Liphe4 2026 Summer School

DETAILED PROGRAM

The End of Certainty

Conversations on the Crisis of Science and Society

7–9 September 2026

Santa Verdiana, Florence

Organized by:

- ***Liphe4***
- ***University of Florence***

Welcome

Liphe4 team

Mario Giampietro, President
Michele Manfroni, Vice-President
Matteo Colonnelli
Sandra Bukkens

Resource persons

Silvio Funtowicz
Mario Giampietro
Ansel Renner
Jacopo Giuntoli

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The summer school is organized as a progressive reconfiguration of the role of knowledge in governance:

- **Day 1 — Complexity & Limits of Knowledge**
  Identifies the breakdown of epistemic closure: limits of modelling, prediction, and control.
- **Day 2 — Post-Normal Science**
  Reorganizes knowledge under these conditions: from certainty to quality, from isolated expertise to extended peer communities.
- **Day 3 — The Politics of Knowledge: Living with Uncertainty in Practice**
  How to decide under uncertainty when examining the institutional and political implications: narratives, identity, uncomfortable knowledge, and collective choice.

Together, the three days move along the trajectory *Diagnosis* → *Redefinition* → *Institutional implications*.

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DAY 1 — MONDAY 7 September 2026

Complexity & the Limits of Knowledge

08:30–09.00 Participant Registration

09:00–09:15 Welcome – Brief explanation of the organization of the Summer School
Mario Giampietro and Michele Manfroni, Liphe4 President and Vice President

09.15–10.00 The epistemological breakdown: the Limits of Modelling
Mario Giampietro

- Hierarchy theory and multilevel analysis.
- Dealing with impredicative (Chicken-Egg) relations.
- Self-referential autopoiesis and structural coupling.

10.00–11.00 How to study the sustainability of Complex Adaptive Systems
Mario Giampietro

- The complexity of metabolic patterns – how to deal with their analysis.
- Structural and functional elements.

11.00-11.30 Coffee break (you will need it)

11.30–12.30 "A spectre is haunting reductionism" – the holon (and holarchies)
Mario Giampietro

12.30–13.30 Group discussion over the concepts introduced in the morning

13:30-15:00 Lunch break

15.00-16.30 The End of Certainty

Art Berman (www.artberman.com)

- Widening gap between scientific models and the lived behaviour of complex systems.
- Dissipative structures persist only as long as flows of energy and materials sustain them. When these flows weaken, complexity unwinds.
- Metacrisis: not only a failure of prediction, but a loss of the conceptual and cultural frameworks needed to integrate scientific knowledge, meaning, and planetary constraints:
  - ✓ Modern knowledge has become fragmented into disconnected domains, lacking a coherent worldview.
  - ✓ Erosion of shared narratives undermines society's capacity to make sense of limits and change.

16.30-17:00 Coffee Break

17.00-18.00 Presentation of participants

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DAY 2 — TUESDAY 8 September 2026

From Certainty to Quality in Science

Framing principle: Quality replaces certainty as the organising principle—knowledge is evaluated in terms of transparency, robustness, and fitness for function under conditions where closure is unattainable.

09.00–10.00 Uncertainty as a Condition of Action

Silvio Funtowicz

- Uncertainty at the science–policy interface is structural and decision-relevant.
- Decisions cannot wait for scientific consensus.
- Uncertainty is not a deficit of knowledge but a constitutive feature of the problem.

Key insight: The central question is whether knowledge is adequate to support and coordinate collective action under constraint.

10.00–11.00 Complexity and the Impossibility of Closure

Silvio Funtowicz

- Systems are marked by ambiguity, emergence, and cross-scale interactions.
- Multiple legitimate perspectives and framings coexist.
- Optimisation presupposes a stability that such systems do not exhibit.

Key shift: From control to adaptive management; from optimisation to robustness and resilience. **Quality shift:** From expert-only validation to extended peer communities, where those affected participate in the appraisal of knowledge claims.

11.00–11.30 Coffee break

11.30–12.30 Case Study 1: The RAINS Model (Acid Rain)

Silvio Funtowicz

- Integrated assessment modelling operated under conditions of uncertain emissions, transboundary dynamics, and policy negotiation.
- Models were used as tools for coordination and negotiation rather than prediction.
- The explicit handling of assumptions enabled comparison across policy options.
- Models functioned as boundary objects, supporting deliberation among actors with different values, assumptions, and policy priorities.

Key insight: Under post-normal conditions, models support deliberation, compromises and coordination rather than deliver certainty.

12.30–13.30 Case Study 2: The Ozone Layer and the Montreal Protocol

Silvio Funtowicz

- Scientific assessments were characterised by persistent uncertainty, model failures, and surprise; the ozone hole was not predicted.
- Policy action—such as the 1977 U.S. aerosol ban, the Vienna Convention (1985), and the Montreal Protocol (1987)—was taken before scientific closure.
- Models and assessments were used to explore assumptions, compare policy options, and coordinate international action rather than to deliver definitive predictions.
- The episode illustrates how governance proceeds when stakes are high, values are contested, and decisions are urgent.

Transitional insight: The central question is not how to eliminate uncertainty or achieve optimal solutions, but how to organise knowledge so that it remains reliable, transparent, and usable when closure is unattainable.

13:30-15:00 Lunch break

15:00–16.15 EU bioeconomy futures: societal metabolism, quality under uncertainty, and responsible collective judgement, Part I

Ansel Renner & Jacopo Giuntoli

- Societal metabolism information space for exploring the EU bioeconomy (agriculture and forestry related).
- The group will examine key variables, historical trajectories, and current configurations, and discuss what these reveal about the structure, constraints, and interdependencies of the system.
- The session brings ideas about complexity, scale, and system interdependence into a concrete empirical exploration of bioeconomy dynamics.

16:15–17.30 EU bioeconomy futures: societal metabolism, quality under uncertainty, and responsible collective judgement, Part II

Ansel Renner & Jacopo Giuntoli

- Use of the setup introduced in Part I to jointly explore alternative futures for the EU bioeconomy and reflect on the biophysical trade-offs they imply.
- Testing different directions of change in biomass appropriation and use, and discussion of feasibility, robustness, and the limits to/place of algorithmic optimisation when values are contested and system behaviour is strongly interconnected.
- Framed in a post-normal science perspective, the session approaches futures studies as a way to support transparent, collective judgement under uncertainty, rather than the more business as usual approach of direct prediction.

20:30 **Social Dinner together with the participants of the summer school "Ecological Macroeconomics & Global South"**

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DAY 3 — WEDNESDAY 9 September 2026

The Politics of Knowledge: Living with Uncertainty in Practice

09.00–10.00 Uncomfortable Knowledge and the Social Construction of Ignorance

Mario Giampietro & Silvio Funtowicz

- Ignorance is not only a lack of knowledge but is actively produced, maintained, and managed within institutions.
- "Uncomfortable knowledge" (e.g. inconvenient evidence, uncertainty, limits) is often excluded or reframed in policy processes.
- Feelings, values, and identities shape how knowledge is accepted, contested, or ignored.
- Biosemiotic processes: social systems reproduce their identity by filtering what can be seen, said, and acted upon.
- Tension between "noble lies" ("yes we can") and "toxic truths" ("we are doomed") shapes socio-technical imaginaries.

Key insight: The problem is how societies tolerate uncertainty and organise ignorance, identity, and meaning in response to it.

10.00–11.00 From Epistemology to Governance: The End of the Cartesian Dream

Mario Giampietro & Silvio Funtowicz

- The aspiration to prediction, control, and optimisation reflects a "Cartesian dream" that is no longer viable under conditions of complexity.
- Policy narratives (techno-optimism, "Ancien Régime Syndrome", policy legends) sustain the illusion of control.
- Models remain useful, but their role is reframed: all models are wrong, some are useful — usefulness depends on context and function.
- Operationalising Post-Normal Science in Governance:
  - ✓ Closure → continuous quality assessment.
  - ✓ Expert authority → institutionalised extended peer communities.
  - ✓ Truth → quality as an ongoing, contested practice.
  - ✓ Participation → negotiation among conflicting values, identities, and imaginaries
  - ✓ Conflict → a source of epistemic enrichment rather than a problem to be eliminated.

Key insight: Quality emerges through plural, institutionalised scrutiny under conditions of conflict, not through isolated expertise.

11.00–11.30 Coffee break

11.30–12.30 Case Study: AI and the Governance of Uncertainty

Mario Giampietro & Silvio Funtowicz

- AI systems intensify post-normal conditions: opacity, speed, and delegation of judgement.
- Decisions increasingly rely on outputs that are not fully interpretable, traceable, or accountable.
- The issue is not only technical performance, but epistemic legitimacy: who evaluates, who is responsible, and under what criteria.

- AI systems operate within predefined frames but cannot assess the adequacy of those frames.
- Risks include displacement of responsibility ("moral crumple zones") and the normalisation of opaque decision systems.

Key insight: AI does not resolve uncertainty; it amplifies the need for institutionalised quality, transparency, and extended peer scrutiny.

Synthesis of Day 3 morning:

- From Epistemology to the Governance of Knowledge.
- From epistemology as justification → epistemology as organised quality in governance.
- From uncertainty as a problem → uncertainty as a condition of collective action.
- From expert authority → distributed, accountable, and participatory knowledge systems.

12.30–13.30 **Reflections, Evaluation, and Next Steps**

Joint Session: Funtowicz, Giampietro, Renner, Giuntoli

- What constitutes epistemic legitimacy under post-normal conditions.
- How quality replaces certainty as the organising principle.
- What institutional arrangements enable extended peer communities.
- The role of science as anticipatory input for responsible governance.

13:30-15:00 **Lunch**

15:00–17.30 **Joint session with the Ecological Macroeconomics & Global South summer school**

End of the Summer School