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# PATHFINDER initiative on: Tackling complexity in science

Alejandro MARTIN HOBDEY  
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# Background / motivation

- Complexity is a critical challenge towards progress in many areas of Science (e.g. biology, cognitive science)
- Increasing need to understand behaviour of ever more complicated man made systems (e.g. electrical grid) – Technological Systems
- Same is true of natural phenomena such as weather, geology, etc – Natural Systems
- Also true of understanding human networks (social, political, enterprise, etc) – Social Systems
- Common approach and techniques emerging to dealing with complex problems in science and technology





# Objectives of initiative

- Bring together high level groups in Complex Systems Science and others in specific disciplines to tackle important problems where complexity is a key issue
- Extend and generalise techniques used in one area to other areas of science (“generalisability”)
- Help structure and co-ordinate the complexity field in Europe





# Emphasis and approach

- Use of tools and techniques of complex systems science such as:
  - Representing complex systems as networks, and networks of networks, etc
  - “Emergence”: key characteristic of complex systems
  - Predictability and extreme events
- Transfer or extension of successful techniques from one area of science to another
- Projects should take a practical problem solving approach, grounded in (experimental, real) data





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# Some possible topics

- Biology, Health, Medicine  
Bio-complexity, Cellular signalling and regulation processes, animal biology (BIOPHOT, STARFLAG, EMBIO, BRACCIA, etc)
- Social Sciences
  - Emergence and robustness of social institutions, financial markets, etc (COMPLEXMARKETS, COL-PLEXITY, CAVES)
- Environmental Sciences
  - Predictability and distribution of extreme events in natures, such as earthquakes, floods, weather, ecology (E2C2)
- Particularly interested in **projects that help bridge gap between physical sciences, and social and other natural sciences**





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# Possible Co-ordination Actions

- Already have a “General Coordination Action” linking together the already funded PATHFINDER projects in the initiative: “GIACS”
- Expect that new funded projects will have some link to GIACS in some formal or informal way
- Expect newly proposed CAs to focus on particular scientific areas or approaches to complexity





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# Possible Support Actions

- Focussed Actions of more limited scope
- One to two years of duration
- Budget range: up to 250.000 €
- Sort of activities envisaged: science mapping, foresight, conference or large work-shop, etc
- It would make sense if there were a link between the SSA and the already supported activities in the NEXT-Complexity initiative





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# Examples of topics not included

- Research of a purely theoretical nature
- ICT – IT related research (FET initiative)
- Purely industrial or engineering nature
- Financial research not related to social sciences (eg. Stock market analysis)
- Research of limited interdisciplinary nature
- Proposals whose primary focus lies in one of the other Pathfinder Initiatives
- Research in Thematic Priorities

