Communications In Science

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August 6th, 2018

What we are talking about today

i.e.,
What I mean by
“communications in science”

1. Why
2. Communication with:
   a. Research groups/collaborations
   b. Professors/Advisers
   c. Other scientists
3. Summary
4. Questions

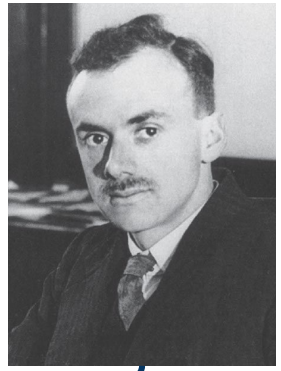
Why am I talking about this...

Believe it or not...

- We, physicists, are ***humans***
- Scientific research is ***a social practice***
- We live among ***scientists and non-scientists***

We work in small and large groups, interact with others in the field, and have to publicize our work!

1 “Dirac” =
1 word per hour

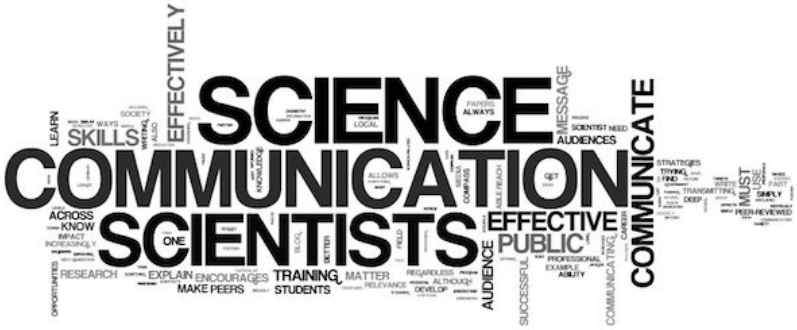


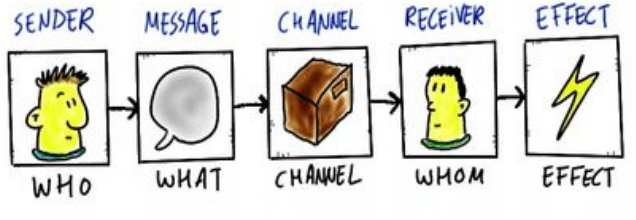
SLAC Group Photo, 2018
This is much more like what science looks like nowadays

Different Communications in Science

As scientists, we often communicate with:

- Members in our groups/institutions
  - Direct collaborators
  - Lasting relationships
- Others in same/similar fields
  - Future collaborators
  - Potential sources of inspirations
- Public, government, younger students, etc.
  - Outreach purposes





Communications within Research Groups / Collaborations

Scientific research is no longer run by the Paul Dirac's and the Sheldon Cooper's

		Authors per paper (% of total)			
Journal	Date	One	Two	Three	Four or more
Physical Review / Physical Review A	1/4/1965	35	40	18	7
	1/1/2011	6	27	29	38
Journal of the American Chemical Society	1/1/1965	14	43	25	18
	1/12/2011	0	14	25	61
Proceedings of the National Academy of Sciences	1/15/1965	32	34	20	14
	1/4/2011	0	11	15	74
Applied Optics	1/1/1965	58	26	11	5
	1/1/2011	0	17	11	72
Journal of Theoretical Biology	1/1/1965	47	53	0	0
	1/7/2011	20	33	27	20
Proceedings of the IEEE	1/1/1965	57	35	6	2
	1/1/2011	12	19	19	50
Science	1/1/1965	78	11	7	4
	1/7/2011	41	15	5	39
Nature	1/2/1965	45	34	18	3
	1/6/2011	28	14	9	49

Collaborating on Science

Collaboration can be great! More teammates!

- Many experts to learn from
- Accomplish big goals together
- Sense of community

Collaboration can be tiring...

- More barriers: existing codes, jargons
- Difficult to reach agreements
- Slow & difficult communications

ATLAS celebrating the Higgs discovery

Barriers to Entry

Current senior student talking to a new undergrad intern about summer project

“Yeah, so I am interested in stop particle searches in final states with large MET. You should first start with downloading the relevant xAOD files. xAOD is just a jargon for event data. You can download them using ‘rucio.’ It is really quite straightforward. You can just search for ‘rucio commands’ in the Twiki.”

… and the undergrad leaves feeling very lost

What did the mentor do wrong?

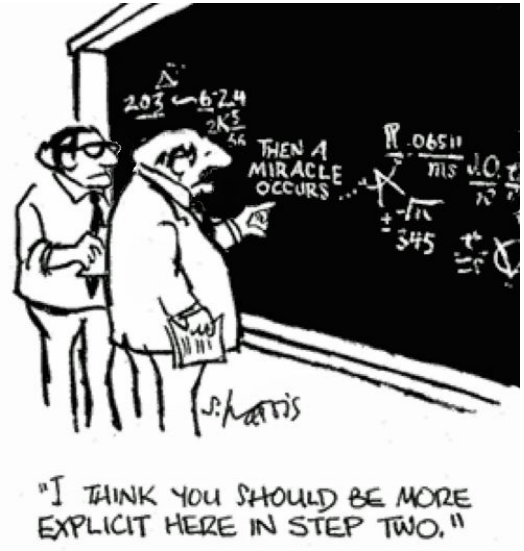
- Too many ***abbreviations/jargons***
  - stop, MET, xAOD, rucio…
- ***Unspecific*** directions
  - “relevant”
  - Download to where?
- ***Not enough*** explanations

What could/should the undergrad have done?

- Explain their ***background***
- Ask ***questions*** and clarify immediately
- Ask whom to go to for ***help***

Specific, explicit, and clear!

1. Don’t assume things
2. Pause every now and then
3. Always double-check



Disagreements in Scientific Research

First thing to note: ***disagreements are good!*** (should be, at least) It forces everyone to think harder

For productive discussion:

- Keep ***specific goals*** in mind
  - In the end, we want to get things done!
- Clarify your stance and ***scope***
  - No argument is completely wrong
- Provide ***detailed arguments***
  - Details can convince people
  - This also allows you to review your thought
- Be ***patient*** and re-visit the idea
  - Time helps
- Be ***respectful***
  - Constructive, not destructive
  - Disagree with an idea, not a person

Hearing two advisors disagree about his dissertation, the grad student feels his brain and fate being torn in half.

Communicating with a Group

As a group gets large, it is difficult for everyone to work harmoniously

Some tips:

- Keep thorough ***documentations***
  - Lab notebooks, README files, Slack, Wiki's
  - Reminders before, summaries after meetings
- Plan with specific ***actionable items***
  - Tasks as specific as possible, including deadlines
- Use ***both group and individual*** comm.
  - Keep the group on the same page
  - Personal communication for specific items

Communications with Professors / Advisers

We've all talked to professors...

What were your struggles? What frustrated you the most? What was unexpected?

- Intimidating
- Difficult to approach
- Way too busy
- Traveling often
- Hands-off
- Not detail-oriented
- Doesn't reply quickly

Flipping open his laptop, the grad student subconsciously shields himself from whatever his advisor will say about his latest draft.

Talking to Professors

Basics:

- Be polite and respectful
- Don’t be discouraged by late / lack of replies
  - Friendly polite reminders could help
- Learn their communication styles and methods

Important notes:

- Professors are ***humans***, too
  - They party, have Facebook accounts, and, surprisingly, were once young students
- Talking to students is ***part of their jobs***
  - Don’t worry about “bothering” them
- ***You are a member*** of the group

Toiling away at a major conference, the grad student gets distracted by carefree senior faculty who are in vacation mode.

Reporting Progress to Professors

Not all professors are active, hands-on researchers. Some focus more on the "***manager***" role. You get to (or have to) lead the project

When reporting...

- Have an agenda/goal before meeting
- Start with ***re-cap***
- Detail v.s. Concise
  - Depends on projects, adviser's style, etc.
  - General rule: ***detailed report on methods / experiments***, concise presentation of results
- Keep ***a detailed log***
  - What was discussed, suggested
  - To-do's until the next meeting
  - Specific goals with deadlines

Realizing that the advisor is contradicting his own thoughts from months ago, the grad student trembles with blinding resentment and terror.

Communications with Other Scientists

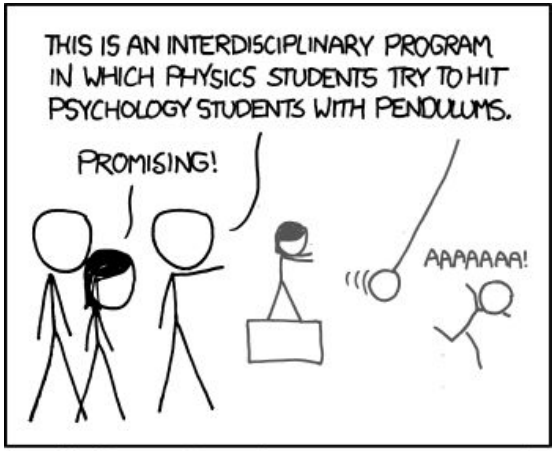
Why talk to other scientists?

Main goals:

- ***Learn***
  - One ultimate physics goal, many different trials
  - How do different works complement each other?
- ***Collaborate***
  - Find people with similar interests and useful skills

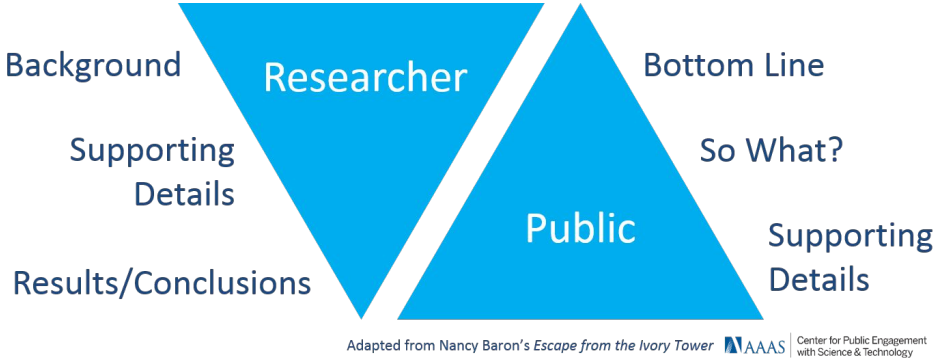
This is ***not limited*** to the same / directly-related fields! ***Interdisciplinary research*** has solved many difficult problems in creative ways, never traditionally expected of.

e.g. biophysics, machine learning in physics, econophysics, complex systems



- "*Interdisciplinary research is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice.*"*

How to Communicate with Other Scientists



Interested scientists from somewhat different fields:

- Somewhere in between
- Focus on how different techniques could generalize

This requires continuous studying!

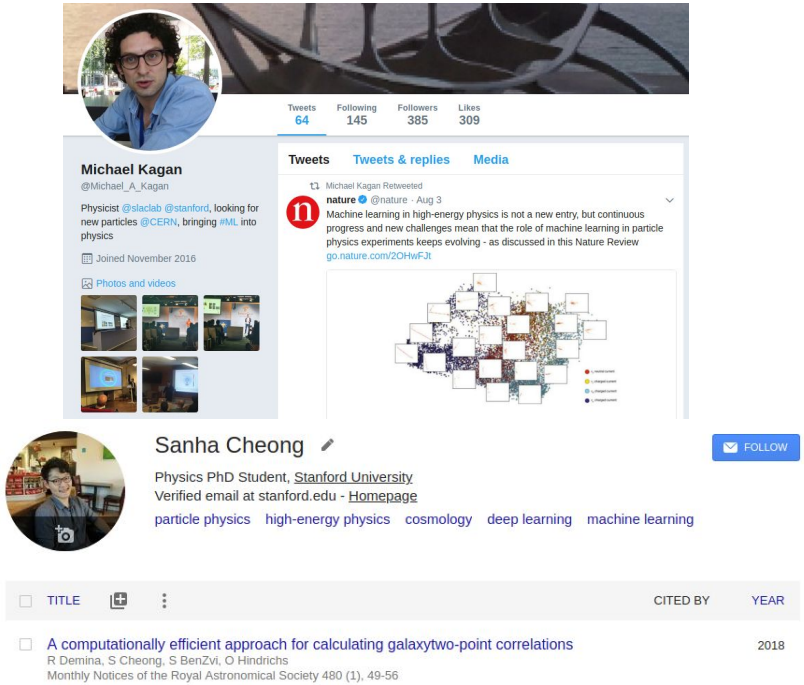
- Go to various talks, read a lot of papers and other articles
- Be critical of the talks and papers you see, and improve on them

Means to Publicizing and Getting Noticed

Of course, papers, posters, conference talks, etc. are great

… but also:

- Social Media
- Blogs/Websites
  - Including your Curriculum Vitae
- Other professional profiles
  - LinkedIn
  - Google Scholar
  - ORCID
  - InspireHEP



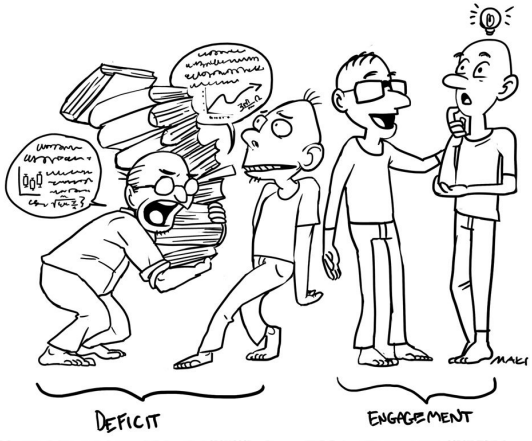
Summary

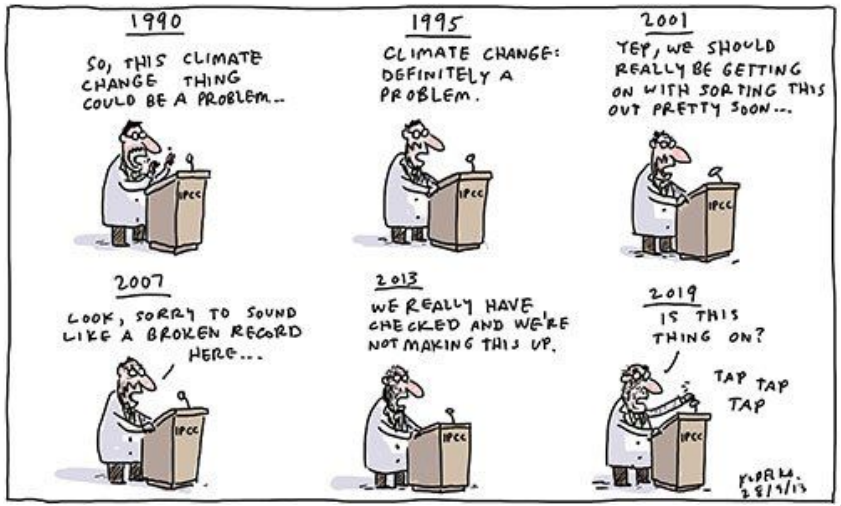
We are humans, and the scientific ***academia is a human society***! Active discussions and collaborations are the ***main thrust of modern scientific progress***.

For effective communications:

- Keep a detailed ***record***
- Know when to be ***specific***
- Understand your ***purpose and target audience***
- Make the effort to ***document and publicize*** your work

Don’t be Paul Dirac! Or Sheldon!





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