



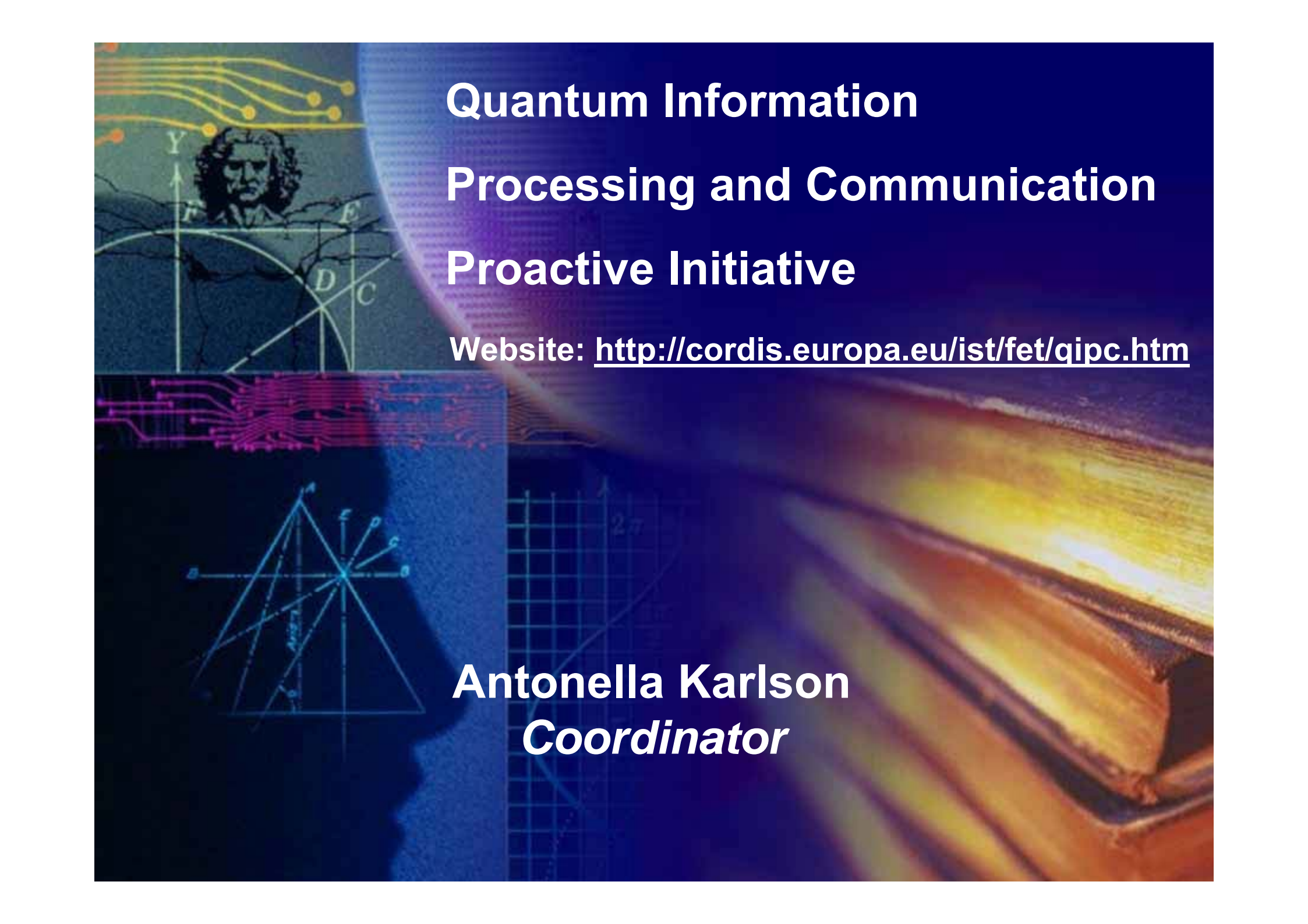
European Commission



**DG Information
Society and Media**



**Future and Emerging
Technologies**



**Quantum Information
Processing and Communication
Proactive Initiative**

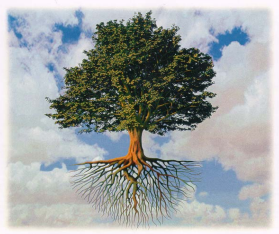
Website: <http://cordis.europa.eu/ist/fet/qipc.htm>

Antonella Karlson
Coordinator

7th European QIPC Workshop

QIPC FET Proactive Initiative

Thank you!



Future and Emerging
Technologies

Program Committee

Artur Ekert (Chairman), Harry Buhrman,
Philippe Grangier, Martin Plenio, Miklos
Santha, Ian Walmsley, Goran Wendin,
Peter Zoller

Sponsor and logistics organization

ERA Pilot QIST project

Coordinator: Dr. Christian Monyk

WELCOME!

QIPC in FP6 initiative

Projects funded in the period 2003-2006:

- 3 Integrated Projects for 25.260M€
- 2 Coordination Action projects for 1.850M€
- 8 STREPs (smaller projects) for 13.582M€
- Very well structured initiative

Traditional events continue

- Annual European QIPC workshop
London, Oct. 2006
- Cluster review with conference
Oxford, Feb. 2007
- At each of these events organize a 'special session' to discuss strategy and planning of the QIPC initiative

FP6 FET Publications

- "Strategic report on current status, visions and goals for research in Europe" – The QIPC EU Roadmap – 2005
- "Quantum Information Processing and Communication in Europe" – collection of articles 'Scientific American' style, 30 articles by 58 scientists + Foreword and Introduction - 2005
- "QIPC as a FET proactive initiative in the IST program" - 2006





ERA-Pilot QIST started 01.02.2005; last for 2½ years

- Collect information for the development of a common strategy for QIPC research
- Map EU QIPC actors (159 groups & 78 funding agencies) and activities
- Map QIPC actors and activities worldwide
- Coordinate national research activities and policies

Coordination Action type

- **Top-down** (institutional level)
- **Coordination** between **national** initiatives and the **EU**
- **Proposition function:** addressed to funding agencies (national & EU)
- **Elaborating guidelines** for funding the research field

Workpackages

- **WP1** (Roadmap): P.Zoller, T.Calarco, D.Binosi
- **WP2** (Int. QIPC actors/activities): V.Buzek, A.Ekert, D.Loss, T.Gyalog
- **WP3** (EU QIPC actors/activities): A.Zeilinger, S.Gigan

Milestones

- **QIPC Strategic Report** (started 2004)
- **QI Classification Scheme (QICS)**

QUROPE started 01.09.2006; last for 3 years

- **Common vision & strategy**
- **Public outreach & dissemination**
- **Web portal & info exchange**
- **Conferences & Young scientists training + NMS**
- **Establish links with industry**
- **International cooperation**



Coordination Action type

- **Bottom-up** (scientific level)
- **Structuring** the community and **representing** it towards the EC
- **Support function:** training and conferences organization
- 'Lobbying' for **focusing attention** on the research field

Workpackages

WP2 (P.Zoller, T.Calarco, D.Binosi)
Vision-Roadmap

Maintain and enlarge the QIPC Roadmap, QICS codes and databases produced by ERA-Pilot

WP3 (A.Zeilinger, E.Polzlik, P.Knight)
Public outreach

Specifically designed for raising the public awareness and visibility of the whole QIPC field

WP4 (E.Polzlik, T.Calarco, D.Binosi, L.Theussl)
Info exchange

Devoted to information broadcast through the developed electronic information infrastructure and feedback channel

WP5 (A.Imamoglu, M.Lewenstein, M.Ziman)
Conferences

Focuses on defining and supporting strategic meetings within the QIPC community

WP6 (N.Cerf, S.Massar)
Schools

Aimed at attracting and training of the next generation of broadly educated QIPC researchers

WP7 (N.Gisin)
Industrial links

Set up to establish an early dialogue with industry and existing R & D areas (whishing lists, etc.)

WP8 (A.Ekert, D.Loss, G.Burkard)
International Cooperation

Aimed at disseminating the EU vision and flavor worldwide and to foster the birth of a novel international coordination program



QIPC Strategic Report (EU QIPC Roadmap)



When

- Start Sept. 2004 Rome
- 1st stable version: April 2005
- 1st update: July 2005
- Published in EPJD Nov. 2005
- FET/EC publication Jan 2006
- 2nd update: Feb 2006
- Updates: 2 per year (ERA) / 1 per year (QUROPE)

Who

40 contributing authors
(ed. P. Zoller; + T.Calarco, D.Binosi)

Each one is the center of a group of indirect contributors

ERA Pilot WP1 from Feb. 2005

Consultation and feedback from the research community via the ERA Pilot WP1 web site: for each update and for the EC (Feb. – March 2005)

ERA-Pilot WP1 most challenging achievement

It will determine the QIPC strategic research agenda in Europe for the next decade, serving as a guideline both to scientists and decision makers.



EU QIPC Roadmap: the European flavor

Executive summary, introduction (why, what), international context, funding

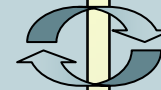
Q. Communication

- Fiber based
- Free space
- Q. Memories
- Q. Repeaters
- Q. Interfaces
- Q. Protocols



Q. Information theory

- Q. algorithms
- Computational models and architectures
- Q. Simulations
- Error correction + purification
- Entanglement
- Noisy comm. channels



Q. Computation

- Trapped ions (electrons)
- Neutral atoms
- Optical traps, Cavity QED, Atom chips
- Supercond. JJ
- Quantum dots
- Linear optics
- Impurity spins / molecular magnets

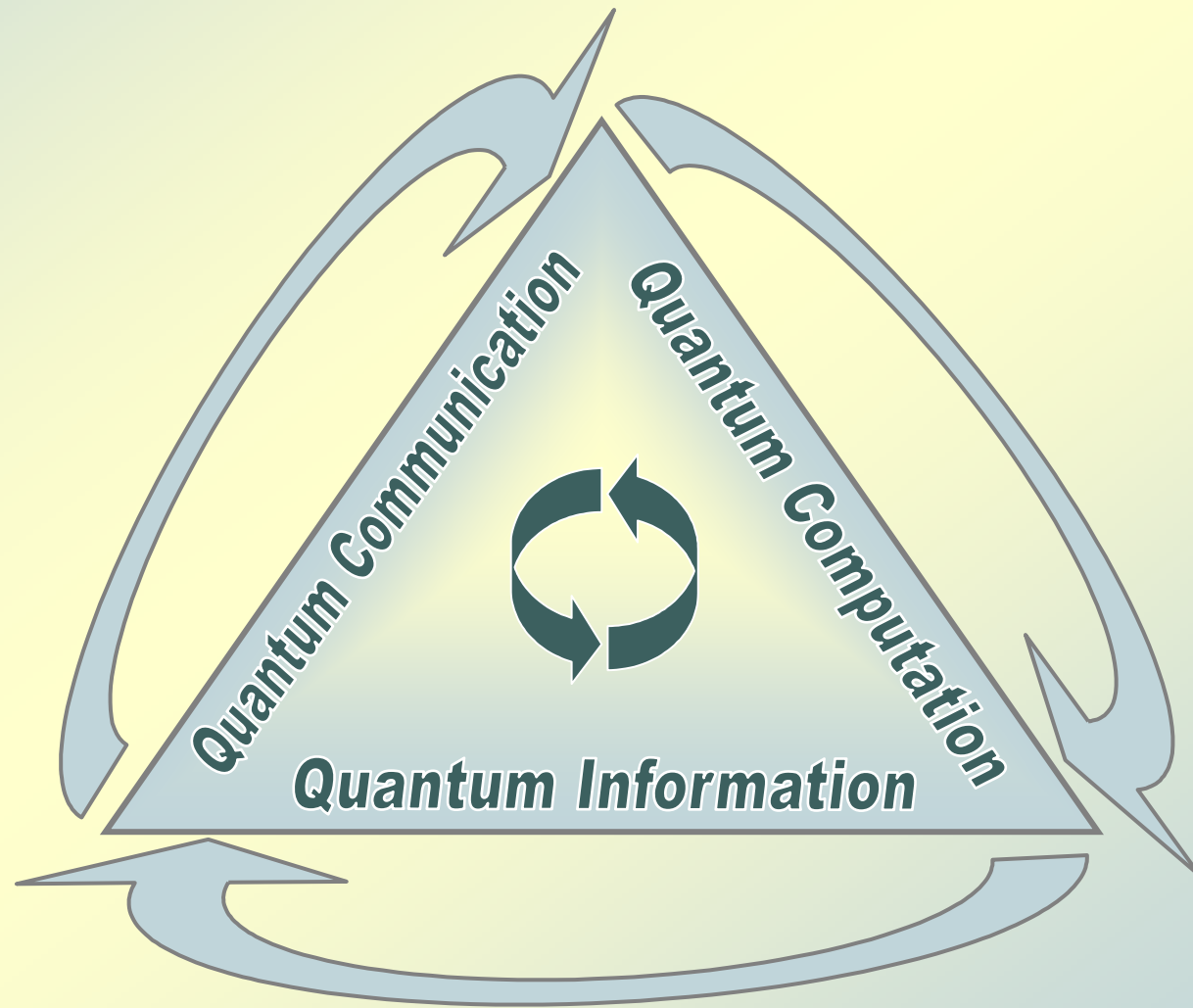
Fundamental issues in QIPC

Q. mechanics, decoherence, gravity

Commercial exploitation

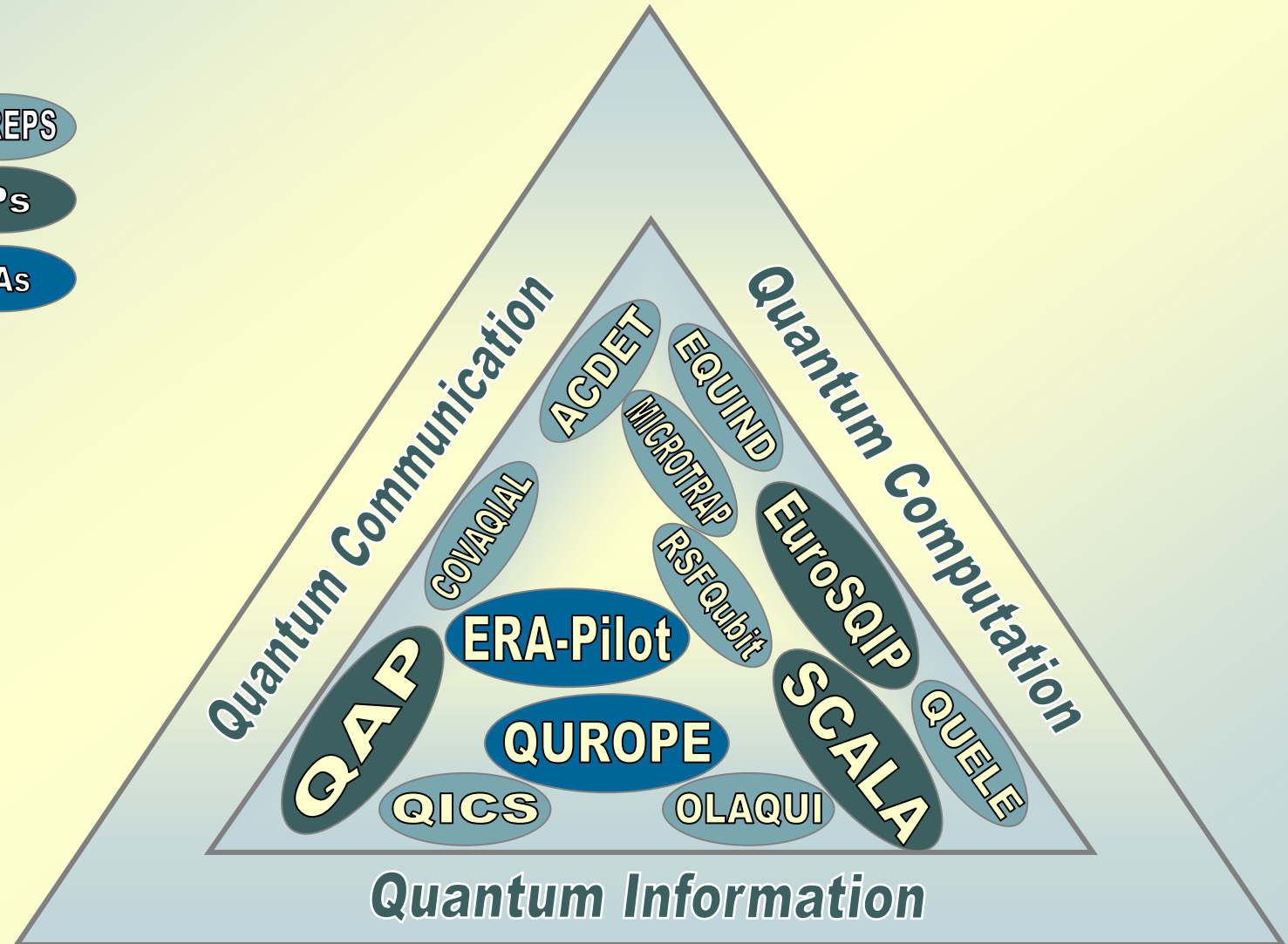
Communication, computing, metrology and q. technologies

Integration between sub-domains



FP6 Projects

- STREPS
- IPs
- CAs



Overview

What has been achieved in FP5 and FP6



Current status

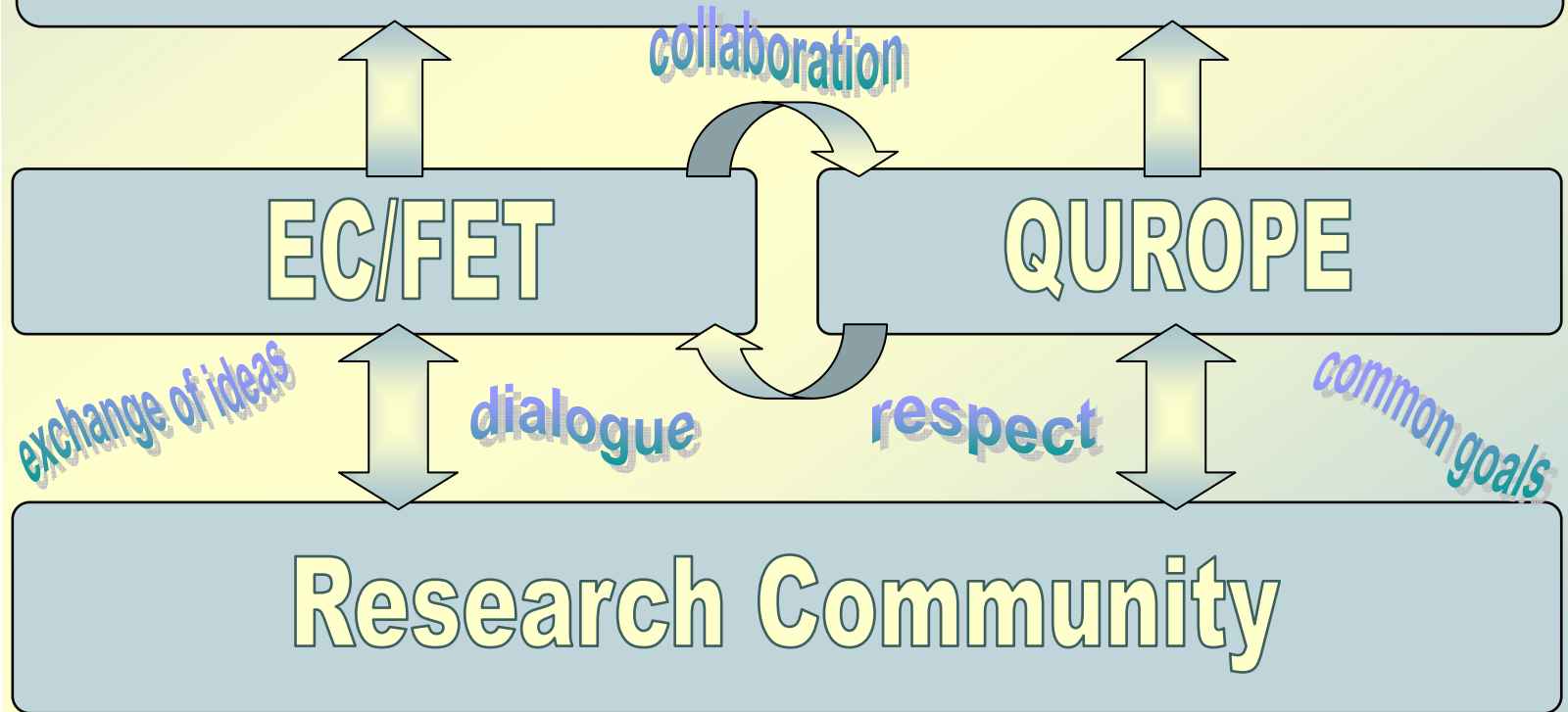
- Some applications are mature enough for real-world deployment
- With the start of the IPs, the year 2006 marks the start of a new more mature stage of development: Integration across different sub-domains and experimental approaches in order to reach concrete research objectives → from components strive to build complete working quantum systems
- The EU QIPC research community has reached critical mass and is scientifically competitive on world scale
- The FET QIPC initiative has started a powerful process to unify and structure the research community at EU level and to build a common European identity
- Development of a common EU research strategy: the QIPC Roadmap

European priorities

Collaboration and synergy between the EC and QIPC researchers

What matters at European level?

- Structure and strengthen the research community
- Create a sense of community and European identity
- Unify the community around the QIPC initiative
- Coordinate efforts between national, local programs and the EU initiative





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Continue to enhance the synergy

Bottom-up approach, active participation of the entire research community, comprehensive and no-nonsense feedback channel, ...

Active collaboration between FET, the projects and the research community in order to respond on time and proactively to:

- the changing needs of the community**
- the fast research developments**
- changes at EU and Commission level**
- changes at international level**

Keep the traditions

The annual QIPC workshop and the cluster review: serve as a platform for information exchange

At each of these events organize a 'special session' to discuss strategy and planning of the QIPC cluster

Actions for the QIPC initiative

Permanent



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Overview at EU level

- It is imperative that at each moment in time we have a clear understanding of the results obtained, an assessment of the strengths and weaknesses in present research, as well as a clear definition of the challenges and the objectives.

EU QIPC Roadmap

- Enhance the development of a common strategy and vision for research at EU level
- Assess the state-of-the-art and trace the way to the future
- continuously keep up-to-date
- implement both at funding and at research level

Grow, Expand, Enhance

- Wide dissemination and promotion of QIPC at all levels
- Support emerging new areas, research topics and applications
- Integration between sub-domains, physical realizations and approaches



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Dedicated Call for proposals

Open end December 2008

Evaluations, negotiations and budget
commitment in 2009

Probably for 20 M€

FET Open

Call open in January 2007

Continuous submission scheme

Similar procedures as in FP6

Actions for the QIPC initiative

Future



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Short-term (1 year)

- **QUROPE**: make an active project that complements the rest of the activities and is a focal point for the entire community
- **ERA Pilot**: implement the planned adjustments to the work in order to meet the current needs
- **Publication – project overview**

Medium term (2 years)

- **QUROPE** to develop (in collaboration with FET and the entire community) an European QIPC web portal
- **Prepare the first QIPC call in FP7 (December 2008)**: research topics, research goals, collaborations, etc. in accordance with the roadmap

Long-term (5 years)

Coordination between national initiatives and the EU program

Develop a common European strategy and platform for international collaboration according to the common EU research strategy

Develop links with potentially interested industry



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Conclusion

The FET QIPC proactive initiative has influenced in a significant way the development of QIPC research in Europe and has led to the emergence of a qualitatively new approach and vision

Announcement

QIPC Cluster Review and Conference 2007

28 February, 1st and 2nd March 2007, Oxford

28 Feb.: conference, reviewers present, everybody welcome, maximal presence from projects; starts at 10h00; dinner

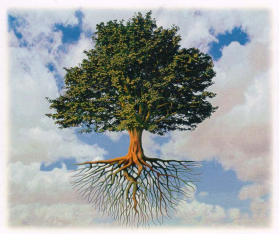
1st and 2nd March: three closed reviews running in parallel, one representative per consortium member; ends at 17h00 on Fri

Registration fee to cover lunch and two coffee breaks for each of the 3 days and dinner the first day. Possibility to register for each day separately.



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Request



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Please send me all info related to:

- Major national or international prizes and acknowledgement**
- Scientific achievements that mark the field**
- Related announcements in the press or in major scientific journals**

Suggestion: gradually QUROPE to take over and reflect on the web site

Thank you for your attention!

