

# Publicizing Your Research

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# You have done the research. Now what?

Hopefully, by now most of the hard work is over: You have done the research, produced pretty graphics and cool demos, discovered interesting results, formulated conjectures, and maybe proved some theorems.

What do you do with all this?



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What do you do with all this? **Publicize your work!**



# Publicizing your research: How?

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- **Give a talk or poster presentation at a local (UIUC) conference.** Relatively easy. Chances for acceptance are good. No travel required, so minimal disruption of class schedule.
- **Give a talk or poster presentation at a regional or national conference.** Harder: Chances for acceptance vary, depending on prestige of conference and number of slots available. Requires travel and overnight stays, may miss a full day of classes. Expenses are incurred, though many conferences have funding to pay for some of the travel costs.



# Publicizing your research: How?

- **Publish a paper.** Hardest: While getting a paper published may be the ultimate goal of a research project, it is rarely realized with IGL/REU level undergraduate research projects. (In fact, I am not aware of any IGL project that has led to a published paper so far, but that may soon change.) **Getting a paper published in a (respectable) journal is a lot harder than getting a talk or poster presentation accepted at a conference, so always try the latter first before thinking about publication.** The publication process is fraught with pitfalls and disappointments, so don't set out on your own. Your advisor/mentor can advise you on whether the work is suitable for publication in a journal, and, if so, can help you guide through the process.





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  - Accepted for 20 minute talk at Texas Undergraduate Geometry Conference.
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This makes you stand out from the crowd, and it can help getting into REU programs and graduate schools.



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- **Develop communication skills.** Giving presentations helps you gain experience and develop confidence in communicating mathematics to others.



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## What is in it for all.

- **Publicity for the IGL, the Math Department, and the University.** By participating in outreach activities and conferences, you help show off the great things that are happening at the IGL and the Math Department to a broad audience:
  - The local community (through outreach events).



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This in turn helps attract talented undergraduates to the IGL and recruit high school prospects to the UI and Math, and it may help in getting funding for IGL. **It is a win-win proposition for everyone!**





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- High School lab visits. TBD.



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- **More conferences:** MAA Mathfest (August), Ohio State (August), Penn State (November), etc. See [www.math.illinois.edu/~hildebr/igl/conferences.html](http://www.math.illinois.edu/~hildebr/igl/conferences.html) for details and links.



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- Most conferences have titles and abstracts from past years on their website. These give you an idea of the level and scope of the talks, and the type of audience you can expect.
- **Consult with your advisor/faculty mentor.**





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Tailor your presentation to the appropriate audience. In case of doubt, aim for the broadest possible audience.

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- **UI Undergraduate Research Symposium:** General public.
- **Undergraduate math conference:** Math undergraduates.
- **Research paper:** Mathematicians, specialists in the field.



# Selling math research: The challenge

- **The problem:** To publicize your research, you have to “sell” it. You need to convince your audience (which, depending on the context, may be the general public, fellow students or faculty, organizers of a conference, editors of a journal, etc.) that you have done something worthwhile, something worthy of accepting for a conference, interesting enough for the audience to attend your presentation, and perhaps substantial enough to merit publication in a journal. How do you do this?



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- **The challenge:** Mathematical research is often highly technical and difficult describe to a general public, doesn't have a tangible impact on our daily lives, and (usually) doesn't help cure diseases, increase the efficiency of light bulbs, etc.





# Selling math research: How to make a case.

- **The topic “sells itself”**. Some topics have a natural appeal to a broad audience that they don't need any further justification. In mathematics those cases are rare, but they do exist. Examples: “Bracketology”. Calculation of Pi to record numbers of digits.



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- **Connections.** The topic has connections with, or applications to, problems in other areas that anyone can relate to. Example: Primitive roots and applications to card shuffling.
- **Intrigue.** The topic involves intriguing, easy-to-understand, but hard, problems.



# Selling math research: Crafting a winning title and abstract

Say you want to give a presentation the UI Undergraduate Research Symposium. You submit a title and abstract, hoping that it will get accepted. How do you maximize your chances that your submission will get accepted for the Symposium, and that your presentation will generate interest among attendees?



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  - “Math and Art: The Good, the Bad, and the Pretty” (Keynote talk at Penn State Undergraduate Research Conference)





# Selling math research: Crafting a winning title and abstract

- **Abstract.** An abstract should be a single paragraph, written in plain English and aimed at a general scientifically interested and educated audience. Avoid formulas, mathematical notations, and terminology. Keep in mind that at broad-based conferences such as the UI Undergraduate Research Symposium, the people judging your submission, or visiting your poster, most likely will not be mathematicians; they may be faculty from other departments, administrators, and possibly even company representatives looking for internship recruits.



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**In a nutshell, your abstract is the “elevator pitch” for your research. It is your best chance to “sell” your work. Make the most of it!**



# Crafting a winning title and abstract: An example

From IGL Project “Number-theoretic random walks” (Yiwang Chan, Natawut Monaikul, M Tip Phaovibul, Tong Zhang).

Possible titles, aimed at different audiences:

- “Incomplete Gauss sums” (Technically the most appropriate title, suitable for a research paper. In fact, there are papers on this subject with titles very similar to this one.)





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- “Number-theoretic random walks” (Title of Spring 2013 IGL Project, has broader appeal (avoids reference to “quadratic residues”), appropriate for undergraduate math conference.))



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- “Number-theoretic random walks” (Title of Spring 2013 IGL Project, has broader appeal (avoids reference to “quadratic residues”), appropriate for undergraduate math conference.))
- **“Do numbers play dice? Visualizing order and chaos in number theory through random walks.”** (“Winning” title, submitted for UI Undergraduate Research Symposium and Rose-Hulman Undergraduate Math Conference.

Attention-grabber, appropriate for broad audience)



## Example, continued.

**Abstract:** Many properties of the natural numbers can be encoded as sequences of 1's and  $-1$ 's. On the surface, such sequences often show no obvious pattern and indeed seem to behave much like randomly generated sequences. In order to gain a deeper understanding of the “random-like” behavior of such sequences, we construct certain “random walks” in the plane formed with these sequences. These random walks provide a natural way to visualize the degree of randomness inherent in a sequence and to detect, and possibly explain, hidden patterns, but they can also open up new mysteries that defy explanation. In this presentation, we report on the research we performed at the Illinois Geometry Lab (IGL) aimed at better understanding these number-theoretic random walks and unraveling some of their mysteries.



# From abstract to research paper: Types of mathematical publications

- **Abstract:** Single paragraph, non-technical description of work. An abstract (along with a title) is typically required for applications to conferences, and decisions on acceptance are based on the abstract and title. Abstracts of accepted talks are published in the conference program.



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- **Extended Abstract:** Like an abstract, but longer (up to a page). A more detailed, nontechnical description of the work. Accompanied by some graphics, this should be appropriate as the “short project description” for the IGL brochure and website.



# From abstract to research paper: Types of mathematical publications

- **Technical Report:** A multi-page LaTeX document describing the work in more detail. Required by some conferences (e.g., for the Rose-Hulman Best Presentation Competition). Should be appropriate as “Report/documentation” for the IGL. Here is a common way to structure such a document:



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  - **2. Description of the problem.** Introduce necessary definitions and notations and state the problem.
  - **3. Results.** State the new results obtained.
  - **References.** Bibliography.



# From abstract to research paper: Types of mathematical publications

- **Research paper:** A longer paper (typically 5–25 pages), written in a form suitable for publication in an appropriate journal. Structured much like a Technical Report, but with additional sections containing the proofs of the results, and possibly a discussion of related work and open questions.

**Keep in mind:** While getting a paper published may be the ultimate goal of a research project, it is rarely realized with IGL/REU level undergraduate research projects. Your advisor/mentor can advise you on whether the work is suitable for publication in a journal, and, if so, can help you guide through the process. **The publication process is a minefield fraught with pitfalls and disappointments; don't set out on your own.**



# Resources

- **Beamer slides of this talk:**  
[www.math.illinois.edu/~hildebr/igl/publicizing\\_math.pdf](http://www.math.illinois.edu/~hildebr/igl/publicizing_math.pdf)
- **Undergraduate conference opportunities:**  
[www.math.illinois.edu/~hildebr/igl/conferences.html](http://www.math.illinois.edu/~hildebr/igl/conferences.html)
- **Resources for giving talks and poster presentations:**  
[www.math.illinois.edu/~hildebr/igl/presentations.html](http://www.math.illinois.edu/~hildebr/igl/presentations.html)
- **Human resources:** Your faculty advisor/mentor, other math faculty. Fellow students/friends.

