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BRIEFING NOTE

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Who Gets to Participate in Science?

The Navier–Stokes Controversy and AI

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Purpose of this note

This note is intended to encourage a dialogue between the mathematics community and the United Nations mandates concerned with the right to participate in science and the right to education.

It does not seek to determine the merits of the rapidly developing controversy surrounding OpenAI's announced solution of the Navier–Stokes Millennium Prize Problem, nor to adjudicate competing claims concerning priority, attribution or the possible influence of researchers' interactions with AI systems.

Instead, it proposes that this controversy offers an unusually concrete opportunity for mathematicians, AI researchers and human-rights experts to examine together a set of questions that are likely to become increasingly important: **what it means to participate in science when artificial-intelligence systems are simultaneously research instruments, repositories of scientific interactions and increasingly capable participants in scientific discovery.**

> **The immediate aim is dialogue rather than adjudication.** The controversy is used here as a case through which two communities—mathematics and human rights—can test and refine concepts of participation, attribution, provenance, academic freedom and scientific governance.

1 Why this conversation now?

On 8 September 2026, OpenAI announced a claimed solution to the Navier–Stokes existence and smoothness problem, one of the Clay Mathematics Institute's Millennium Prize Problems. According to OpenAI, a large-scale deployment of AI agents produced a finite-time blow-up construction for the forced Navier–Stokes equations. The claimed result is potentially of historic mathematical importance, but—as is normal for a result of this magnitude—it remains subject to intensive examination by the mathematical community.

The mathematical announcement was accompanied by a second controversy.

Mathematicians Tristan Buckmaster and Levent Alpöge (also, as it happens, Anthropic employee) had independently been working on closely related problems concerning fluid equations, using AI systems in the course of their research. Their work included a result for the Euler equations and related progress toward Navier–Stokes. OpenAI has stated that reports that another group might be approaching a Millennium Problem helped prompt it to concentrate unusually large computational resources on Navier–Stokes. Buckmaster has subsequently raised questions about the relation between the two research efforts, about attribution, and about whether interactions with OpenAI systems could have indirectly informed OpenAI's models. OpenAI disputes important parts of his account and says it did not use the researchers' prompts or proofs to direct the agents that produced its result.

One particularly important point remains open. OpenAI has stated that, while it considers it unlikely, it cannot categorically rule out that de-identified information derived from researchers' use of its products contributed to improving relevant models. It has since strengthened this statement concerning user data collected in the last two weeks.

These are very different questions from the mathematical correctness of the proof. They concern

the **social and institutional conditions under which AI-assisted mathematics is emerging**.

THREE DISTINCT QUESTIONS

1. **What happened in this particular case?** This is a factual question, parts of which remain contested.
2. **What should count as a scientific contribution when research is mediated through AI?** This is substantially a question for scientific communities themselves.
3. **What procedural and institutional conditions should govern AI systems that increasingly mediate scientific participation?** This is a question on which scientific communities, scientific societies, technology providers, universities, States and human-rights institutions may all have something to contribute.

This note is primarily concerned with the third question.

2 Why the right to participate in science?

The present discussion has an antecedent.

At the 2023 Human Rights Council Social Forum on science, technology and innovation, I intervened on behalf of PersonalData.IO on *"Citizen science, open science and open innovation; the right to participate in science; the right to seek, receive and impart information."*

That intervention grew out of work examining how individuals could use rights over data concerning them to investigate systems that would otherwise remain opaque. It drew in particular on work with platform workers, including Uber drivers and delivery workers, and asked whether such bottom-up investigative practices could themselves constitute forms of participation in science. Together with my collaborators at PersonalData.IO, and with the leading participation of Dr. Jessica Pidoux (University of Neuchatel), these practices have for instance been integrated into the scientific canon, through university consortiums.

The 2024 report of the Special Rapporteur in the field of cultural rights, Alexandra Xanthaki, subsequently cited that intervention in discussing examples of public and participatory science involving reverse engineering, access to knowledge and the creation or use of data to defend rights. See *Right to participate in science*, A/HRC/55/44, footnote 56.

The Special Rapporteur's report places participation at the centre of the right to science. It describes the right not merely as access to scientific products, but as encompassing opportunities to contribute to scientific endeavour, participate in decisions concerning scientific progress and take part in the processes through which knowledge is generated. The report also emphasizes open science as opening the practices and tools of the research cycle to wider collaboration and participation.

> **Continuity with the 2023 intervention.** The Navier–Stokes controversy offers an opportunity to test and refine that framework in a setting the 2023 intervention did not yet confront directly: *what happens when the system through which a scientist participates in research can itself learn from scientific participation and later become a scientific actor?*

The original 2023 intervention can be viewed on UN Web TV at: https://webtv.un.org/en/asset/k15/k154t3ap8w?kalturaSeekFrom=2556&kalturaClipTo=3100&kalturaStartTime=1.

3 A perspective shaped by mathematics, Cambridge Analytica and Uber

My route to this question is somewhat unusual.

I am a mathematician by training. Over the past decade, however, much of my work has concerned situations in which individuals interact with computational systems while possessing only a partial view of what those systems know or do.

During the Cambridge Analytica investigations, this involved questions about the transformation of personal and social data into models used for political purposes.

Later, through PersonalData.IO and related work, I became involved in efforts by Uber drivers and researchers to understand algorithmic management using data-access rights. Individual drivers saw only fragments of the system through which work was allocated, priced, evaluated and governed. By bringing together data obtained by multiple individuals, it became possible to investigate parts of the platform from below.

More recent work extends this approach to the data-labour supply chain. A participatory collaboration among academics, an NGO and a union mapped data-labour industries across Africa while centring workers' collective action and demands for recognition. Related research used the GDPR to audit the working conditions of African content moderators, showing how data-access rights can produce legally grounded evidence about employment practices that had remained unavailable to the workers concerned. These contributions illustrate how participation in knowledge production can be organized not only around individual access to data, but also around collective inquiry, worker organization and the development of evidence that can support rights claims.

The point of recalling these experiences is **not to infer misconduct in one domain from events in another**, nor to claim that Cambridge Analytica, Uber and OpenAI are otherwise equivalent. It is to identify a methodological continuity among them: the difficulty participants face when computational systems know more about them than they can know about those systems.

> **"What can a participant know about a computational system when the system can observe much more about the participant than the participant can observe about the system?"**
>
> A recurring problem of informational asymmetry

In AI-mediated science, this asymmetry acquires a new character. Researchers may provide an AI system with conjectures, tentative proofs, examples, failed approaches, code, corrections, literature assessments and judgements about which directions appear promising.

These are not merely records of scientific activity. They may themselves be valuable **inputs into scientific capability**. That possibility deserves investigation without presupposing what conclusions the investigation should reach.

4 What mathematicians may want human-rights experts to understand

The mathematics community already has elaborate norms concerning scientific contribution.

Mathematical ideas circulate through papers and preprints, but also through seminars, conferences, correspondence, informal discussions, conjectures, proof sketches, failed arguments and unpublished intermediate results.

Credit can attach to many different kinds of contribution: a theorem, a proof, a conjecture, a method, a reduction, a decisive example or an observation that opens a new line of attack.

At the same time, **independent discovery is both possible and legitimate**. Different mathematicians can reach the same result or similar methods independently. Establishing intellectual dependence can therefore be difficult even when all participants are human.

AI systems make this ecology harder to interpret.

A model might independently reproduce a mathematical idea. It might synthesize an idea from widely distributed public material. It might have acquired a capability through training in ways that cannot meaningfully be attributed to a single source. Or scientific interactions with particular users might have influenced later system capabilities indirectly.[1]

These possibilities should not be collapsed into a single concept such as plagiarism. Nor should human-rights institutions attempt to replace the mathematical community's own processes for establishing priority, validity and appropriate attribution.

Rather, the question is whether the emergence of AI introduces **new institutional relationships for which existing scientific norms may need additional support**.

5 What human-rights thinking may contribute to mathematics

The right to participate in science offers a different vocabulary.

The 2024 report of the Special Rapporteur emphasizes not only access to science but participation in its production and direction. It describes opportunities for people to contribute to the scientific enterprise, participate in decision-making and obtain information relevant to that participation. It is also careful not to equate participation with the rejection of expertise: differences in epistemic competence and the importance of scientific expertise remain central.

That balance is useful here. The issue is not whether every interaction with an AI system makes someone a co-author. The question is instead whether people who engage in scientific inquiry through increasingly powerful technological intermediaries retain meaningful **agency within the scientific process**.

This may involve questions of scientific freedom, attribution, access to research infrastructure, confidentiality, informed choice, transparency, provenance, contestability, and participation in the governance of infrastructures on which research increasingly depends.

[1] We want to emphasize that it ought to be possible, in principle and to the extent that it would be useful, to attribute partial credit in such systems, with appropriate extensions of human taxonomies such as CRediT.

> **A shared question.** What does meaningful participation in science look like when researchers and AI systems increasingly contribute to each other's capabilities?

6 Can participation itself become a scientific resource?

A useful question for dialogue may therefore be:

> **"Can scientific participation itself become a resource from which AI systems learn?"**
>
> Question for discussion

Consider a researcher working intensively with an AI assistant. The researcher does not merely submit finished knowledge. Over hundreds of interactions, they may reveal which conjectures they consider plausible; which papers are relevant; which proof strategies have failed; which computational experiments appear informative; where an argument contains a subtle error; how a theorem could be strengthened; or which open problem now appears tractable.

From the researcher's perspective, this may simply be the ordinary use of an instrument. From the perspective of a learning system, the same interaction may constitute extraordinarily rich scientific feedback.

Different technical architectures will use such information differently, and in some systems it may not be used for model improvement at all. But the distinction is conceptually important.

If scientific interactions can contribute to improving the systems through which subsequent science is conducted, then questions arise about the relationship between **using a scientific tool** and **participating in the production of the tool's scientific capabilities**.

There may be no simple answer. That is precisely why a dialogue is useful.

7 The perspective of AI developers

Any such discussion should also take seriously the constraints faced by AI laboratories.

Modern machine-learning systems are not conventional databases in which every generated idea can be traced neatly to one prior source. Capabilities can emerge from large quantities of distributed information. A particular mathematical output may not possess a meaningful one-to-one causal provenance. Requirements for complete attribution could therefore produce technically misleading accounts of how models work.

There are also legitimate reasons for confidentiality. A system provider cannot necessarily disclose information about other researchers' interactions. Model security and the prevention of gaming or misuse may limit some forms of transparency. Companies may also have legitimate commercial interests in proprietary technologies.

The appropriate question is therefore probably not whether every mathematical output can be traced to every human who influenced it. It is more modest:

> **“What forms of record-keeping, disclosure, governance and contestability become reasonable when AI systems function as important infrastructure for scientific research?”**
>
> A possible framing for cross-community dialogue

The answer may vary substantially across training, fine-tuning, retrieval, agentic systems and ordinary inference. Developing workable distinctions is one area in which collaboration between mathematicians, AI developers and human-rights specialists could be particularly valuable.

8 Scientific provenance

One concept worth refining is **scientific provenance**.

In conventional scholarship, provenance is partly expressed through references, acknowledgements, dates, correspondence and the history of drafts. AI-mediated research may require additional forms of provenance.

For example, in an appropriate case, one might want to understand a chain resembling:

> **research interaction $\rightarrow$ retention or non-retention $\rightarrow$ model development or evaluation $\rightarrow$ model version $\rightarrow$ AI research process $\rightarrow$ intermediate mathematical claim $\rightarrow$ human verification $\rightarrow$ scientific publication**

This should not be understood as a proposal that every system must expose every stage or identify every contributor. Rather, it suggests a research question:

What minimum information needs to survive if meaningful disputes about scientific contribution are ever to be investigated?

This question concerns AI laboratories, but also universities and researchers. A university may need policies concerning the submission of unpublished work to AI services. Researchers may need better ways of documenting AI-assisted research. Journals, scientific societies and professional societies may eventually need to develop conventions for documenting the role of models in discovery and verification, handling attribution disputes, and defining appropriate standards of disclosure.

Provenance may therefore become a shared responsibility rather than a demand addressed exclusively to AI companies.

9 The right to education

The same questions have a particular importance for the right to education.

Students and early-career researchers are increasingly being encouraged to use AI systems as tutors, coding assistants, writing tools and research collaborators. This creates enormous possibilities for widening access to scientific expertise.

But education should also develop the capacity to understand, question and eventually contribute

autonomously to knowledge.

A student may therefore need to understand not only *how to use an AI research tool*, but also what happens to the material submitted to it; what forms of confidentiality can reasonably be expected; how AI use should be disclosed; how to distinguish assistance from scientific contribution; how to verify AI-generated claims; and how scientific credit operates when humans and machines interact.

The educational question is therefore not whether AI belongs in science education. It is what kind of scientific agency students should acquire in an environment where AI becomes ordinary research infrastructure.

This is a natural point of contact between the right-to-education mandate and the right-to-science mandate. It also connects to earlier work on data power in education and to the Special Rapporteur on the right to education's examination of the impact of digitalization on the right to education.

10 Questions for a dialogue with the mathematics community

Rather than proposing answers at this stage, this note suggests a number of questions that could structure a discussion between the mandates, mathematicians, scientific societies, AI researchers, universities and AI developers.

1. What forms of interaction with an AI system should count as participation in scientific production?
2. What does appropriate attribution mean when a scientific contribution passes through an AI model rather than directly from one researcher to another?
3. How should the mathematical norm of independent discovery apply to AI systems trained or improved through large-scale human interaction?
4. What scientific provenance is technically possible and scientifically meaningful?
5. What information should researchers receive about whether and how their scientific interactions may be retained or used to improve future systems?
6. What expectations of confidentiality should attach to unpublished mathematical work submitted to AI services?
7. When a company both provides a widely used scientific tool and conducts research in the same field as its users, what institutional safeguards are appropriate?
8. How can such safeguards coexist with privacy, commercial confidentiality, cybersecurity and the legitimate interests of other researchers?
9. What mechanisms should exist when researchers believe that their interactions have contributed to a subsequent scientific output?
10. What should universities teach students about these questions?
11. **Meta-question: What divergences of opinion, norms and expectations emerge across cultures and continents, while avoiding the assumption that any culture or continent speaks with a single voice?**

12. Which problems can be addressed through existing scientific norms and professional standards, and where—if anywhere—are additional legal or human-rights safeguards required?

I believe the questions outlined above are crucial for understanding the evolving relationship between human researchers and AI systems in scientific practice. The Navier-Stokes case provides a concrete example that brings these abstract considerations into focus.

11 An invitation to continue an existing conversation

The 2023 Social Forum created a space for dialogue between the United Nations human-rights system and a broad range of scientific and civil-society actors. My own intervention at that Forum asked how citizen science, access to information and the ability to investigate data-intensive systems might contribute to the right to participate in science. The Special Rapporteur subsequently incorporated that example into her report on the right to participate in science.

The Navier–Stokes episode suggests a useful next stage in that conversation.

Previously, the question was largely:

> **“How can people use data to investigate powerful computational systems?”**
> Question emerging from earlier work on platform power

AI-mediated science raises a reciprocal question:

> **“What happens when powerful computational systems learn through the scientific activity of the people using them?”**
> Question raised by AI-mediated science

The mathematics community has developed sophisticated norms concerning proof, priority, attribution, openness, peer scrutiny and independent discovery.

Human-rights thinking brings another set of concepts: participation, access, freedom, equality, autonomy, transparency and accountability.

Neither body of thought, on its own, is likely to provide complete answers to the institutional changes now taking place.

> **Invitation.** The purpose of this briefing is not to ask the Special Rapporteurs to resolve a mathematical controversy. It is to suggest that the controversy offers an opportunity for the mandates and the mathematics community to learn from one another while the institutions of AI-mediated science are still being formed.

A dialogue of that kind would itself be an exercise in the right to participate in science.

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