



TRUCE
Training and Research in Unconventional Computation in Europe



WP1

Roadmap Development

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FP7 – ICT: Coordinating Communities, Identifying new research topics for the FET Proactive Initiatives and Fostering Networking of National and Regional Programmes
Project no. 318235






Objectives WP1

- To develop the **first draft of a comprehensive roadmap document for UCOMP research** and development in Europe and beyond, in order to identify new trends, challenges and opportunities.
- To assess the quality of the draft roadmap and to ensure its dissemination to key stakeholders.

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Deliverables WP1

- D1.1 : Overview and consultation report (M12) – delivered
- D1.2 : Intermediate roadmap document (M24)
- D1.3 : Release version of roadmap document (M36)



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Milestones WP1

- MS4 : Overview of community audit completed (M18)
- MS6 : Community consultation completed (M12) – *initial literature review complete, survey underway*
- MS7 : Draft roadmap delivered (M24)
- MS8 : Release roadmap delivered (M36)



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Activities WP1

1. Scoping
2. Initial Information Gathering
3. Roadmap Draft Design
4. Structured Community Consultation



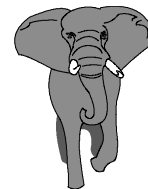
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Scope : the UCOMP domain

*like defining the bulk of zoology by calling it
the study of 'non-elephant animals'*

Stan Ulam (attrib)
on the name "non-linear science"



**non-linear science /
unconventional computation**

linear science /
conventional computation



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the UCOMP domain

- the UCOMP domain is essentially *the whole of computation*
- what would be a roadmap for Physics, Biology, or Mathematics?
 - not a technology roadmap!



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not a technology roadmap

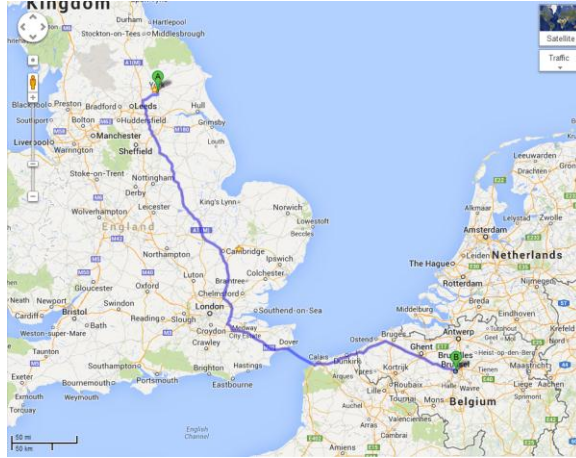
*Technology roadmapping is **driven by a need**, not a solution. ... It is a fundamentally different approach to start with a solution and look for needs. Technology roadmapping provides a way to identify, evaluate, and select technology alternatives that can be used to satisfy the need.*
[Garcia & Bray 1997]



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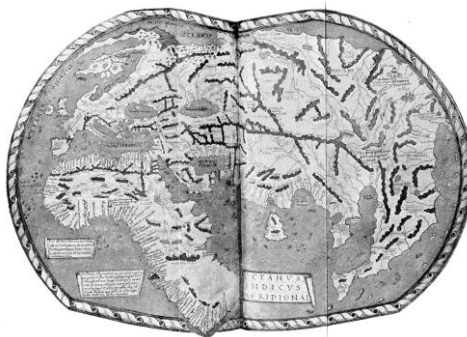
technology roadmap metaphor



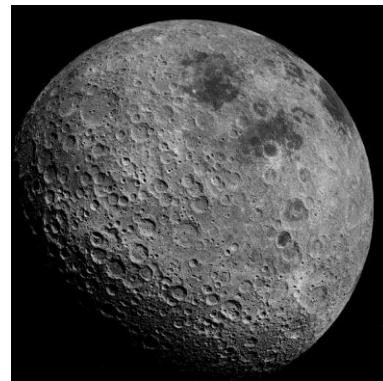
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UCOMP roadmap metaphor



terra incognita



“here be dragons”



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Information gathering I

- technical literature
 - conference proceedings and journals
- subdomain roadmaps
 - Quantum Information Science and Technology (USA)
 - QIPC: Quantum Information Processing and Communication (EU)
 - ChemBioIT: A Chemical and Biological Information Technology Science and Technology (EU, COBRA)



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Information gathering II

- community at conferences
 - UCNC, Milan, July 2013
 - Ontario 2014, New Zealand 2015
 - ECAL, Taormina, September 2013
- Google ngrams
 - bacterial, droplet, billiard ball, reservoir / computer, computing, computation, 1950–2008
 - No ngrams found. Note that this tool requires ngrams to occur in at least 40 books.



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Roadmap draft design

- initial identification of the terrain's axes
 - categories and subcategories
 - conventional computation lies at the “origin” of the respective axes
- used in the survey design
- will be modified by the survey results



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1. computational model

- the abstract computational concepts
 - digital/boolean
 - conventional TM / CAs
 - quantum
 - circuit / measurement / adiabatic / continuous
 - analogue
 - GPAC / real number / fuzzy / neural / amorphous-field
 - hybrid



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2. computational substrate

- the physical realisation of the model
 - silicon
 - optical
 - complex physical materials
 - LCD / nanotubes / graphene / non-linear materials
 - chemical computing
 - biological computing
 - bacteria / slime moulds
 - special purpose analogue materials



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3. scalability

- the space/time/composition limits to larger versions, as a property of the model and substrate



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4. programming

- use to perform a particular computation
 - building the computer
 - programming the computer
 - configuration / loading the program
 - providing the input
 - executing the program
 - reading the output



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5. applications

- the class(es) of problems suited to a particular kind of unconventional computer
 - no necessity for universality



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Community Consultation

- web questionnaire
 - <https://www.surveymonkey.com/s/TRUCEroadmap>
 - defining UCOMP
 - current status
 - existing resources
 - demographic info
 - prize draw
 - funded by MMU, *not* by the Commission!



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Community Consultation

- launched 7 November
 - at EU ICT 2013 event in Vilnius
 - and a Royal Society mtg in UK
 - item in December edition of the FET Newsletter
- As of 14 Nov, have 25 respondents
 - 12 fully completed, 13 semi completed



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Workplan for years 2-3, WP1

- analyse questionnaire responses
- draft next iteration of roadmap design
- put out for further consultation
- prepare final draft



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