

Cybernetics Live
8th October 2025 1700-1900
Decoding Reality – Quantum Information
Prof Vlatko Vedral

Pre Event Survey Results

Here is a thematic map summarizing the most prominent themes found in the responses to each survey question:

What would you like to know about QI Theory?

- **Limits of understanding:** Many questions focused on the boundaries and constraints of knowledge, referencing concepts like Ashby's law, bandwidth, and Shannon's information theory.
- **Foundations of quantum information and theory:** Inquiries were raised about quantum entanglement, agency, measurement problems, and the relationship with other quantum concepts.
- **East vs. West paradigms:** Multiple references compared Chinese and Western approaches to information and agency.
- **Role of historical experience and meaning:** Several responses requested clarification about information, meaning, agency, and their historical or philosophical status in QI theory.

What would you like to tell Vlatko about Cybernetics that you think is relevant to QI?

- **Core cybernetic principles:** Key themes included feedback, control, emergence, observer-system coupling, reflexivity, and adaptation.
- **Living systems and systems theory:** There was a call to connect QI theory with biological and ecological models, referencing Stafford Beer and the Viable System Model.
- **Integration and context-dependence:** Respondents emphasized the necessity of embedding context, interconnectedness, and reflexivity in QI frameworks.

What question would you ask around the social impact of the quantum?

- **Societal impact, governance, ethics:** Themes ranged from privacy, policy, and governance challenges to the implications for collective intelligence and decision-making.

- **Democracy, agency, sustainability:** Some responses were optimistic about social transformation or sustainability, while others were skeptical of QI's direct societal effects.

What are the three most important cybernetic principles for QI theory?

- **Requisite variety, feedback, and adaptation:** Core principles such as adaptation, regulation, emergence, observer inclusion, hierarchy, and recursion dominated the answers.
- **Complexity and systems theory:** Philosophical concerns around complexity, time, selection, and viable organization were repeated.

What are possible priority areas of research that Quantum Cybernetics might consider?

- **Cognition, neuroscience, and decision making:** Recommendations included quantum cognition research, neuroscience, and modeling decision-making under uncertainty.
- **Biological and ecological systems:** Living systems, biosphere viability, and integrating biology with cybernetic models featured strongly.
- **Methodological critique:** Some responses questioned the conceptual compatibility of "quantum cybernetics" or encouraged research on fundamental theories.

Any other comments?

- **Interdisciplinary breadth and practical demonstration:** Calls for wider disciplinary engagement and more practical applications or demonstrations.
- **Philosophy, feedback, dissemination:** Feedback focused on continual dialogue, philosophical rigor, and the need to share results more broadly.

These themes reflect diverse interests and concerns within the respondent group, ranging from foundational theory to practical and societal implications.

Here are paragraph summaries based on all 12 responses for each survey question.

What would you like to know about QI Theory?

Respondents provided a wide range of questions and areas of interest, emphasizing foundational limits of human understanding (drawing on Ashby's requisite variety and Shannon's theory), the nature and implications of quantum entanglement, and comparisons between Eastern and Western paradigms of quantum information. Several responses sought clarification about the relationship between quantum information, agency, historical experience, and meaning, while others raised deep theoretical inquiries regarding the ontological and epistemological status of information within quantum measurement. Overall, the entries highlight a multidisciplinary curiosity and a desire for QI theory to address both conceptual and practical explanatory gaps.

What would you like to tell Vlatko about Cybernetics that you think is relevant to QI?

Answers covered the intersection of cybernetics and QI theory, stressing feedback, control, observer-system coupling, and emergence as critical cybernetic concepts. Multiple respondents urged Vlatko to engage with the historic and philosophical roots of cybernetics, referencing thinkers such as Ashby and Beer. There is a clear call to integrate lessons from living systems, reconsider regulatory and feedback mechanisms within quantum frameworks, and ensure context-dependence and reflexivity become part of QI's foundation. Respondents also noted the conceptual overlap between cybernetic principles of agency, mutualism, and classical regulatory models as vital for developing the field.

What question would you ask around the social impact of the quantum?

Survey answers reflect both optimism and skepticism about the potential for quantum information (QI) to influence society. Questions focused on social, ethical, and governance-related consequences if QI becomes widely adopted, with specific attention to knowledge work, privacy, decision-making, sustainability, and ecological impact. Some replies were skeptical, suggesting limited societal relevance, while others imagined profound changes for collective intelligence, agency, and democratic process. The diversity of the concerns underscores the uncertainty and breadth of possible QI applications in social domains.

What are the three most important cybernetic principles for QI theory?

Most responses stressed classic cybernetic concepts—including requisite variety (Ashby's Law), feedback, adaptation, emergence, regulation, and environmental coupling. Some respondents connected these principles directly to quantum frameworks, while others pressed the differences between cybernetics and general systems theory, or pointed out philosophical tensions related to time and complexity. There is a consensus on the importance of observer inclusion, reflexivity, and hierarchical organization, urging a multidisciplinary approach for QI's theoretical foundations and practical applications.

What are possible priority areas of research that Quantum Cybernetics might consider?

Respondents suggested research directions spanning creativity, biosphere viability, quantum cognition, neuroscience, multi-agent systems, and strong emergence. Some entries were critical, questioning the conceptual compatibility of quantum cybernetics, while others proposed highly specific topics such as quantum cybernetic modeling of decision-making under uncertainty, organization of quantum/classical agent networks, and integration with systems biology. The breadth of potential research priorities reflects the community's mix of theoretical enthusiasm, methodological skepticism, and practical ambition.

Any other comments?

Participants offered feedback ranging from further philosophical reflections on information limits to endorsements for new practical demonstrations and interdisciplinary collaboration. Several comments praised the focus and advancement represented by QI theory, though others sought more concrete implementation, dissemination beyond academia, and additional opportunities to contribute to ongoing research and workshops. Some commented on the need for broader disciplinary involvement and raised interesting discussion points around systems theory, mathematical rigor, and transitions in professional domains.

Here are the 12 responses to the survey file.

Question: What would you like to know about QI Theory?

1. Based on Shanon's theory and Ashby's requisite variety, we can conclude that we are only able to understand as much information as our bandwidth allows. Since our bandwidth is limited, there are limits to what humans can understand. Therefore there are limits on what we can understand and on what we know to ask. When do you think this limit will be reached?
2. A general account and brief reports on positive results in a range of fields. How it differs from other existing approaches
3. How does quantum entanglement link to the block universe?
4. What is the relation of QI Theory to Quantum Communications and Quantum Energy?
5. If the Chinese QI already treats information, matter, and agency as one continuum, why does Western 'quantum information' pretend it's discovering something new instead of admitting it is catching up?
6. (a) In "Physics Does Not Need Observers", "observer" effects at the quantum are re-articulated as the entanglement of physical systems. (b) Ross Ashby was a psychiatrist but his work took him towards general theories of systems. His Law of Requisite Variety (1956) posits that a regulator must provide at least as much variety (range of possible responses) as the disturbances it faces - "only variety can absorb variety." Is there any merit in exploring conceptual relationships between (a) and (b)?
7. QI and historical Information of experience ... must correlate. How?
8. What insights into the nature of information can QI theory provide and how does it reconcile the ontological status of information with the epistemological constraints imposed by quantum measurement?
9. The main axis for QI theory used to be Oxford, Cambridge and Imperial ... what is the grouping now you have the Quantum Hub in place? Are you letting any biologists in?
10. What is the role of agency in QI theory? Is it fundamental to the framework, or does it emerge from more basic principles?

11. How are information and meaning related within QI theory, and how do these concepts interact at the quantum level?
12. Is there a universal limit to quantum information, or do physical systems allow for interpretations beyond the current theory?

Question: What would you like to tell Vlatko about Cybernetics that you think is relevant to QI?

1. see notes
2. Nothing as yet I will be there to learn.
3. The interconnected and interacting feedback loops generate emergent properties, in the block universe analogous to space, time, and gravity. The skill of a cybernaut is to intervene, analogous to collapsing the wave front, in a manner that supports the evolution of relevant emergent capabilities.
4. It is a broad framework to process inquiry about communication and control at all stages and levels of "systems" or phenomena.
5. If the Chinese QI already treats information, matter, and agency as one continuum, why does Western 'quantum information' pretend it's discovering something new instead of admitting it is catching up?
6. I am waiting to learn QI ... before "comparing"
7. Feedback and Control; Observer-System Coupling: Cybernetics treats the observer as part of the system—a view that resonates with quantum measurement theory, where the act of observation alters the system state. This could help reframe debates around quantum realism and relational interpretations. Circular Causality and Emergence: Cybernetics models systems with recursive causality and emergent behaviour. These ideas may help conceptualise quantum entanglement and the emergence of classical phenomena.
8. There is Haeckelian history in early cybernetics with such as Stafford Beer recognising that living systems offer exquisite insight as to the working of a 3.8 bn year developed system. His Viable System Model needs re-examination in the light of both QM and QI theories. Cybernetic analysis of living systems offers up a model for the biological qubit, the G-Quadruplex, the quantum

mechanical organisation of the human genome then following on that and removing much 'randomness' from evolution.

9. The relationship between observer and observed needs to be clarified with greater specificity in QI.
10. Cybernetics underpins the regulatory and feedback mechanisms that may be foundational to QI; Vlatko should consider this in interfacing information and control with physical systems.
11. QI theory needs to include models of decision based on feedback, not just information flow.
12. Agency, reflexivity, and context-dependence are key cybernetic principles valuable for QI.

Question: What question would you ask around the social impact of the quantum?

1. see notes
2. Nothing as yet I will be there to learn.
3. Innovation in the agentic era must accelerate as quantum information systems are developed. What happens to knowledge working?
4. How does it help us understand shifts and influences in culture?
5. If the Chinese QI already treats information, matter, and agency as one continuum, why does Western 'quantum information' pretend it's discovering something new instead of admitting it is catching up?
6. I don't think QI has anything to instruct/improve society with.
7. In what areas can current QI theory have the greatest positive societal impact if implemented properly?
8. Depends on what he thinks they are going to do ... Social impact depends on who is investing and how distributed quantum computing becomes ...?
9. What will be the implications for privacy, agency, and governance if QI-based technologies become widespread?
10. How might QI theory change our understanding of collective intelligence or social decision-making?
11. Could QI theory help address ecological or sustainability crises facing societies?

12. What are the ethical risks of applying QI insights to information control at scale?

Question: What are the three most important cybernetic principles for QI theory?

1. Based on Shanon's theory and Ashby's requisite variety, we can conclude that we are only able to understand as much information as our bandwidth allows. Since our bandwidth is limited, there are limits to what humans can understand. Therefore, there are limits on what we can understand and on what we know to ask. When do you think this limit will be reached?
2. No idea. I would expect to be told this.
3. Emergence, requisite variety, and feedback.
 - a. feedback processes. 2. self-regulation and self-organization. 3. Recursive expression of communication and control process - recursive, mutual interactions—applicable to ecological, social, technological, and even philosophical domain
4. If the Chinese QI already treats information, matter, and agency as one continuum, why does Western quantum information pretend it's discovering something new instead of admitting it is catching up?
5. (General Systems—not cybernetics per se): Information and energy have totally different influences/mechanisms. QI cannot explain or justify complexity emergence. Cybernetics is a TIME SEQUENTIAL information dynamic. QI is a backtracking workaround since QM is based on statistics, which foundationally starts by ERASING Time. QI is trying to re-invent what QM statistics already destroyed.
 - a. Requisite Variety (Ashby's Law) 2. Feedback and Adaptation 3. Observer Inclusion and Reflexivity. Cybernetics treats the observer as embedded within the system.
6. Always remain open to others being able to contribute something valuable (policy making); examine working example to understand 'system working' for scientific purposes; living systems are necessarily QM systems; when the environment and organism are in 1:1 relation w.r.t. external variety and internal response, you are looking at a perfect system. Always examine the extremes.
7. Regulation, communication, and hierarchy—the interplay of these enables robust and adaptive systems.
8. Adaptation, self-regulation, and environmental coupling are critical—without them, control and viable organization would be impossible.

9. Observation, recursion, and selection for viability.
10. Integrated modeling of feedback, control, and purposeful action.

Question: What are possible priority areas of research that Quantum Cybernetics might consider?

1. No idea. I would expect to be told this. Possibly survey form design.
2. How patterns of interaction can be consciously created adding to the viability of the biosphere.
3. What can QI theory offer Quantum Cybernetics in terms of creativity?
4. If the Chinese QI already treats information, matter, and agency as one continuum, why does Western quantum information pretend it's discovering something new instead of admitting it is catching up?
5. "Quantum Cybernetics" is like saying "gaseous stone"; they are not co-extant or relevant.
6. Quantum Decision Theory: Modelling decision-making under quantum uncertainty, with applications in economics, AI, and ethics. Quantum Cognition and Perception: Exploring whether cognitive processes exhibit quantum-like dynamics, and how cybernetic models can capture them. Neuroscience / Consciousness research.
7. Living Systems - 100% quantum, 3% noise ... The G-Quadruplex @ 1,000 qubits per chromosome's telomeres, with a further 23,000 embedded with functional genes, implies ~ 46,000 qubits per cell ... Explore & Discuss.
8. Research on strong emergence and downward causation in quantum/cybernetic systems.
9. Multi-agent systems, notably the interplay and organization of quantum and classical agents.
10. The impact of QI-informed cybernetics on autonomous technologies and social systems.
11. How quantum feedback protocols differ from classical, and whether quantum observers can be modeled cybernetically.
12. Integrating QI models with systems biology and ecological cybernetics.

Other comments:

1. Based on Shanon's theory and Ashby's requisite variety, we can conclude that we are only able to understand as much information as our bandwidth allows. Since our bandwidth is limited, there are limits to what humans can understand. Therefore, there are limits on what we can understand and on what we know to ask. When do you think this limit will be reached?
2. Not yet.
3. Thought provoking questions.
4. No!
5. Just waiting to hear/see another "conventional" presentation ... for -maybe- ... something new and interesting
6. I'd be interested in getting started / participate in QI research. I am an economist by training, most recently as an Oxford Martin School Fellow. Currently I am working in the finance industry, but would be interested in exploring: (i) development of an economic framework around cognition (human and AI); and (ii), QI in decision and neuroscience context (e.g., Jeffrey Schwartz and Henry Stapp - OCD, neuroplasticity) - as I want to eventually transition to cognitive/neuroscience. Thanks
7. Prof V to be congratulated making it to systems theory via physics and maths ... the hard work is done recognising we are talking about manifold embedded systems ... Badly missing Fractal Geom and Chaos references ... shouldn't examine 'reality' using pure mathematics ...
8. Please organize future sessions to include more practical demonstrations.
9. QI theory crosses boundaries, so bring together a wider spectrum of disciplines for deeper dialogue.
10. Will there be a follow-up workshop to develop collaborative research projects?
11. This topic needs broader dissemination beyond academic circles.
12. Thank you for the opportunity to contribute.