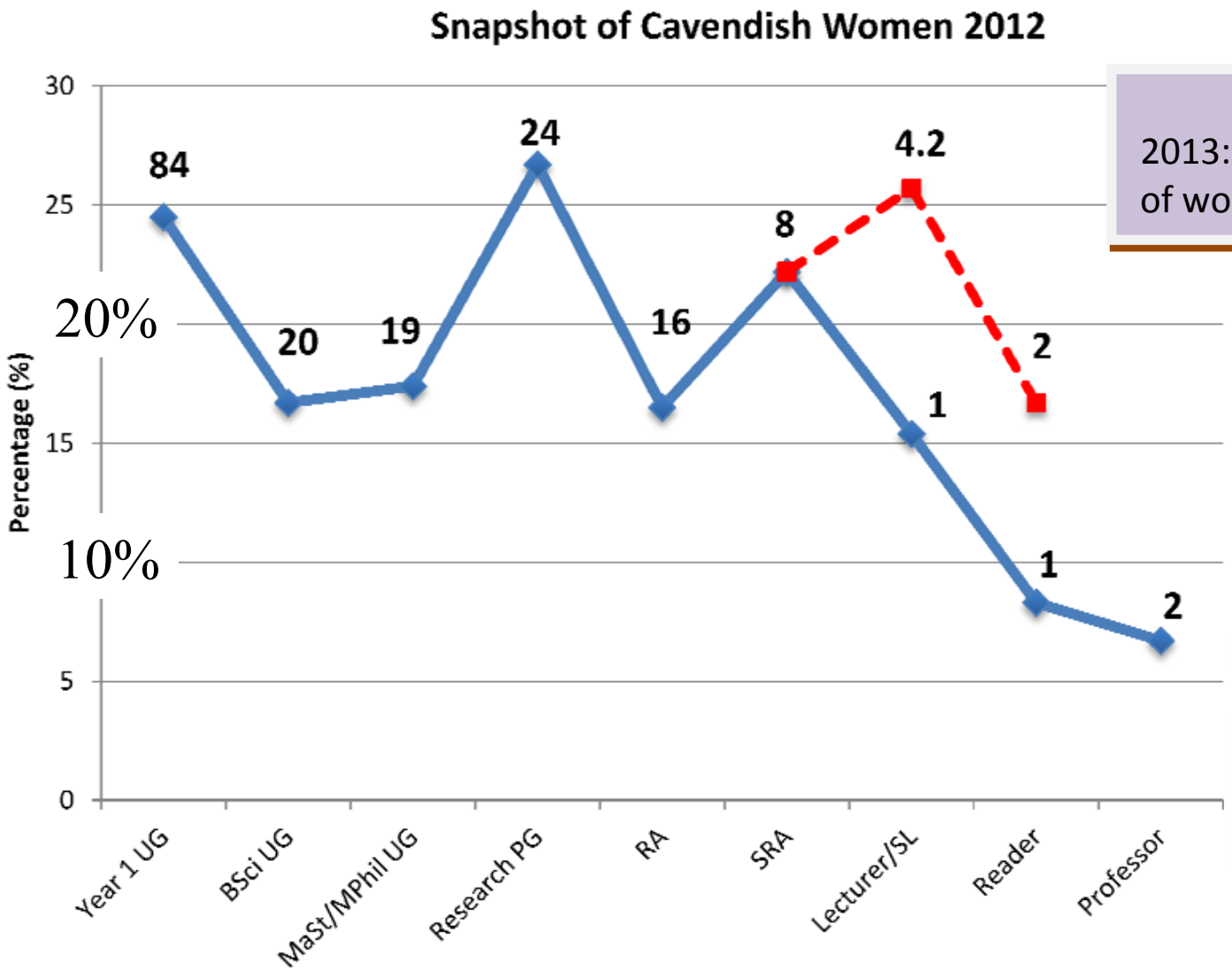
The Image of Chemistry

Top 5 images on Google: (“Chemistry images”)





The Departments Biggest Challenge



2013: 64% increase in number of women academic staff.

THE Biggest Challenge

THE Biggest Challenge

THE Biggest Challenge

Only 20% A2-level (& equiv.) physics students are girls.

Critical Friends

Critical friends have been key to our success…

- IoP Project Juno supports physics departments with visits, advice and complementary recognition to Athena SWAN.

IOP | Institute of Physics
Juno Champion

- University of Cambridge
  - E&D, WiSETi and Athena SWAN team
  - School of Physical Sciences E&D Forum
  - Gender Equality Group & Vice-Chancellor

Equality & Diversity

New Initiatives

IoP "Opening Doors" Project

Minister launches IOP project to stamp out gender bias

4 June 2014

Women and equalities minister Jenny Willott said gender stereotypes had put girls off of STEM careers for too long as she launched an IOP project aimed at eradicating their influence.

Called Opening Doors, the pilot proje
will be funded by the Government
Equalities Office. It will enable the IOF
research ways to remove gender-rela
obstacles that still stand between
students, their subject choices and the
career paths.

Senior Physics Challenge

Rutherford Schools Project

BBC Sign in News Sport Weather iPlayer TV

NEWS EDUCATION & FAMILY

Home World UK England N. Ireland Scotland Wales Business Politics Health Education Sci

League Tables | School Report

8 May 2013 Last updated at 05:07

Share

Cambridge tutors to school A-level physics students

By Katherine Sellgren
BBC News education reporter

Academics from Cambridge University are to help tutor sixth-form physics students across the UK to prepare them better for university study.

The five-year project will offer online learning, workshops for students and support for physics

Physics Exam Project

Cambridge Natural Sciences course

Student (m/f) academic qualifications at entry ~equal

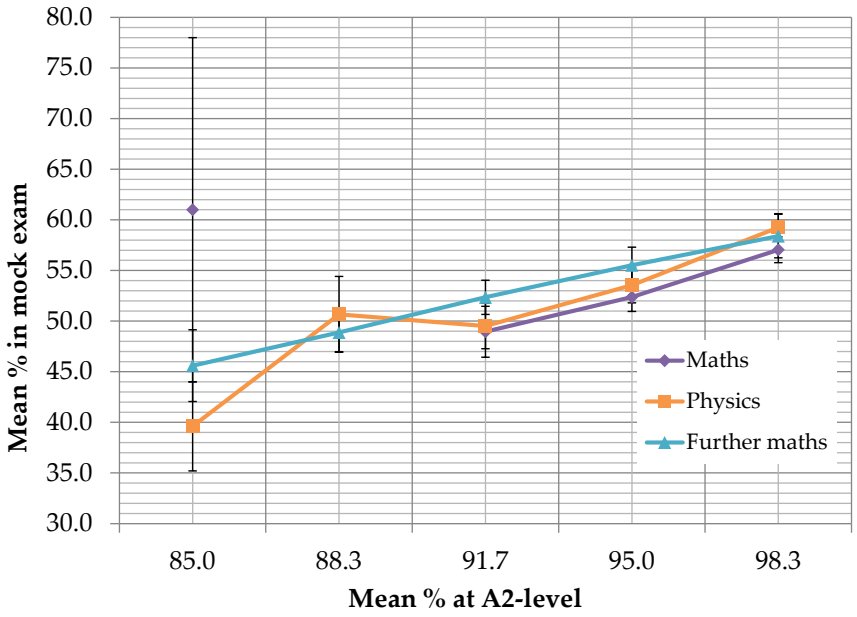
2013 intake: A2-level scores (marked out of 600)

	Physics			**Maths**			**Further Maths**		
	Mean	σ	N	Mean	σ	N	Mean	σ	N
Female	570.2	20.9	56	574.2	22.0	55	554.0	52.2	39
Male	566.3	22.0	159	573.7	18.4	159	555.9	30.5	116

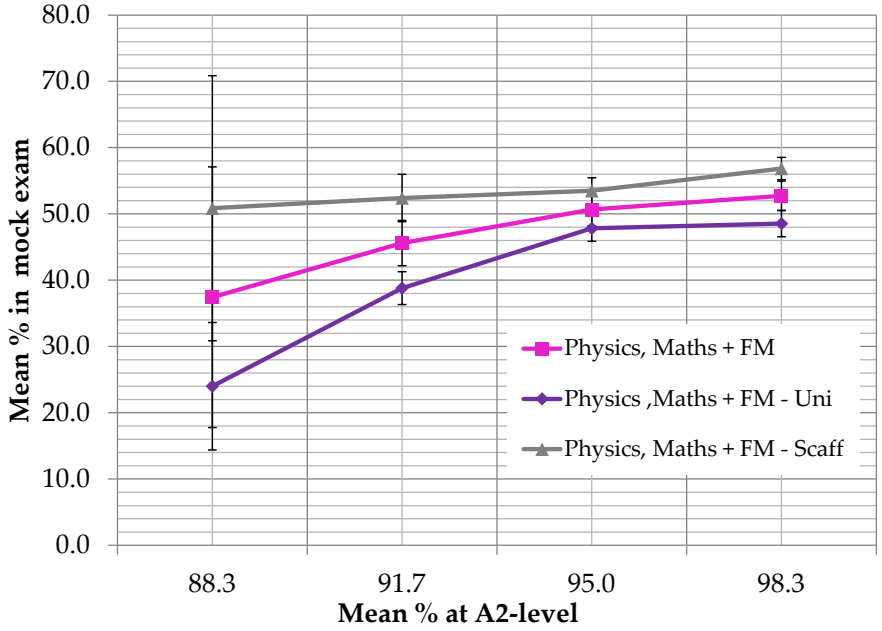
Taken from the following study.

Physics Exam Project

Mean % at A2-level versus Mean % in mock exam



(a) A2-level physics, maths and further maths.



(c) University and scaffolded questions for cohort with A2-level physics, maths and further maths.

Scaffolded questions also reduces correlation.