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Tooling around

Our dependency on software

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Style of labnotes & publication from 1850-2000
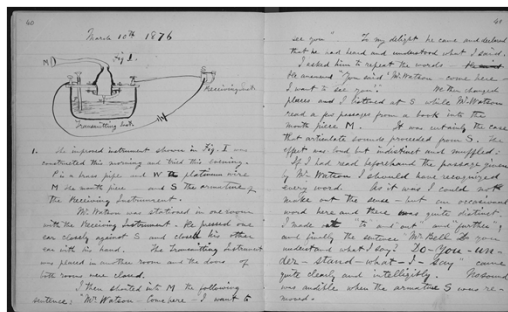
Digital hardware-late 1990s ed.

Software-big role for acceleration in science

- Office suite: Manuscripts, Grant applications, Analyses, Reviews, Email
- Servers (Data storage, Upload)
- Software that drives lab hardware (PCR cycler, scanner for western blots, microscopy)
- Digital libraries (PubMed, Genbanks, …)
- Helper software (stand alone or online)

Basic software tools for researchers

Essential

- Office Suite
  - Word processor
  - Spreadsheet
  - Screen Presentation
- Reference Manager
- Image Editing Software

Good to Have

- Statistical Software
- Vector Graphics Editor

Better to Have

- Strategy for note taking, organizing, archiving
- Strategy for backup /prevention of data loss

Types of Software (licenses)

1. Commercial Software
2. Freemium Software
3. Freeware
4. Open Source

Which type of software am I going to use now and in the future ?

Things you run into

- Software/Tools in your research environment changes (microscopy, mol bio)
- Software/Tools is not really fit-for-purpose
- You use only a small fraction of a software package for one specific function
- The software you need is not available at your institution

Obsolete Office Packages
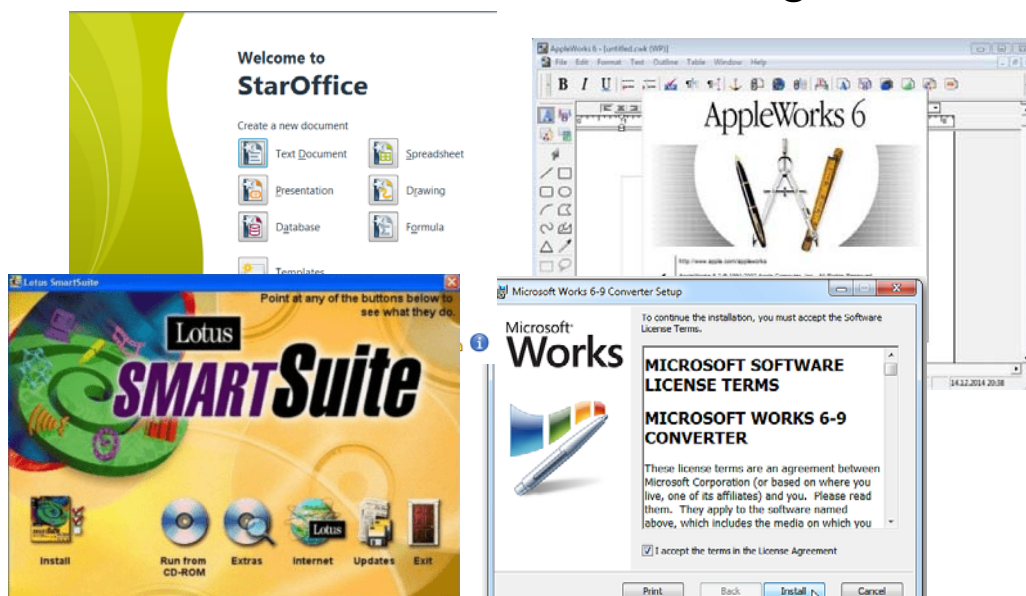
MS Word 1995-2016...same,same but different
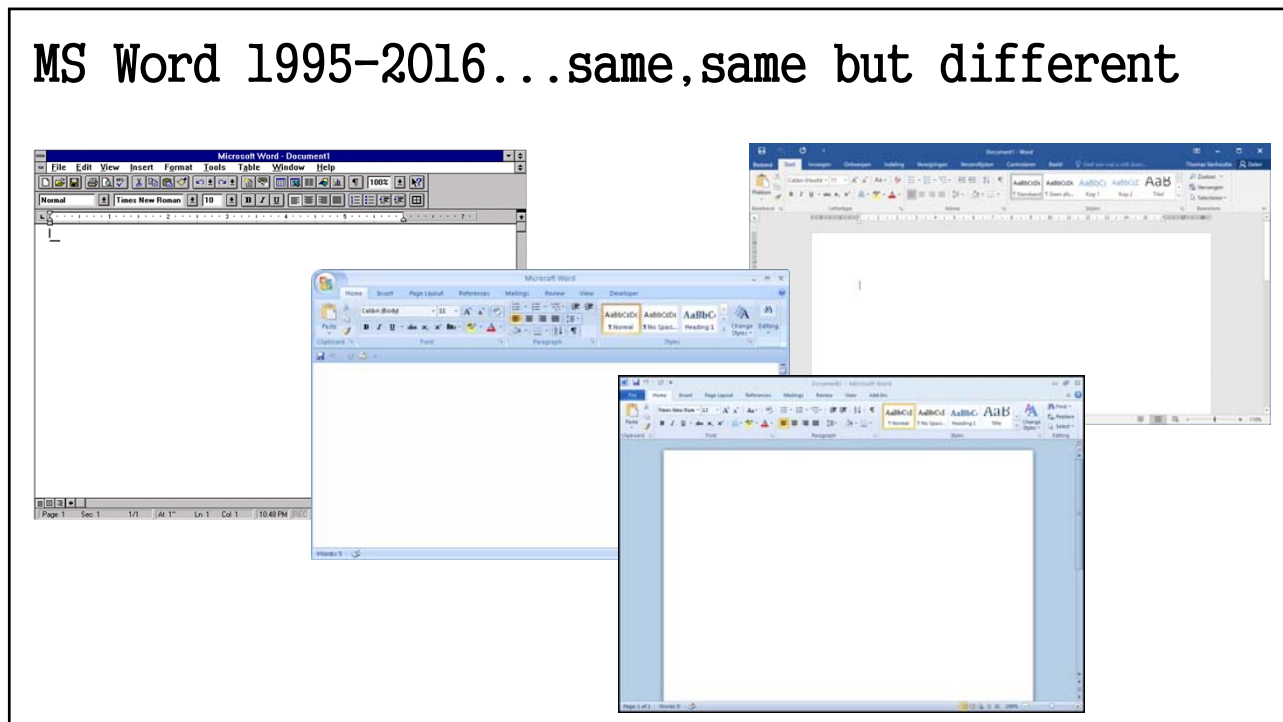
Questions before committing to a (propriatory) software

- How long has the software been around (versions, update cycles) ?
- How much does one licence cost for home use /academic version ?
- What are export and import formats exist? Are they useful to transfer your data to a competing product? Can I obtain raw data ?

Questions before committing to a (propriatory) software

- Is/are there user forums dedicated to this software? How current are entries/verions users use ?
- Are there YouTube videos for certain functions ?
- Are there non-propriatory alternatives ?

Basic software (propriatory)

Essential

- Office Suite (Microsoft Office)
  - Word processor (Word)
  - Spreadsheet (Excel)
  - Screen Presentation (Powerpoint)
- Reference Manager (Endnote)
- Image Editing Software (Adobe Photoshop)

Good to Have

- Statistical Software (SPSS, SAS)
- Vector Graphics Editor (Adobe Illustrator)

Better to Have

- Strategy for note taking, organizing, archiving (MS OneNote)
- Strategy for backup /prevention of data loss (Google, Apple, Amazon Cloud service)

When committing to non-propriatory…

- What is the software licence ?
- Does the software run on multiple platforms (incl. Linux) ?
- Is it open source /code on GitHub ?
- Is there a good documentation? Can you contact the developer?
- Are there proriatory alternatives? Comparable functionality?
- Do not rely on free online Tools

Basic software (non-propriatory)

Essential

- Office Suite (Apache OpenOffice. WPS Office Suite)
  - Word processor
  - Spreadsheet
  - Screen Presentation (GoogleDrive)
- Reference Manager (Zotero, Mendeley, JabRef)
- Image Editing Software (GIMP, Photoscape, Paint.NET)

Good to Have

- Statistical Software (R Project)
- Vector Graphics Editor (Inkscape, Gravit, Vectr)

Better to Have

- Strategy for note taking, organizing, archiving (Evernote, Google Keep, NAS-specific Note Station)
- Strategy for backup /prevention of data loss (Dropbox, Google Drive, Apple, Amazon Cloud service)

René's four rules for researcher software use

Rule 1: The tools you use today are likely your tools tomorrow
- if you made a meeting poster in PPT, you will always use PPT
- if made a figure for publication in Photoshop, you will most likely use PS over and over again

Rule 2: You'll remember your tools but you will have forgotten how to use them
- Write down your workflows
- Download that youtube video that explained the use

Rule 3: The older you get, the more reluctant you will be to try out new tools
- Couch is just more comfortable

Rule 4: Learn how to code and you can set your own rules.
- This skill will make you more valuable and successful than your peers

Academic writing

Google Documents

- Simplistic interface
- Free and syncs across devices
- Sharing (anyone with email address) view/edit
- Editing in real-time
- Chat & comment option
- Useful Addons (F1000 Workspace)
- instantly saved online / offline working option

Google Doc Example

3 working modes

Builtin searchbar;
Results are instantly
citable as footnotes

F1000 Addon = Full Citation Manager

Multiple resources for citations

Dynamic citation links

Overleaf

- Uses **LaTeX** as document preparation system (plain text with commands; similar to HTML editor)
- True WYSIWYG output, layout of images and tables
- Good for building large documents, like thesis
- Import option for bibliographies
- Journal templates – direct submission (ORCID signin)

Overleaf Template & Plans

Problem: Track changes can make Word documents almost unreadable

Draft(s) - Side by Side

Draft

🏠 DRAFT

- Various import functions (Gdrive, Dropbox, Evernote, FTP)
- Commenting out function for not used text
- Transcription of podcasts, video presentations, and interviews (YouTube, vimeo)
- Create simple presentations, checklist within a doc
- Also for making blog entries and websites (CSS support)
- Social analytics reports

Draft improves your writing

🏠 DRAFT

Bot analyzes text for redundancies

Writefull

- provides feedback on writing by checking your text against databases of correct language
- DB: Google Books, Google Scholar, Google News, Google (in 9-36 languages)
- can be activated in any tool like Word, Outlook, TextEdit
- Writefull's search bar
- Completely free of charge
- For MacOSX, Windows and Linux! – http://writefullapp.com

Writefull

studies have _ that	
Books, Scholar, News, Web	
studies have shown that	56%
studies have demonstrated that	10%
studies have found that	8%
studies have indicated that	8%
studies have suggested that	7%
studies have revealed that	3%
studies have reported that	2%
studies have confirmed that	2%
studies have concluded that	1%
studies have established that	1%
studies have documented that	1%
studies have noted that	<1%
studies have determined that	<1%

Missing word in context

a *vivid* experience	
Books, Scholar, News, Web	
a memorable experience	28%
a rich experience	25%
a powerful experience	14%
an intense experience	14%
a vivid experience	8%
a dramatic experience	6%
a stirring experience	2%
a realistic experience	2%
a gay experience	1%
a pictorial experience	<1%
a picturesque experience	<1%
a lifelike experience	<1%
a graphic experience	<1%

Synonyms in context

growing concern vs increasing conce	
Books, Scholar, News, Web	
growing concern	63%
increasing concern	37%

Examples from the Wikipedia:

ends at home, and their **growing concern** for him. Elizabeth McGo
960s. Since the 1970s, **increasing concern** for animal welfare led
wide, internet safety is a **growing concern** for both children and ac
materials becomes an **increasing concern** . Increase in the sophis
f 10 April, 2014, There is **growing concern** in Cameroon for the infl
tients have become an **increasing concern** for emergency nurses.
marine mammals are of **growing concern** . The effects can be botl
ter 1913. In 1940, with **increasing concern** about national security
?004[update], there was **growing concern** by many technology prc
Nations has expressed **increasing concern** at "the humanitarian ir

Comparison of two chunks

REF-N-WRITE

REF-N-WRITE
LOOKUP AND LEARN

- Aimed at people struggling with academic writing, non-native English speakers and beginner writers
- Microsoft Word Add-in
- Import ref material for full tex search within Word
- Lookup for language ideas and paraphrases
- Have your documents read out to you
- Recycle your own text while reducing self-plagirism
- 30 £ per license

Four useful services on the web

- **NaCTeM Service Systems (**http://www.nactem.ac.uk/services.php**)**
- **NCBI services (**https://www.ncbi.nlm.nih.gov/gquery/**)**
- **Protocols.io (**http://blogs.plos.org/plos/2017/04/protocols-io-tools-for-reproducibility/**)**
- **LabWorm (**http://labworm.com**)**

The act of creating scientific knowledge
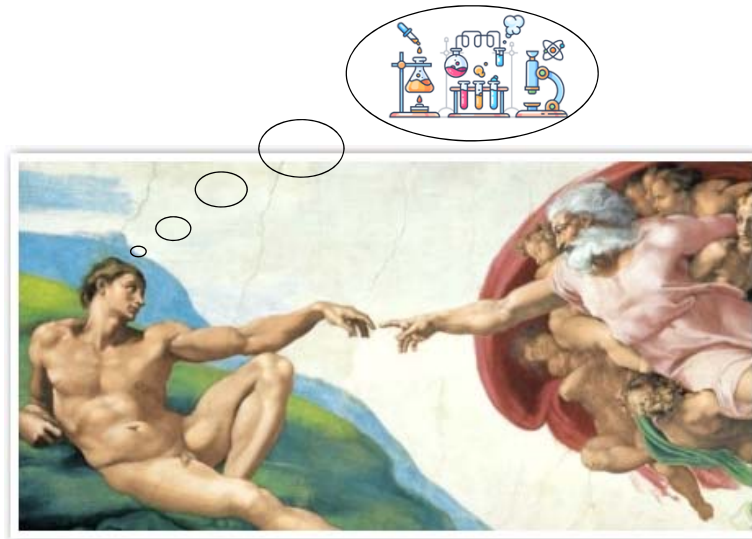
Required skill: Creativity

- Needed for research proposal, grant applications, research publications, experimental designs, teaching, …
- Basic German Law, Article 5 (3): Arts and sciences, research and teaching shall be free.
- Natural human curiosity and motivation are driving force
- How do scientist decide what to study?

Art of the soluble

- Figuring out which questions are solvable through scientific investigation, and then figuring out the solutions to those questions
- Break big problems into smaller ones that are solvable
- Figure one which of the smaller ones could lead to a breakthrough
- Image in advance possible outcomes of different observations
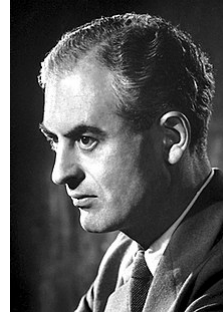
Peter Medwar;
biologist,
Nobel Prize
winner 1960

Logical thinking

- Logical thinking is always a part of the creative process
- What if...? (logically thinking through consequences)
- Just like artists: Scientists have to use their imagination to come up with well-informed explanations
- Result is a rigorously tested story that makes sense at current knowledge base

Observation skills

- E.g. Mendels experiments with garden peas; about heredity of traits
- Creativity involves abstraction – models, model organisms..
- Observe and document
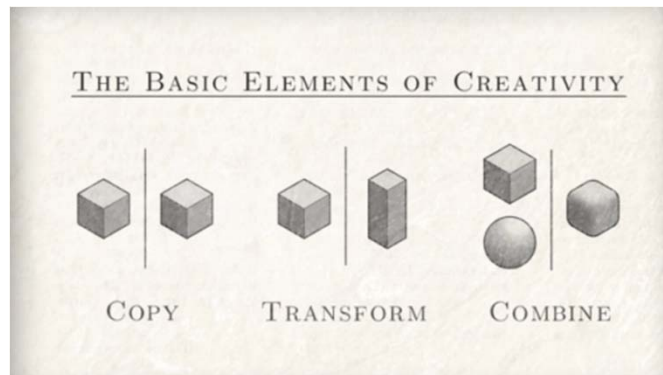- Mentally carve away some of the complexity to reveal simple principles

Source: http://www.mendelweb.org

Develop your own scientific creativity

- Break down a very big question into more manageable part
- Take advantage of your background knowledge to think creatively about the answers to smaller questions
- Reading the literature; become familiar with materials, visit talks, posters, symposiums; talk to experts; visit patient groups
- New knowledge can be generated only if you know the current state
- Gain expertise in related or others fields and research techniques
- Develope a routine: every Friday I catch up with the literature, ...write on a grant, ...manuscript...

https://www.visionlearning.com/en/library/Process-of-Science/49/Creativity-in-Science/182

The most dramatic results can happen when ideas are combined. By connecting ideas together, creative leaps can be made, producing some of history's biggest breakthroughs." ~ Kirby Ferguson

Creativity isn't magic: it happens by applying ordinary tools of thought to existing materials. And the soil from which we grow our creations is something we scorn and misunderstand even though it gives us so much — and that's… copying." ~ Kirby Ferguson

TED Talks about creativity

- Kirby Ferguson: Creativity is a remix - https://www.youtube.com/watch?v=zd-dqUuvLk4

- David Kelley: How to build your creative confidence - https://www.ted.com/talks/david_kelley_how_to_build_your_creative_confidence/transcript#t-83946