



What is Research?

Research encompasses many forms of disciplined human thought, including the natural sciences, the social and behavioral sciences, and the humanities;

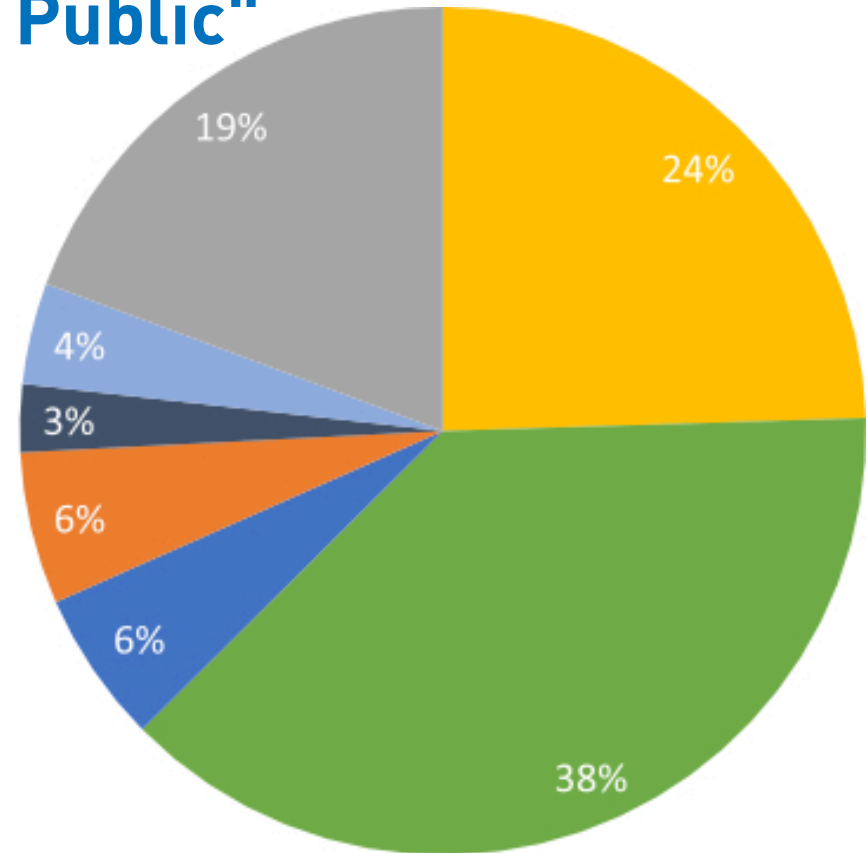
Research includes the generation of new knowledge, grounded in the rational analysis of empirical evidence



Excerpt from "Annual Report 2019 to the DFG Senate and the Public"

**Inquiries 2019
by disciplines (n = 155)**

- Humanities and Social Sciences (n=38)
- Life Sciences/Medicine (n=59)
- Natural Sciences (n=9)
- Engineering/Computer Science (n=9)
- Other or interdisciplinary (n=4)
- general inquiry/all disciplines (n=6)
- unknown (n=30)



Graphic taken from "Jahresbericht 2019 an den Senat der DFG und die Öffentlichkeit"



Why Global Science?

- The Research Enterprise has always been global
- Scientists are always looking for their peers
- International and interdisciplinary linkages as well as challenges are increasing
- Scientists are increasingly called for advice
- Scientific cooperation has a supporting role in international diplomacy
- Challenges are global, like energy production, climate change or pandemics



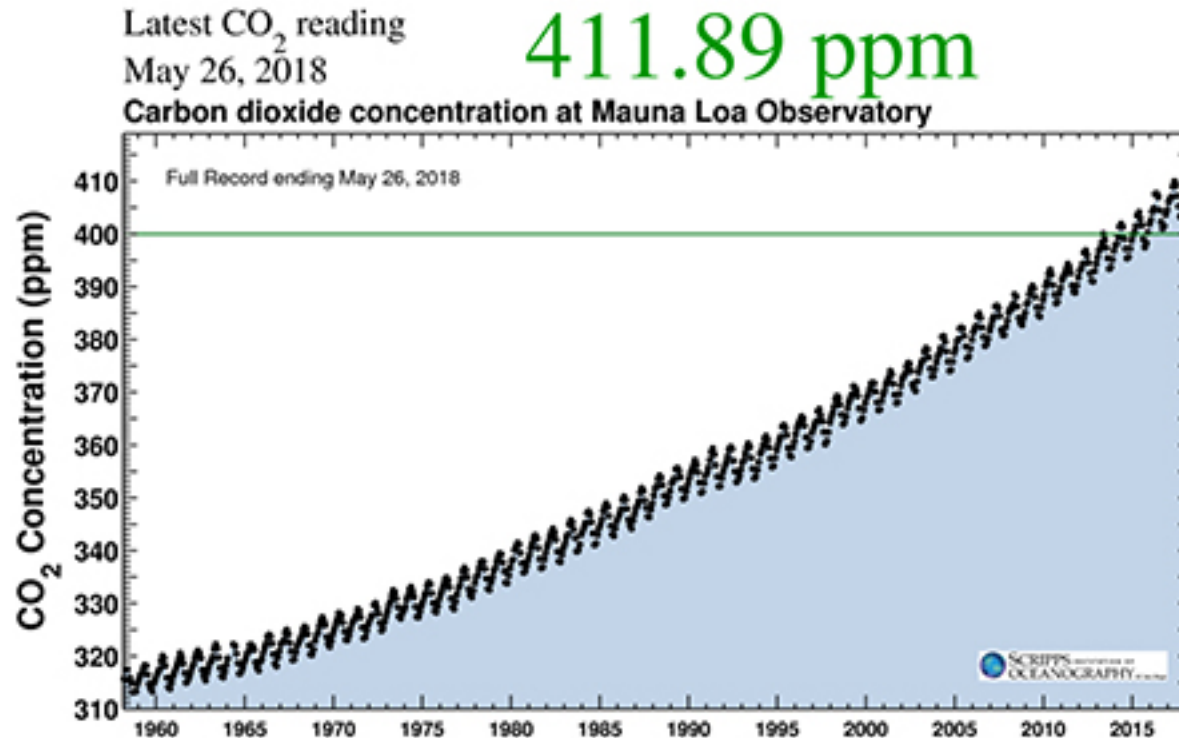
Why Global Science?

- Around 1690, the great G.F. Leibniz traveled to the Netherlands and Great Britain to meet Christiaan Huygens in The Hague and Isaac Newton in London
- Science and Diplomacy: In order to reestablish relationships between Israel and Germany a delegation of well-known German scientists, Werner Heisenberg, Otto Hahn and Feodor Lynen travelled to the Weizmann Institute, Rehovot



The Keeling-Curve

A daily record of global atmospheric carbon dioxide concentrations



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International Research Institutions

CERN (1954) – Conseil Européen pour la Recherche Nucléaire

EMBL (1978) – European Molecular Biology Laboratory

ESA (1975) – European Space Agency

ESO (1962) – European Southern Observatory

ERC (2006) – European Research Council



Top organisations hosting ERC Principal Investigators

Host Institution	Country	ERC grants following the Horizon 2020 calls (2014-2020)	
		Total	Synergy PIs
National Centre for Scientific Research	FR	366	15
Max Planck Society	DE	166	17
University of Oxford	UK	150	4
University of Cambridge	UK	137	3
Swiss Federal Institute of Technology Zurich	CH	122	8
Helmholtz Association of German Research Centres	DE	120	8
University College London	UK	106	2
Weizmann Institute	IL	92	4
Tel Aviv University	IL	86	1
University of Edinburgh	UK	80	
University of Munich (LMU)	DE	80	2
Hebrew University of Jerusalem	IL	76	3
University of Copenhagen	DK	76	8
University of Amsterdam	NL	75	
Swiss Federal Institute of Technology Lausanne	CH	71	4
Delft University of Technology	NL	65	
Utrecht University	NL	63	1
National Institute of Health and Medical Research	FR	62	8
Imperial College	UK	60	3
University of Leuven	BE	57	1
University of Zurich	CH	56	2
Spanish National Research Council (CSIC)	ES	56	4
University of Helsinki	FI	53	1
Leiden University	NL	52	1
Technical University of Munich	DE	52	2



Science and Diplomacy



Departure of the
Max-Planck-Delegation
on 01.12.1959 in Zürich,
on its way to Tel-Aviv



The Values of Research

Honesty
Fairness
Objectivity
Reliability
Skepticism
Accountability
Openness



Steps in Performing Research

- Preparing a research plan; the role of mentoring
- Carrying out research itself
- Reporting of research results
- Preventing irresponsible practices
- The researcher's responsibility to society
- Preventing the misuse of research (dual-use)
- Scientific self-regulation



The Role of Mentoring

- Provide career guidance
- Exchange ideas, provide time for discussions
- Enhance networking, access to meetings
- Proper balance between private and professional interests
- Encourage independence
- Foster awareness of issues of research integrity
- Provide expertise for data collection and analysis



The Role of Self-Correction in Science

(Majority of preclinical cancer papers are not reproducible)

- 1: Were experiments blinded?
- 2: Were experiments repeated?
- 3: Were there positive and negative controls?
- 4: Were all the results presented?
- 5: Were reagents validated?
- 6: Were statistical tests appropriate?

Begley, C.G. (2013) Six red flags for suspect work. *Nature* 497, 433-434



Potential Biohazards of Recombinant DNA Molecules

By Paul Berg, David Baltimore, Herbert W. Boyer, Stanley N. Cohen, Ronald W. Davis, David S. Hogness, Daniel Nathans, Richard Roblin, James D. Watson, Sherman Weissman, Norton D. Zinder

Science 26 Jul 1974:

Vol. 185, Issue 4148, pp. 303

DOI: [10.1126/science.185.4148.303](https://doi.org/10.1126/science.185.4148.303)



Moratorium on genetic manipulations - Asilomar: the conference of debate

4.

Voluntary moratorium

The immediate reason: cloning of entire genome of SV40 in *E. coli*: contagious tumor?
Fears: human health and ecosystem of Earth

Asilomar Conference (1975): Something can be considered dangerous
if it is proved to be dangerous



Paul Berg

James Watson

Sidney Brenner



Source: <https://slideplayer.com/slide/13000076/>



1st International Summit on Human Genome Editing

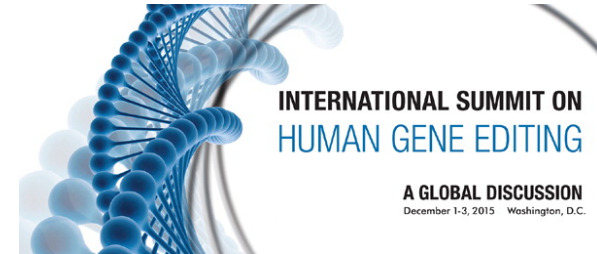
in Washington, D.C. in December 2015

Topics:

- recent scientific developments in human gene editing
- the range of ethical and governance issues associated with these advances

Organizers:

- The National Academy of Sciences
- National Academy of Medicine
- Chinese Academy of Sciences
- The Royal Society of the UK



Responsible Global Science



Gene
Center
Munich

2nd International Summit on Human Genome Editing, Nov 18





13 MARCH 2019

Adopt a moratorium on heritable genome editing

Eric Lander, Françoise Baylis, Feng Zhang, Emmanuelle Charpentier, Paul Berg and specialists from seven countries call for an international governance framework.

Eric S. Lander, Françoise Baylis, Feng Zhang, Emmanuelle Charpentier, Paul Berg, Catherine Bourgain, Bärbel Friedrich, J. Keith Joung, Jinsong Li, David Liu, Luigi Naldini, Jing-Bao Nie, Renzong Qiu, Bettina Schoene-Seifert, Feng Shao, Sharon Terry, Wensheng Wei & Ernst-Ludwig Winnacker

Nature 567, 165-168 (2019)

Responsible Global Science



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Thank you for your attention!