

Emacs Org-mode

A scientist's take
on planning, note-taking,
documentation, and publishing
using plain text files

by Carsten Dominik

<http://orgmode.org>

Org-Mode?

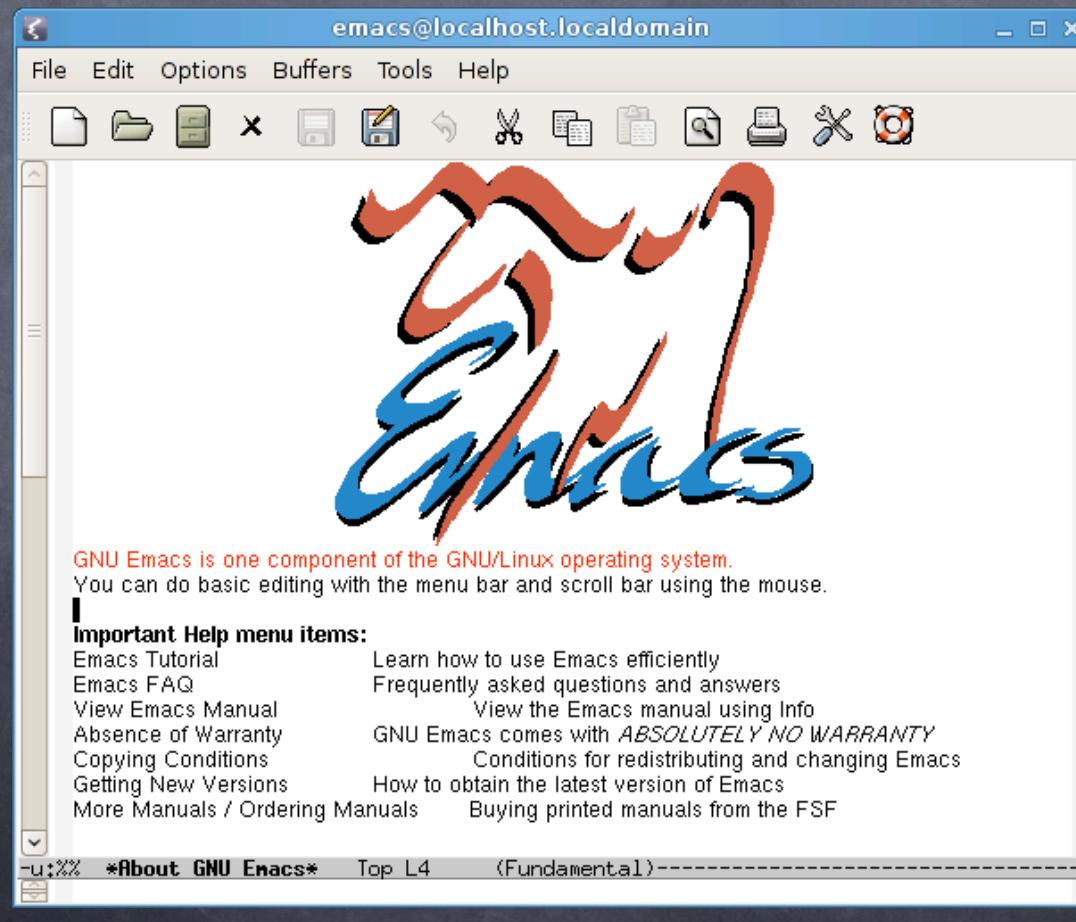
What kind of a name is that??

- ⦿ Org-mode is a system for ORGanizing and tracking nearly everything in your life, both private and professional
- ⦿ Org-mode is a MAJOR MODE in the Emacs Editor



OK OK, one step back!

What is Emacs?



What is Emacs?

- ⦿ Emacs is an Editor for text files
- ⦿ While it has mouse commands,
it is at its best with keyboard commands
- ⦿ Self-documenting
- ⦿ Highly customizable
- ⦿ Highly expandable
- ⦿ Modes (Major and Minor)



Why Emacs as Org-mode Base?

- ⦿ Emacs is old, but still heavily used among scientists and programmers
- ⦿ Ultra-portable platform for running code like a Java virtual machine
- ⦿ Many other useful systems run in Emacs: Mailers, Newsgroup Readers, even web-browsers.
This is good for integration of a note-taking system without relying on a vendor like Apple to do it for you



Working with Text Files? That is so 1970s! Or is it?

- ⦿ The only truly portable format,
read and edit anywhere, anytime
- ⦿ Never get locked into proprietary software
or file formats
- ⦿ Can be easily processed with other tools
- ⦿ Problem-free history with version control



Org-mode as an outliner

- ⦿ Almost everything that has to be structured can be represented as an outline
- ⦿ Org-mode makes capturing, writing, editing, and restructuring information and notes very simple
- ⦿ Outlines are also the basic structure of books, scientific papers, and presentations

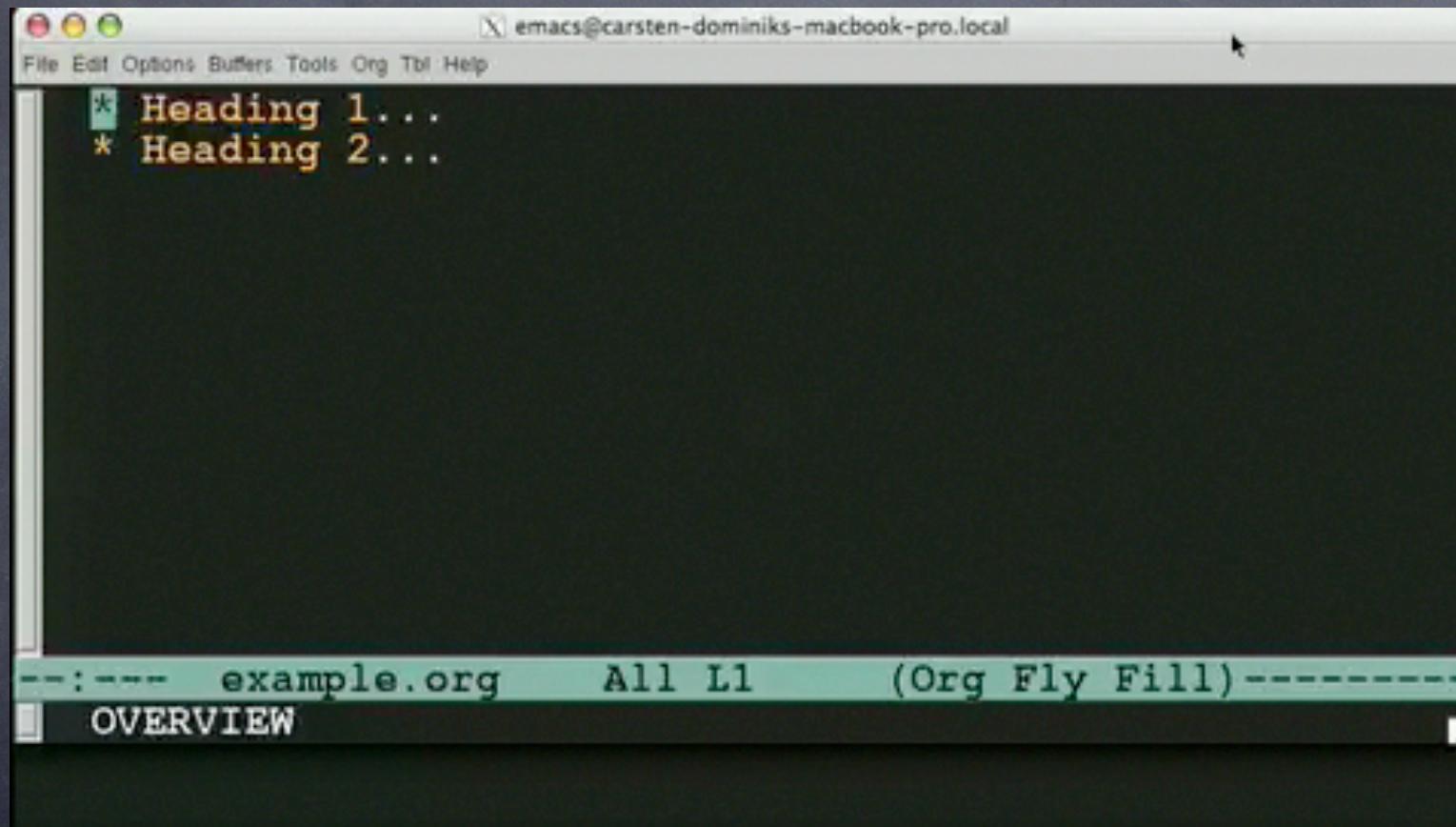


Outline - Keys

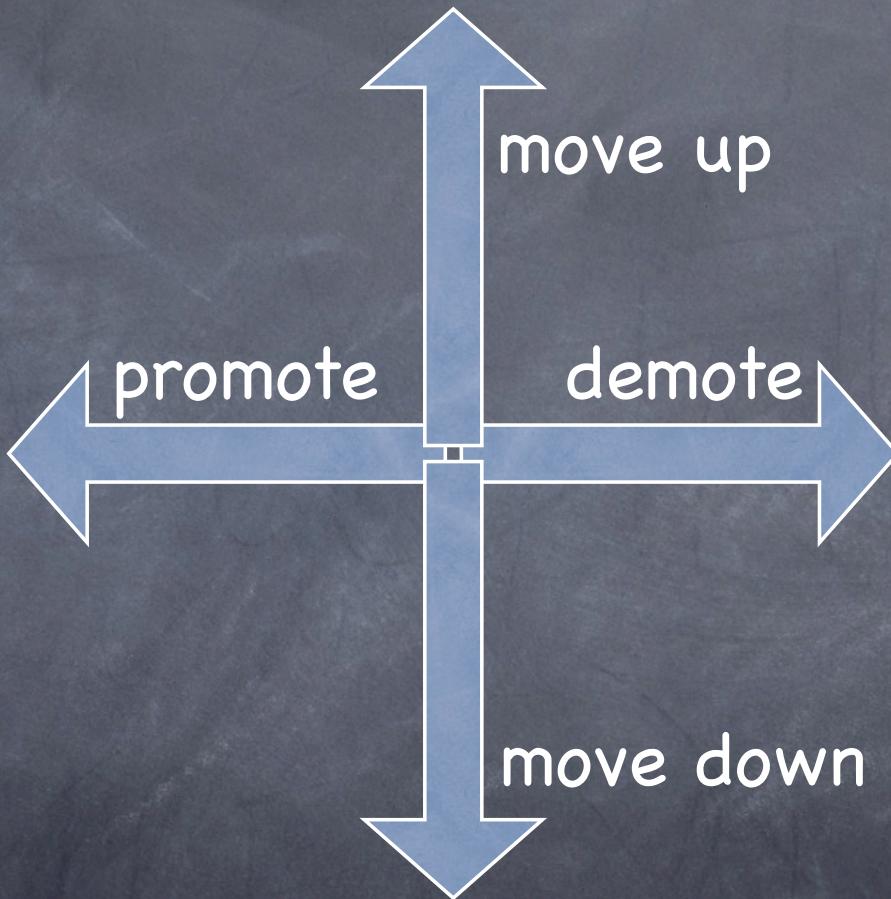
Action	Key
Cycle subtree	TAB
Cycle globally	S-TAB



Visibility Cycling with TAB and S-TAB



Restructuring without Cut&Paste



Hold down Meta or M-S
while using cursor keys



Structure Editing

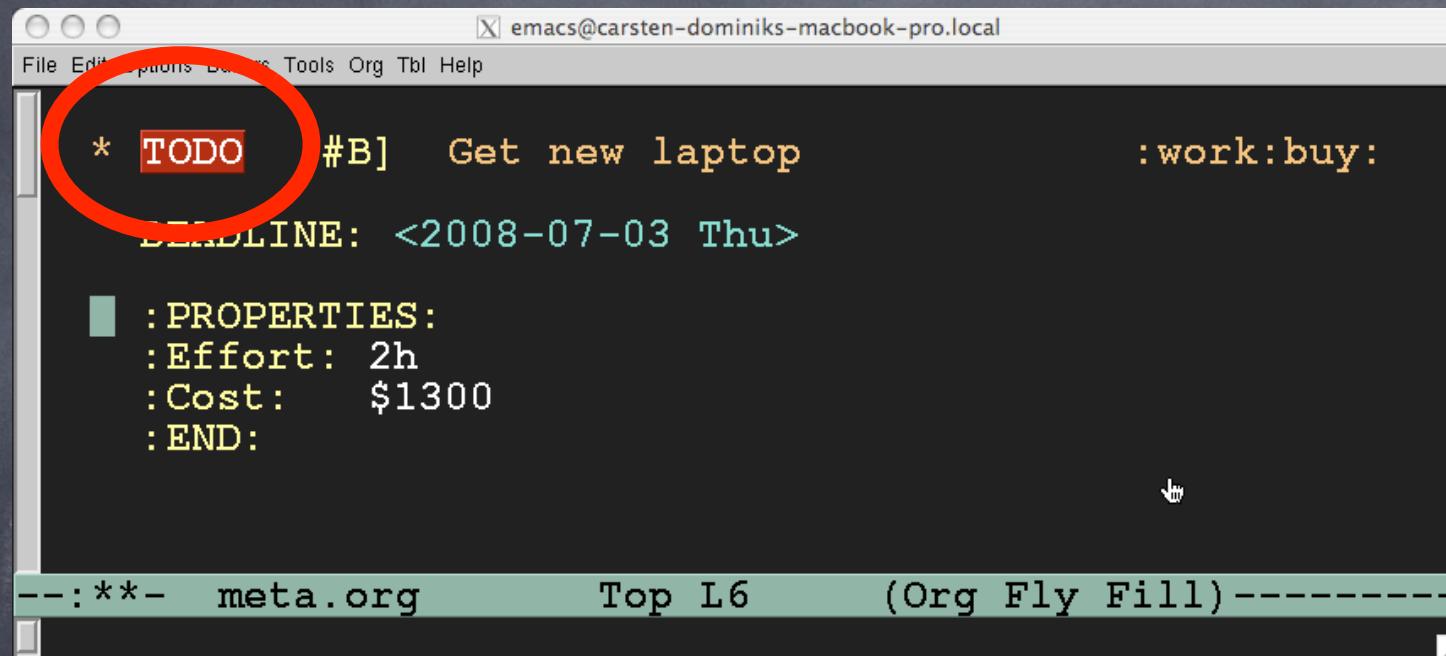
```
Demonstration of Structure Editing

* headline 1
* headline 2...
* headline 3
* headline 4...
* headline 5
```

---:--- sedit.org All L14 (Org Fly Fill)-----



Meta Data



The screenshot shows an Emacs window titled "emacs@carsten-dominiks-macbook-pro.local". The buffer displays an Org mode entry:

```
* [TODO] #B] Get new laptop :work:buy:  
  DEADLINE: <2008-07-03 Thu>  
  
  :PROPERTIES:  
  :Effort: 2h  
  :Cost: $1300  
  :END:
```

A red circle highlights the "[TODO]" status indicator. The bottom of the window shows the footer: "--:***-- meta.org Top L6 (Org Fly Fill) -----".

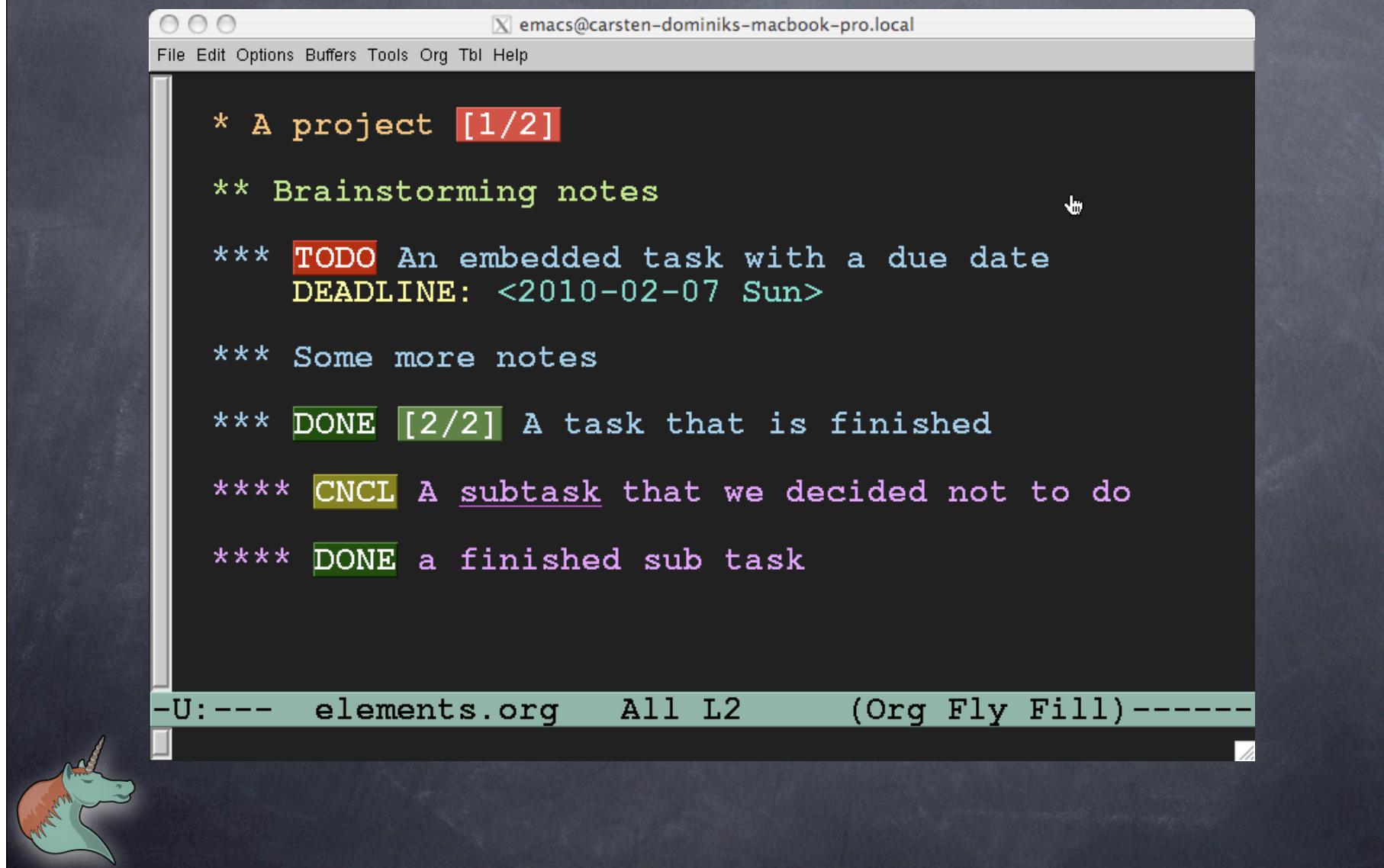


Hyperlinks

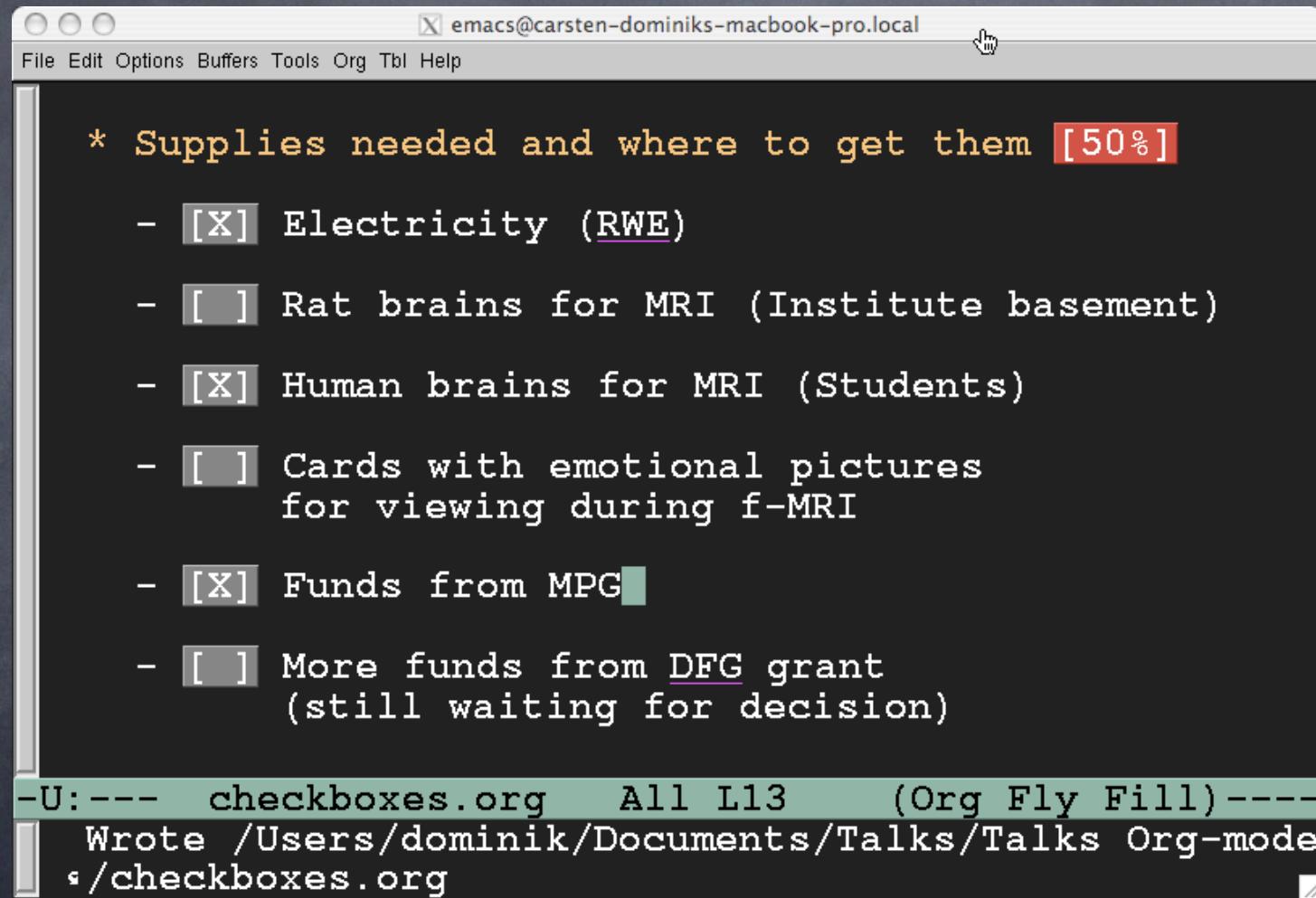
- ⦿ <http://www.astro.uva.nl/~dominik>
- ⦿ <file:/home/dominik/images/jupiter.jpg>
- ⦿ <file:papers/last.pdf>
- ⦿ <docview:papers/last.pdf::25>
- ⦿ [id:B7423F4D-2E8A-471B-8810-C40F074717E9](#)
- ⦿ [news:comp.emacs](#)
- ⦿ <mailto:adent@galaxy.net>
- ⦿ [vm:folder#id](#)
- ⦿ [wl:folder#id](#)
- ⦿ [mhe:folder#id](#)
- ⦿ [rmail:folder#id](#)
- ⦿ [gnus:group#id](#)
- ⦿ [bbdb:R.*Stallman](#)
- ⦿ [irc:/irc.com/#emacs/bob](#)



Embedded tasks



Checkboxes



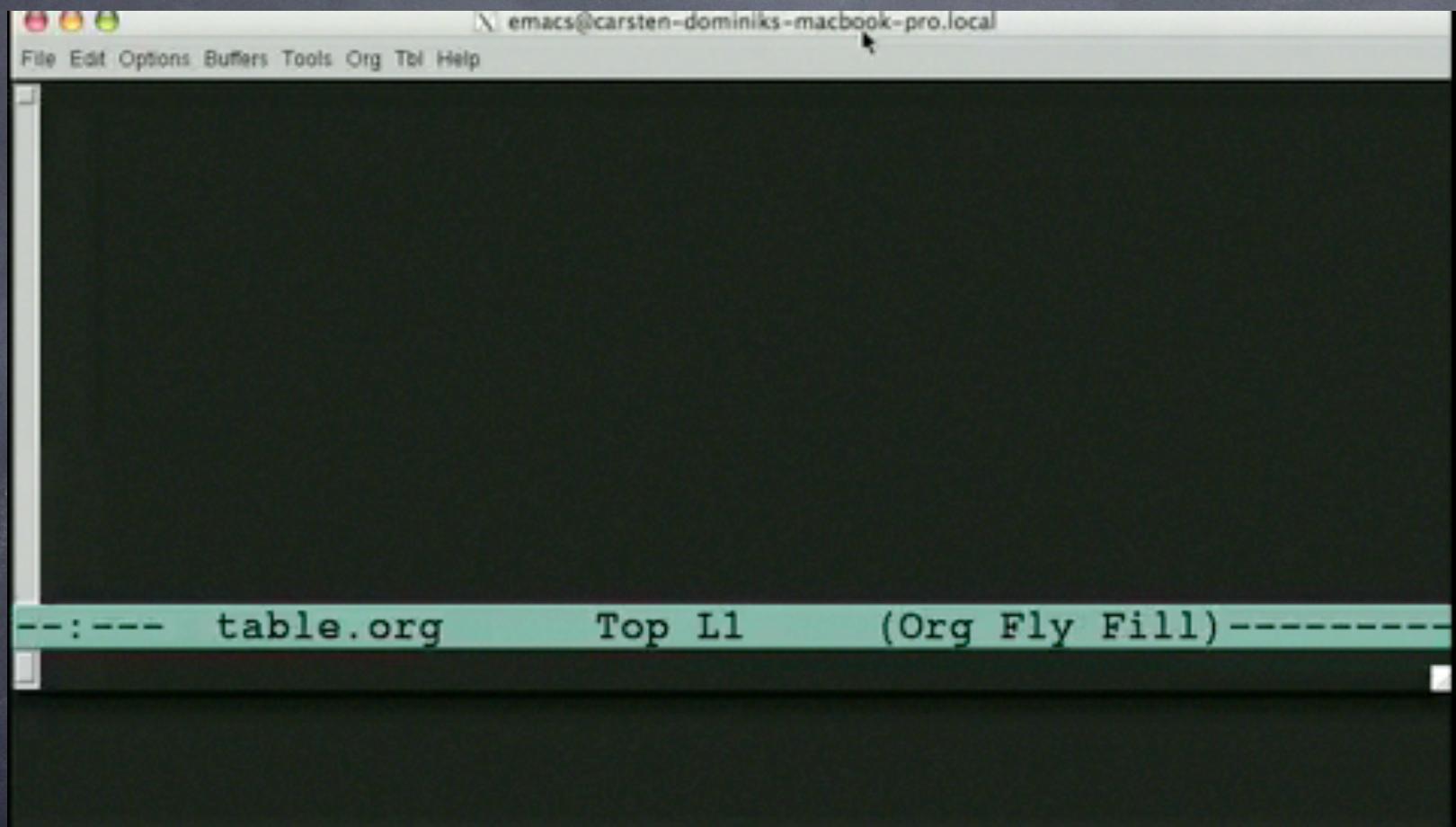
The screenshot shows an Emacs window titled "emacs@carsten-dominiks-macbook-pro.local". The menu bar includes "File", "Edit", "Options", "Buffers", "Tools", "Org", "Tbl", and "Help". The main buffer displays an Org-mode list:

- * Supplies needed and where to get them [50%]
 - [X] Electricity ([RWE](#))
 - [] Rat brains for MRI (Institute basement)
 - [X] Human brains for MRI (Students)
 - [] Cards with emotional pictures
for viewing during f-MRI
 - [X] Funds from MPG
 - [] More funds from [DFG](#) grant
(still waiting for decision)

The status bar at the bottom shows "-U:--- checkboxes.org All L13 (Org Fly Fill)---" and "Wrote /Users/dominik/Documents/Talks/Talks Org-mode /checkboxes.org".



Tables



Example File: Meeting Notes



```
emacs@carsten-dominiks-macbook-pro.local
File Edit Options Buffers Tools Org Tbl Help
NOTES      -*- mode: org -*-

#+OPTIONS: H:3; num:t; toc:t; {n:nil; @:t; /:t; ^:t; *:t; TeX:t
#+STARTUP: indent
#+INFOJS_OPT: view:info toc:t ltoc:t path:http://orgmode.org/org-info.js

* ALMA
  1mm about 30 arseconds field of view, scales as 1/\lambda
  Alma http://www.eso.org/sci/facilities/alma/observing/tools/etc/index.html

* Disk and dust miniworkshop in Garching...
* NOVA science meeting Utrecht <2010-01-07 Thu>...
* ISM/CSM meeting <2009-10-08 Thu>...

* Astrochemistry Kickoff NWO <2009-10-07 Wed>
  #+OPTIONS: num:nil

  * My thoughts:...
  * 14.10-14.40 Astrochemistry: An astronomical view by Prof. dr. Ewine van Dish...
    * TODO Astrochemistry, what is it?...
  * 14.40-15.10 Astrochemistry: A view from chemistry by Dr. ir. Gerrit Groenenbe...
  * 15.10-15:30 Short five-minute presentations...

  * 16:25-16:45 Prof. dr. Xander Tielens Toward a Dutch Astrochemical Network: p...
    * DONE Write the proposal
  * 17.00-17.30 Identification of possible themes...
  * 17.30-18.00 Break (soup, sandwiches)...
  * 18:00-19:00 Discussion in subgroups on themes...
  * 19:00-19:30 Synthesis of themes and follow-up steps toward an astrochemistry...

* CO meeting <2009-08-31 Mon>...
* Dynamics of Disk and Planets <2009-08-17 Mon>--<2009-08-21 Fri>...
* HS3F/HEXOS Toulouse <2009-05-25 Mon>--<2009-05-28 Thu>...
* EARA workshop Leiden <2009-03-16 Mon>--<2009-03-20 Fri>...

* MTRI meeting <2008-12-11 Thu>
-U:--- meetings.org Top L6 Git:master (Org Ind Fly Fill)-----
Wrote /Users/dominik/org/meetings.org
```

Example TODO List



```
emacs@carsten-dominiks-macbook-pro.local
File Edit Options Buffers Tools Agenda Help
TEACHING: TODO Reduce some stuff in the lectures
TEACHING: TODO Put in more little calculations
TEACHING: TODO
TEACHING: TODO Look at the setup and plan your lectures
gtd: TODO Write Hi
gtd: WAIT Tell Gis about Astronelles latest paper, needs optically thin,
gtd: TODO Check vtherm
gtd: TODO Send Kees an example excercise with answer block
gtd: TODO Organize April meeting!
gtd: TODO deadline NWO Vrije competitie
gtd: TODO Define finishing dates for master students and put them into ,
gtd: TODO Formulate Bachelor projects
gtd: TODO Ringberg 14-18 June, check this
gtd: WAIT Ask Paul Sexton about copyright
gtd: TODO Top-grants
gtd: TODO Open competition NWO
gtd: TODO Reply about the exoplanet book, and about the star and planet,
gtd: TODO React on this email
gtd: TODO Peace and War, the omnibus edition
gtd: TODO Contact Marc Spij about NOVA project
gtd: TODO launching disk winds in thermal way?????
gtd: TODO Idea: magnetic fields slashing out gas and dust.
gtd: TODO Organize phone conferences with Sebastia :cecilia:
gtd: PROJ Write new Syllabus planetenstelsels
gtd: PROJ Write new Syllabus star and planet formation
gtd: PROJ What Try out SWIFT, see if we can get it to run
gtd: TODO Figure out how to compile it, and then do compile it
gtd: TODO Find a student to work with it
gtd: TODO Wecker kaufen :buy:
gtd: PROJ Implement org-capture.el
gtd: TODO Make hidden stars intangible, at least with indent-mode
gtd: TODO Uniquify outline path when completing for refile
gtd: TODO Write a page about Org security risks
--: -*- *Org Agenda* 14% L32 (Org-Agenda Week Grid Habit)-----
```

Example Agenda



```
emacs@carsten-dominiks-macbook-pro.local
File Edit Options Buffers Tools Agenda Help
Week-agenda (W05-W06):
Sunday    7 February 2010
  gtd:      Sched.14x:  TODO Check vtherm
  gtd:      Sched. 7x:  WAIT Tell Sjjs about Antonellis latest paper, needs o:
  gtd:      Sched. 7x:  TODO Send 0-0-0 an example excercise with answer block
  gtd:      Scheduled: TODO Organize April meeting!
  gtd:      In  8 d.:  TODO deadline NWO Vrije competitie
  gtd:      In  8 d.:  TODO Top-grants
  gtd:      In  8 d.:  TODO Open competition NWO
  gtd:      In 10 d.:  TODO Formulate Bachelor projects
Monday    8 February 2010 W06
  Ann:      *Colloquium (11:00-12:00)*
Tuesday   9 February 2010
  TEACHING: 9:00..... Hoorcollege Planetenstelsels Amsterdam
  gtd:      Scheduled: TODO Ringberg 14-18 June, check this
  gtd:      Scheduled: TODO Reply about the exoplanet book, and about the st:
  gtd:      Scheduled: TODO React on this email
Wednesday 10 February 2010
  Ann:      *Vennick Wellink (15 Jahre)*
Thursday   11 February 2010
  TEACHING: 9:00-11:00 Hoorcollege Star and Planet Formation
  TEACHING: 11:00..... Werkcollege Planetenstelsels Amsterdam
  TEACHING: 11:00-13:00 Werkcollege Star and Planet Formation
Friday     12 February 2010
Saturday   13 February 2010
  Ann:      *Bachelor excercises (10-12 hrs)*
--:;%*- *Org Agenda* All L6 (Org-Agenda Week Grid Habit)-----
  Rebuilding agenda buffer...done
```

Tracking Scientific Projects

What can be done in a single document?

- ⦿ notes, notes, notes
- ⦿ the project schedule and due dates
- ⦿ detailed log of actions and progress
- ⦿ a complete specification of the steps taken in data analysis;
- ⦿ an article for publication
- ⦿ a digital slide show;
- ⦿ a facility to track data acquisition graphically
- ⦿ and more...



Exporting and Publishing

- ⦿ HTML
- ⦿ DocBook
- ⦿ LaTeX, as gateway to PDF,
great for scientific notes
- ⦿ BEAMER Presentation (also via LaTeX)
- ⦿ ASCII, are very readable email format
(even though Org files are already readable)
- ⦿ Sets of documents can be linked to
a publishing project



A
p
r
o
j
e
c
t



emacs@carsten-dominiks-macbook-pro.local

* PROJ Figure out how planets form
:PROPERTIES:...

--:*** project.org Top L18 (Org Ind Fly Fill)-----

HTML Export



project.org

Smart R D Google Social APoD ADS BBC News Search Service Buy Teaching >

project.org

project.org

1 PROJ Figure out how planets form

1.1 DONE Literature study

Boss 1997 Johansen 2007

1.2 Discussion with Kees 2010-02-06 Sat

1.2.1 CNCL Idea 1: Gravitational Instability

Canceled because this is a hard Hydro problem.
Probably does not work because of cooling efficiencies.

1.2.2 DONE Idea 2: Capturing Planets from other stars

Does not work, because of angular momentum issues
and 3-body collisions.

1.2.3 WAIT Idea 3: Dust aggregation

- Estimate time scales for settling
[Weidenschilling paper](#)

initial size	Settling time	final size
0.1	2000	2mm
1	1000	2mm
10	500	2.5mm

Author: Carsten Dominik
<carsten.dominik@gmail.com>

Date: 2010-02-08 Mon

Done Not Signed In

PDF Export

project.org
Carsten Dominik
2010-02-08 Mon

1 PROJ Figure out how planets form

1.1 DONE Literature study

Boss 1997 Johansen 2007

1.2 Discussion with Kees <2010-02-06 Sat>

1.2.1 CNCL Idea 1: Gravitational Instability :B_block:
Canceled because this is a hard Hydro problem. Probably does not work because of cooling efficiencies.

1.2.2 DONE Idea 2: Capturing Planets from other stars :B_block:
Does not work, because of angular momentum issues and 3-body collisions.

1.2.3 WAIT Idea 3: Dust aggregation :B_block:

- Estimate time scales for settling
Weidenschilling paper

initial size	Settling time	final size
0.1	2000	2mm
1	1000	2mm
10	500	2.5mm

BEAMER Presentation

Discussion with Kees <2010-02-06 Sat>

Idea 1: Gravitational Instability

Canceled because this is a hard Hydro problem. Probably does not work because of cooling efficiencies.

Idea 2: Capturing Planets from other stars

Does not work, because of angular momentum issues and 3-body collisions.

Idea 3: Dust aggregation

- Estimate time scales for settling
Weidenschilling paper

initial size	Settling time	final size
0.1	2000	2mm
1	1000	2mm
10	500	2.5mm

Carsten Dominik Figure out how planets form

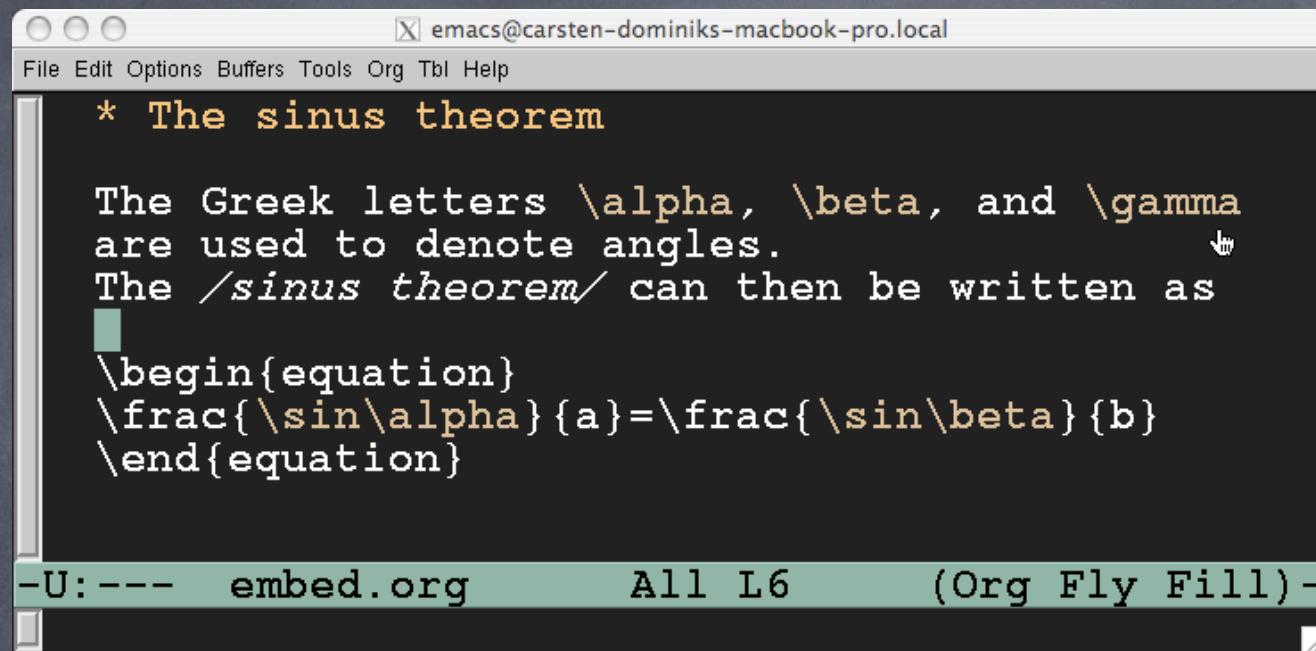


Further scientific tools

- ⦿ Embedding LaTeX for formulas and more
- ⦿ Embedding arbitrary source code snippets
- ⦿ Executing code snippets in many languages
- ⦿ Capturing results to create tables or plots
- ⦿ Reproducible Research
- ⦿ Literate Programming



Embedded LaTeX



The screenshot shows an Emacs window titled "emacs@carsten-dominiks-macbook-pro.local". The buffer contains Org mode code:

```
* The sinus theorem

The Greek letters \alpha, \beta, and \gamma
are used to denote angles.
The /sinus theorem/ can then be written as

\begin{equation}
\frac{\sin\alpha}{a}=\frac{\sin\beta}{b}
\end{equation}
```

The status bar at the bottom shows "-U:---- embed.org All L6 (Org Fly Fill)-".

1 The sinus theorem

The Greek letters α , β , and γ are used to denote angles. The *sinus theorem* can then be written as

$$\frac{\sin \alpha}{a} = \frac{\sin \beta}{b} \quad (1)$$



Embedded Code Examples

The image shows a Mac OS X desktop environment. In the top-left corner, there is a small icon of a green unicorn with a red mane. On the right side of the screen, there is a window titled "emacs@carsten-dominiks-macbook-pro.local". The menu bar includes "File", "Edit", "Options", "Buffers", "Tools", "Org", "Tbl", and "Help". The main buffer contains the following text:

```
* Code examples

#+begin_src f90
!
! Make the gas temperature
!
tgas = sqrt(0.5)*tredux*tstar*sqrt(rstar/r)
tgasi = sqrt(0.5)*tredux*tstar*sqrt(rstar/ri)
#+end_src
```

Below the Emacs window, there is a "Mark set" indicator. To the right of the Emacs window is a Safari browser window. The title bar of the browser says "embed". The address bar shows "project.org". The search bar has "Google" typed into it. The toolbar includes standard buttons for back, forward, search, and others. The main content area of the browser displays the same code as the Emacs buffer:

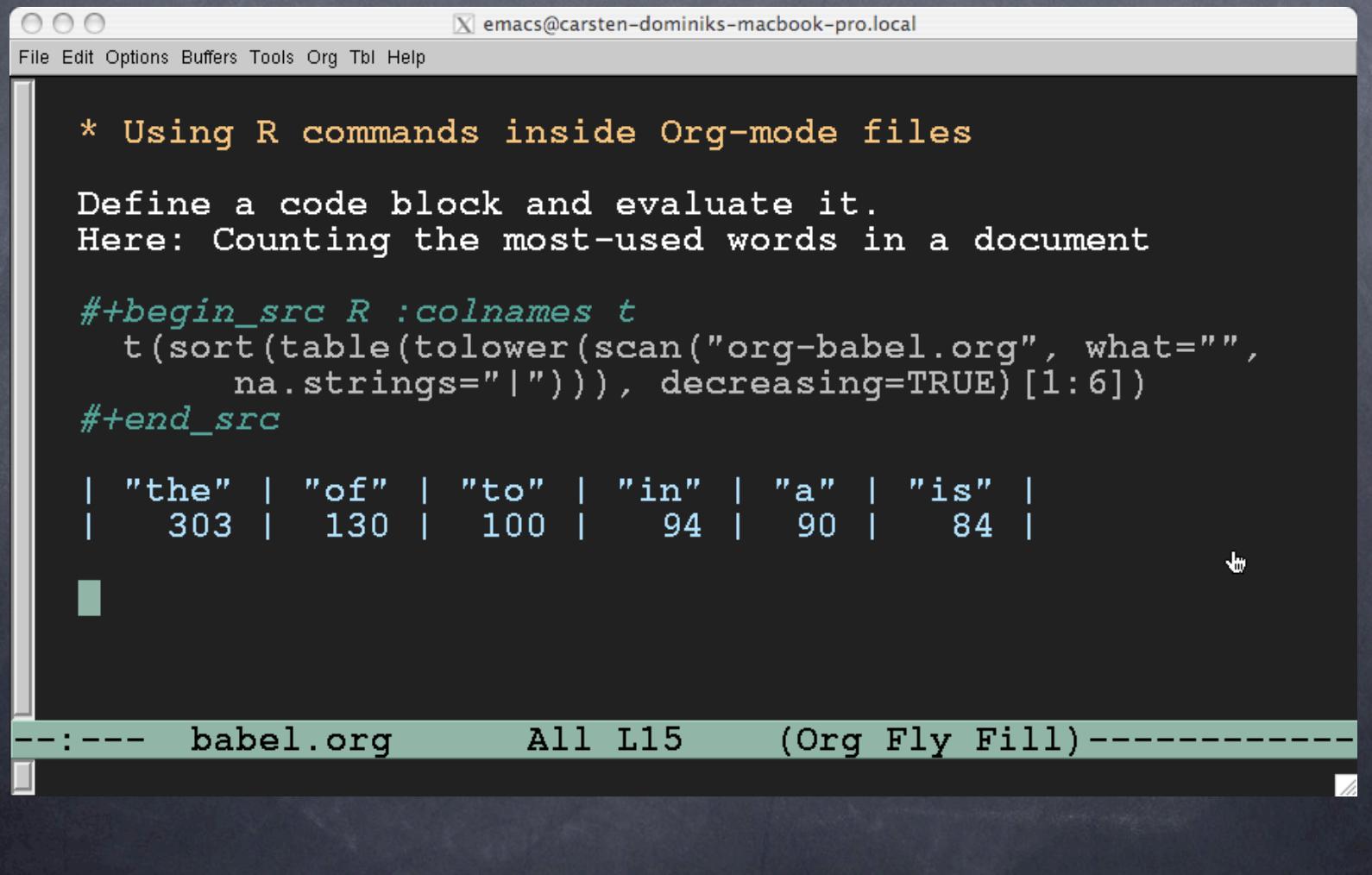
2 Code examples

```
!
! Make the gas temperature
!
tgas = sqrt(0.5)*tredux*tstar*sqrt(rstar/r)
tgasi = sqrt(0.5)*tredux*tstar*sqrt(rstar/ri)
```

The bottom status bar of the browser indicates "Done" and "Not Signed In".

Running Code: Org-Babel

by Eric Schulte and Dan Davison



The screenshot shows an Emacs window titled "emacs@carsten-dominiks-macbook-pro.local". The buffer contains Org-mode code for running R commands. The code includes a title section, a note about defining a code block, and a specific example for counting words. It then defines an R code block to sort word counts and prints the results. The results show the top six most-used words in the document "babel.org" along with their counts.

```
* Using R commands inside Org-mode files

Define a code block and evaluate it.
Here: Counting the most-used words in a document

#+begin_src R :colnames t
  t(sort(table(tolower(scan("org-babel.org", what="",
    na.strings="|"))), decreasing=TRUE) [1:6])
#+end_src

| "the" | "of" | "to" | "in" | "a" | "is" |
| 303 | 130 | 100 | 94 | 90 | 84 |
```

At the bottom of the window, there is a status bar with the text "---- babel.org All L15 (Org Fly Fill) -----".

Literate Programming

- ⦿ Let us change our traditional attitude to the construction of programs: Instead of imagining that our main task is to instruct a **computer** what to do, let us concentrate rather on explaining to **human beings** what we want a computer to do. **Donald Knuth**
- ⦿ Two operations
 - ⦿ Weave a readable document
 - ⦿ Tangle the computer source code



Reproducible Research

- ⦿ Combining scientific results with the tools that were used to produce them
- ⦿ Make the publication a self-contained laboratory for reproducing the results



Other resources

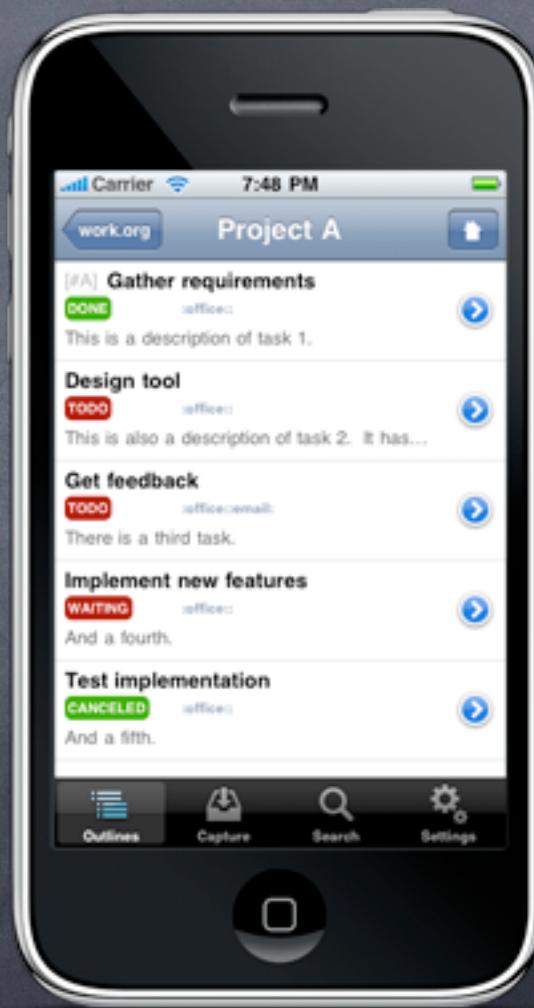
- ⦿ Homepage: <http://orgmode.org>
- ⦿ Google Tech Talk about Org-mode
<http://www.youtube.com/watch?v=oJTwQvgfgMM>
- ⦿ Tutorials
<http://orgmode.org/worg/org-tutorials>
- ⦿ Mailing list:
emacs-orgmode@gnu.org
- ⦿ Worg site:
<http://orgmode.org/worg>



MobileOrg

by Richard Moreland

- ⌚ Free iPhone Application
- ⌚ take Org-mode files
on the road
- ⌚ use offline
- ⌚ tick-off tasks
- ⌚ capture new notes



Users of Org-mode

- ⦿ An archaeologist running an archaeology company
- ⦿ A farmer and mountaineer
- ⦿ Scientists from various fields
- ⦿ Computer scientists
- ⦿ One-person consultancy companies
- ⦿ Director of Computer Science company and University Research group
- ⦿ A historian
- ⦿ A blind person, running his world through Emacs
- ⦿ Head of IT group at the Max-Planck-Institute for Neurological Research :-)



<http://orgmode.org/worg/org-people.php>

Twitter-length statements

⦿ The sheer elaborated insanity of the org-mode spreadsheet is a distilled microcosm of all that is wonderful and brain-damaged about emacs Zenoli

⦿ If I hated everything about Emacs, I'd still use it for Org-mode Avdi

⦿ It used to be that I hated leaving Emacs to do anything; now it's getting to the point that I hate even leaving org-mode! Eric Fraga

⦿ If humans could mate with software, I'd have Org-mode's babies Chris League



Acknowledgements

- ⦿ The mailing list members of emacs-orgmode@gnu.org
- ⦿ Eric Schulte and Dan Davison for Org-Babel
- ⦿ Thomas S. Dye for examples I used in this talk
- ⦿ Sebastian Rose for driving the HTML support
- ⦿ Bastien Guerry for writing the LaTeX exporter
- ⦿ Eric Fraga and others for driving BEAMER export
- ⦿ Baoqiu Cui for writing the DocBook exporter
- ⦿ Richard Moreland for MobileOrg
- ⦿ Stefan Vollmar for the invitation

