INCREASING DIVERSITY IN HOMOTOPY TYPE THEORY

The purpose of this document is to provide those concerned with lack of diversity among the researchers working on Homotopy Type Theory with ways of addressing this problem. It was prepared by the organizers (D. Christensen, C. Kapulkin, D. Licata, E. Riehl, M. Shulman) of the AMS Math Research Communities workshop on Homotopy Type Theory, June 4th–10th, 2017.

This document provides ideas for organizers of conferences and workshops on Homotopy Type Theory to reach out to underrepresented minorities and to help them become successful researchers in the field. However, we hope that all members of our community will benefit from reading it.

A number of people contributed resources and suggestions to this document in the comments section of a Facebook post

https://www.facebook.com/k.kapulkin/posts/10207619358178462.

or by contacting us privately. We would like to thank all those participating in the discussion, and we are deeply grateful to everyone for their contributions, insights, advice, and suggestions.

1. Resources

When organizing an event (a conference, workshop, summer school, etc.), we should make sure that the opportunity reaches as many qualified individuals as possible. The following list contains some of the general-audience mailing lists, websites, and blogs where a HoTT-related event may be advertised:

- Homotopy Type Theory Google Group: HomotopyTypeTheory@googlegroups.com;
- algtop-l mailing list: algtop-l@lists.lehigh.edu;
- categories mailing list: categories@mta.ca;
- Foundations of Mathematics mailing list: fom@cs.nyu.edu;
- Types mailing list: types@lists.chalmers.se;
- TYPES/announce mailing list: types-announce@lists.seas.upenn.edu;
- Coq Club mailing list: coq-club@inria.fr;
- AGDA mailing list: agda@lists.chalmers.se;
- HoTT Café Google group: hott-cafe@googlegroups.com.
- Lean Google group: lean-user@googlegroups.com
- Homotopy Type Theory blog: https://homotopytypetheory.org/
- The n-Category Café: https://golem.ph.utexas.edu/category/;
- Math Meetings website: http://mathmeetings.net/.

In addition, there are some resources dedicated to underrepresented minority groups:

- Women in Topology mailing list: wit@groupes.epfl.ch;
- Women in Computational Topology website:
  http://appliedtopology.org/women-in-computational-topology/;
- Facebook group Women in Logic: https://www.facebook.com/groups/WomenInLogic/.

- Association for Women in Mathematics: https://sites.google.com/site/awmmath/. The AWM does not advertise any events on its website, however it is possible to contact the local chairs and ask them to forward the announcement to prospective participants.
- Underrepresented Students in Topology and Algebra Research Symposium (USTARS) website: http://www.ustars.org/

Programs that members of the HoTT Research Community may consider engaging in:

- The National Alliance for Doctoral Studies in the Mathematical Sciences: https://www.mathalliance.org/. The program matches students from underrepresented groups with faculty mentors, sponsors REUs, etc. Some of the current mentors work in closely related fields, for instance: Robert Bruner, Thomas Hales, and Craig Westerland.
- The EDGE program (Enhancing Diversity in Graduate Education): http://www.edgeforwomen.org/. The program helps women succeed in graduate studies in mathematical sciences through mentoring.
- The GEM Fellowship: http://www.gemfellowship.org/. The program promotes opportunities for underrepresented minorities to enter industry at the graduate level.

It is important to get involved as early as possible as several similar programs were recently discontinued due to lack of funding:

- The George Washington University Summer Program for Women in Mathematics (SPWM): https://www2.gwu.edu/~spwm/.
- The Center for Women in Mathematics at Smith College: http://www.math.smith.edu/center/.
- The Career Mentoring Workshop at Wheaton College: http://wheatoncollege.edu/camew/.
- The Carleton College Summer Mathematics Program for Women: http://www.math.carleton.edu/smp/.

2. Everyday practice

Reach out personally. Whenever advertising an opportunity to underrepresented minorities, it is important to reach out as personally as possible, through email and in person. When doing so, try to be as direct as possible, e.g., avoid saying *everyone is encouraged to apply*, instead say *this is for you, you should apply.* Keep repeating and reinforcing the message. (See Safia Chettih's comment.)

Talking one-on-one with individuals who left the field may help us determine whether (knowingly or not) we were treating some people differently in different contexts. Ask those who work in the field whether they have been or are feeling unwelcomed, and what can you done to address these issues.

Invite speakers from underrepresented groups. As an organizer, whenever inviting a member of a privileged group, think if there is a member of underrepresented group working on the same topic with similar qualifications. (See Justine Jacot's comment.) As Marcy Robertson pointed out, "*the organizers need to work a little harder and be more creative about who "fits" the program.*" It is encouraging to see that members of your group have been successful in the field.

Make sure to secure funding for the speakers from underrepresented groups. Marcy Robertson again: "*statistically, most women* [and other minorities] *are at lower level positions, tend to be at liberal arts schools, and are less likely to hold grants, etc and, as such, if you want to increase diversity you need to be ready to fund them.*"

Provide networking opportunities. At each event, try to provide a networking opportunity for members of underrepresented minorities, e.g., a diversity tea, which will be advertised inclusively so as to encompass a number of overlapping axes of diversity and so that everyone will feel welcome to attend. A side benefit of taking a broad focus on "diversity" rather than a narrow one on "gender" is to mitigate against low numbers. With an event like this advertised on the official schedule and supplemented by private emails encouraging certain people to participate, we hope that underrepresented mathematicians will get the sense that they are seen without feeling tokenized.

That was mentioned, among other people, by Keara Kelly, who also wrote that often, people attending conferences and events only talk to those they already know, leaving many newcomers (especially those from minority groups) alone, without anyone to talk to. As an organizer:

- encourage everyone to join a conversation;
- come up with some ice breakers;
- if you are deciding the seating at lunch/dinner, avoid putting all the big shots together—instead sit them next to students;
- if you are putting together working groups, mix more experienced researchers with those new to the field.

Be a good leader. The mathematical leaders shape the field in many ways, not only through their mathematical insights. For a field to be open and inclusive, its leaders need to be open and inclusive as well. Matilde Marcoli mentioned that "*if the field has a problem there is usually a simple explanation, one or several leading figures in the field actively bullying others out of the field... this may not be always evident as they may act one way in public and a different way behind the scenes or under cover of anonymity...*"

While several people who contacted us described the community as open and welcoming, it was also mentioned that "(...) *sometimes the most visible side to the public is people with very strong opinions and polarizing big ideas, which can be intimidating to students less sure of themselves.*"

Be inclusive. From an email: "*When promoting an event/programme where participants have to apply, avoid deterring using terms that describe a candidate's perceived abilities, like 'elite', 'bright', 'high-achieving', etc. All these terms do is encourage people who think they are smart to apply.* (...) *In my experience, women are especially affected by problems of low self-confidence and you might deter them from applying by suggesting only people with a high opinion of themselves can apply. It's better to replace them by neutral terms that describe in details what the prerequisites are: having taken a course in some subject, being a graduate student, or even personal stuff like being passionate, interested, motivated.*