Chronicles from the Web

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The myth of mathematicians' splendid isolation

- The highest level of mathematics research is still seen as a solitary activity.
- Yet innovations made possible by technological advancement and set up by
 mathematicians, and quite often actively supported by influential members of the
 community, have been creating new modes of mathematical production and
 harnessing the power of social computing.
- The power of these innovations comes from developing collective intelligence through sharing information and understanding.
- Newgroups (sci.math, etc.), mailing lists (FOM, DMANET, etc.), online fora (MathLinks, Ask Dr. Math, etc.), blogs (Tao's What's new, Baez' This Week's Finds, the n-Category Café, etc.), and the Polymath projects are samples of these innovations.
- In this talk, we will focus on one of the most effective innovations so far: MathOverflow (shortly, MO).

[N12] M. Nielsen, Reinventing discovery: The new era of networked science, Princeton NJ: Princeton University Press, 2012.
[GN09] T. Gowers and M. Nielsen, Massively collaborative mathematics. Nature 461 (2009), 879–881.

MathOverflow: What is it?

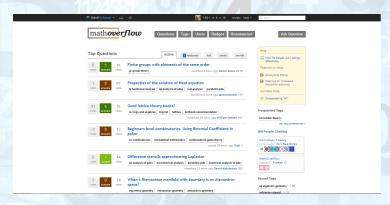
- An interactive Q&A website for (mostly) professional mathematicians, which serves both as a collaborative blog and an online community.
- It allows users to ask questions and submit ("post") answers.
- In particular, it awards Karma for good questions and good answers, as the ones and the others can be rated by users, who are accordingly credited merit points for their activity on the website.
- A typical response is an informal dialogue, allowing error and speculation, rather than pretending rigorous mathematical arguments. Yet, the community works hard to maintain fairly high standards, so professionals stay interested and involved.
- Elected monitors are established within the community, and experienced users are able to flag comments and posts for moderators' attention.
- Contributions of enthusiastic users and active and proactive debates taking place on "MathOverflow Meta", a dual website explicitly designed, e.g., for discussing the policy of MO or creating a consensus around "sensible questions".

Before logging in



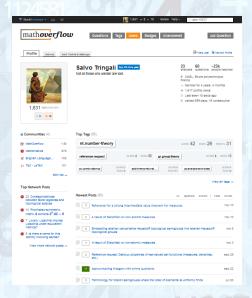
- Extremely friendly interface.
- A list of hot tags (particularly useful for statistics...).
- A list of most recent questions asked, answered, or edited.
- A link to the chat rooms where mathematicians from all around the world do typically discuss questions posted on the forum.

After logging in

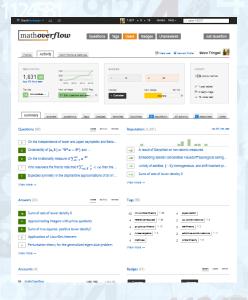


- A menu summarizing the credits awarded to the user.
- Links to detailed statistics concerning users' profile and activity.

User's profile



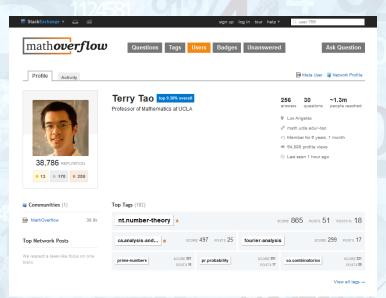
User's activity



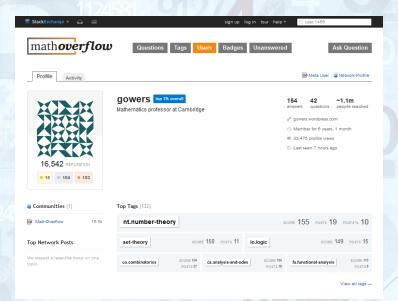
Early history and development

- MO was created by Berkeley graduate students and postdocs Anton Geraschenko, David Zureick-Brown, and Scott Morrison, and first went online in September 2009.
- About two years later (in June 2011), MO joins the Stack Exchange network (first launched by Atwood and Spolsky in 2009).
- MO didn't start out as a professional mathematics Q&A site. It started out wanting to be one. In particular, it had to:
 - Defend against wave after wave of "trolls" (most notably including undergraduate calculus students posting for homework help...).
 - Discourage and defy a certain propensity of the community to become an open discussion forum for mathematicians (and of individuals to behave as smart asses...).
- As hoped, it expanded very quickly, involving many famous mathematicians around the world, including a number of Fields medalists.

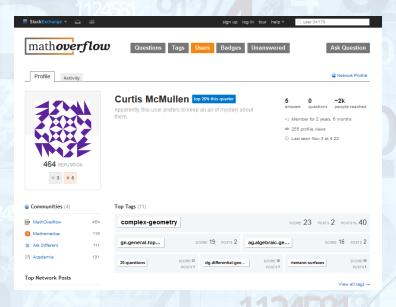
Illustrious users: Terry Tao



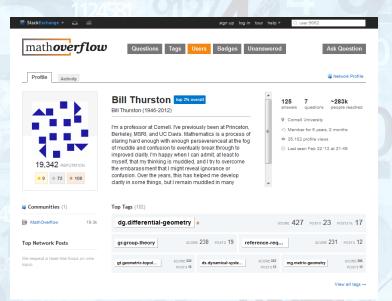
Illustrious users: Tim Gowers



Illustrious users: Curtis T. McMullen



Illustrious users: Bill Thurston (1946-2012)



Milestones and coarse statistics (updated to Nov 18, 2015)



· Questions: 66k. Answers: 106k.

Answered questions: 78%.

Users: 49k

Exceptional users: Hamkins' records (updated to Nov 18, 2015)



Current Karma: ∼ 118k.

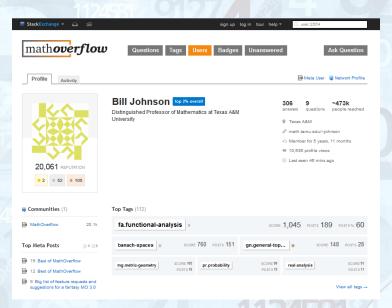
• Current answers: 1260

Current questions: 58.

In the words of mathematicians

- MO describes itself as "A place for mathematicians to ask and answer questions."
- Terence Tao on What's new characterized MO as akin to "the venerable newsgroup sci.math, but with more modern, 'Web 2.0' features."
- John C. Baez writes that "MO has become a universal clearinghouse for math questions."
- According to Gil Kalai, MO "is run by an energetic and impressive group of very (very very) young people."
- Jordan Ellenberg comments that MO "offers a constantly changing array of new questions" and is "addictive" in a "particularly pure form".
- Bill Johnson describes MO as "a good resource for mathematics and a fun place as well" (find it tepid? Think again, as B.J. is one of the most active MO users!).

Illustrious users: William Bill Johnson



Why getting involved with MO

- Researchers from all over the world and at any level (from PhD students to Fields medalists) pose questions related to their own research, such as:
 - Questions about well-known, aimed at getting a feeling of the state-of-the-art on the subject and understanding, e.g., if there are (i) interesting subquestions they may try to approach or (ii) strategies that have already been attempted, and if so why they have failed.
 - Open questions that have been passed unnoticed or are known to a restricted circle of specialists, but not particularly famous out of a specific domain.
 - Questions about a technical (and potentially false!) lemma needed in the proof of something intricate, for which people in one's circle haven't provided any useful advice.
 - References to existing results that imply or subsume one's own result (so to include it
 in the bibliography or understand if it is worth of something or not).
- This has eventually led to a number of collaborations and resulted in publications in top-tier journals where at least significant progress has been made on long-standing open problems and conjectures.
- Responses often present information from experts in a specific field, and are readily checked by other users: the effectiveness of MO comes from information sharing.

Preprints on very famous conjectures: "Strong claims need strong evidence"

Assets



Likewise, MO is faster than any traditional channel of discussion in "broadcasting the news" when it comes to "novel mathematics", while maintaining a very prudential policy, particularly with papers claiming to solve fundamental problems.

Very famous conjectures discussed on MO



Up to Nov 18, 2015: More than 600 questions related to the Riemann hypothesis and generalizations thereof (most of them very technical and instructive).

Not especially open problems discussed on MO

Assets



100 open problems have been listed and for some of them there has been substantial progress by active users on MO, though not major experts in the specific area.

Publishing and publishers

- According to a 2013 study commissioned by various publishers, MO is very effective: 90% of questions are answered completely or in part, and a nontrivial percentage of discussions address an error in work that has already appeared in print.
- Accordingly, there are initiatives by various publishers of research mathematics interested in creating a multiparty collaboration with MO to:
 - automatically capture citations entered on the website;
 - o republish them as linked open data.
- In particular, this would help maintain annotation repositories allowing publishers to make mathematicians coming to their websites aware of MO discussions potentially relevant to the papers they are viewing, and so ultimately to their research work.