ESS 203 – Glaciers and Global Change

Wednesday January 20, 2021.

Outline for today

- highlights of last Friday lecture: – *Cooper Crowder*
- Today's highlights on Friday: – *Jennifer Lomeli*

So where are we now?

- We can answer "What is a glacier?"
- We know a bit about how curious scientists think.
- Now we will explore how they communicate their ideas and results.

Questions for Curious Anthropologists studying Scientists *(as a Cultural Phenomenon) …*

Before we go too far into this topic, what are your current thoughts now about scientific communication?

- Each Group takes 6 minutes to discuss all 3 questions.

- How do scientists communicate their work?
- What is Peer Review?
- Why does good science depend on it?

https://docs.google.com/document/d/1ra4UiD_2YHp-r2foS5kuVX0ubpYwbR6DkRJoELsuiXQ/edit#heading=h.30r95iukzn56

Reading a Scientific Paper

Sometimes it is valuable to go to a peer-reviewed scientific source to learn about a scientific question.

- Scientific results can affect your life
  - Medicine (new cures, genetics, pandemics, …)
  - Climate (extreme weather, drinking water, sea level, …)
  - Biology (agriculture, endangered species, genomics…)
- You can read or hear about scientific results in the news, but often reporters get the story wrong.
- And now fake news is widespread in our "post-truth" world …
- In this course, we will read some peer-reviewed articles from the journals *Nature* and *Science*.

Understanding Scientific Papers

Why can scientific fields make substantial progress quickly?

- Researchers all over the world can quickly learn about results of their colleagues.

- Findings are communicated in ways that allow others to duplicate experimental conditions, reproduce results, or develop ideas and methods further, knowing that the prior work is sound.

Peer Review - I

The primary medium for communicating scientific results is publication in peer-reviewed science journals.

- Many of these journals are now published on-line as well as in hard-copy form.
- Many new (and some old) journals are published ***only*** on-line.

- When a manuscript is received by a journal, a scientific editor sends the manuscript to at least two other scientists who are experts in the subject matter of the manuscript, i.e. they are "peers" of the author (or authors).

Peer Review - II

Reviewers must not be closely associated with the authors of the manuscript in question, i.e. they are free of conflict-of-interest.

- These experts read and critique the manuscript, and send their written evaluation to the editor.

- They have the option to remain anonymous; this guarantees that they can be frank without jeopardizing their own careers or grant prospects etc, should the authors of the manuscript be powerful figures who take unkindly to honest criticism.

Peer Review - III

A paper is published only after it successfully addresses all the comments and concerns of the reviewing peers.

- Papers that cannot pass peer review do not get published.
- Rejected manuscripts can be revised and submitted again to the same or different journals, but they still have to hold up under peer review.

- This process improves the reliability of the science, and the effectiveness of the communication from the authoring scientists.

Two co-authors face a peer-review revision deadline

Will there be time, will there be time
To revise the draft to meet reviewers that it meets;
There will be time to murder and create,
And time for those anonymous hands
That lift and drop those questions on your plate;
Time for you and time for me,
And time yet for a hundred indecisions,
And for a hundred more revisions,
Before the taking of a toast and tea.

(Anon.)
Who gratefully acknowledges inspiration by T.S. Elliot and *The Love Song of J. Alfred Prufrock.*

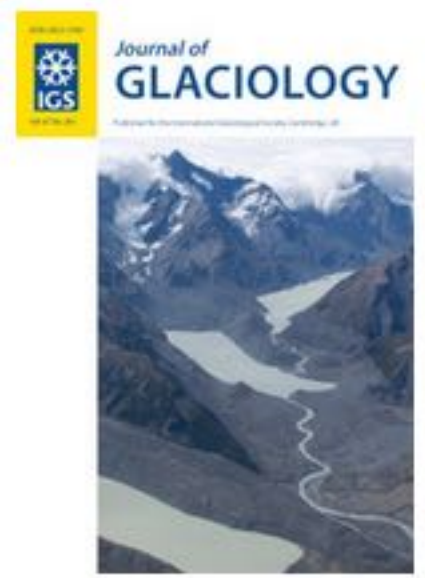
Types of Scientific Journals - I

Journals dedicated to publishing research articles in very specialized fields

- *Journal of Glaciology*
- *Journal of Crystal and Molecular Structure*
- *Journal of Cyclic Nucleotide and Protein Phosphorylation Research* (I didn't make that up!)

- Read mainly by hard-core specialists.
- Small circulation.

[Examples]



Types of Scientific Journals - II

Some journals publish peer-reviewed research findings in many different fields across the sciences.

- The two most widely respected examples are *Nature* and *Science*.
- These journals have a large circulation, because scientists from many research disciplines read these journals to stay in touch with other areas of science, as well as their own.

[Examples]

Types of Scientific Journals - III

Some journals publish news stories written by science reporters about new and exciting developments in science.

- These are ***not*** peer-reviewed.
- An example would be *Science News*.

Some peer-reviewed journals such as *Nature* and *Science* also publish news about science, and editorials on issues relating to science.

- Layout of the journal makes it very clear to readers whether they are reading peer-reviewed material, or commentary.

Publishers

Many specialized journals are published by scientific societies.

- Income from journal sales is used to organize research conferences and provide other services to scientists who are members.

Some journals are published by large publishing houses as profit-making ventures (for the investors in the publishing company that sells the journals ☺, ***not*** for the scientists who submit the articles ☹).

- High cost of commercial subscriptions is a challenge for Libraries, including UW Library.

Dear ESS Dept., Jan 23, 2015

The Libraries currently has a subscription to the SEG Digital Library (Society of Exploration Geophysicists) which provides us with online access to the following serials:

The Leading Edge
Geophysics
Journal of Environmental & Engineering Geophysics
Global Meeting Abstracts
Technical Program Expanded Abstracts

It's up for renewal, but the price has increased considerably (nearly 80%). Our serials budget is tight and I am considering cancelling the SEG Digital Library. However, we can find a way to renew if the ESS Dept. feels strongly that we should maintain full access. Alternative access to content from these titles would be available via our Interlibrary Loan Dept.'s desktop article delivery service at no charge to faculty/staff/students, if a cancellation decision was made.

I would greatly appreciate any feedback from ESS on this issue; contact me directly at: parsonsm@uw.edu

Thanks!
Matt Parsons
ESS Library Liaison

One Disincentive to Publish

Scientists are ***not*** free-lance journalists.

- They are ***not*** paid for their articles.
- In many journals, scientists ***pay*** the journal a fee (from research grants) based on the length of their paper, to offset the publication costs.
- Most journals will publish meritorious papers even if the authors are broke.

In general, reporters at the science-news magazines are the only writers who are paid for their written work.

- Bummer!

Are Those Scientists Nuts?

What is a writer's first obligation? Obviously it is to sell enough stuff to pay the rent. **Nobody but a blockhead, said Dr. Johnson, writes except for money.** Beyond that practical consideration lies a duty not so easily defined. It is to use words precisely, to keep their sword edges honed, to search for the exact word and not settle for a nicked saber. Ah, but other considerations intrude. For whom are we writing? In what forum?

James J. Kilpatrick. Sun Jan 22, 2006. *The Writer's Art*

Samuel Johnson (1709-1784) Often referred to simply as **Dr Johnson**, was one of England's greatest literary figures: a poet, essayist, biographer, lexicographer and often considered the finest critic of English literature. (Wikipedia)

So there must be other incentives …

Motivation for Scientists to Publish

To be "team players".

- Scientists need to share their own work if they want to benefit from easy access to results of work by other scientists.

Some journals are harder to get published in than others.

- Scientists enjoy the prestige and reputation that comes with a good publication record in "distinguished" journals.

To get Promotion and Grants

- Promotion Review and Grant Review panels consider a scientist's publication record.

Format of a Scientific Paper - Title

Scientists don't have time to read everything that is published in their field.

- Title must state the subject succinctly and clearly.
- Readers should be able to tell from the title whether the article describes research that they want to read about (or not).

Format of a Scientific Paper - Authors

Just as in the arts, or in industry, reputations depend on the quality of work.

- Proper citation and giving credit to the right individuals for ideas and results is essential.

- The names and addresses of the authors are displayed prominently, so that the article can be easily referenced.

- (Plus, authors like to see their names in print.☺)

Format of a Scientific Paper - Abstract

Almost all scientific articles have an abstract.

- Usually a single paragraph at the beginning of the article.

- Describes the essential points in the paper, including the conclusions.

- Abstracts are often collected in databases specializing in particular fields of study, so that scientists can quickly find work relevant to their own.

nature geoscience

ARTICLES

https://doi.org/10.1038/s41561-017-0039-7

Massive collapse of two glaciers in western Tibet in 2016 after surge-like instability

Andreas Kääb[1]*, Silvan Leinss[2], Adrien Gilbert[1], Yves Bühler[3], Simon Gascoin[4], Stephen G. Evans[5], Perry Bartelt[3], Etienne Berthier[6], Fanny Brun[6,7], Wei-An Chao[8], Daniel Farinotti[9,10], Florent Gimbert[7], Wanqin Guo[11], Christian Huggel[12], Jeffrey S. Kargel[13], Gregory J. Leonard[14], Lide Tian[15], Désirée Treichler[1] and Tandong Yao[15]

Surges and glacier avalanches are expressions of glacier instability, and among the most dramatic phenomena in the mountain cryosphere. Until now, the catastrophic collapse of a glacier, combining the large volume of surges and mobility of ice avalanches, has been reported only for the 2002 130×10^6 m^3 detachment of Kolka Glacier (Caucasus Mountains), which has been considered a globally singular event. Here, we report on the similar detachment of the entire lower parts of two adjacent glaciers in western Tibet in July and September 2016, leading to an unprecedented pair of giant low-angle ice avalanches with volumes of $68\pm2\times10^6$ m^3 and $83\pm2\times10^6$ m^3. On the basis of satellite remote sensing, numerical modelling and field investigations, we find that the twin collapses were caused by climate- and weather-driven external forcing, acting on specific polythermal and soft-bed glacier properties. These factors converged to produce surge-like enhancement of driving stresses and massively reduced basal friction connected to subglacial water and fine-grained bed lithology, to eventually exceed collapse thresholds in resisting forces of the tongues frozen to their bed. Our findings show that large catastrophic instabilities of low-angle glaciers can happen under rare circumstances without historical precedent.

Author contact information

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Author Contributions

"All authors conceived the study, and collected, processed and analysed data. A.K., S.L., S.G., E.B., F.B., J.S.K., G.L. and D.T. performed remote-sensing analyses, A.G. performed mass-balance and thermo-dynamical glacier modelling, Y.B., P.B. and S.G.E. performed avalanche modelling, W.-A.C. and F.G. performed seismic data analysis and modelling, W.G., L.T., T.Y. and A.G. carried out field surveys and reconnaissance, and S.G.E., D.F. and C.H. performed further analyses and interpretations. All authors contributed to writing the paper."

Honorary authorship is strongly discouraged!

Competing Interests

The authors declare no competing financial interests.

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Format of a Scientific Paper – Text & Figures

The body of the manuscript describes

- Questions being addressed.
- Motivations to solve the question.
- Prior Research on the topic.
- Methods and Analyses.
- New results.
- Implications.
- Conclusions, i.e. what was learned that was valuable?

The Question, and motivation to answer it

"A third type of glacier instability involves the detachment of large parts of low-angle valley glaciers. This process has been documented only for the 2002 Kolka Glacier event (Kazbek massif, Caucasus), when a 130×10^6 m^3 ice/rock avalanche travelled 18 km down-valley and claimed 120 lives[18–20]. The massive 2016 glacier collapses in Tibet[21] have changed this picture and opened up critical questions about the causes of the detachments and the potential for similar events to occur elsewhere. Here, we describe the Tibet twin events and reconstruct the evolution of the collapsed glaciers since the 1960s, on the basis of remote sensing and mass-balance modelling."

New Results

"In conclusion, the Aru twin glacier collapses have allowed us to recognize a new form of glacier instability—the catastrophic collapse of large parts (here ~25–30% by area, and up to 40% by volume) of an entire valley glacier. These collapses seem possible through a rare but not unique array of factors that coalesce to an anomalous increase in driving stresses, and rapid and sustained reduction of basal friction. It is spectacular and completely unprecedented that such combined exceedance of stability thresholds, highly unlikely for one glacier alone, occurred for two neighbouring glaciers within just two months."

Figures

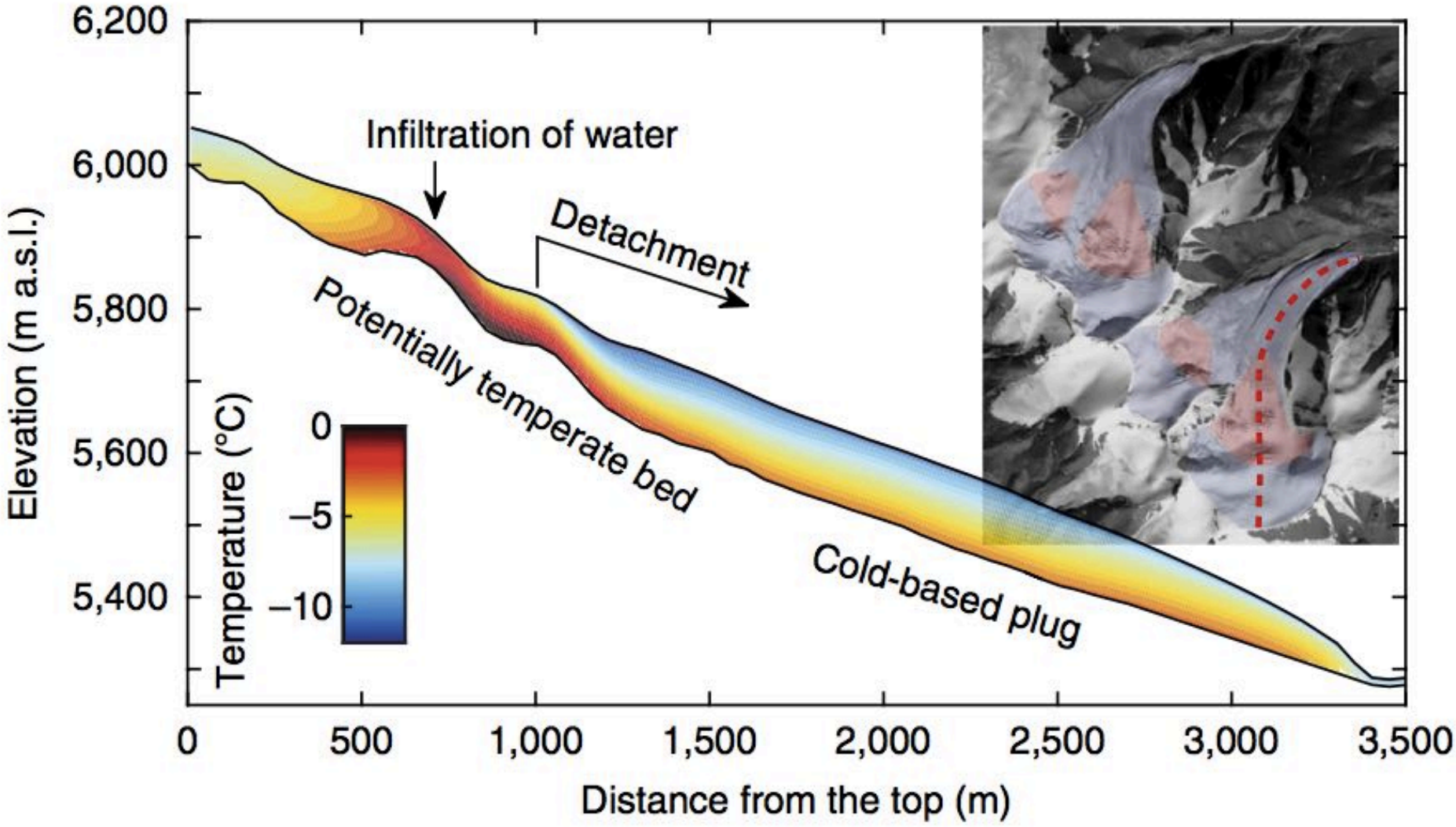
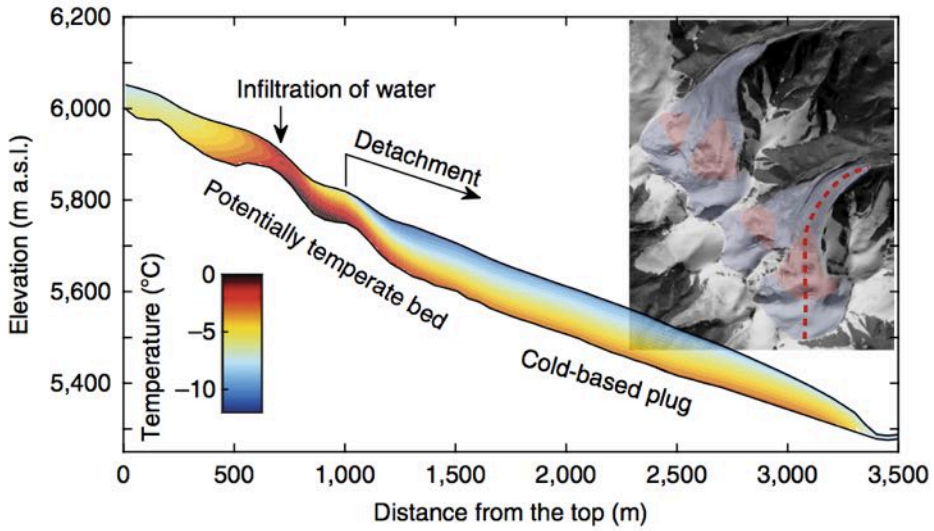

6,200
6,000
5,800
5,600
5,400
Elevation (m a.s.l.)
Infiltration of water
Detachment
Potentially temperate bed
Cold-based plug
Temperature (°C)
0
−5
−10
0
500
1,000
1,500
2,000
2,500
3,000
3,500
Distance from the top (m)

Figure captions explain what is shown



"**Fig. 6 | Modelled two-dimensional thermal structure of the Aru glaciers**. Median scenario of a suite of thermodynamic steady-state flow-line modelling results of the thermal structure of Aru-2 for the mean 1980–1995 climate conditions. The models indicate temperate (thawed) basal conditions at the position of the later scarp head and under the upper zone of the detached glacier part, and otherwise cold (frozen) basal conditions. The results for Aru-1 are very similar and not shown. Inset, schematic representation of the basal temperature of the Aru glaciers at steady state. The areas in blue are probably cold-based ice; the areas in red are potentially temperate-based ice."

Methods

“Methods, including statements of data availability and any associated accession codes and references, are available at https://doi. org/10.1038/s41561-017-0039-7”

History

“Received: 13 July 2017; Accepted: 28 November 2017; Published online: 22 January 2018.”

Format of a Scientific Paper – References

Publications that were important for prior research or ideas are included so that readers can follow the trail backward.

- All entries must be cited in the Text (i.e. it is not just a *Suggested Reading* list).

- Details are given in a References section (or occasionally as footnotes on each page).

Format of a Scientific Paper – References

1. Faillettaz, J., Funk, M. & Vincent, C. Avalanching glacier instabilities: Review on processes and early warning perspectives. *Rev. Geophys.* 53, 203–224 (2015).
2. Huggel, C. Recent extreme slope failures in glacial environments: effects of thermal perturbation. *Quat. Sci. Rev.* 28, 1119–1130 (2009).
3. Evans, S. G. et al. A re-examination of the mechanism and human impact of catastrophic mass flows originating on Nevado Huascaran, Cordillera Blanca, Peru in 1962 and 1970. *Eng. Geol.* 108, 96–118 (2009).
4. Evans, S. G. & Delaney, K. B. in *Snow and Ice-related Hazards, Risks, and Disasters Hazards and Disasters Series* (eds Haeberli, W. & Whitemann, C.) 563–606 (Elsevier, Amsterdam, 2015).
5. …

Reading a Scientific Paper

When you read a scientific paper, keep these three questions in your mind:

1) What is the question that the paper tries to answer?
2) What is the answer (according to the authors)?
3) What points are still unclear to you?

Questions for Curious Anthropologists studying Scientists *(as a Cultural Phenomenon) …*

Let's revisit our initial questions …

- Each Group takes a few minutes to discuss all 3 questions.

- How do scientists communicate their work?
- What is Peer Review?
- Why does good science depend on it?

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