IPOL: A Research Journal for Reproducibility in Image Processing

ISIS Meeting on Reproducibility
in Image and Signal Processing
Telecom ParisTech

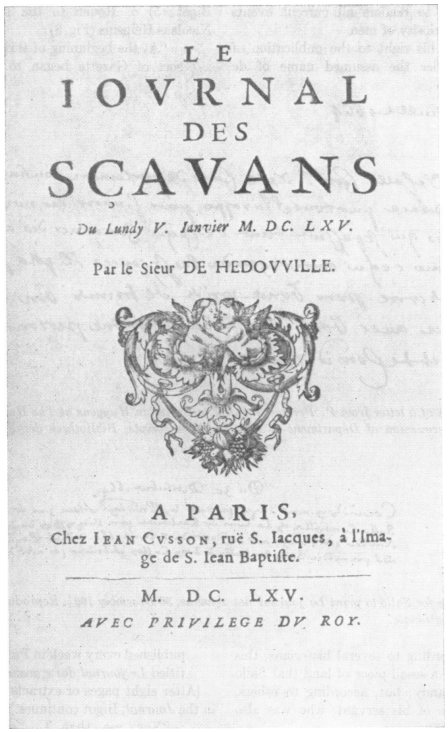
2014-01-16

Nicolas Limare
CMLA, ENS Cachan, FR
IPOL — Image Processing On Line
http://www.ipol.im/

Outline

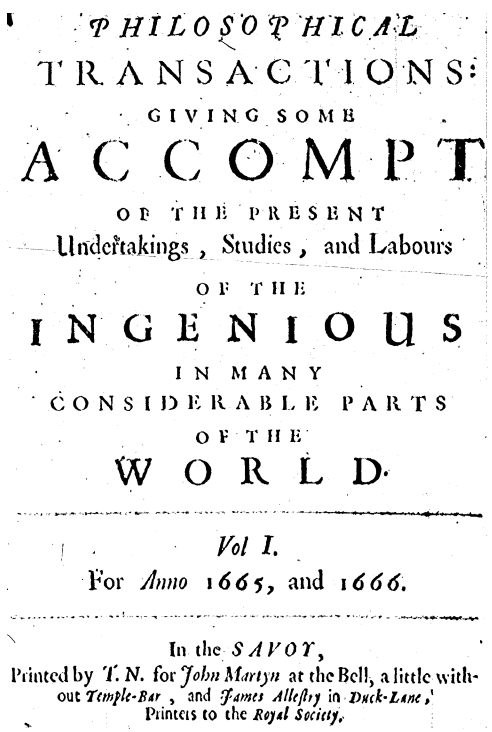
- Research articles *vs*. research software : complementarity and differences.
- Place of the IPOL Journal in this context : features, editorial model and choices, activity and benefits.
- Hands-on overview of what IPOL has and how it works.

Journals



LE
IOVRNAL
DES
SCAVANS
Du Lundy V. Ianvier M. DC. LXV.
Par le Sieur DE HEDOVVILLE.

A PARIS,
Chez IEAN CVSSON, ruë S. Iacques, à l'Image de S. Iean Baptiſte.
M. DC. LXV.
AVEC PRIVILEGE DV ROY.



PHILOSOPHICAL
TRANSACTIONS:
GIVING SOME
ACCOMPT
OF THE PRESENT
Undertakings, Studies, and Labours
OF THE
INGENIOUS
IN MANY
CONSIDERABLE PARTS
OF THE
WORLD.

Vol I.
For *Anno* 1665, and 1666.

In the *SAVOY*,
Printed by *T. N.* for *John Martyn* at the Bell, a little without *Temple-Bar*, and *James Allestry* in *Duck-Lane*,
Printers to the *Royal Society*.

Journals are still the way scientific knowledge is shared, validated, collected and and organized.

- 1665 : *Philosophical Transactions of the Royal Society* & *Journal des sçavans*
- 2010 : 25400 journals in science, tech & medicine, total 50 million articles published since 1665

What is the place of software ?

How Software and Articles Relate

"*Basically,* ***software is the specification*** *for how the software is supposed to work. And* ***anything less than the specification doesn't really tell you anything*** *about how it's ultimately going to behave. And that just makes software really, really hard.*" — Douglas Crockford

"*I don't think a program is finished until you've written some reasonable documentation. And I quite like a specification. I think it's unprofessional these people who say, 'What it does? Read the code.'* ***The code shows me what it does. It doesn't show me what it's supposed to do.***" — Joe Armstrong

Peter Seibel, Coders at Work: Reflections on the Craft of Programming

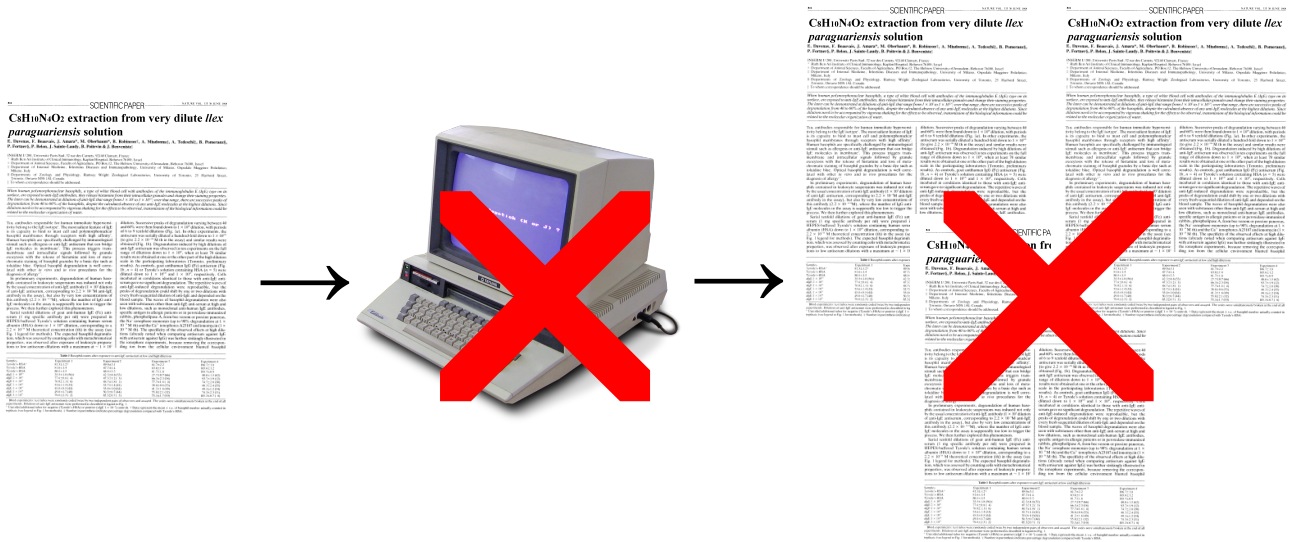
→ software and articles are complementary:

- text and figures in an article describe, explain, illustrate and put in context
- software source code provides all the details and converts the theoretical algorithm into a practical tool

~~Reproducible~~ Usable Research

Without the software, one can not

- reproduce
- verify
- compare
- reuse
- extend
- share

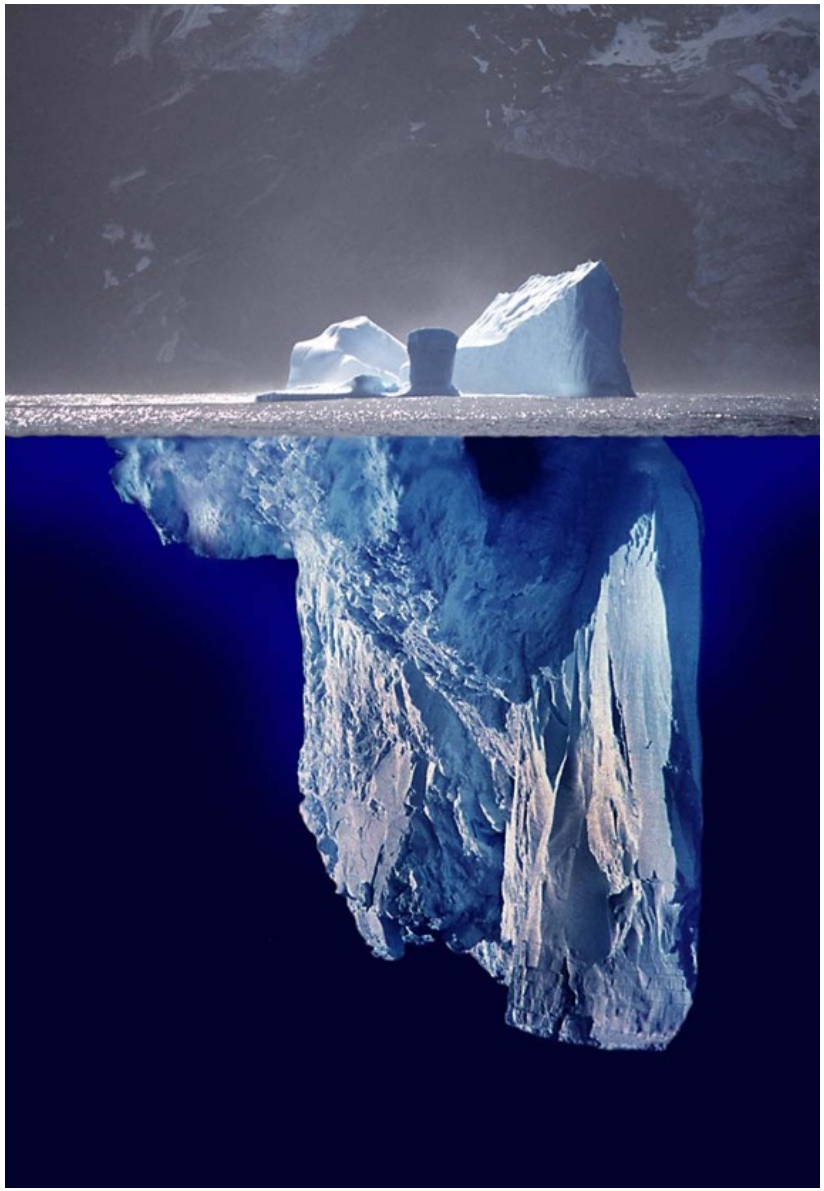


Applied math articles without software are like dead-ends.

Communication *vs.* Science

communication

science



article

software
data
parameters
pre/post processing
visualisation
...

© Uwe Kils

Software in Image/Signal Processing

- Personal & lab web pages, cf. Xin Li's R*eproducible Research in Computational Science* (500+ links)
- Free software libraries, cf. VTK, CGal, DGtal, etc.
- External repos like Runmycode, Insight, Astrophysics source code library, etc..
- Supplementary materials in some journals

Problems :

- Not mandatory
- No editorial control

Issues with Real-World Research Software

Other people's software is

- not released
- not archived
- not usable
- not readable
- different from the article
- obsolete
- buggy

Our software is

- not known enough
- not used enough
- not used correctly
- not cited
- not counted as a research activity
- too expensive to clean-up

… and vice versa :-)

Science Code Manifesto

- **All source code** written specifically to process data for a published paper **must be available** to the reviewers and readers of the paper.
- **The copyright** ownership **and license** of any released source code **must be clearly stated**.
- **Researchers** who use or adapt science source code in their research **must credit the code's creators** in resulting publications.
- **Software** contributions must be included in systems of scientific **assessment, credit, and recognition**.
- **Source code must remain available**, linked to related materials, for the useful lifetime of the publication.

http://sciencecodemanifesto.org/

Code = Article

- **All source code must be available**.
- **The copyright and licence must be clearly stated**.
- **Researchers must credit the code's creators**.
- **Software assessment, credit, and recognition**.
- **Source code must remain available**.

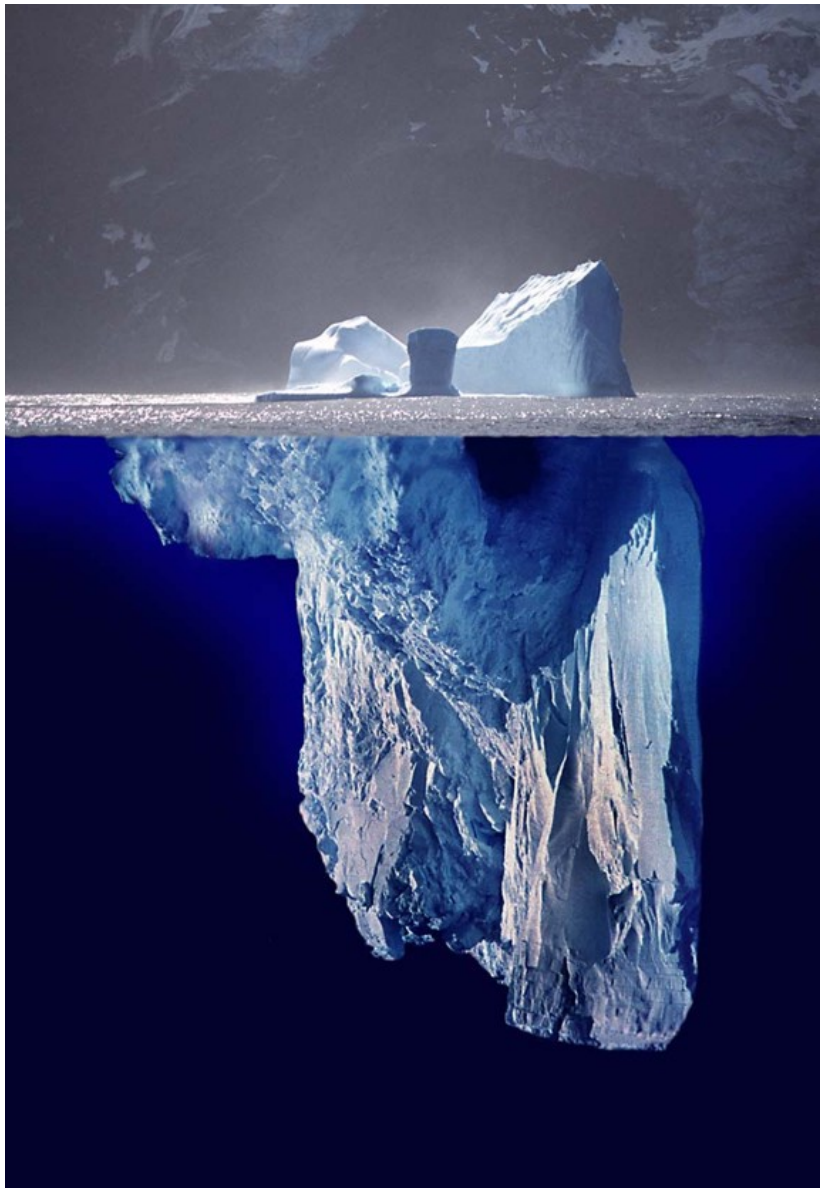
→ Research code must be managed like research articles.

=

SCIENTIFIC PAPER

$C_8H_{10}N_4O_2$ extraction from very dilute *Ilex paraguariensis* solution

Communication *vs.* Science



IPOL
IMAGE PROCESSING ON LINE

article

software — PUBLISHED

data
parameters
pre/post processing
visualisation
...

PROVIDED WITH THE ARTICLE+SOFT

IPOL: Image Processing On Line

http://www.ipol.im/

IPOL is a **research journal** of image processing and image analysis. Each article contains a text describing an **algorithm** and **source code**, with an **online demonstration** facility and an **archive** of online experiments. The text and source code are **peer-reviewed** and the demonstration is controlled. IPOL is an **Open Science** and **Reproducible Research** journal.

+

Universitat de les Illes Balears

IPOL: Image Processing On Line

Journal

- editorial project and comitee
- review and validation process with editors and reviewers
- ISSN and DOI registration, scholarly citation indexation
- since 2010
- open access

Software

- mandatory implementation for every article
- software is read, tested, verified and published
- software review focuses on
  - text/code matching
  - readability and documentation
- editorial rules on language, dependencies, packaging, portability, etc.
- free software license

Software in IPOL

- Review and validation by the journal is not a warranty of formal correctness
- Software guidelines are ad-hoc, for this research community and the goals of the journal

- IPOL published algorithms and their implementation, not software
- IPOL is not a software library
- IPOL is not a software development or diffusion service ; updates are elsewhere

Web Demo and Archive

- direct and open access to the algorithms
- real-time server-side processing of free data
- using the code reviewed and published
- public archive of experiment on original data

→ verification the content of the article

→ quick test of an algorithm before further work

→ experimental exploration of an algorithm: multiple parameters and/or input data

→ robustness assessment over a large input sample

→ feedback from the readers/users

Impact/Activity

- since 2010:
  - 52 articles published
  - 25 public preprints
  - 200+ citations (cf. Google scholar...)
  - 75000 demo archives (170G, 1500 archives/demo)
- statistics 2013:
  - 130000 visits
  - 15000 downloads of code or data
  - 60000 demo experiments, 30000 on original data

Conclusions

- towards *software as science*, included in the scientific publication system
- putting software online in not enough ; it must be *published* with a controlled editorial process
- open web demo is surprisingly useful
- new impact factors, beyond citations and beyond the research community : number of downloads, number of experiments
- IPOL is also a new way to work, communicate and collaborate : easy exchange with colleagues, showcase for other submissions, packaged archival of one's work, interactive teaching material

IPOL: Contacts

http://www.ipol.im/
edit@ipol.im
discuss@list.ipol.im
@IPOL_journal