OPEN NOTEBOOK SCIENCE: TOOLS OF THE TRADE

ANTHONY SALVAGNO ANTHONY@IHEARTANTHONY.COM

Scientific information is published in peer reviewed journals as a complete account. Unfortunately there is nothing complete about the process. Frequently intermediate and supplementary experimental data is excluded, methods are not nearly detailed enough, and results are manipulated for appearance. Open notebook science aims to be a complete account of the scientific process: from ideas and planning, to experimental setup and protocol design, all the way through data interpretation and commentary. Here I talk about tools to create and support an open notebook, effective use of the medium, and how social interaction creates a community.

WHAT IS OPEN NOTEBOOK SCIENCE?

Open Notebook Science (ONS) is the practice of making the entire primary record of a research project publicly available online as it is recorded. This online location is known as an open notebook and is the online analog to the paper notebook most scientists keep in their lab. It is the storage center for project plans, experimental protocols and setups, raw and interpreted data, and even unfiltered interpretations.

RESEARCH IN REAL-TIME

ONS allows scientists to share their research in real-time. As an experiment is recorded, notes can be published immediately allowing the discovery process to happen much faster than through traditional means. Scientists around the world can benefit from open access to successful and failed protocols, can reuse and enhance data that may not be useful to the author, and can verify results in much shorter time scales.

ALTERNATIVE TO PUBLICATION

ONS can even be used as an alternative form of publication. Posts are search engine indexed, and can be peer-reviewed by peers in real-time. If mistakes are made, errors can be corrected and the need for embarrassing retractions will no longer be needed. Since the entire experiment is recorded, access to data and methods are in full detail and completely uninhibited.

COMMUNICATION IN REAL-TIME

ONS allows researchers to communicate and collaborate in real-time via integration with social media and commenting systems..

Collaboration

Collaborators can keep up to date with labs through ONS and can communicate with experimenters. Labs can simultaneously plan experiments around recent developments and share data and tools.

Criticism

The interaction via ONS can also provide peer-review. Comments can be left that ask to explain methods more clearly, provide new interpretations for data, or point out experimental errors. With ONS potential issues in a publication can be spotted well before the document hits the journal.

Outreach

Science literacy can be improved with ONS. The general public can read through the entire experiment from start to finish and gain an understanding for how modern science is performed. Citizen science projects can even be incorporated that allow the public to interact with a scientist or an experiment.

OPEN NOTEBOOK SCIENCE IN PRACTICE

ONS is the future of science because it can enhance the scientific process of discovery and innovation by removing hurdles created through poor communication channels and closed access to information. In order for ONS to take the next leap and become a more integral component of science, more scientists need to adopt ONS. How can this be accomplished? There are many different ways ONS can be spread through science culture...

INDIVIDUALLY

research

http://research.iheartanthony.com

If you are a student, professor, or research scientist create your own open notebook and give back. If you've ever read wikipedia then you've gained knowledge from one of the largest educational sources in the world. Give back by providing your research in real-time. My notebook is freely available for all to read at IheartAnthony's Research.

ACADEMICALLY

Physics 308-L

http://goo.gl/PD5x0

I taught a Physics lab course (Physics 308L) that trained students to work with one another via a network of open notebooks. The network provided a case study into how collaborators, peers, and others may interact in an open notebook community. All the course material and the student notebooks are available online, and I'm always available to discuss methods for training future open notebook scientists.

INSTITUTIONALLY

The Open IGERT

http://goo.gl/dDlqr

Lots of universities are joining the open access movement and creating their own open access initiatives. I cowrote an NSF IGERT grant nicknamed "The Open IGERT" that is focused on teaching graduate students to become open scientists through various means, with an emphasis on ONS and data management. The largest barrier to providing open access is fear of data security and data misuse. By developing an educational program, open access initiatives can trickle down and these fears can be dispelled. The IGERT grant is available online.

THE TOOLS OF OPEN NOTEBOOK SCIENCE

There are many tools available to become an open notebook scientist. When thinking about software for your open notebook consider tools that are:

- Search Engine Indexed
- Self Organized
- Customizable

PLATFORMS

There are tons of great services available on the web that can be used for ONS. When looking for an open notebook software, pick one that has features that fit your needs. While there are services that are specifically designed to be notebook like, I find the best platforms are actually not notebooks at all...

- Wordpress
- Media Wiki
- Google Docs
- GitHub

SUPPLEMENTAL

While platforms provide the backbone of a notebook, there are many useful services that can be used and tied in with your notebook. These services can be combined seamlessly if you have a notebook that integrates with lots of other software via basic html editing, or embed codes.

Data Hosting and Backup

Google Docs

Institutional Repository

figshare

http://goo.gl/crljr

GitHub

DropBox

Video Hosting

BenchFly

http://goo.gl/Fi7xt

Youtube

Presentation Sharing

Scribd

Slideshare

http://goo.gl/H8Ptb

Image Hosting

Flickr

Photobucket

Picasa

Communication

Disqus

Facebook

Google +

Twitter @thescienceofant

I ♥ ANTHONY'S RESEARCH

BUSTING SCIENCE OPEN

#SciFund Challenge

KitchLab Always contribute.

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