Microsoft Research

European Science Initiative

Fabien Petitcolas

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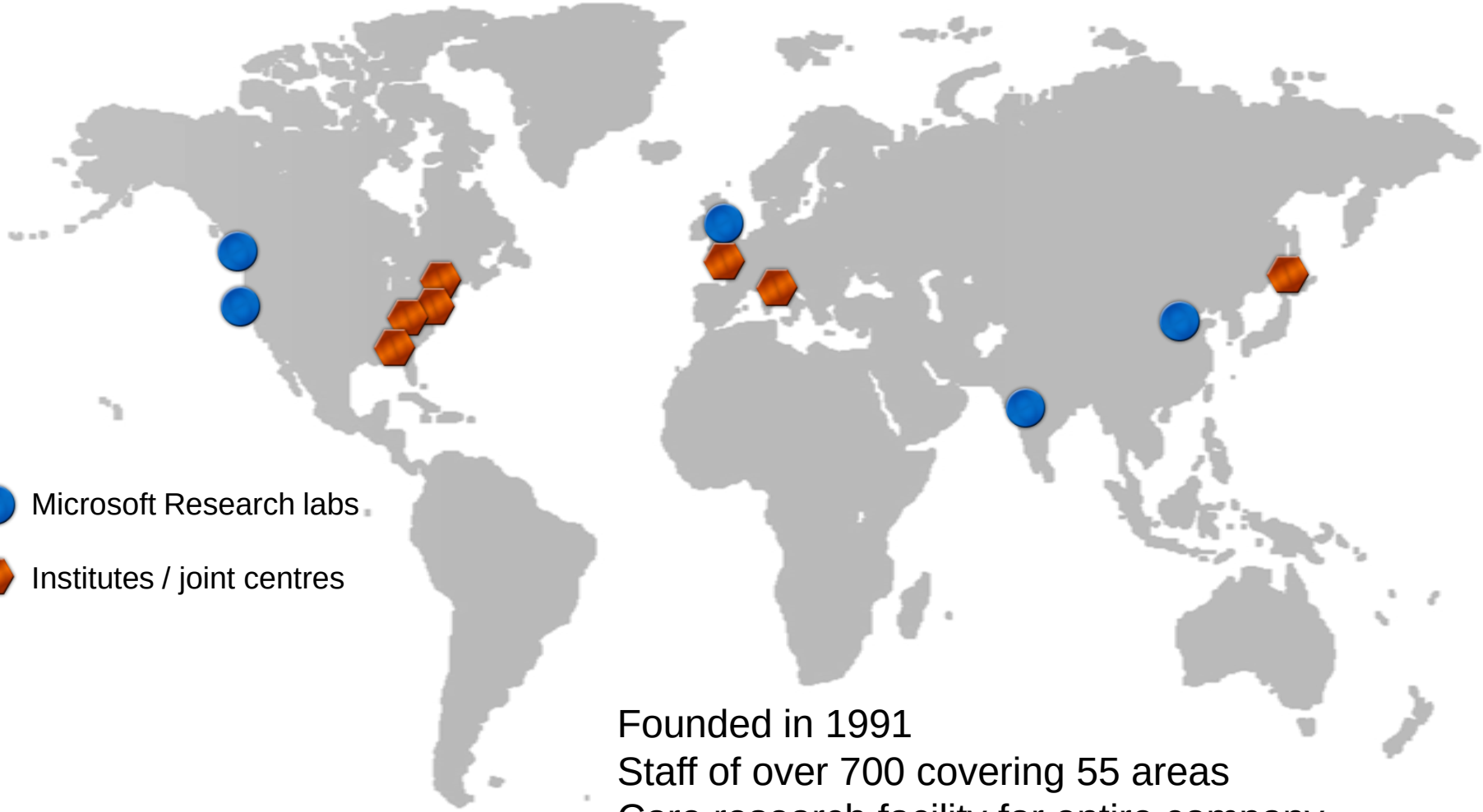

Founded in 1991
Staff of over 700 covering 55 areas
Core research facility for entire company

Microsoft Research

Microsoft Research mission

- Advance the state of the art in our chosen areas of computer science
  - Making computers easier to use
  - Reducing the cost of computing
  - Making software developers more productive
- Transfer the resulting technology to Microsoft businesses
- Ensure Microsoft has a future
  - Provide corporate agility – rapid response to change
  - Reservoir of technology
  - Pool of expertise and smart people
- Create a technical asset for Microsoft in Europe

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MSR Cambridge

90 Researchers

120 total staff

Plus 50-60 interns

1 Turing Award winner

1 Kyoto prize winner

2 Marr prize winners

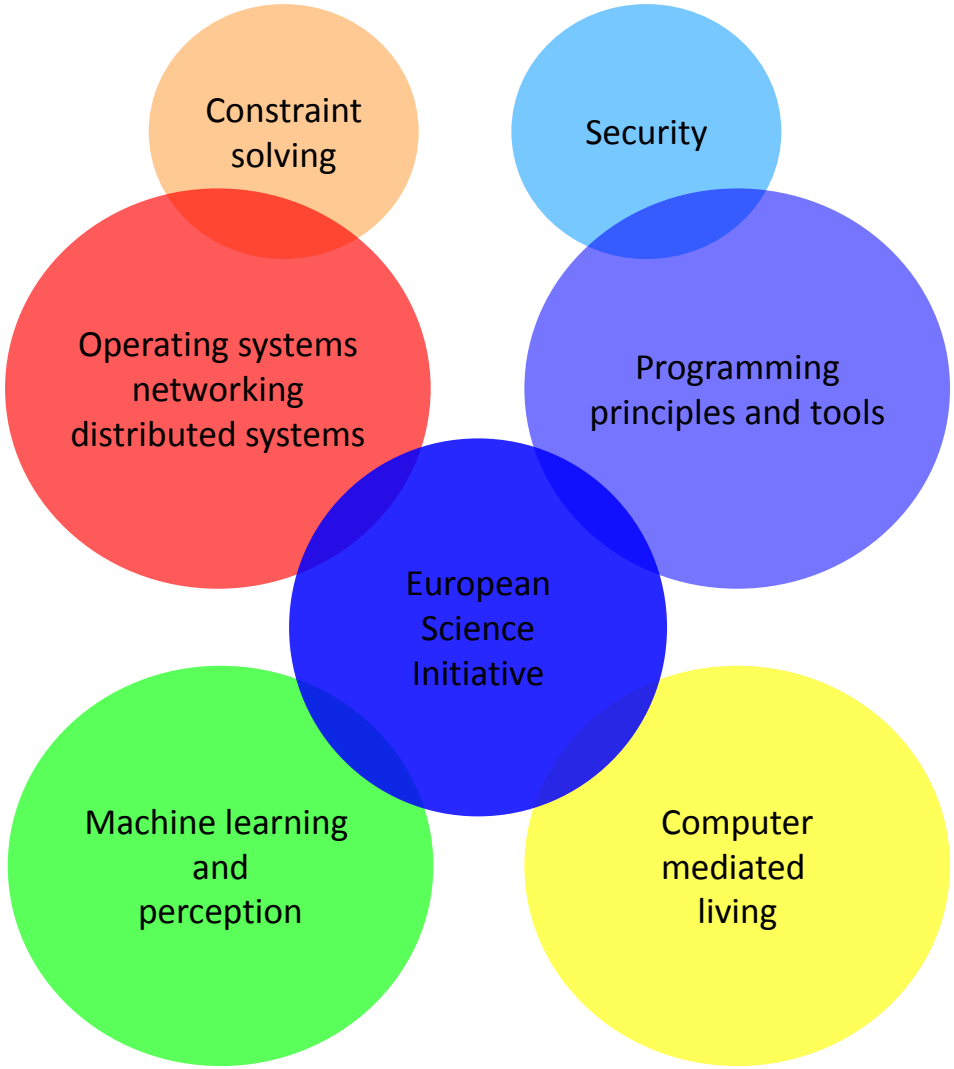
2 ACM Fellows

3 Royal Society Fellows

3 Royal Academy of Engineering Fellows

70+ top tier publications

65+ patents filed



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Jobs & internships

- Post-doc positions
  - A great opportunity to work with some of the top minds in the research community, and the strongest teams, in a whole range of areas of computer science and information engineering.
  - Competitive salary and benefits package
  - Eligible for relocation expenses
  - research.microsoft.com/aboutmsr/jobs/postdocs/about_uk.aspx
- Internships for PhD students
  - 60 interns (PhD) each year at MSR Cambridge
  - Competitive salary
  - research.microsoft.com/aboutmsr/jobs/internships/about_uk.aspx

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European Science Initiative

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Aim

Create, enable, accelerate fundamental advances in science through computing and in computing through science by research at their intersection

Context

- Important developments underway at intersection of computing & science
- Potential to profoundly transform science, economy, society
- Enabling new conceptual and technological tools – foundations for new scientific revolution: ‘new kinds’ of science
- Tools instantiated in software
- As world’s largest software company can’t afford to remain ‘nowhere’ here – Need & opportunity to contribute, lead, learn

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Model

- Focus where we can make a difference
  - Scientific: Systems Biology, Ecology & Environmental Science, Bio-computation
  - Technological: New kinds of tools to address important scientific challenges
  - Community: Support scientists, Support science, build tools to do better / different science, bring together people & ideas that might not otherwise meet
- ‘Open Innovation’
  - Team = combination of internal + external scientists + joint appointments
  - Public-private partnerships (e.g., CoSBi, INRIA, IRCSET)
- Inter-disciplinarity
  - People – as well as projects

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Joint centres

- *Microsoft Research-University of Trento Centre for Computational and Systems Biology*
  - February 2005
  - Computational tools to enable biologists and others working in the life sciences to better understand and predict complex processes in biological systems
- *Microsoft Research INRIA Joint Centre*
  - April 2005
  - Application of mathematics to improve software and systems security
  - Development of new software tools for the management and analysis of complex scientific data.

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2020 SCIENCE

140,000 reports requested

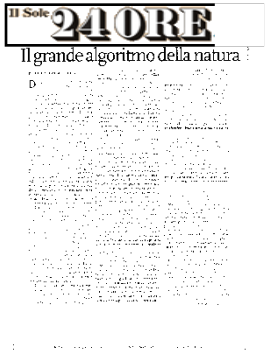
Project got on front cover of Nature

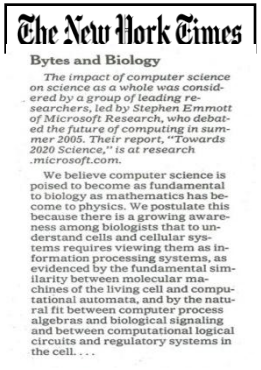
Discussed in House of Lords

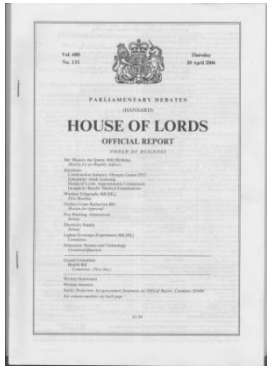
Influenced Science Policy in UK, USA, Denmark, Israel, Sweden, Norway, Ireland, Canada

Continues to have significant influence in science community worldwide

Over 200 press articles worldwide about our work







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Ecology & Environmental Science

Aim	New kinds of theoretical and computational tools and methods to accelerate advances in areas that present important and urgent scientific challenges: Understanding our *Biosphere* and changes occurring to it

Focus	**Projects**
Understanding Ecosystems and Biodiversity	1. Modelling species distributions 2. Modelling invasive species spread and impact 3. Modelling food webs & ecosystem entropy 4. Advanced techniques for modelling plant and forest growth 5. Global Pandemic Modelling System
Understanding Biotic component of Climate System	1. Connecting tree physiology to evapotranspiration and global climate 2. understanding biogeochemical feedback on earth system 3. development of a new fire model for use in earth systems modelling 4. Landscape-scale coupled biological–meteorological model
Managing Ecological and Biodiversity Data	1. Integrating ecological and biodiversity data 2. Automatic monitoring of vulnerable species 3. Global database of forest inventory 4. Remote sensing of rainforest biodiversity 5. Tools for cloud forest conservation 6. Initial release of digitized Cambridge Herbarium Collection, including Darwin's collection from voyage on *The Beagle*

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Computational Biology

Aim	Create new conceptual and technological tools and methods that enable important advances in areas of biological science that present fundamental challenges and opportunities

Focus	**Projects**
Programming language for biology	1. Extend and refine SPiM, esp UI + efficiency on multicore 2. Ability to visualise causality in pi-calculus using Msg Sequence Charts 3. Make tools more biologist-friendly through GUI
Understanding Living Systems 1: ***Cell***	1. Dynamic, modular method of modelling gene regulatory networks from simple computational elements (currently requires fixing system topology before implementation) -- model robust (stochastic) cellular clocks from genetic building blocks 2. Toolkit for stochastic time-series modelling of single cell (assay) data -- integrating in-silico + in-vitro data through standard measure of comparison – apply to apoptosis pathway and gene delivery process 3. Abstract machine (for process calculi with compartments) for whole cell modelling *4. Generic Executable Cell – modifiable to all cell types*
Understanding Living Systems 2: ***Immune System***	1. Compositional model of MHC Class I Antigen Presentation (key immune system pathway) using SPiM [see above] 2. Test model predictions
Understanding Living Systems 3: ***Whole Organism***	*1. Lead effort to build complete compositional, executable, dynamic computational model of whole organism (C.Elegans likely candidate) inc visualisation (& animation of dynamics), intra/extra cellular input-output, development, maturation, apoptosis, environment*

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Community

- PhD Scholarship programme
  - Summer School
- Fellowship for early career scientists
- European Science Award

- Inspire

- Workshop series
- Seminar series

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PhD scholarship programme

- Encourage interdisciplinary research
- Increase and help collaboration between MSRC and Academia
- Identify potential employees and interns
- Create a community
- Open application process
  - Reviews by internal and external experts
  - Ranking

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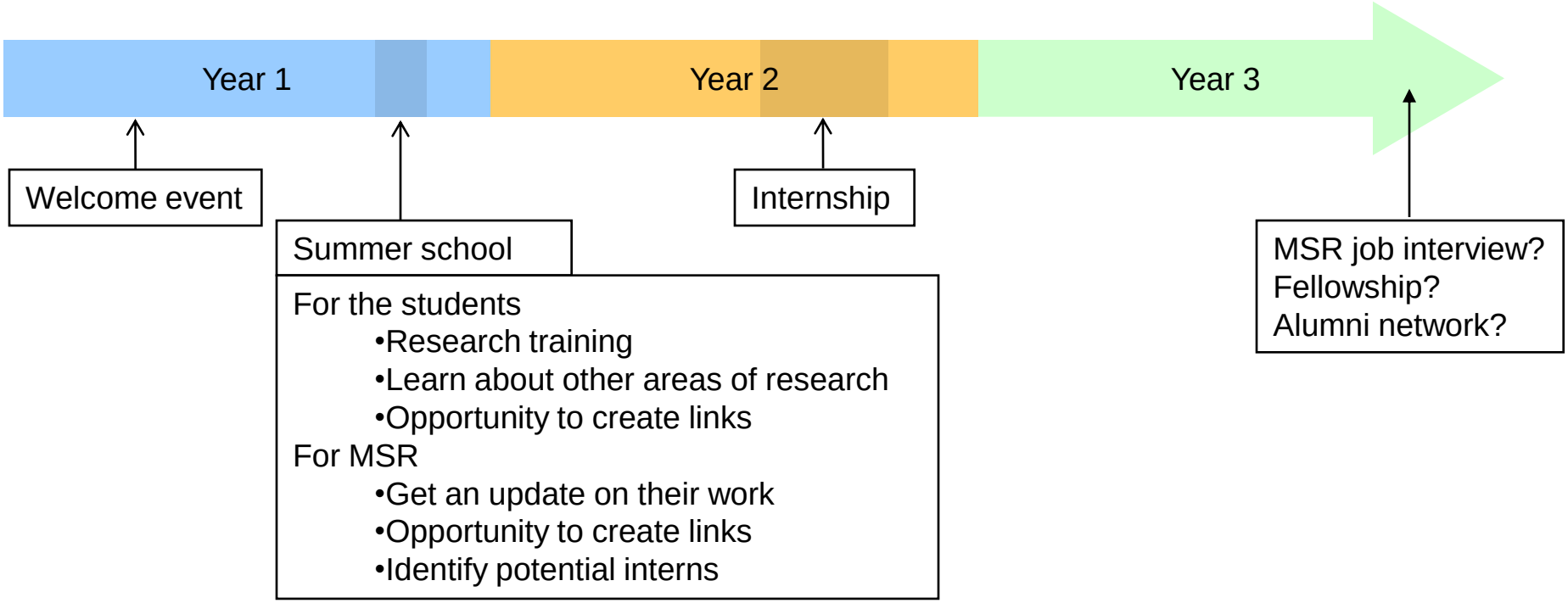
PhD – Not just funding



TabletPC
Travel grant to tier-1 conferences
Co-supervision by MSR people

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Fellowship programme

- Recognise and support early- career scientist
- Encourages faculty to develop and maintain intellectual independence at a critical time in their careers
  - Very flexible 2-year sponsorship (€250,000)
- Reward far-reaching research that extends the impact of computing
  - Systems biology
  - Computational ecology
- Nomination by HoD or professors
  - Screening
  - Review by internal and external experts
  - Interviews

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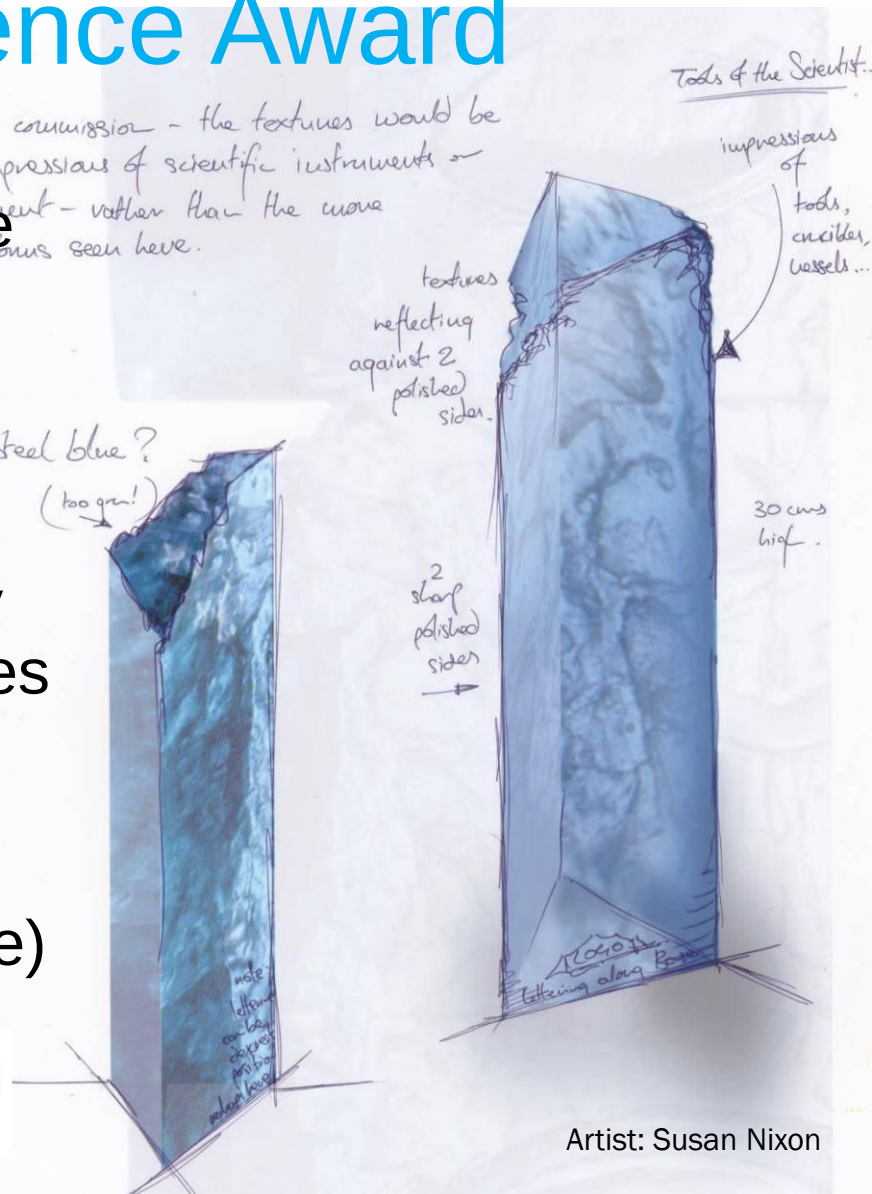
European Science Award

- Recognise scientists in Europe who have made a significant contribution to their research field through the use of computational methods
- Selection by the Royal Society and the Académie des Sciences
- Nomination and references
- Selection based on passed achievement (shortlist and vote)



Artist: Susan Nixon

INSTITUT DE FRANCE
Académie des sciences

THE ROYAL SOCIETY

European Science Award

- Characteristics
  - Amount: €250,000
  - Even years:
    - Biological sciences ∩ computer science
    - Ceremony in London
  - Odd years:
    - Physical sciences ∩ computer science
    - Ceremony in Paris
- Committee
  - 3 from Royal Society
  - 3 from Académie des Sciences

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Inspire programme

- Promote interaction between academics from Africa / Middle East and
  from Europe / USA:
  - Visiting researchers/teachers
  - Sponsorship of research summer schools
- Encourage students to do research
  - Recognise exceptional students who want to embark on a research career

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Research summer school sponsorship

- Bring together students and lecturers from Africa and the Middle East in a program of lectures and tutorials by internationally renowned speakers
- Sponsorship to support attendance of students or faculty to the summer school
- Applications considered twice a year (March & September)
- Sponsorship up to €10,000
- Email: msrinsp@microsoft.com

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Volunteer researcher & lecturer

- Facilitate visit of academics from Europe and the USA
  - Online service that matches host universities with academics from Europe or the USA who volunteer to teach computer science
  - Travel stipend to some of the volunteers to assist with travel expenses
  - www.msr-inspire.net

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research.microsoft.com/ero/