The Joint Centre

Jean-Jacques Lévy

INRIA Rocquencourt & MSR-INRIA Joint Centre

CENTRE DE RECHERCHE COMMUN
INRIA MICROSOFT RESEARCH

Plan

1. Context
2. Track A
3. Track B
4. Future

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Context

Politics

INRIA

Gilles Kahn

Michel Cosnard

Michel Bidoit
Véronique Delebarre

Eric Boustouller
Stephen Emmott
Gérard Giraudon
Gérard Huet
Jean Vuillemin

Joint Centre

J.-J. Lévy

Stephen Emmott
Malik Ghallab
Claude Puech
Ken Wood

MSR Cambridge

Roger Needham

Andrew Herbert

Marc Jalabert
Bernard Ourghanlian

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Strong points in french CS research

mathematics and theoretical CS

- **formal methods**
- **programming langages**
- **computer algebra**
- **computer human interfaces**
- **computational geometry**
- **vision**
- **· · · INRIA · · ·**
- **basic software (prototypes and real tools)**

- b, coq, trusted logic
- ada, caml, lelisp, lustre, esterel
- maple libraries, scilab
- nextStep, Mac OS X interface
- CGAL
- realviz
- ilog, altavista · · · exalead
- polyspace, astree, unison
- ...

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Strong points in french CS research

formal thinking = theory + *hacking*

- formal methods
- programming langages
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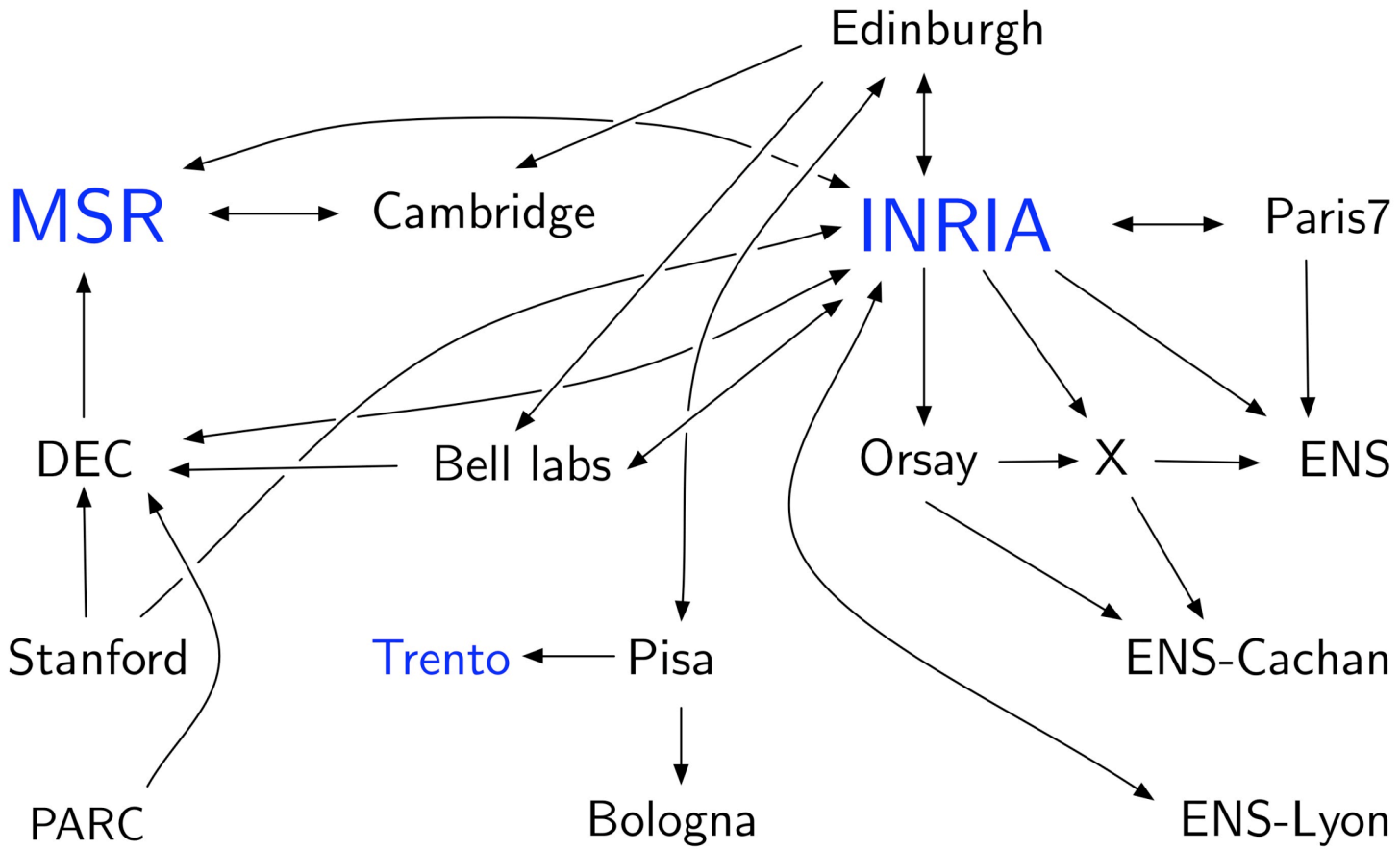
Long cooperation among researchers



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Organization

a rather complex system

- **7 research projects (in two tracks)**
- **12 resident researchers**
- **non permanent researchers paid by the Joint Centre**
- **permanent researchers paid by INRIA or MSR**
- **operational support by INRIA Saclay**
- **1 system manager** (Guillaume Rousse, INRIA Saclay)
- **1 administrative assistant** (Martine Thirion, Joint Centre)
- **1 deputy director** (Pierre-Louis Xech, MS France)
- **active support from MS France**

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Track A

Software Security

Trustworthy Computing

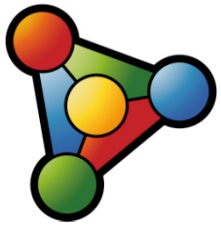
Mathematical components

Georges Gonthier, MSRC
Assia Mahboubi, INRIA Saclay/LIX
Enrico Tassi, Bologna
Y. Bertot, L. Rideau, L. Théry, Sidi Ould Biha, INRIA Sophia

Guillaume Melquiond, ENS Lyon,
Sean MacLaughlin, CMU,
Benjamin Werner, INRIA Saclay/LIX,
Roland Zumkeller, LIX
François Garillot, MSR-INRIA (PhD)

Computational proofs

- computer assistance for long formal proofs.
- reflection of computations into Coq-logic.



4-color

Appel-Haken

finite groups

Feit-Thompson

Kepler

Hales

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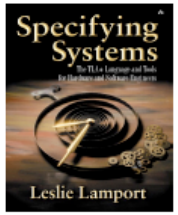
Tools for formal proofs

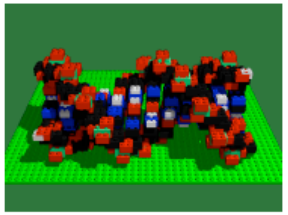
Damien Doligez, INRIA Rocq.
Leslie Lamport, MSRSV
Stephan Merz, INRIA Lorraine

Natural proofs

- first-order set theory + temporal logic
- specification/verification of concurrent programs.
- tools for automatic theorem proving



TLA+



tools for proofs

Zenon

Secure Distributed Computations and their Proofs

Cédric Fournet, MSRC
Karthik Bhargavan, MSRC
Ricardo Corin, INRIA Rocq.
Pierre-Malo Deniélou, INRIA Rocq.
G. Barthe, B. Grégoire, S. Zanella, INRIA Sophia

James Leifer, INRIA Rocq.
Jean-Jacques Lévy, INRIA Rocq.
Tamara Rezk, INRIA Sophia
Francesco Zappa Nardelli, INRIA Rocq.
Nataliya Guts, MSR-INRIA (PhD)

Distributed computations + Security

- programming with secured communications
- certified compiler from high level primitives to low level crypto-protocols
- formal proofs of probabilistic protocols

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Track B

Computational Sciences
Scientific Information Interaction

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Application of CS research to the Sciences

Projects

- **Information interaction**
  - ¬ dynamic encyclopedia of mathematics
    (Bruno Salvy)
  - ¬ management of scientific workflows
    (Wendy Mackay, J.-D. Fekete, Mary Czerwinski, George Robertson)

- **Scientific data analysis**
  - ¬ image and video analysis for sciences and humanities
    (Jean Ponce, Andrew Blake)
  - ¬ adaptive search for E-science
    (Y. Hamadi, M. Schoenauer)

Dynamic dictionary of math functions

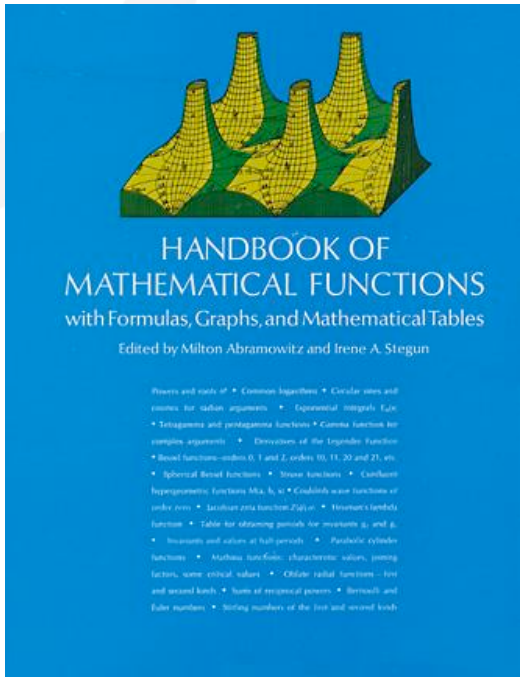
Bruno Salvy, INRIA Rocq.,
Alin Bostan, INRIA Rocq.,
Frédéric Chyzak, INRIA Rocq.

Henry Cohn, [Theory Group] MSRR

Computer Algebra and Web for useful functions,

- functions defined by linear differential equations.
- dynamic tables of their properties.
- generation of programs to compute them.

Maple 11



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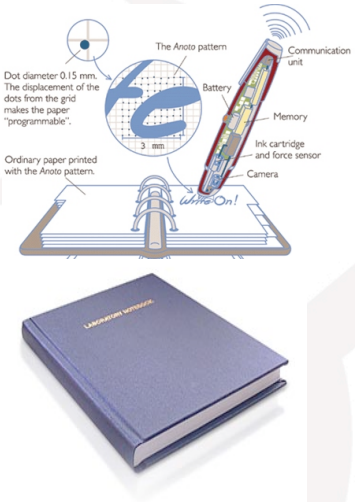
ReActivity

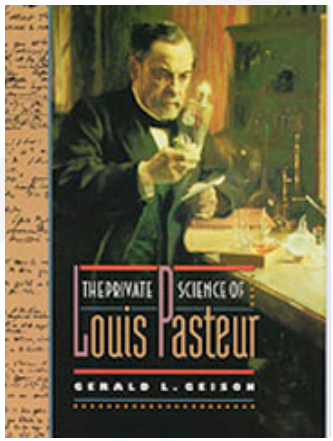
Wendy Mackay, INRIA Saclay,
J.-D. Fekete, INRIA Saclay,
Mary Czerwinski, [Vibe], MSRR,
George Robertson, [Vibe] MSRR

Michel Beaudouin-Lafon, Paris 11,
Olivier Chapuis, CNRS,
Pierre Dragicevic, INRIA Saclay,
Emmanuel Pietriga, INRIA Saclay,
Aurélien Tabard, Paris 11 (PhD)

Logs of experiments for biologists, historians, other scientists

- mixed inputs from lab notebooks and computers,
- interactive visualization of scientific activity,
- support for managing scientific workflow.





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Adaptive Combinatorial Search for E-science

Youssef Hamadi, MSRC
Marc Schoenauer, INRIA-Saclay
Anne Auger, INRIA-Saclay

Lucas Bordeaux, MSRC
Michèle Sebag, CNRS

Parallel constraint programming and optimization for very large scientific data

- improve the usability of *Combinatorial Search* algorithms.
- automate the fine tuning of solver parameters.
- parallel solver: “disolver”

MoGo

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Image and video mining for science and humanities

Jean Ponce, ENS
Andrew Blake, MSRC
Patrick Pérez, INRIA Rennes
Cordelia Schmid, INRIA Grenoble

Computer vision and Machine learning for:

- *environmental sciences*: change detection in dynamic satellite imagery
- *archaeology and cultural heritage preservation*: 3D object modeling and recognition from historical paintings and photographs
- *sociology*: human activity modeling and recognition in video archives

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Future

Future

- signing CRAs of Track B in 2007
- 30 resident researchers
- tight links with French academia (phD, post-doc)
- develop useful research for scientific community
- provide public tools (BSD-like license)
- become a new and attractive pole in CS research
- and source of spin off companies

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