

# Scientific Integrity

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# 3 pillars of responsible research

## Ethics

Fit between research and technology and cultural and legal values

## Deontology

Independence from external pressure, lack of conflict of interest

## Scientific Integrity

Guarantees the quality of research results

## Scientific integrity is not obvious ...

Two cases of scientific misconduct

# The Bell labs



Davisson, Germer : diffraction of electrons by a crystal, Nobel 1937

Nyquist 1934-1954, Shannon 1941-1972 : information theory

Bardeen, Shockley, Brattain : first transistor Nobel, 1956

Anderson : localization in disordered materials, Nobel 1977

Penzias, Wilson : background cosmic radiation, Nobel 1978

Chu : cold atoms, Nobel 1997

Störmer, Laughlin, Tsui : fractional quantum Hall effect, Nobel 1998

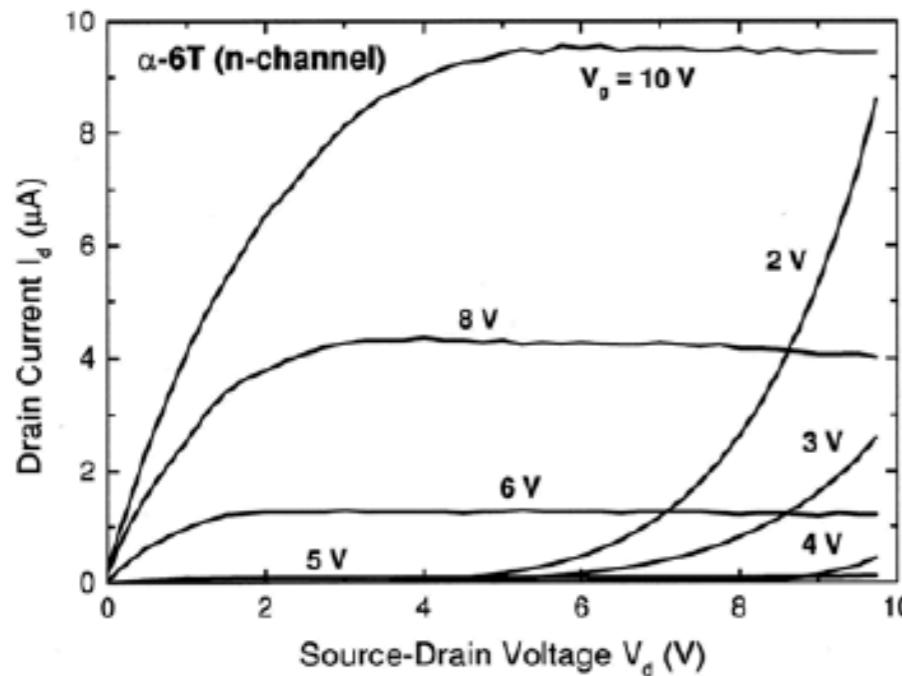
Boyle, Smith : CCD, Nobel 2009

Betzig : superresolution microscope, Nobel 2014

Ashkin : optical tweezers, Nobel 2018

## Publications by Jan Hendrick Schön 1998-2002

- J. H. Schön; Ch. Kloc; R. Laudise; B. Batlogg (1998). "Electrical properties of single crystals of rigid rodlike conjugated molecules". *Physical Review B*. 58 (19): 12952–12957.
- J. H. Schön; S. Berg; Ch. Kloc; B. Batlogg (2000). "Ambipolar Pentacene Field-Effect Transistors and Inverters". *Science*. 287 (5455): 1022–3.
- J. H. Schön; Ch. Kloc; R. C. Haddon; B. Batlogg (2000). "A Superconducting Field-Effect Switch". *Science*. 288 (5466): 656–8.
- J. H. Schön; Ch. Kloc; B. Batlogg (2000). "Fractional Quantum Hall Effect in Organic Molecular Semiconductors". *Science*. 288 (5475): 2338–40.
- J. H. Schön; Ch. Kloc; A. Dodabalapur; B. Batlogg (2000). "An Organic Solid State Injection Laser". *Science*. 289 (5479): 599–601.
- J. H. Schön; Ch. Kloc; B. Batlogg (2000). "A Light-Emitting Field-Effect Transistor". *Science*. 290 (5493): 963–6.
- J. H. Schön; Ch. Kloc; B. Batlogg (2000). "Mobile iodine dopants in organic semiconductors". *Physical Review B*. 61 (16): 10803–10806.
- J. H. Schön; C. Kloc; B. Batlogg (2000). "Perylene: A promising organic field-effect transistor material". *Applied Physics Letters*. 77 (23): 3776
- J. H. Schön; Ch. Kloc; B. Batlogg (2000). "Superconductivity at 52 K in hole-doped C<sub>60</sub>". *Nature*. 408 (6812): 549–52.
- J. H. Schön; Ch. Kloc; B. Batlogg (2000). "Superconductivity in molecular crystals induced by charge injection". *Nature*. 406 (6797): 702–4.
- J. H. Schön; Ch. Kloc; E. Bucher; B. Batlogg (2000). "Efficient organic photovoltaic diodes based on doped pentacene". *Nature*. 403 (6768): 408–10.
- J. H. Schön; Ch. Kloc; H. Y. Hwang; B. Batlogg (2001). "Josephson Junctions with Tunable Weak Links". *Science*. 292 (5515): 252–4.
- J. H. Schön; A. Dodabalapur; Ch. Kloc; B. Batlogg (2001). "High-Temperature Superconductivity in Lattice-Expanded C<sub>60</sub>". *Science*. 293 (5539): 2432–4.
- J. H. Schön; Ch. Kloc; A. Dodabalapur; B. Batlogg (2001). "Field-Effect Modulation of the Conductance of Single Molecules". *Science*. 294 (5549): 2138–40.
- J. H. Schön; Ch. Kloc; D. Fichou; B. Batlogg (2001). "Conjugation length dependence of the charge transport in oligothiophene single crystals". *Physical Review B*. 64 (3): 035209.
- J. H. Schön; Ch. Kloc; B. Batlogg (2001). "Low-temperature transport in high-mobility polycrystalline pentacene field-effect transistors". *Physical Review B*. 63 (12): 125304.
- J. H. Schön; Ch. Kloc; B. Batlogg (2001). "Hole transport in pentacene single crystals". *Physical Review B*. 63 (24): 245201
- J. H. Schön; Ch. Kloc; B. Batlogg (2001). "Universal Crossover from Band to Hopping Conduction in Molecular Organic Semiconductors". *Physical Review Letters*. 86 (17): 3843–6.
- J. H. Schön; C. Kloc (2001). "Fast organic electronic circuits based on ambipolar pentacene field-effect transistors". *Applied Physics Letters*. 79 (24): 4043.
- J. H. Schön (2001). "Plastic Josephson junctions". *Applied Physics Letters*. 79 (4): 2208–2210.
- J. H. Schön; M. Dorget; F. C. Beuran; X. Z. Zu; E. Arushanov; C. Deville Cavellin; M. Laguës (2001). "Superconductivity in CaCuO<sub>2</sub> as a result of field-effect doping". *Nature*. 414 (6862): 434–6.
- J. H. Schön; M. Dorget; F. C. Beuran; X. Z. Xu; E. Arushanov; M. Laguës; C. Deville Cavellin (2001). "Field-Induced Superconductivity in a Spin-Ladder Cuprate". *Science*. 293 (5539): 2430–2.
- J. H. Schön; Ch. Kloc; T. Siegrist; M. Steigerwald; C. Svensson; B. Batlogg (2001). "Superconductivity in single crystals of the fullerene C<sub>70</sub>". *Nature*. 413 (6858): 831–3.
- J. H. Schön; H. Meng; Z. Bao (2001). "Self-assembled monolayer organic field-effect transistors". *Nature*. 413 (6857): 713–6.
- J. H. Schön; A. Dodabalapur; Z. Bao; Ch. Kloc; O. Schenker; B. Batlogg (2001). "Gate-induced superconductivity in a solution-processed organic polymer film". *Nature*. 410 (6825): 189–92.
- J. H. Schön; Z. Bao (2002). "Nanoscale organic transistors based on self-assembled monolayers". *Applied Physics Letters*. 80 (5): 847.
- J. H. Schön; H. Meng; Z. Bao (2002). "Self-Assembled Monolayer Transistors". *Advanced Materials*. 14 (4): 323–326.



Schön et al., Light-emitting field-effect transistor, Science 290, 963 (2000)

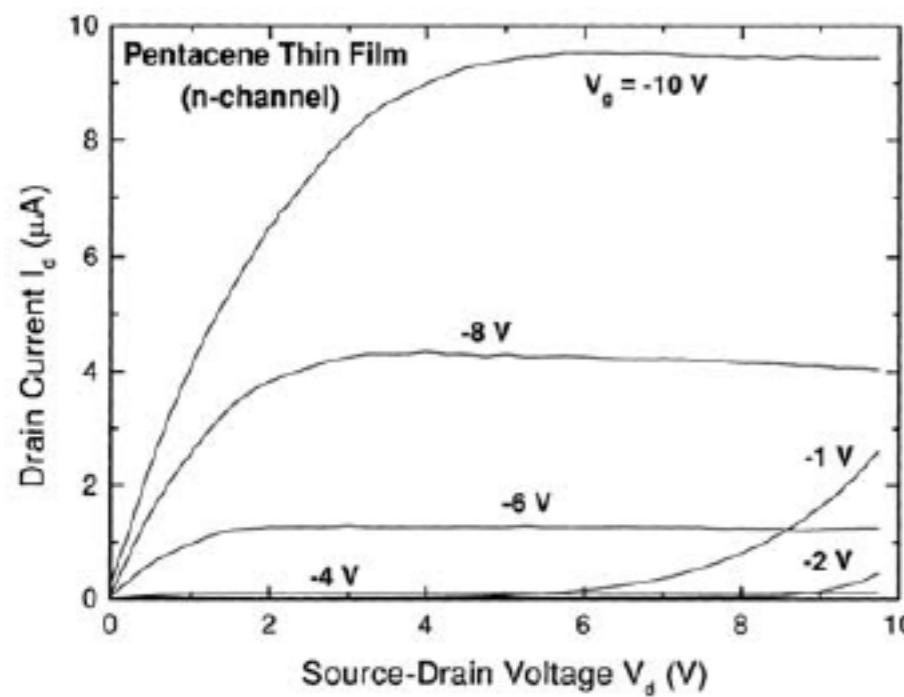


Figure 9. Triode characteristic from Paper (VIII), "AmbipolarOrganic", Fig. 2: "pentacene."

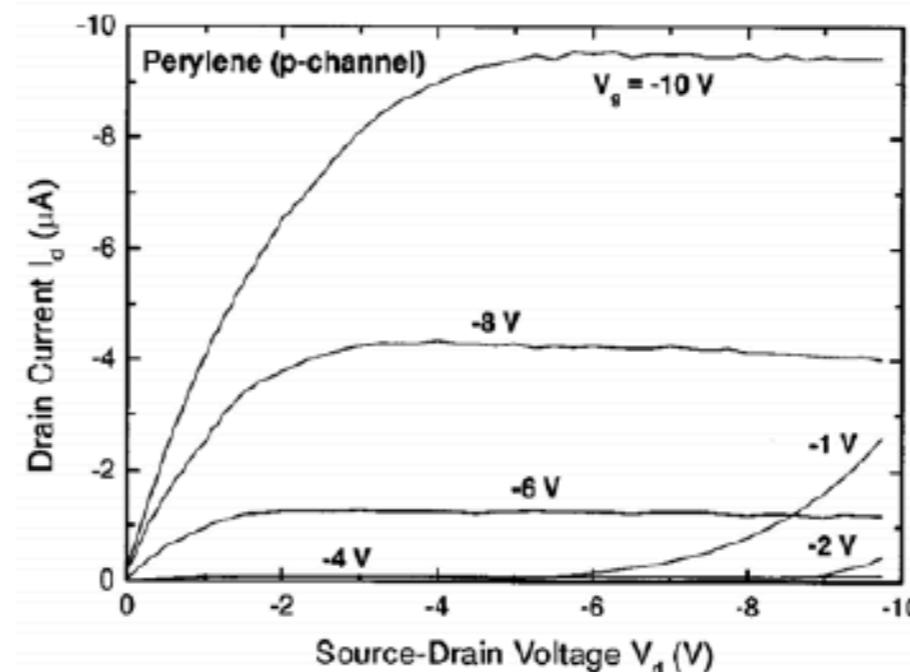


Figure 8. Triode characteristic from "Perylene" (VI), Fig. 2: "perylene". Note the sign change from Figure 7. One curve is missing.

Schön et al., Perylene, a promising field-effect transistor material, Applied Physics Letters 77, 3776 (2000)

Schön et al., Ambipolar organic devices for complementary logic, Synthetic Metals 122, 195 (2001)

J. H. Schön; Ch. Kloc; R. Laudise; B. Batlogg (1998). "Electrical properties of single crystals of rigid rodlike conjugated molecules". *Physical Review B*. 58 (19): 12952–12957.

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J. H. Schön; M. Dorget; F. C. Beuran; X. Z. Zu; E. Arus; J. P. Gauvin; C. Deville Cavellin; M. Lagu  s (2001). "Superconductivity in CaCuO<sub>2</sub> as a result of field-effect doping". *Nature*. 414 (6862): 434–6.

J. H. Schön; M. Dorget; F. C. Beuran; X. Z. Zu; E. Arus; J. P. Gauvin; C. Deville Cavellin; M. Lagu  s (2001). "Field-Induced Superconductivity in a Spin-Ladder Cuprate". *Science*. 293 (5539): 2430–2.

J. H. Schön; Ch. Kloc; T. S. Saitist; M. Steiner; R. Waldkirch; J. W. Stevenson; B. Batlogg (2001). "Superconductivity in single crystals of the fullerene C<sub>70</sub>". *Nature*. 413 (6858): 831–3.

J. H. Schön; H. Meng; Y. Zhao (2001). "Self-assembled monolayer organic field-effect transistors". *Nature*. 413 (6857): 713–6.

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J. H. Schön; Z. Banerji (2001). "Nanoscale organic transistors based on self-assembled monolayers". *Applied Physics Letters*. 80 (5): 847.

J. H. Schön; H. Meng; Y. Zhao (2002). "Self-Assembled Monolayer Transistors". *Advanced Materials*. 14 (4): 323–326.

# The Voinnet/Dunoyer case

Olivier Voinnet

Engineering degree AgroParisTech 1996

Ph.D. Norwich Univ. 2001

CNRS « chargé de recherches » Strasbourg 2002

CNRS bronze medal 2004

CNRS « directeur de recherches » Strasbourg 2005

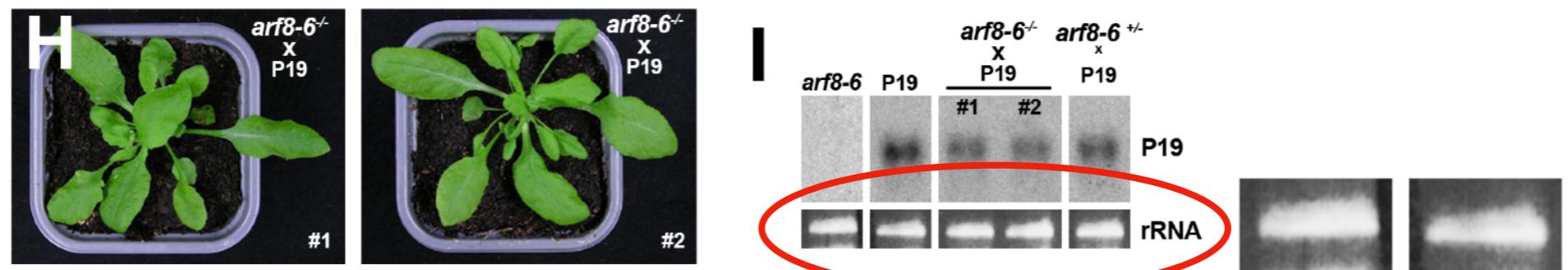
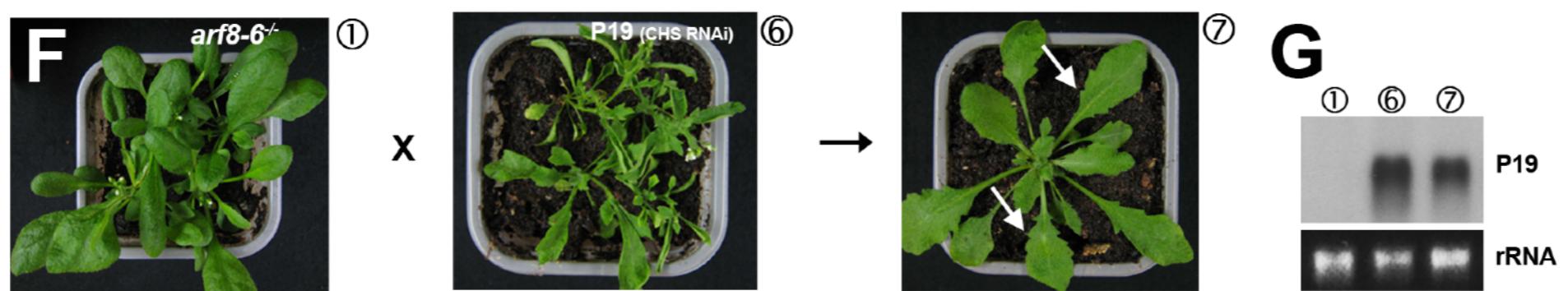
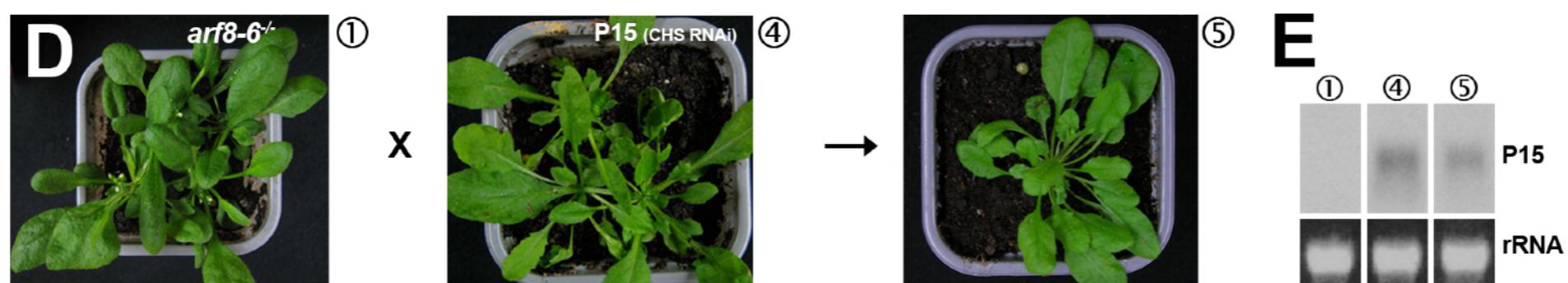
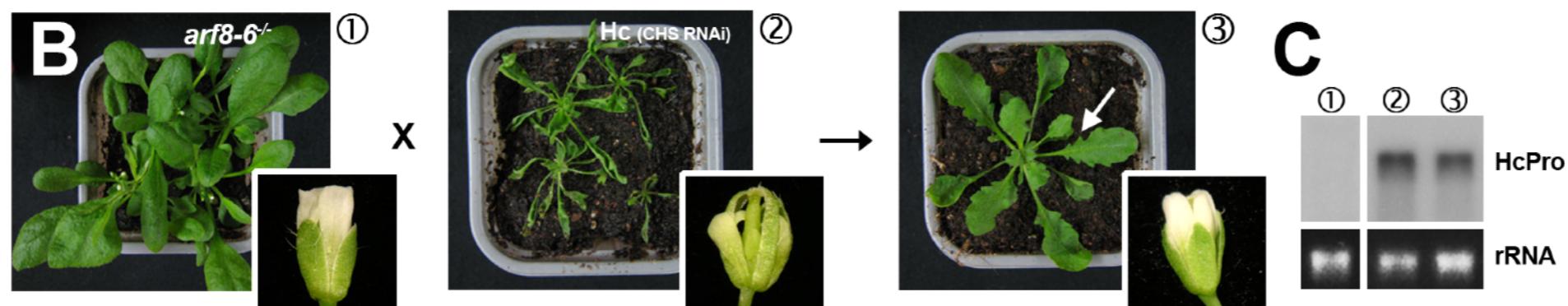
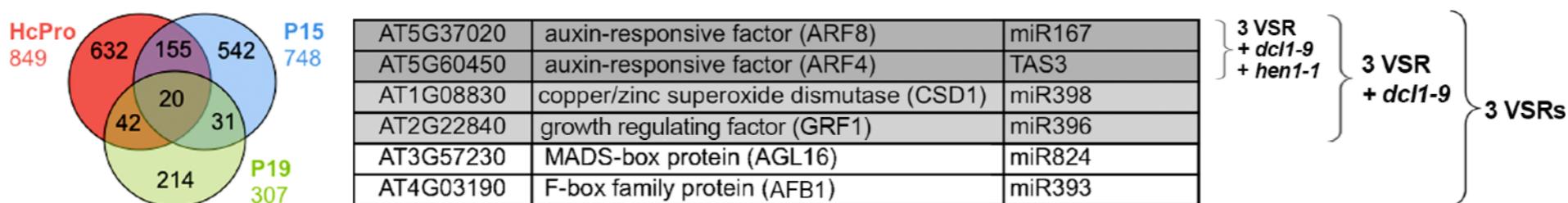
CNRS silver medal 2007

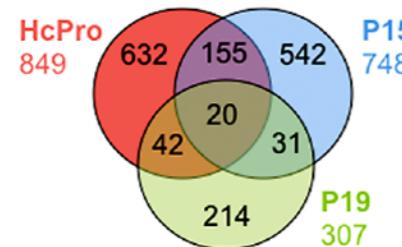
EMBO gold medal 2009

Professor of RNA biology ETH Zürich 2010

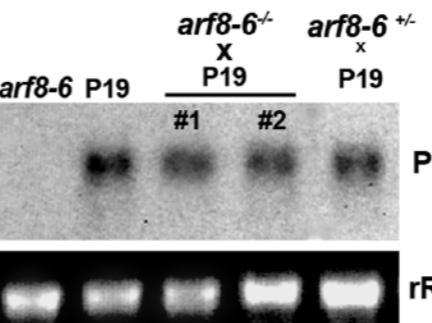
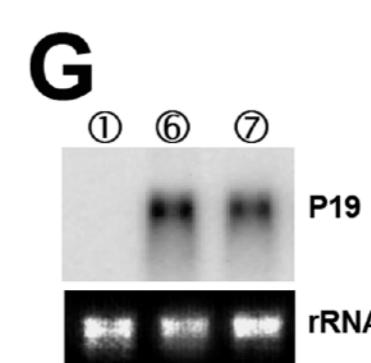
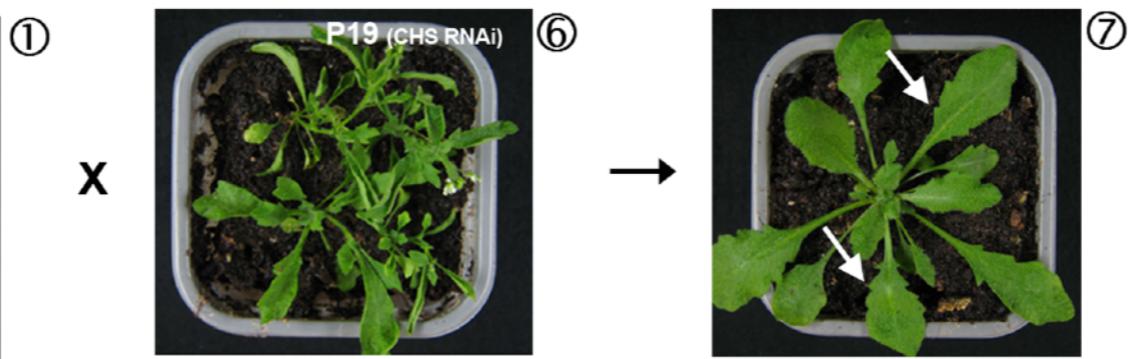
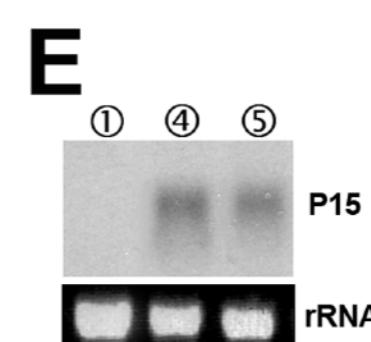
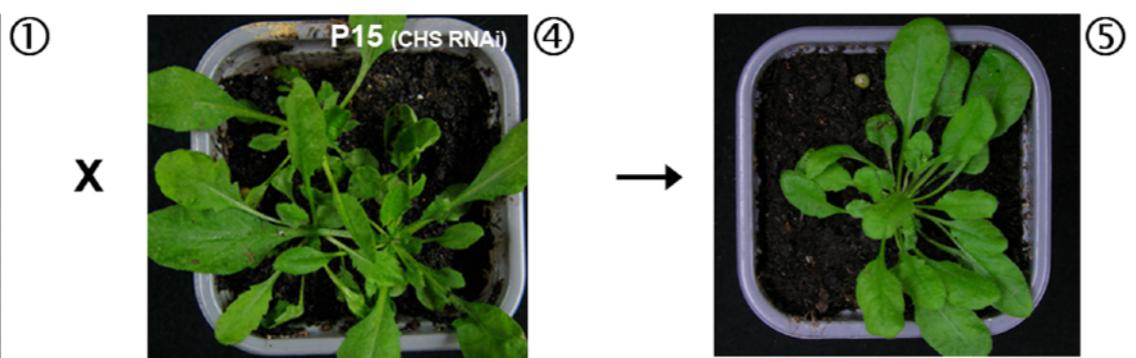
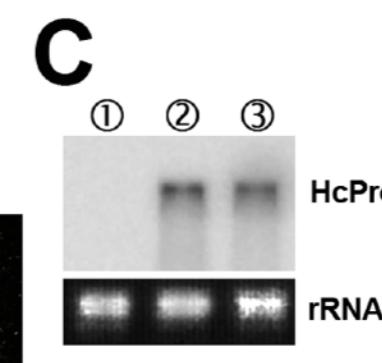
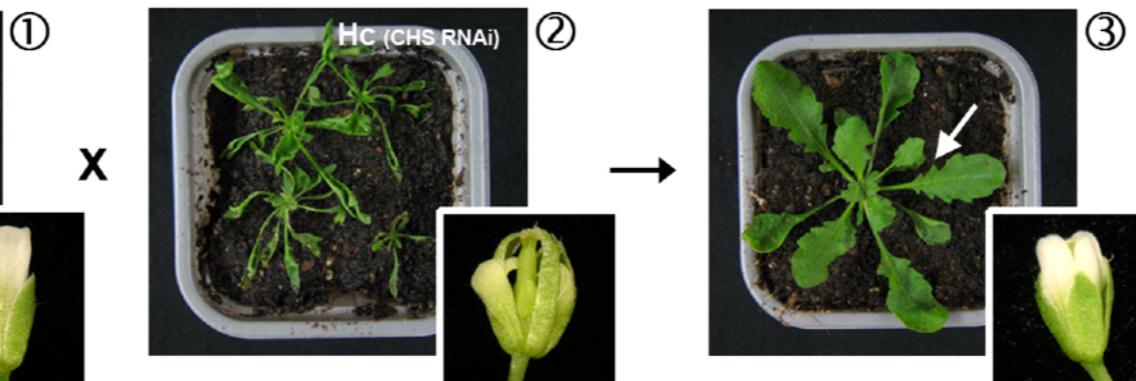
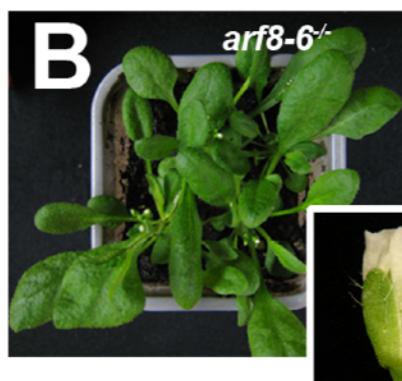
Académie des Sciences 2014

2015 : comment on the [PubPeer](#) site regarding image manipulation in papers by Voinnet's group



**A**

AT5G37020	auxin-responsive factor (ARF8)	miR167
AT5G60450	auxin-responsive factor (ARF4)	TAS3
AT1G08830	copper/zinc superoxide dismutase (CSD1)	miR398
AT2G22840	growth regulating factor (GRF1)	miR396
AT3G57230	MADS-box protein (AGL16)	miR824
AT4G03190	F-box family protein (AFB1)	miR393



← Corrected control lanes

# Investigations on the Voinnet/Dunoyer case

## Investigation by ETH Zürich

OV is not guilty of a major scientific misconduct, despite manipulation of images by coauthors

ETHZ recommends retraction of 4 papers and correction of 3 others

The scientific conclusions are nevertheless not altered

OV receives a warning and ETH reorganizes the lab

## Investigation by CNRS

OV is suspended 2 years by the CNRS

P.Dunoyer is suspended 1 year

From the investigation report by ETH Zürich :

« He (O.Voinnet) responded by giving insights into the way his lab was run with each individual researcher being subjected to considerable pressure and only having occasional chances (approx. once in six months) to present his/her data at lab meetings.

The picture that emerged was one of an exciting but high-pressure environment at the forefront of science and where the lab was in strong competition with other laboratories....

OV admitted that many papers were assembled too quickly, with “no moment of reflection”, in a highly competitive environment. »

## Scientific integrity in our conduct

The primary victim of misconduct is the scientific enterprise; the misrepresentation of data works against science.

Do not fabricate false data

Do not alter nor embellish data

Do not plagiarize data from someone else

Record accurately and keep track of raw data

Record precisely data processing (images and other signals)

Data should eventually be publicly available

Cite accurately previous work by other people

Authorship should reflect correctly the personal contributions to a publication

# References

Code de conduite européen pour l'intégrité en recherche

The European code of conduct for research integrity (<https://allea.org/code-of-conduct/>)

On the intranet ESPCI/research soon

Online course on scientific integrity : <https://www.fun-mooc.fr/courses/course-v1:ubordeaux+28007+session01/about>

Schön case :

- . « Plastic fantastic » E.S. Reich McMillan2010
- . Report published by Lucent technologies ([https://media-bell-labs-com.s3.amazonaws.com/pages/20170403\\_1709/misconduct-review-report-lucent.pdf](https://media-bell-labs-com.s3.amazonaws.com/pages/20170403_1709/misconduct-review-report-lucent.pdf))

Voinnet/Dunoyer case :

- . Report published by ETH Zürich ([https://ethz.ch/content/dam/ethz/main/news/eth-news/medienmitteilungen/2015/PDF/untersuchungsbericht/Report\\_of\\_ETH\\_Commission\\_Voinnet.pdf](https://ethz.ch/content/dam/ethz/main/news/eth-news/medienmitteilungen/2015/PDF/untersuchungsbericht/Report_of_ETH_Commission_Voinnet.pdf))
- . Testimony by O.Voinnet at an EHESS seminar « Politiques des sciences » ([pds.hypotheses.org](https://pds.hypotheses.org))