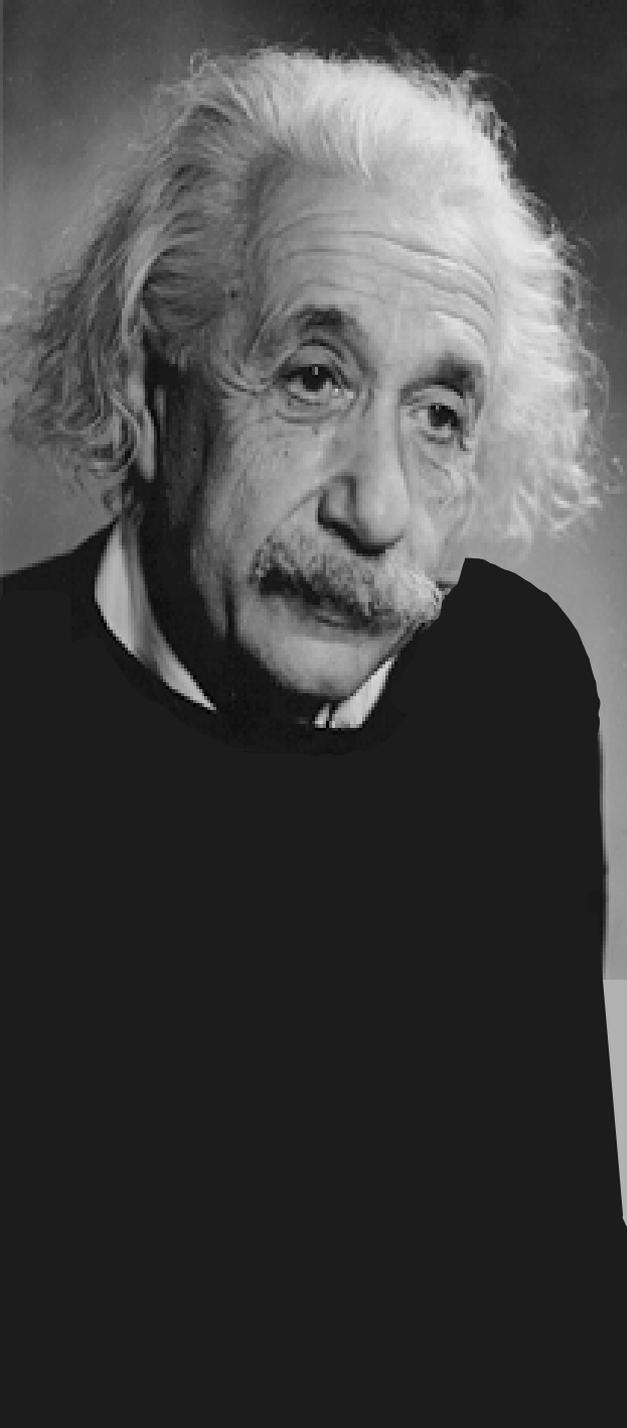


The National Perspective on Traineeships and Support

June 18, 2004





The Expert

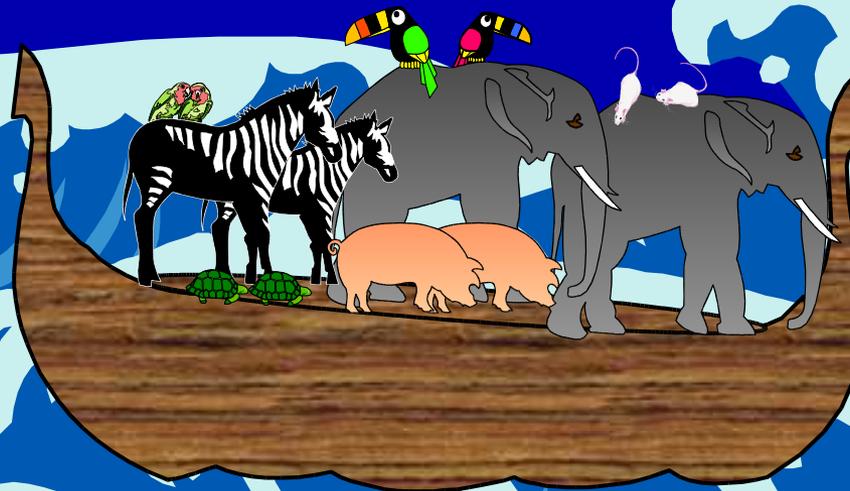




The Other Guy



Never Discuss Floods With Noah In the Audience



Some Thoughts About the Future of Traineeships and Their Support

At least two kinds of issues will shape the future

- Tensions among needs, types and levels of available support
- Broad trends in science and its conduct
 - We need to adjust training support mechanisms (and levels) to accommodate them

I have little to add to the issue of levels of support

- Economic issues are outside my expertise
 - Market forces are critical
 - Say no more
 - There are many Noahs here

But there is a tension/balance among types of trainee support

Specifically, there is a clear tension between fellowship and research assistantship approaches to support...

...and that's as important as financial issues

The majority of trainees are supported on their mentor's research grants

- Works well if the mentor-mentee relationship is a good one
 - Non-exploitative
- Works well once the trainee knows his/her interests clearly
- Works poorly if either is untrue

A subset of trainees receive their own support (fellowships)

- Can provide great portability and flexibility
- But also can provoke some distance from the mentor who “doesn’t need you” as much

If I had my way, everyone would have a sequentially combined experience

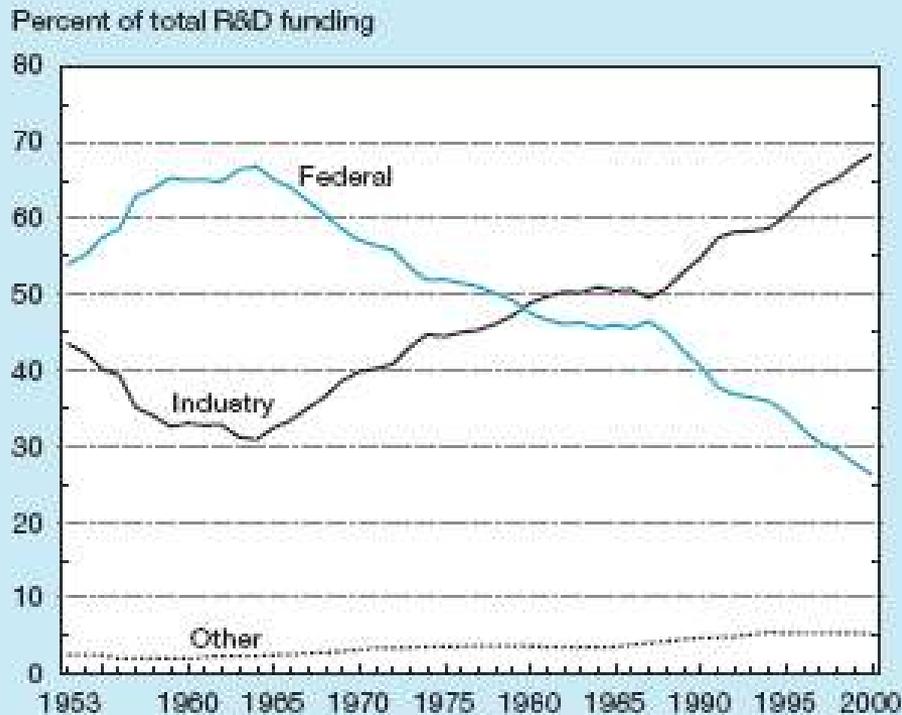
- Begin with fellowships for maximum flexibility and mobility
- Switch to mentor's grant support later for bonding and closer mentorship
- For post-docs as well as for graduate trainees

Trends in science will also shape the future of training and traineeships

Trends of the last decade

- Career paths are changing
 - People stay in training longer
 - Industry is a much bigger player

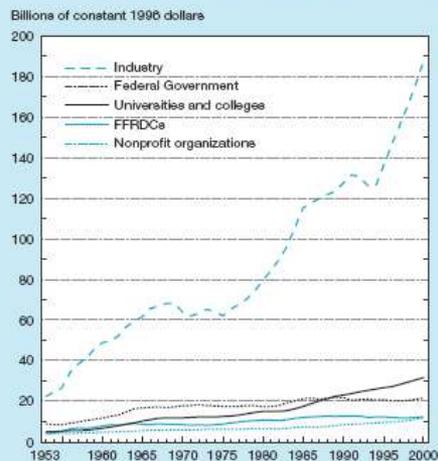
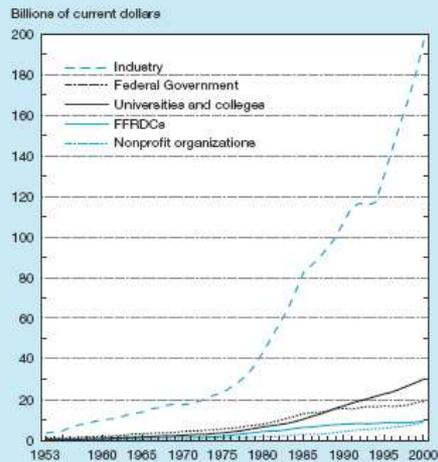
Figure 4-3.
Shares of national R&D expenditures, by source
of funds: 1953–2000



See appendix table 4-5. *Science & Engineering Indicators – 2002*

Industry is providing
a greater share of
support

Figure 4-10.
National R&D performance, by type of performer:
1953–2000



FFRDCs = Federally Funded Research and Development Centers
See appendix tables 4-3 and 4-4.

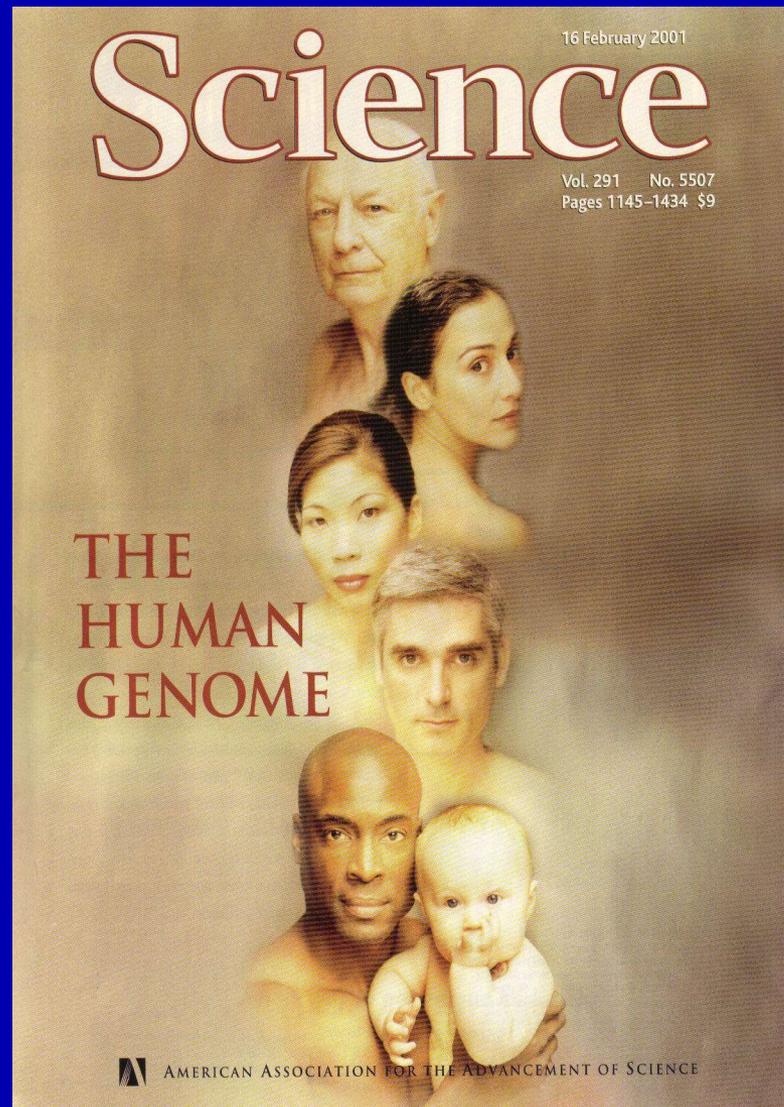
Science & Engineering Indicators – 2002

Industry is performing a greater share of the research

We need to prepare trainees for a wider range of places to work!

Trends within science itself

- Big science has hit the life sciences

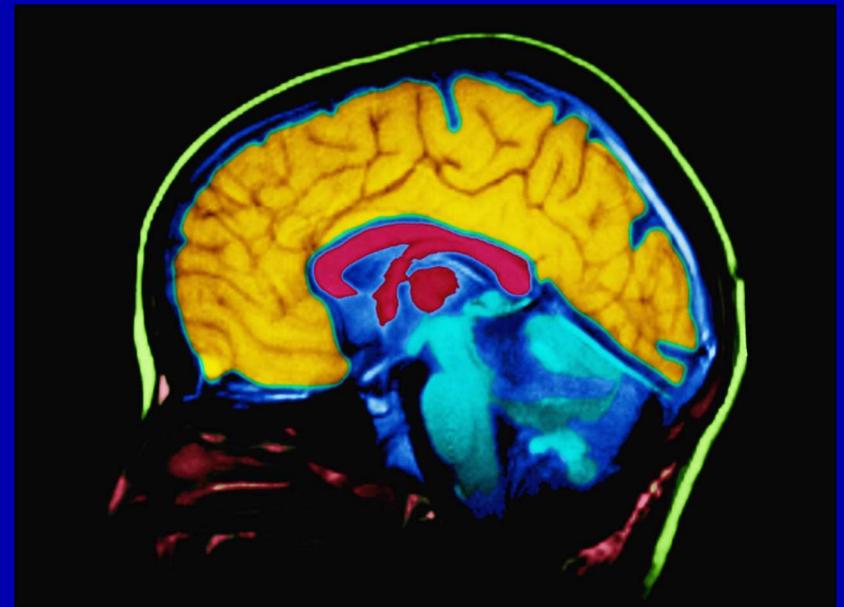


Trends of the last decade

- Big science has hit the life sciences
 - Hit physical sciences long before
 - How do we structure support for life science trainees to do big science?

Trends of the last decade

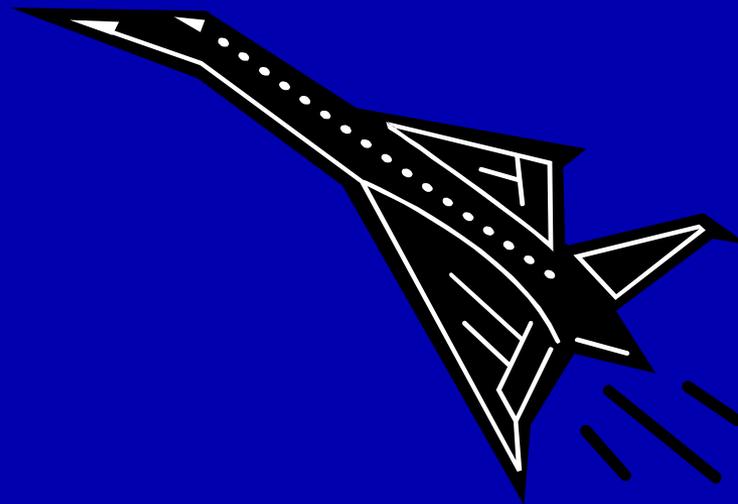
- Big science has hit the life sciences
- All scientific fields are now clearly inter-dependent



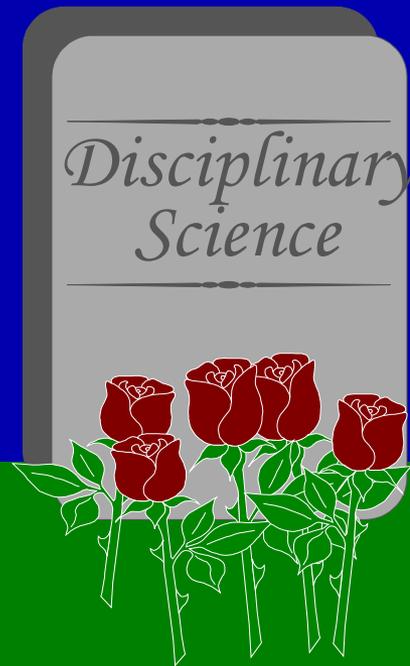
Trends of the last decade

- Big science has hit the life sciences
- All scientific fields are now clearly inter-dependent
- No longer such a thing as “disciplinary science”

The Leading Edge is Multidisciplinary



The Leading Edge Requires Collaboration Across Fields



Are we training students to be able to work in
a truly multidisciplinary team/environment?

Trends of the last decade

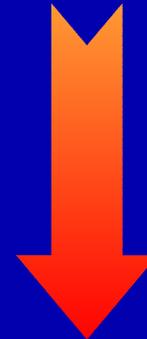
- Big science has hit the life sciences
- All scientific fields are now clearly inter-dependent
- No longer such a thing as “disciplinary science”
- Technology is now driving science
 - More than the reverse

SCIENCE

Historical View



TECHNOLOGY



APPLICATION

SCIENCE

A More Realistic View



TECHNOLOGY

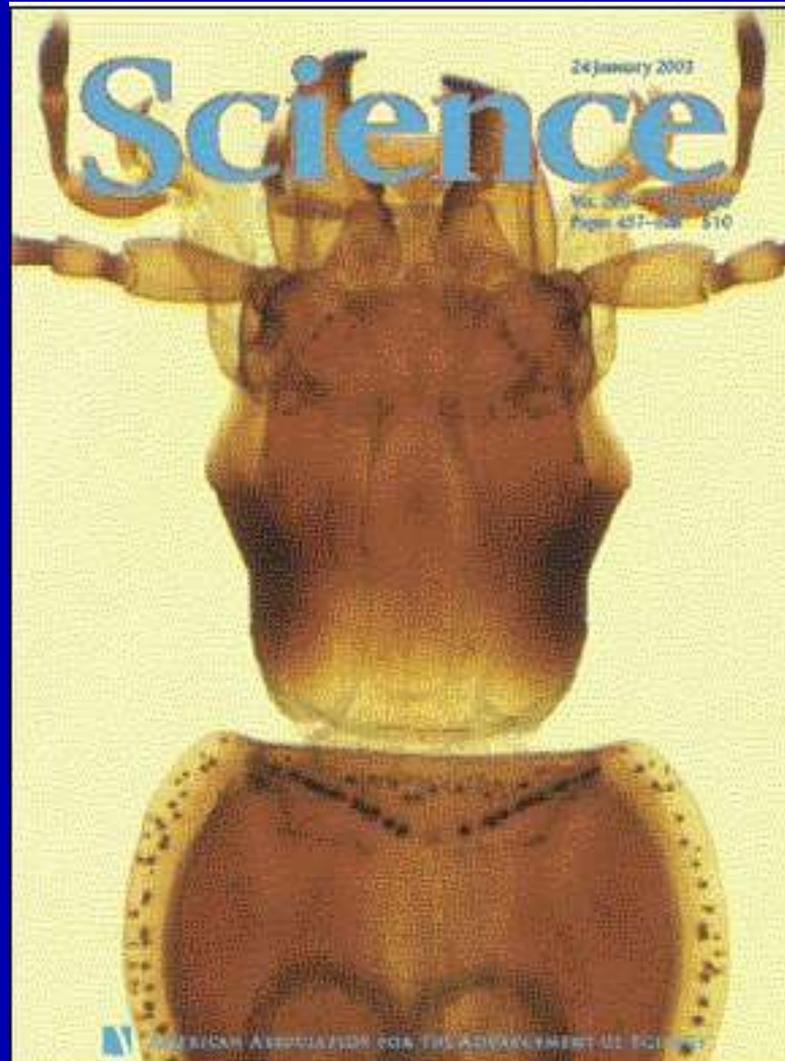


SCIENCE

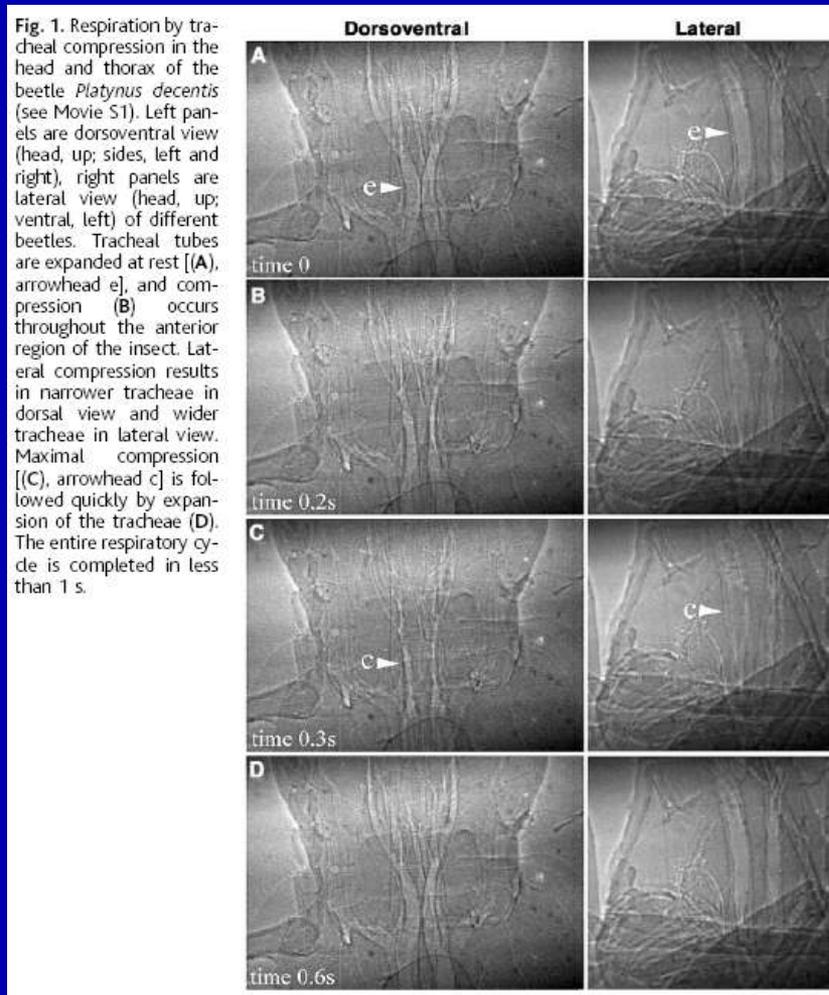
Technology is enabling

- New science
- New questions
- New understanding

A couple of examples....



Synchrotron x-ray of insect breathing





Cortical Plate

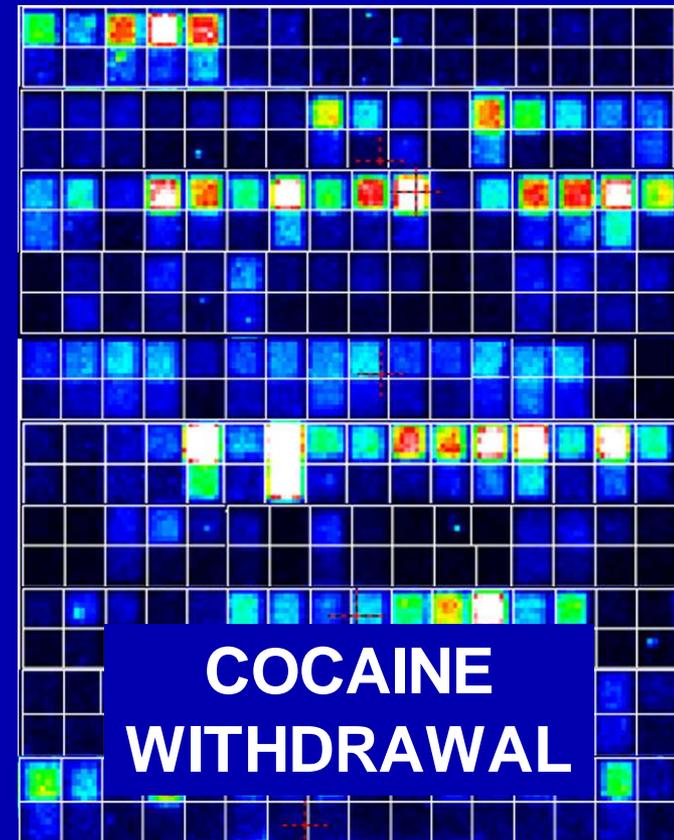
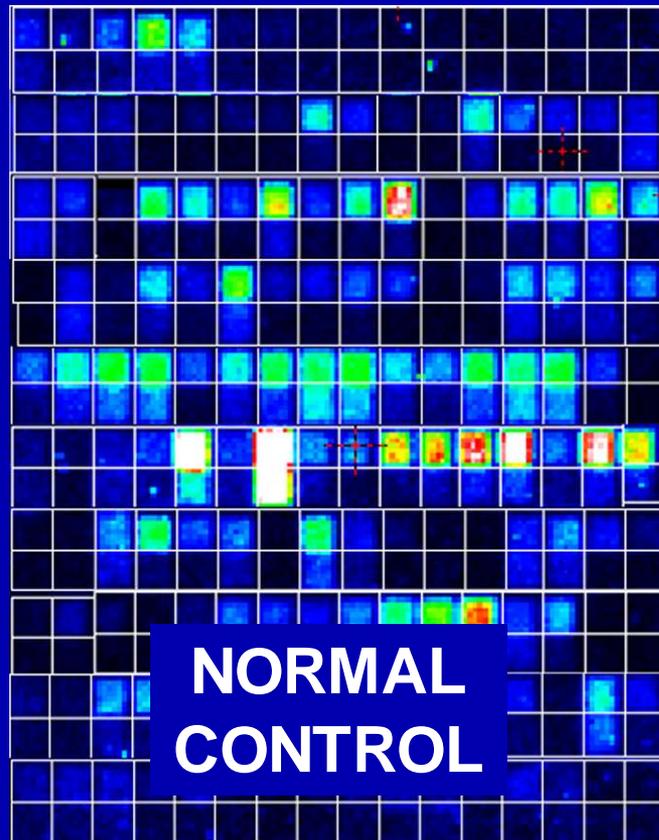
Duration: 12.4 hrs
Frame interval: 5 min
Stain: CellTracker Green
Preparation: E14 coronal slice
15 μm stack projection
Depth: 100 μm

Technology is changing some
fundamental paradigms about scientific
thinking.

We are seeing hypothesis *generating* science and technology, as well as hypothesis *driven S&T...*

“Discovery Science”

GENE EXPRESSION BY MICROARRAY PROFILING



Is our training maximally matched to these trends?

Training is becoming more and more complex

- How to do big science?
- How to work in multidisciplinary teams?
- How to fully exploit technology?
- How to work in an array of different settings?

This complex training will be very expensive

- May require support for multiple trainers at the same time
- May require travel among labs/facilities
- May take even longer to complete

Are our training approaches appropriate for
the science enterprise of the future?

...are we financing training in
appropriate ways?

Q

Who's cultivating tomorrow's scientific geniuses?



Questions and Answers.

Some particularly gifted children might be able to make quantum leaps in their education and find science a relatively easy subject to comprehend. Others may need a little more help and encouragement at an early age. Helping develop that talent and provide the learning tools necessary is something we at AAAS care passionately about. It's a big part of the very reason we exist.

Our educational programs provide after-school activities such as the iconic City web-based science adventure game,

based on the Peabody Award-winning Kinetic City radio show; Science Media Kit, with over 400 science lessons available on the Internet; and Project 2025, which provides teaching best practices to foster an improved understanding of science and technology in K-12 classrooms.

AAAS has been helping to answer the questions of science and scientists since 1848, and today is the world's largest multidisciplinary, nonprofit membership association for science-

related professionals. Our weekly journal, *Science*, will give you an inside track to a world of scientific information, understanding, and knowledge. We work hard at advancing science and serving the needs of our members and society by supporting improved science education, sound science policy, and international cooperation.

So, if your question is how do I become a member, here's the answer: Simply go to our website at www.aaas.org/join.

or in the U.S. call 202 326 6477, or internationally call +44 (0) 2023 326 525. Join AAAS today and you'll discover the answer to all of the world's...



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