Un viaggio entusiasmante verso la parità

Luisa Torsi

Dipartimento di Chimica - Università degli Studi di Bari "Aldo Moro" Bari (I)

The Faculty of Science and Engineer - Åbo Akademi University – Turku (FI)

Potenza - Ottobre, 2019

the team & principal collaborations

G.Mangiatordi
IC-CNR

F. Torricelli
UNIBS

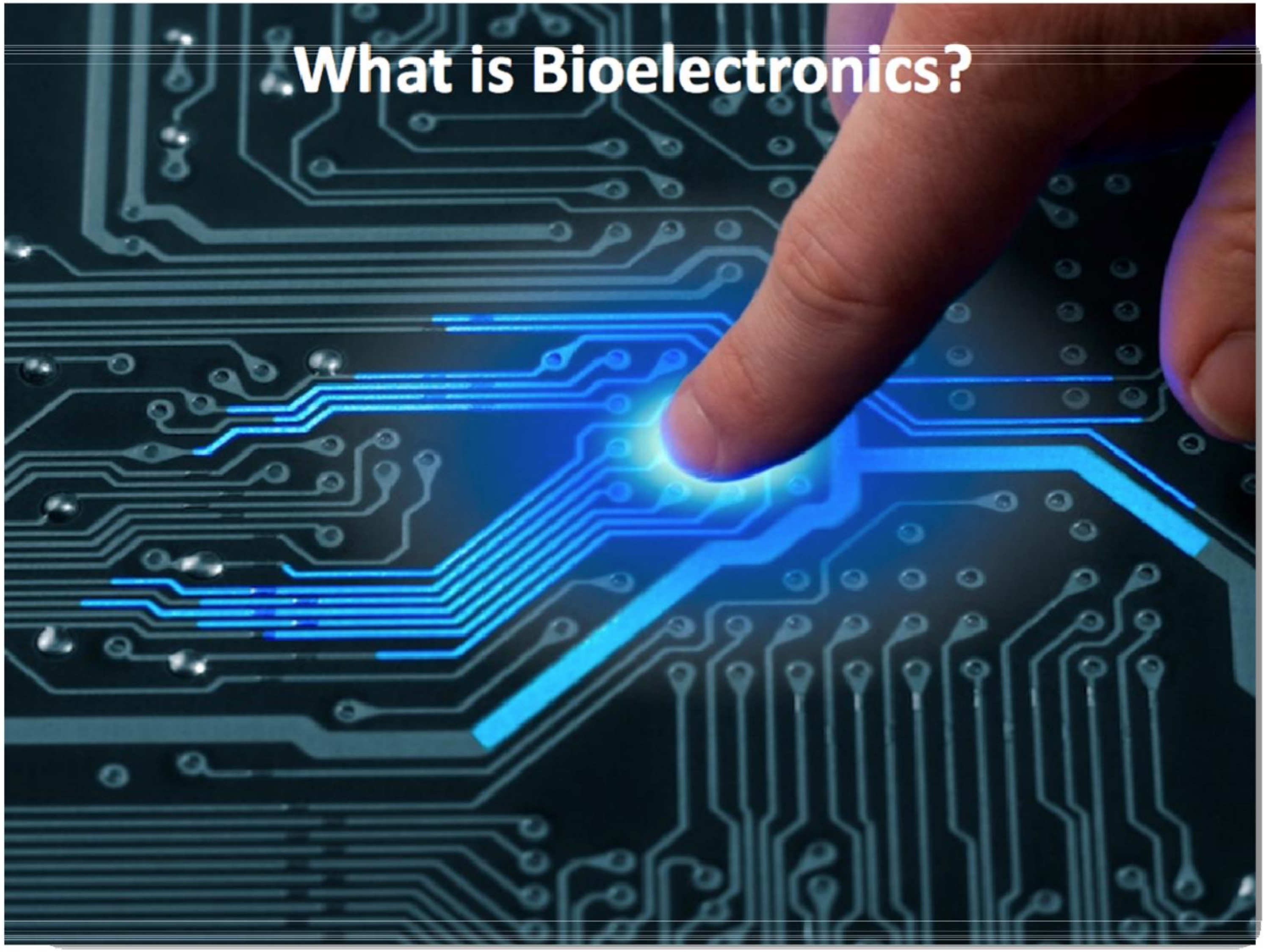
D. Alberga

L.Sarcina

D.Blasi

F. De Noto

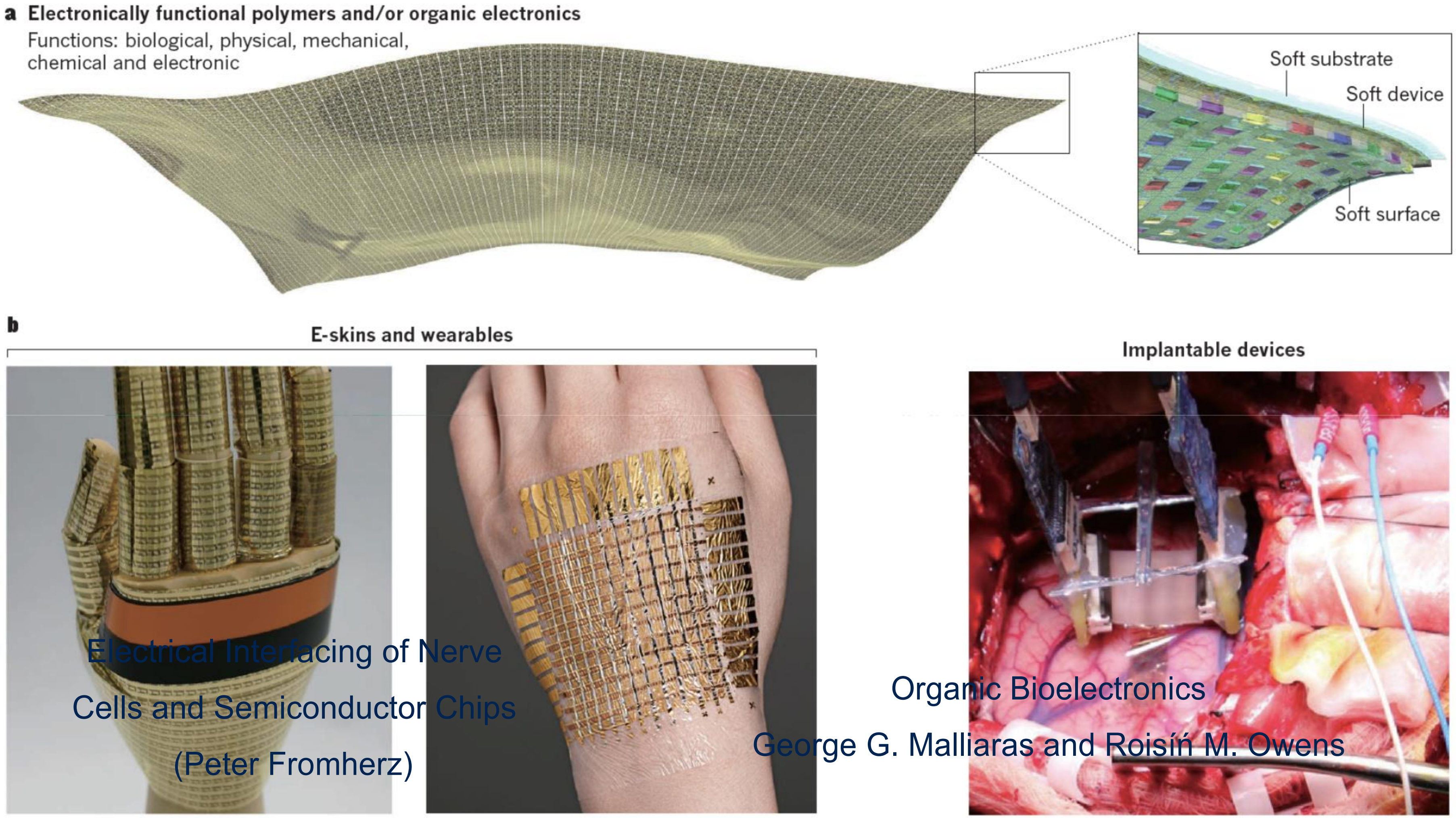
what is bio-electronics



everything starts with Luigi Galvani

During the dissection of a frog, his zinc scalpel and the copper rod reacted to make the frog's leg jump —> "animal electricity"

large-area bio-electronics

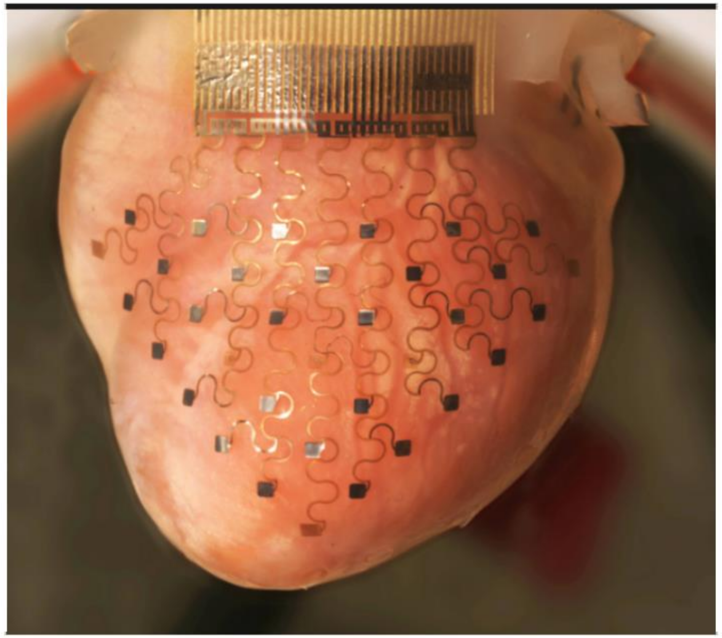


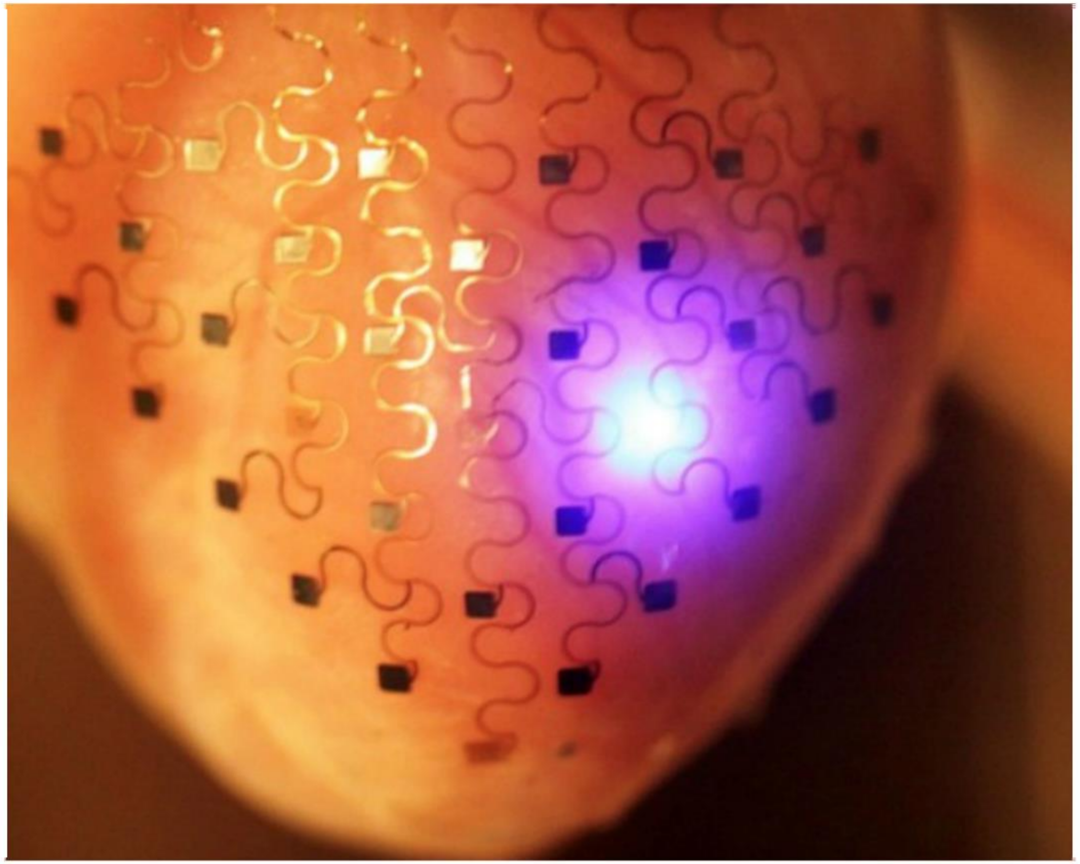
Electrical Interfacing of Nerve Cells and Semiconductor Chips (Peter Fromherz)

Organic Bioelectronics
George G. Malliaras and Roisín M. Owens

The rise of plastic bioelectronics
Takao Someya[1,2], Zhenan Bao[3] & George G. Malliaras[4]

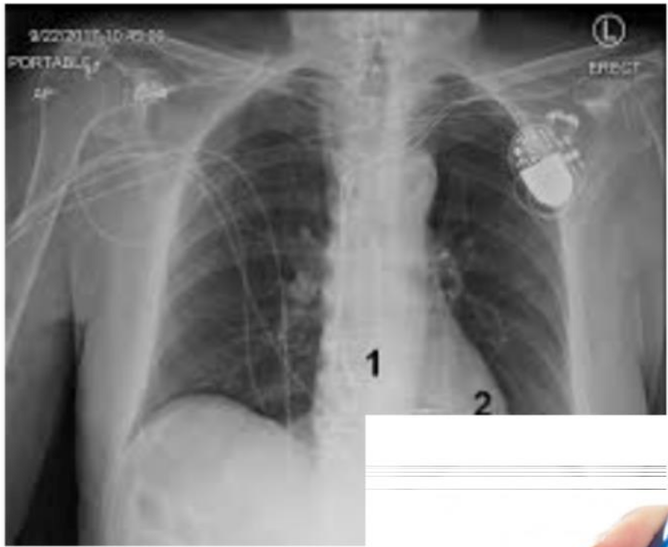
3-D silicone "heart sock





Hyun-Joong Chung, professor of chemical and mechanical engineering at the University of Alberta, John Rogers, professor of engineering and chemistry at the University of Illinois

example of bio-electronic devices



Highlighted in Nature

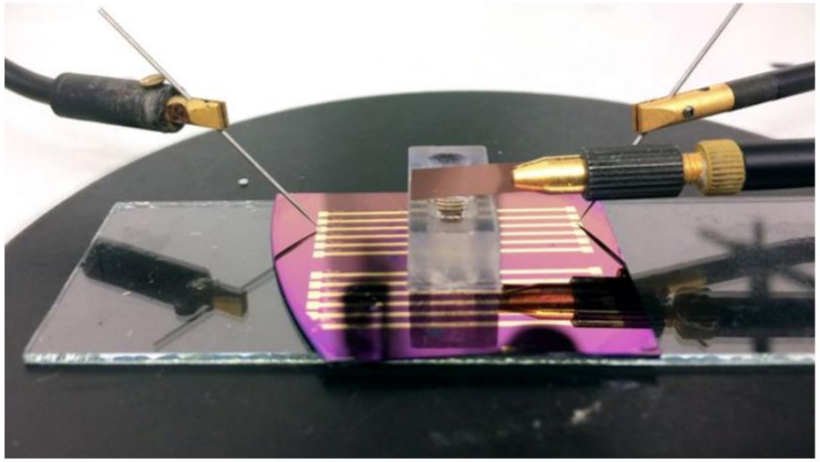
nature.com > nature > research highlights > article

a natureresearch journal

MENU

nature
International journal of science

Search E-alert Submit Login



An ultra-sensitive detector includes an antibody-coated 'gate' (brown rectangle, centre), which controls the current flowing through electrodes (gold lines). Credit: Eleonora Macchia

An ultra-sensitive detector includes an antibody-coated 'gate' (brown rectangle, centre), which controls the current flowing through electrodes (gold lines). Credit: Eleonora Macchia

TECHNOLOGY · 16 AUGUST 2018

A sensor detects the light touch of a single molecule

Contact with just one antibody molecule regulates current flow through a transistor.

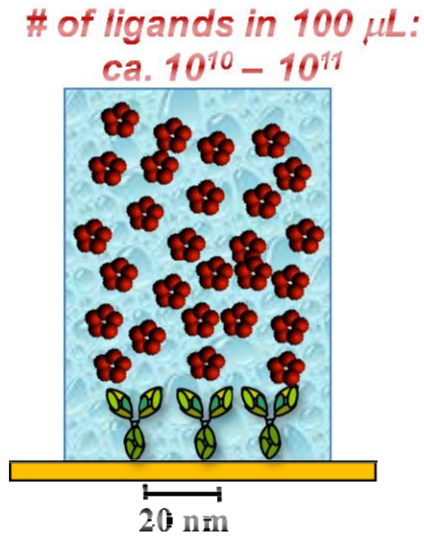
E. Macchia et al. Nat. Comm 2018 DOI: 10.1038/s41467-018-05235-z

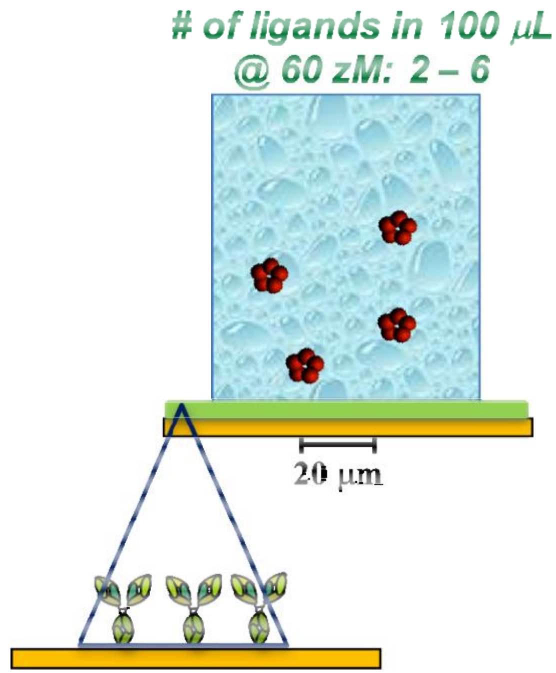
the concept

- Label-free single-molecule detection with manometric transducers —> unable to sense a cue in a bulk milieu

- Conceptualising some cells' ability —> large-area processable mm-sized transistor hosting 10^{12} capturing proteins detect a single biomarker in diluted saliva and blood serum

- The SiMoT sensing mechanism involves a 2-stage amplification process:
  1. FET-induced sensor response amplification
  2. Work function change propagating via H-bond network

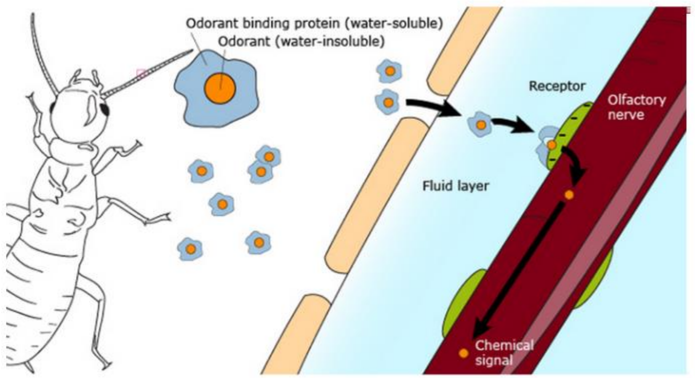


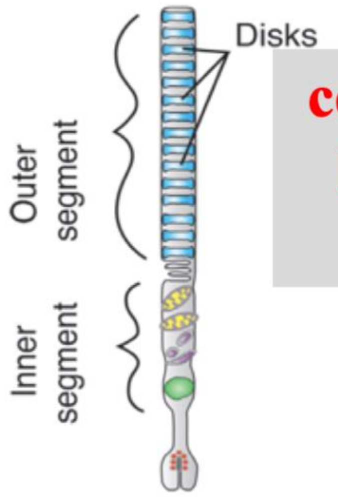


but for cells it works differently

Antennal receptors in moths sense single molecules of pheromones

[Kaissling K-E. 1971. Insect olfaction. In Beidler LM, ed; Olfaction, Handbook of Sensory Physiology, Vol IV, Part I. Berlin: Springer-Verlag. p. 351–431.]

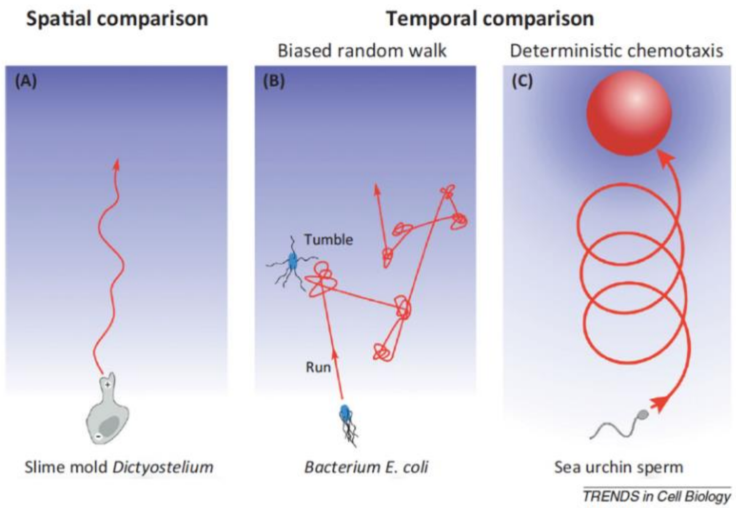




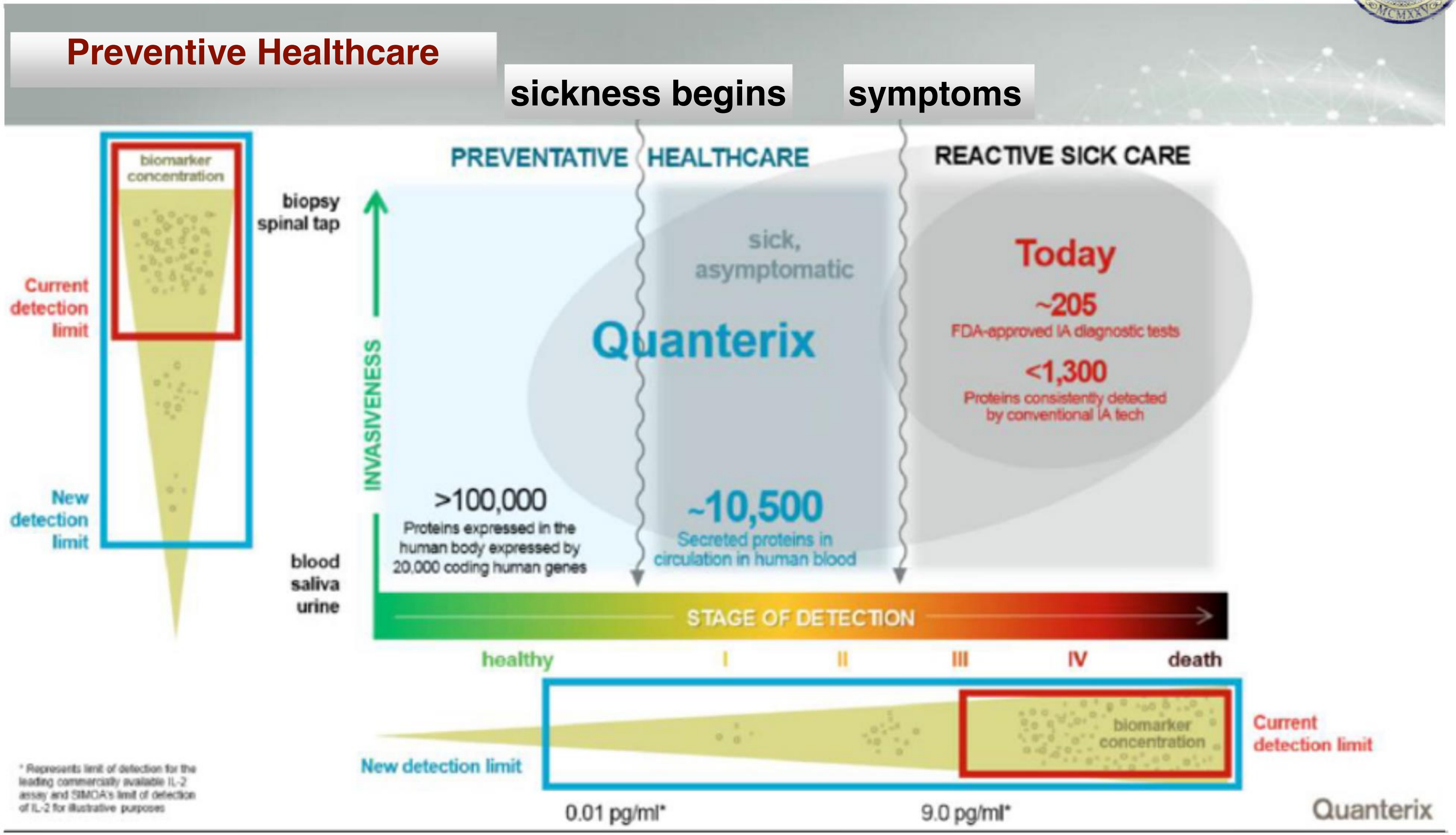
cell surface must be covered by an extraordinary large number of receptors, that are also highly packed (~ 10^4 μm^{-2})

At the physical limit: sea urchin sperm count single molecules

[Luis Alvarez, Benjamin M. Friedrich, Gerhard Gompper, and U. Benjamin Kaupp, Trends in Cell Biology March 2014, Vol. 24, No. 3]



Quanterix^{R} preventive healthcare

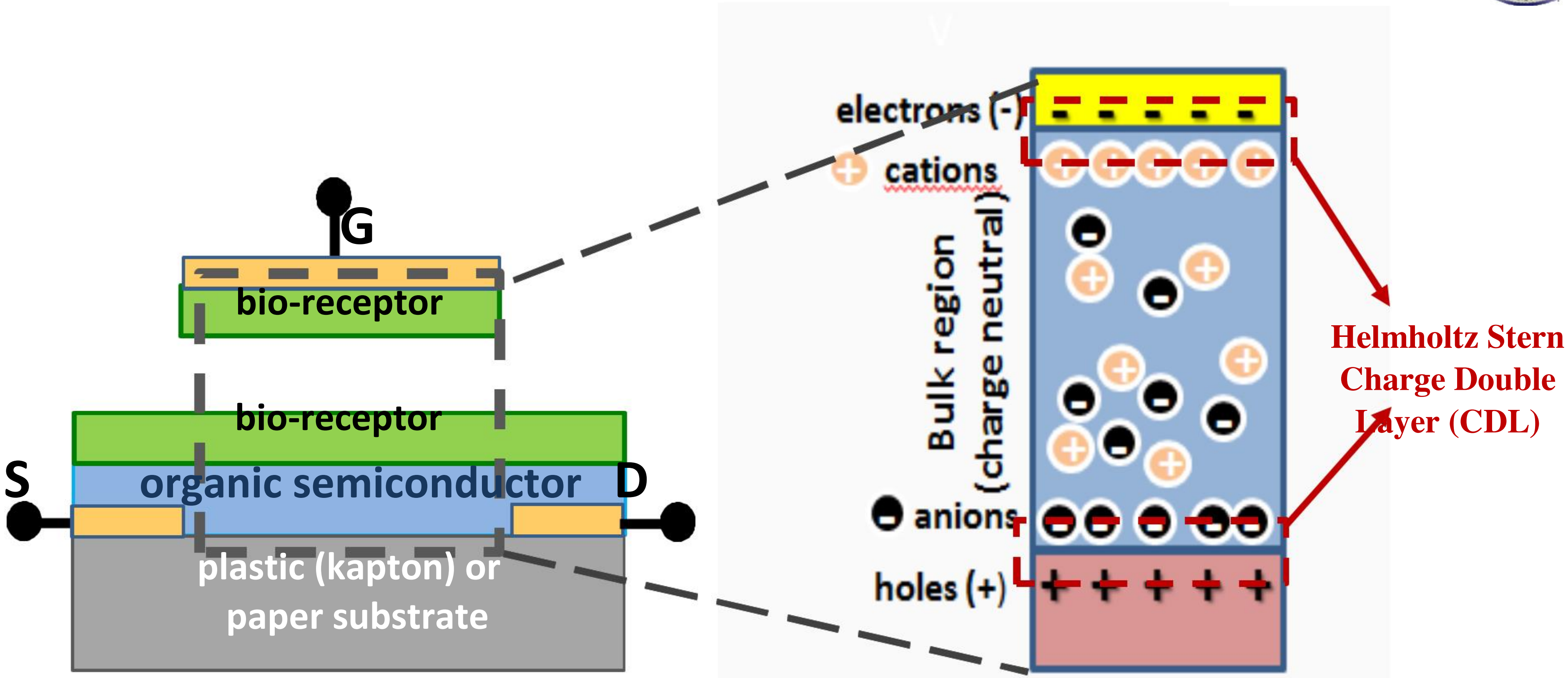


1 molecule in 100 μl —> [c] = 10 zM

https://www.americanlaboratory.com/Blog/345962-SIMOA-After-Five-Years-And-One-More-Thing/

Luisa Torsi - UNIBA

how electrolyte-gated FET work

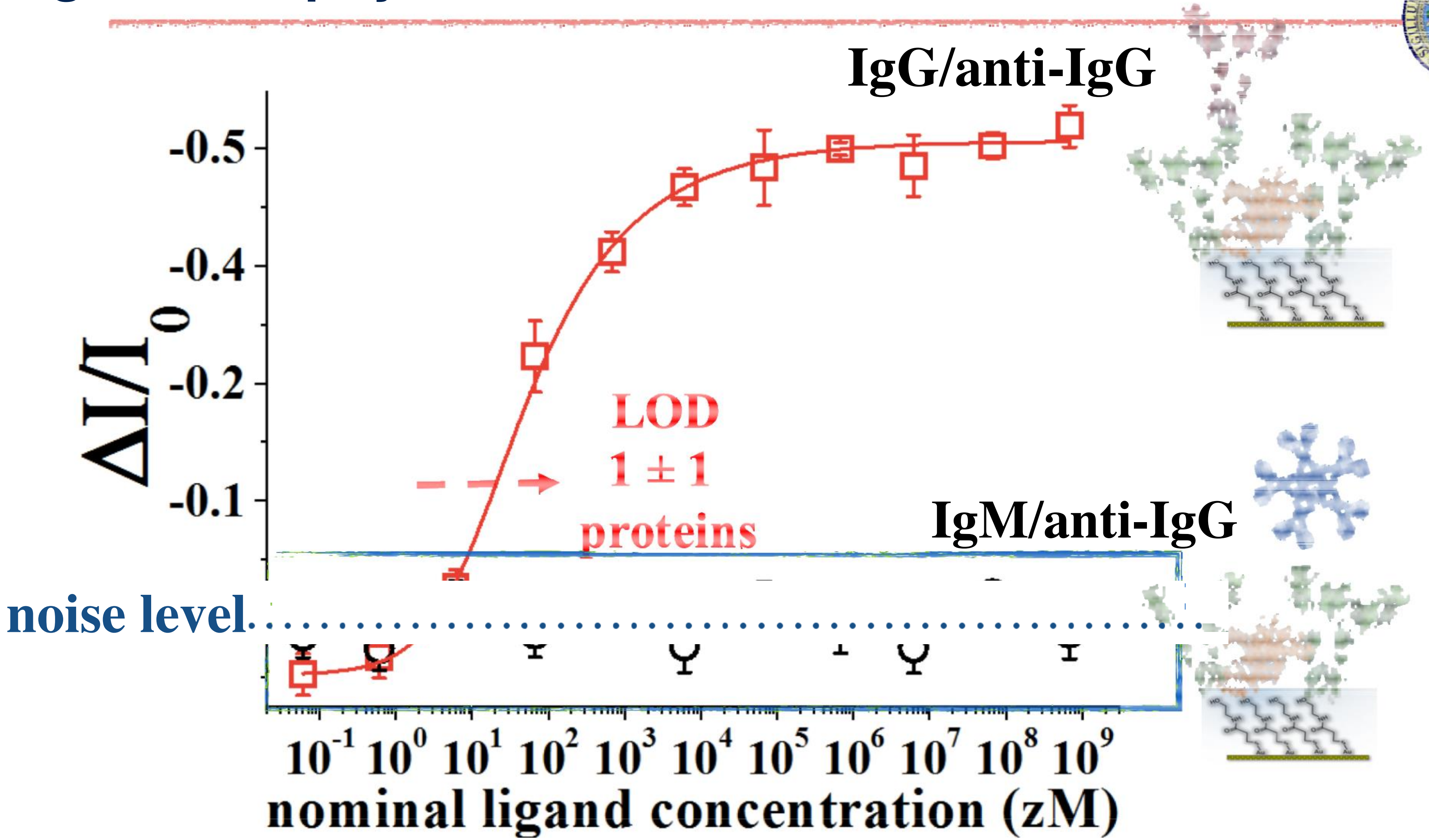


water self-ionization

a) electrostatic mode
of carriers accumulation
(impermeable OSC)

H. Klauk, *Organic electronics II: More materials and applications; Wiley-VCH* *S. H. Kim, K. Hong, W. Xie, K. H. Lee, S. Zhang, T. P. Lodge, C. D. Frisbie, Adv. Mater. 2013, 25, 1822-1846*

IgG at the physical limit in PBS

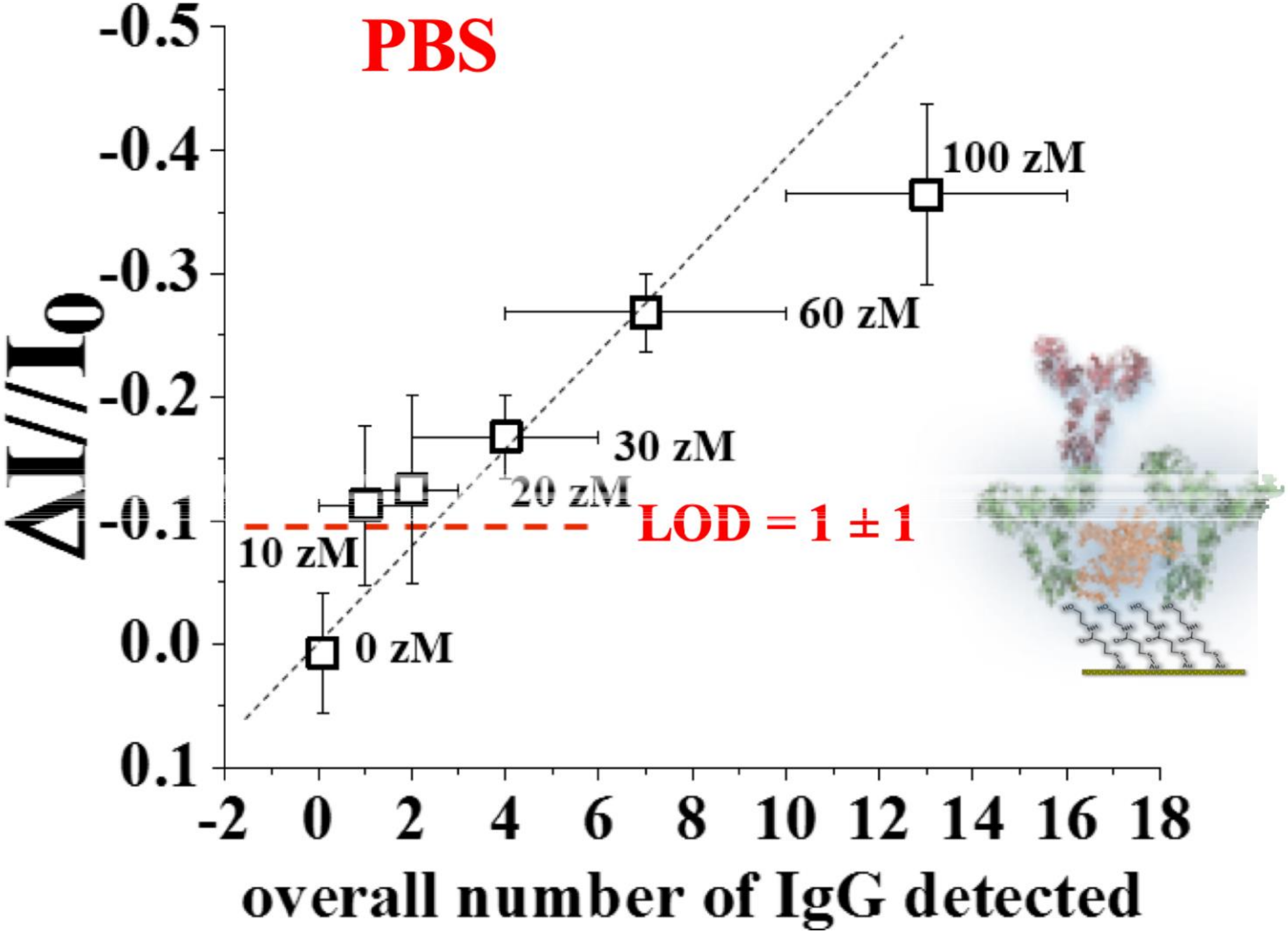


level of the Limit of Detection = $\bar{\eta} \pm k\sigma_n$
(LOD) =

et a given level of confidence: false positive

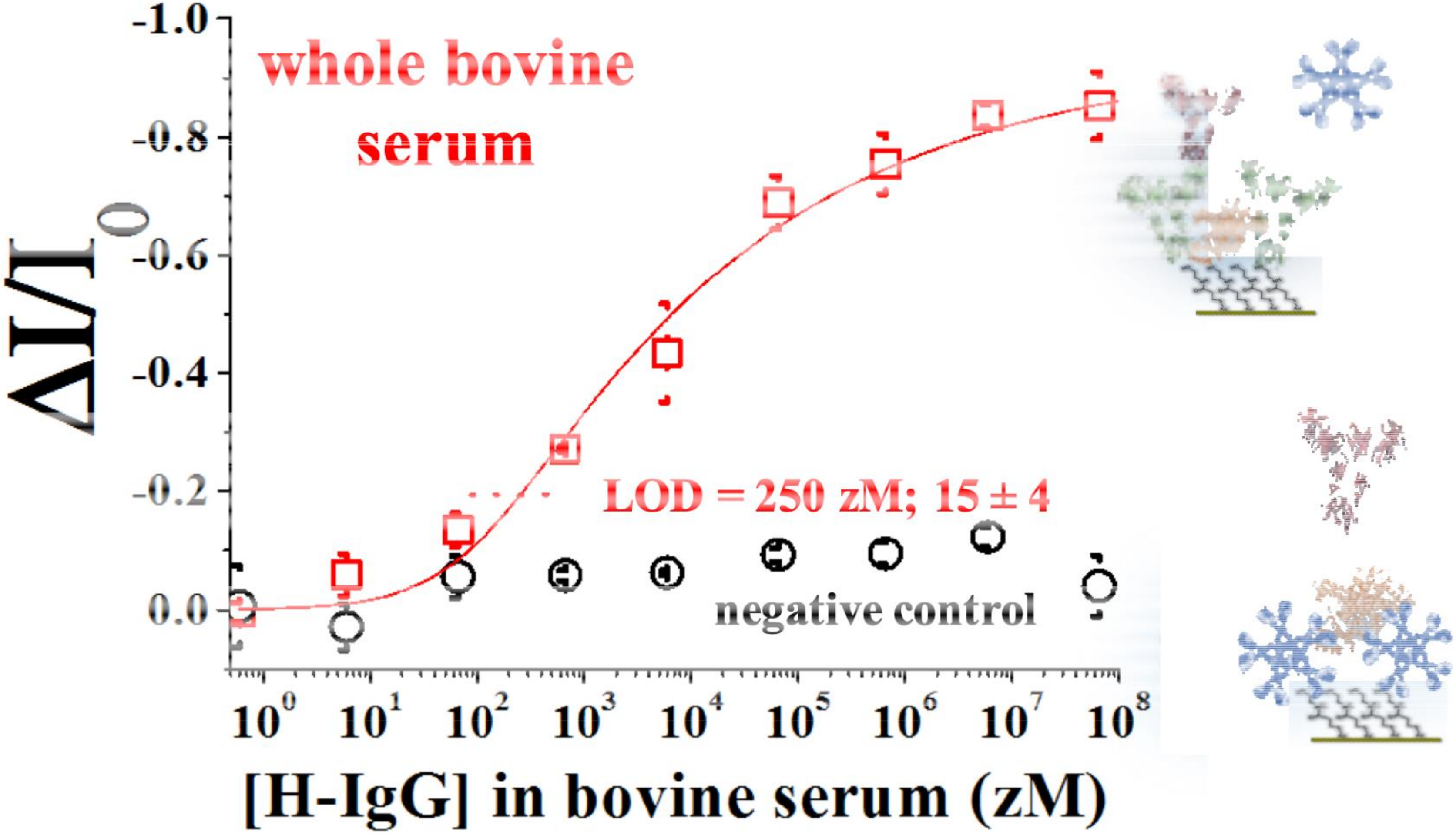
E. Macchia et al. Nat. Comm 2018 DOI: 10.1038/s41467-018-05235-z

IgG "really" at the physical limit in PBS



E. Macchia et al. Nat. Comm 2018 DOI: 10.1038/s41467-018-05235-z

and in a real sample



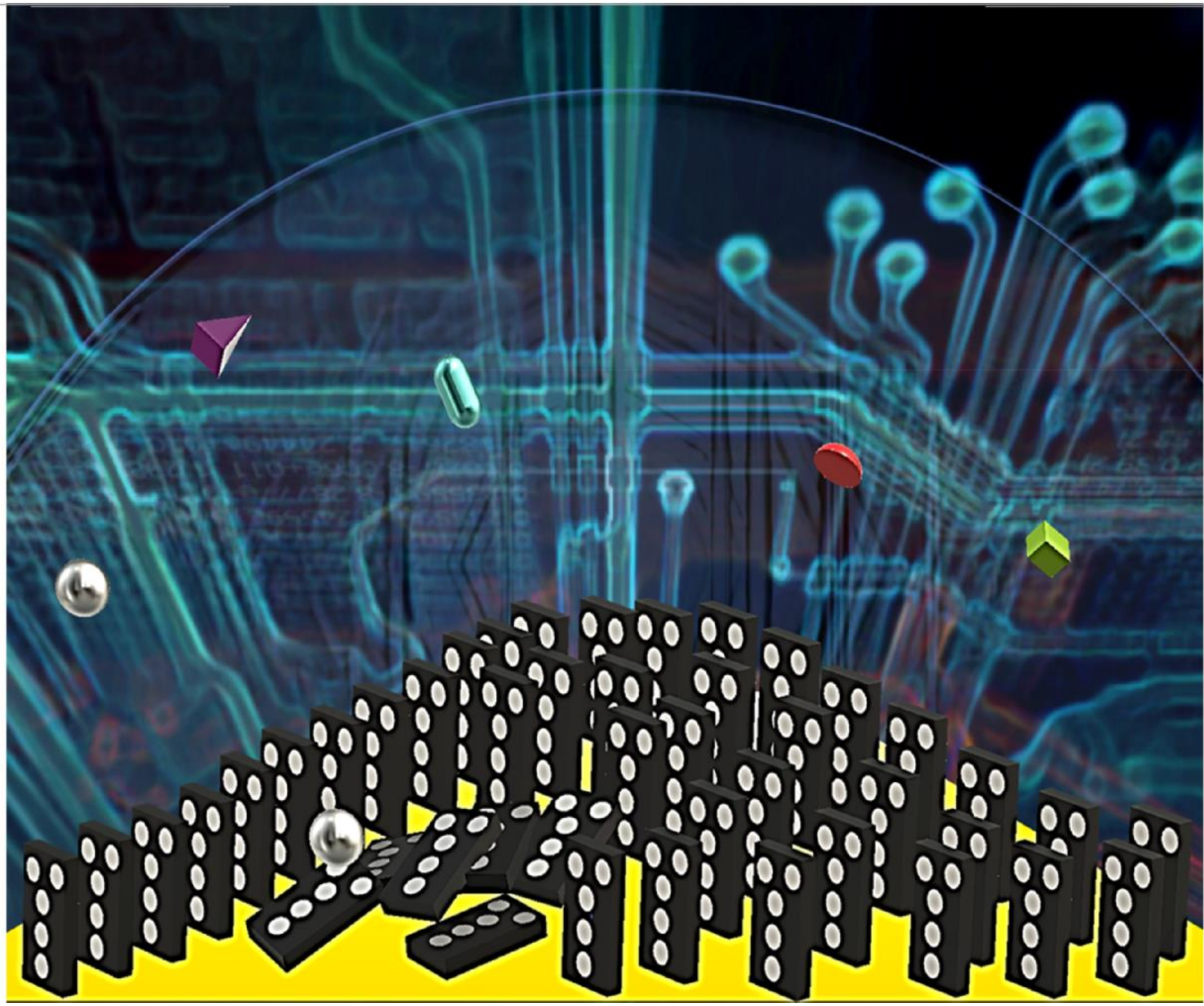
E. Macchia et al. Nat. Comm 2018 DOI: 10.1038/s41467-018-05235-z

the domino effect / cooperative interactions

CM CHEMISTRY OF MATERIALS

Label-Free and Selective Single-Molecule Bioelectronic Sensing with a Millimeter-Wide Self-Assembled Monolayer of Anti-Immunoglobulins

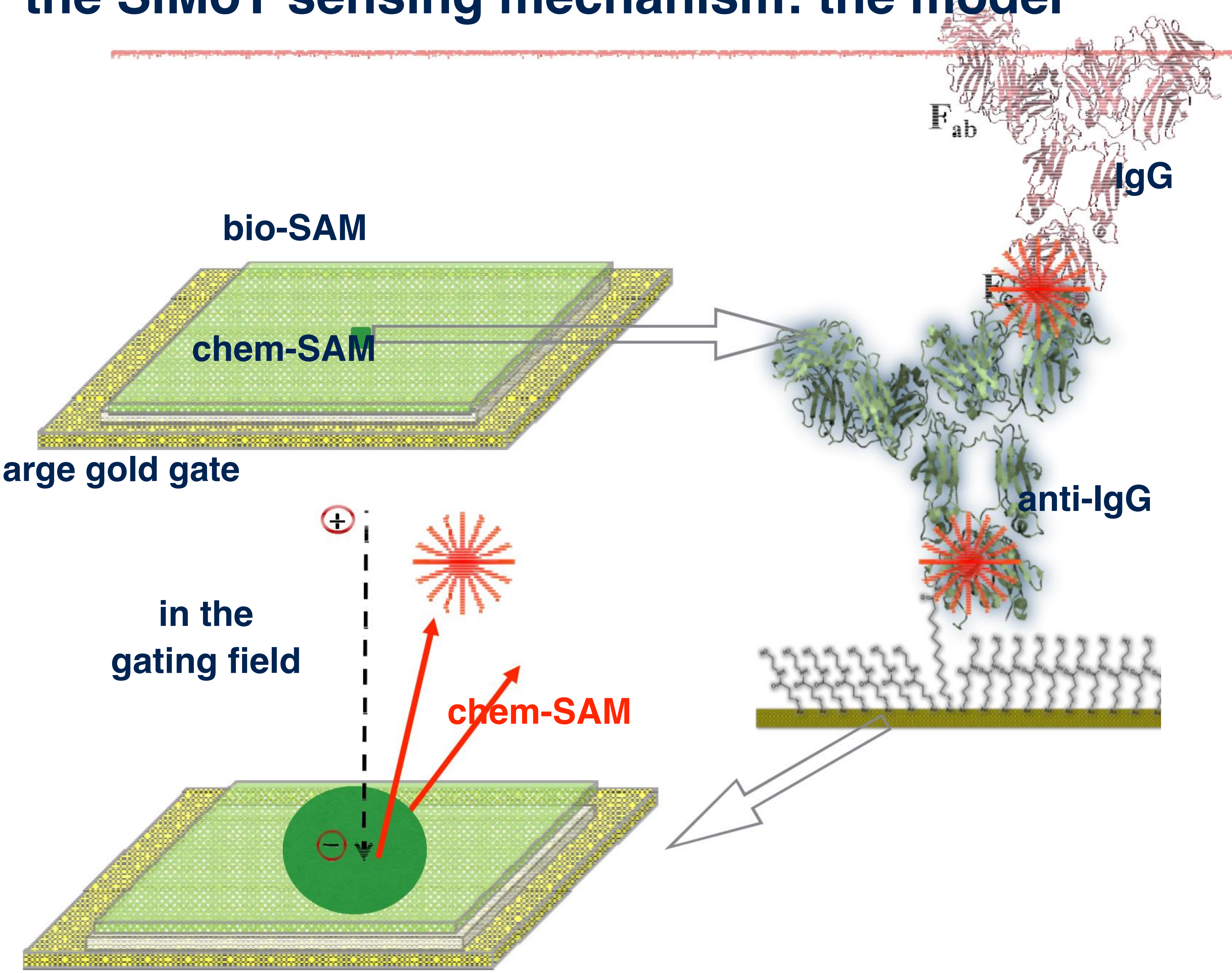
among 20 most highly downloaded papers in July 2019



Special Issue to celebrate Prof. J.L. Bredas 70th birthday

E. Macchia and A. Tiwari et al. Chemistry of Materials 2019 DOI: https://doi.org/10.1021/acs.chemmater.8b04414

the SiMoT sensing mechanism: the model



On average, women in the labour market still earn 24 per cent less than men globally.

5 GENDER EQUALITY

But, why should gender equality matter to me?

Regardless of where you live in, gender equality is a fundamental human right.

SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

Gender equality and women's empowerment – United Nations Sustainable Development

SHE FIGURES 2015

European Commission

EUROPEAN COMMISSION

Directorate-General for Research and Innovation
Directorate B – Open Innovation and Open Science
Unit B.7 Science with and for Society

E-mail: RTD-SIS7-SHE-FIGURES-2015@ec.europa.eu

European Commission
B-1049 Brussels

Foreword

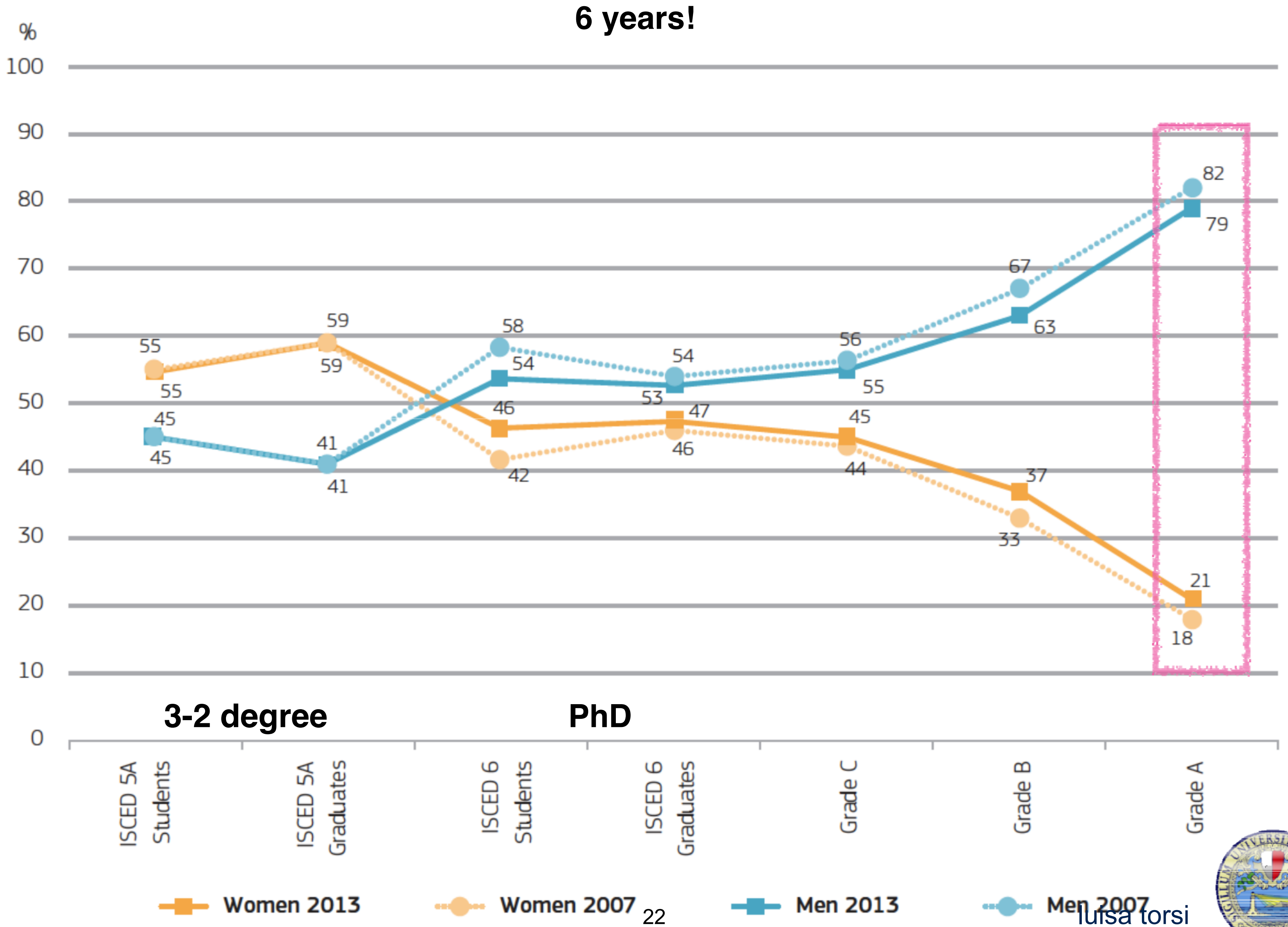
Working towards gender equality is an essential part of European research and innovation policy. Since 2003, the She Figures have monitored new developments related to careers, decision-making and, most recently, how the gender dimension is considered in research and innovation content.

More and more, European women are excelling in higher education, and yet, women represent only a third of researchers and around a fifth of grade A, top-level academics. Although the number of female heads of higher education institutions rose from 15.5 % in 2010 to 20 % in 2014, there is clearly still a long way to go before we reach gender equality in European research and innovation professions.

Therefore, I want to encourage research organisations to be the agents of change, taking practical steps to eliminate any remaining bias which prevent or hinder women from entering, or fulfilling their potential in research careers. To this end, this edition of the She Figures introduces new specific indicators on gender equality progress in research organisations.

Carlos Moedas
European Commissioner
for Research, Science and Innovation

Figure 6.1. Proportion of women and men in a typical academic career, students and academic staff, EU-28, 2007–2013



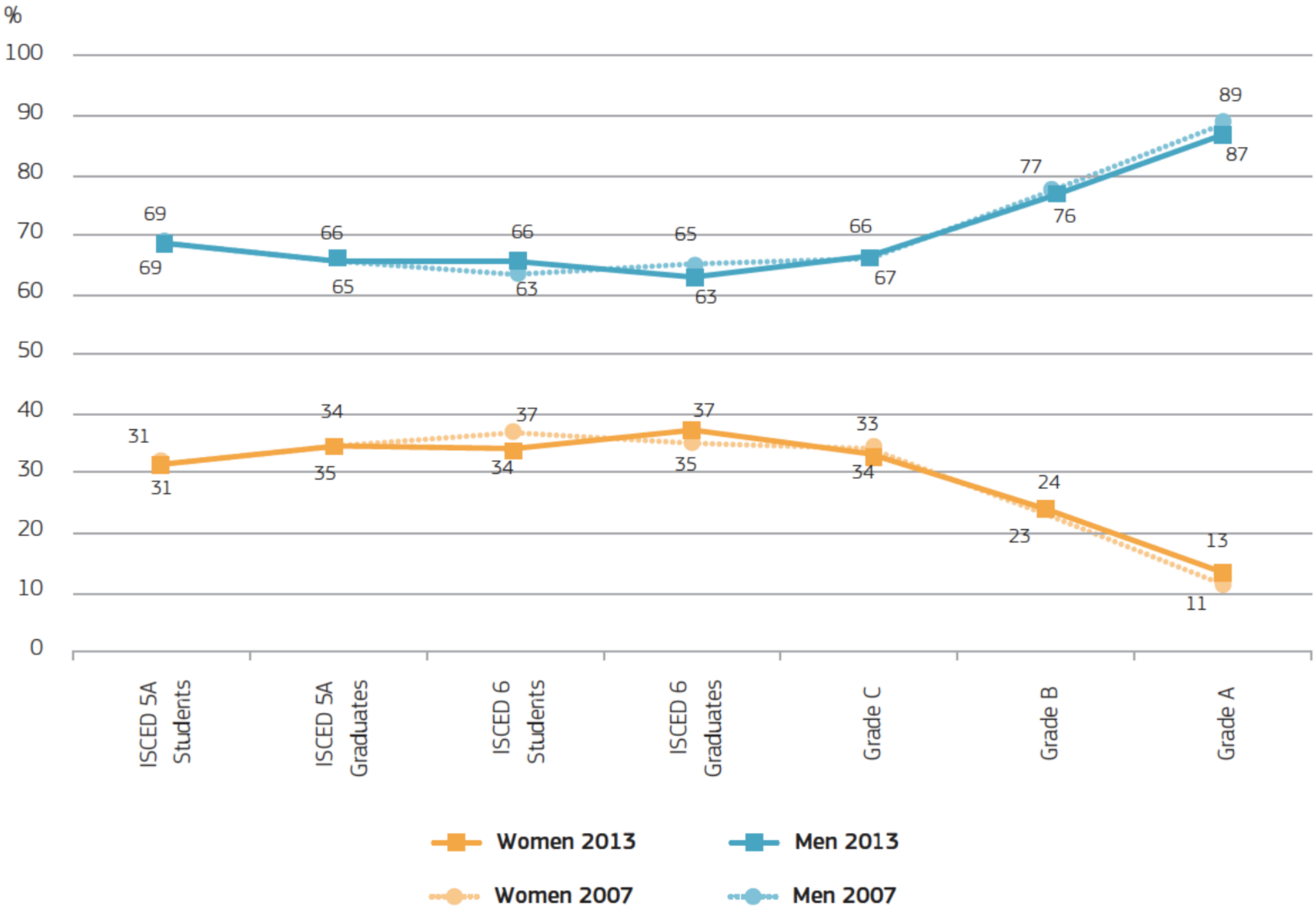
luisa torsi

SHE Figures 2015

Country	Women at Grade A	Women at Grade B
Belgium	15.6	30.1
Denmark	19.2	31.2
Finland	26.6	47.9
France	19.3	39.5
Germany	17.3	22.8
Italy	21.1	35.0
Netherlands	16.2	25.2
Norway	25.2	41.0
Romania	29.7	50.4
Spain	20.9	39.5
Sweden	23.8	44.8
Switzerland	19.3	29.3

6

Figure 6.2. Proportions of women and men in a typical academic career in science and engineering, students and academic staff, EU-28, 2007–2013

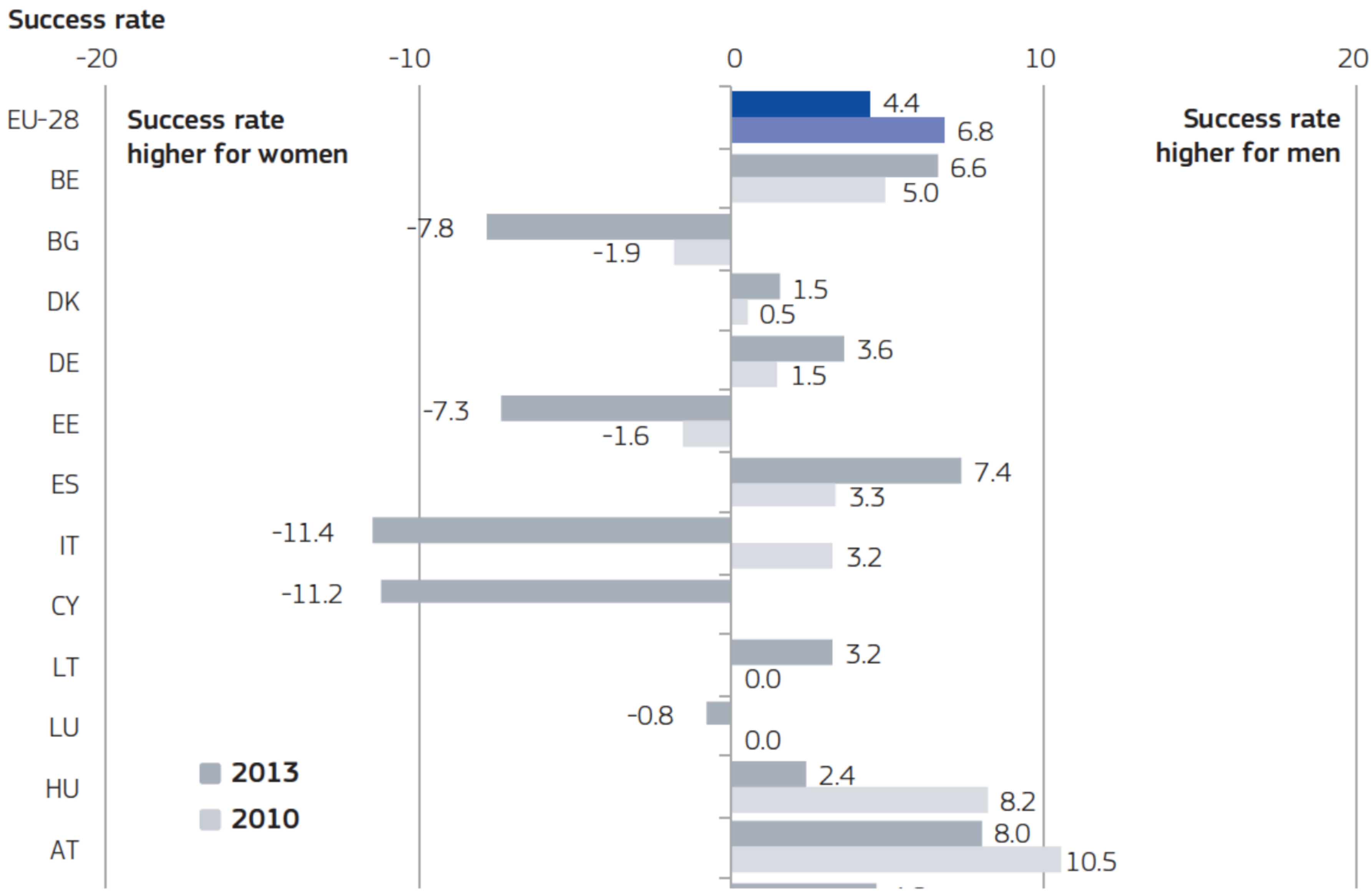


Women and men in research show different patterns in terms of their research & innovation outputs (Chapter 7). Men in the EU tend to have greater success in **funding applications** in national programmes, outstripping women by 4.4 percentage points in 2013 (success rate for men = 31.8 %; rate for women = 27.4 %).

Women are less likely than men to hold the corresponding author role in scientific publications or to apply for patents. Between 2010 and 2013, just 9 % of **patent applications** in the EU registered a woman as the inventor. However, as **corresponding authors**, women and men appear to have relatively similar scores when it comes to the expected impact of their papers and their propensity to co-author papers with international partners (i.e. papers published by authors from at least two countries located within the EU and/or beyond).

In the period spanning from 2010 to 2013, the propensity to integrate a **gender dimension in research content** measured in scientific articles in the EU-28 ranged from virtually zero in agricultural sciences, engineering and technology, and natural sciences to over 6 % in the social sciences. This proportion increased in the EU faster than worldwide over the period spanning from 2002 to 2013. Although the proportion of publications with a gender dimension is highest in the social sciences, between 2002 and 2013 the growth rate was lowest in this field. Conversely, engineering and technology had one of the lowest proportions of publications with a gender dimension (0.1 % in 2010–2013), but the highest growth rate between 2002 and 2013 (14 %).

Figure 7.5. Evolution of the funding success rate differences between women and men, 2010–2013



Insight Report

The Global Gender Gap Report 2017

WORLD ECONOMIC FORUM

- On current trends, the overall global gender gap can be closed in exactly 100 years across the 106 countries covered since the inception of the *Report*, compared to 83 years last year. The most challenging gender gaps remain in the economic and health spheres. Given the continued widening of the economic gender gap, it will now not be closed for another 217 years. However, the education–specific gender gap could be reduced to parity within the next 13 years. The political dimension currently holds the widest gender gap and is also the one exhibiting the most progress, despite a slowdown in progress this year. It could be closed within 99 years. The health gender gap is larger than it stood in 2006.

EIGE
European Institute for Gender Equality

Promoting gender equality in academia and research institutions

PDF 978-92-9493-625-7 doi:10.2839/384762 MH-01-16-928-EN-N

Figure 1.
Policy efforts towards the promotion of gender equality in research in the European Union

1997
- Amsterdam Treaty

1999
- EC's communication on Women in Science
- Establishment of Helsinki Group

2000
- 1st mapping of policy measures at Member State level (ETAN report)

2001
- Establishment of 'Women in Science' unit D6 research

2002
- FP6 (2002-2007)

2003
- She Figures

2006
- She Figures 2006
- Roadmap for equality between men and women

2007
- FP7 (2007-2013)
- EP's report on Women in Science

2008
- EC's thematic report: 'Mapping the Maze: Women to the Top in Research'

2009
- She Figures 2009
- EC's thematic report: 'The Gender Challenge in Research Funding'

2010
- EC's report 'Stocktaking 10 years of 'Women in Science' policy by the European Commission (1999-2009)'

2011
- EC's report 'Structural change in research institutions'

2013
- She Figures 2012

2014
- Horizon 2020 (2014-2020)
- Gender Equality as a priority in the ERA progress report
- EC's report 'Gender Equality Policies in Public Research'

2015
- She Figures 2015
- Council Conclusions 'Advancing Gender Equality in the ERA'
- ERA Roadmap 2015, gender as cross-cutting issue in H2020

PDF 978-92-9493-625-7 doi:10.2839/384762 MH-01-16-928-EN-N

Steps to establish a Gender Equality Plan

Based on the insights gathered and field experience, for a Gender Equality Plan to be successfully implemented, it is important to be aware that each step of the process requires specific types of interventions. In order to ensure the effectiveness and the success of a Gender Equality Plan, the following steps can be identified.

- **Step 1: Getting started**, in which the importance of promoting gender equality is acknowledged and essential information is gathered in order to start establishing the Gender Equality Plan.
- **Step 2: Analysing and assessing the state-of-play of the institution**, in which the national (or regional) legal and policy backgrounds are analysed; sex-disaggregated data is collected and processed; procedures, processes and practices are critically assessed with a view to detect gender inequalities and gender bias in the institution;
- **Step 3: Setting up a Gender Equality Plan**, in which objectives are defined, targets are set, actions and measures to remedy the identified problems are decided, resources and responsibilities are attributed and timelines are agreed upon;
- **Step 4: Implementing a Gender Equality Plan**, in which activities are implemented and outreach efforts are undertaken so as to gradually expand the network of stakeholders;
- **Step 5: Monitoring progress and evaluating a Gender Equality Plan**, with attention to process as well as to progress, accompanying the implementation phase. Findings from the monitoring exercise(s) allow to adjust and to improve interventions, so that their results can be optimised. Evaluating the impact of short-, mid- and long-term transformations is understood as an opportunity to enhance the support to gender equality initiatives. It also paves the way for future, even more resolute actions, and offers a valuable knowledge for their design.
- **Step 6: What comes after a Gender Equality Plan**, in which (based on the evaluation, the findings and progress made), a decision should be made on how to continue the efforts undertaken so far and what a new Gender Equality Plan should address.

PDF 978-92-9493-625-7 doi:10.2839/384762 MH-01-16-928-EN-N

Good practices promoting the integration of gender equality into academia and research institutions

- Raising awareness and building competences of staff involved in recruitment and selection processes
- Ensuring a balanced representation of women and men in decision-making structures
- Rewarding the integration of a gender dimension in research and teaching
- Monitoring and evaluating the institution's progress towards achieving gender equality
- Coordinating and providing support to implement gender equality actions in the institution
- Promoting a gender-integrated leadership programme
- Fostering gender-sensitive practices to support career progression.

The positive impact of gender mainstreaming in academia and research institutions

Based on the findings from the national fieldwork at EU Member State level, the following **main impact drivers for effective gender mainstreaming** in research and higher education institutions were identified:

- Senior leadership and management support
- A well-equipped and well-located gender equality body
- Involvement of different categories of stakeholders (inside and outside the organisation)
- Embedment into existing structures and management procedures
- Setting clear targets and practical objectives
- Flexibility and resilience
- Availability of sex-disaggregated data
- Developing competences
- Monitoring and evaluation practices

PDF 978-92-9493-625-7 doi:10.2839/384762 MH-01-16-928-EN-N

The role of women is science:
still a long way to go