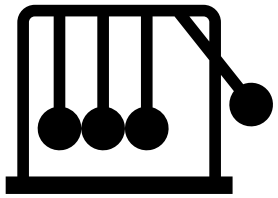
Session 1: Scratching the Surface

GRAD SCHOOL 101, LaTeX, AND THE COMMAND LINE

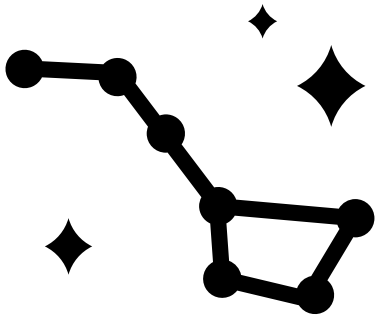
STARFISH SCHOOL 2022

Who are we and why are we doing this?

Astronomy is more than just the Physics

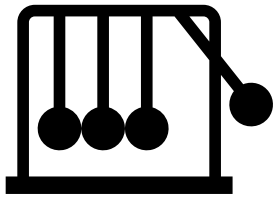


Physics



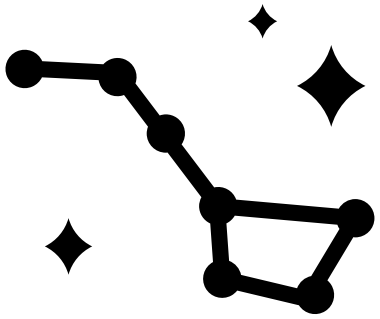
Astronomy

Astronomy is more than just the Physics

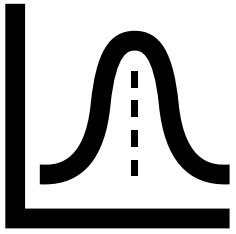


Physics

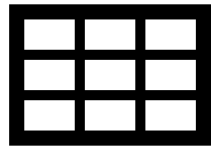
Computing



Astronomy



Statistics



Data Analysis

Expectations

This bootcamp is about helping you become the best Astro grad student/researcher you can be!

This is not about grading or becoming expert in any of these concepts. It's about knowing that these tools and techniques exist, letting you get your hands dirty with them, and knowing where to search for help.

Our expectations for you are:

- Try things
- Ask questions to us and your peers throughout the bootcamp
- Do your best to complete the exercises as a group
- Help each other

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student/researcher you c

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- Do your best to complete the exercises as a group
- Help each other

HOT TIP

Sometimes, we'll have tips that will help make your life/research easier. We'll throw them into these Hot Tip boxes. Look out for the pepper!

Expectations

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Our expectations for you are:

- Try things
- Ask ques
  bootcam
- Do your
- Help eac

COOL CATCH

Sometimes, there'll be something we want to point out that we want to warn you about, or make you aware of before it causes a problem. That'll be in these cool catch boxes. Look for the snowflake.

Rough Schedule

Times	Session	What are you doing?
12:30-2pm	Lunch	Eating boxed lunches, chatting to your group, discussing the topics of last session
2 – 3PM	First session	Hands on learning/teaching sessions
3PM	Coffee	Grab coffee and a snack
3 – 5PM	Second session	Continue to hack on problems

Time and Project Management

Allow your future self to thank your past self

- Our idea of academia…

- The reality of academia…

Tips to a less stressed work life

- Deadlines really matter, and don't matter at all

Tips to a less stressed work life

- Deadlines really matter, and don't matter at all
- Eat the frog

Tips to a less stressed work life

- Deadlines really matter, and don't matter at all
- Eat the frog
- Don’t confuse being 'busy' for being effective (NYT article, postdoc article)

Tips to a less stressed work life

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- 80/20 rule

Tips to a less stressed work life

- Deadlines really matter, and don't matter at all
- Eat the frog
- Don’t confuse being 'busy' for being effective
- 80/20 rule
- Parkinson's rule

Tips to a less stressed work life

- Make a (work) budget – transition to work

Tips to a less stressed work life

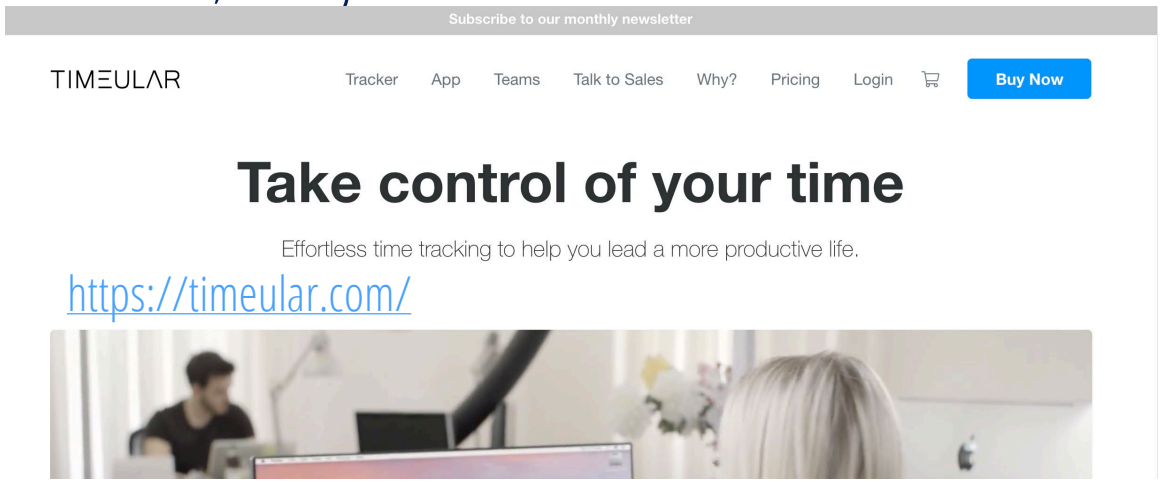
- Make a (work) budget
- No, really.
- Forgive yourself.

Tips to a less stressed work life

- Make a (work) budget
- No, really.
- Forgive yourself.
- Don't hide.

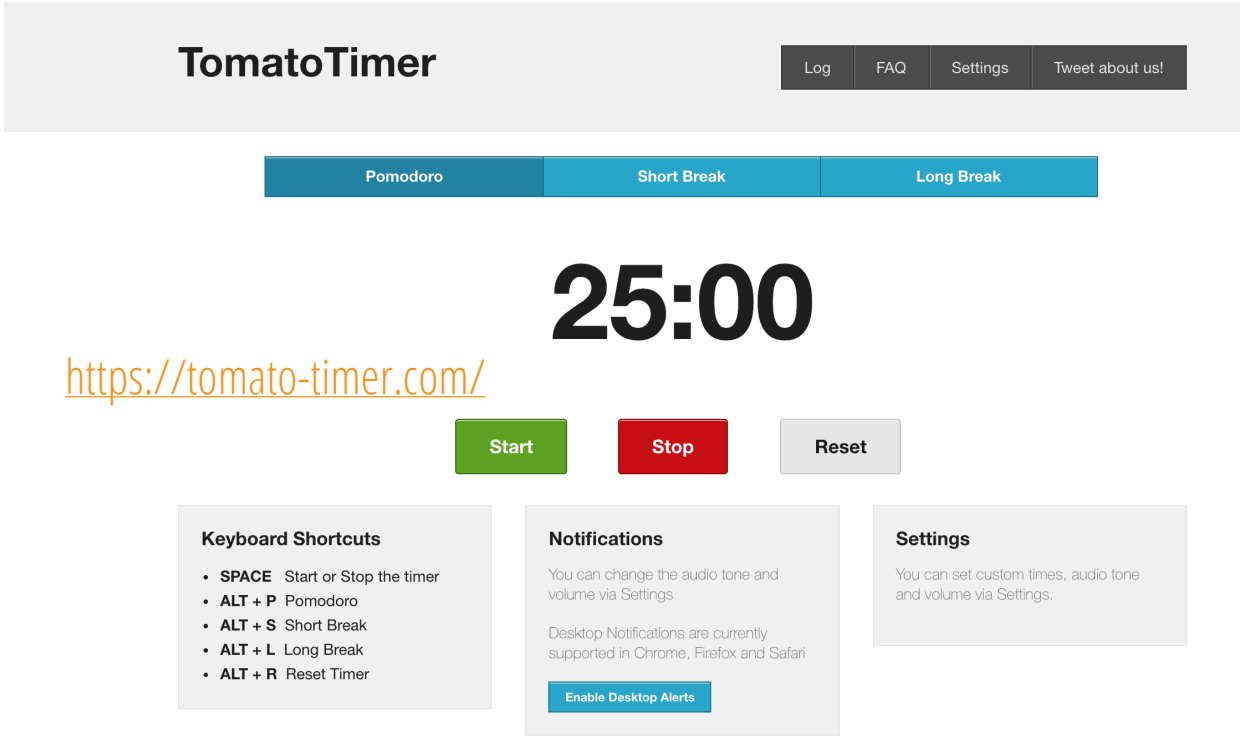
Tips to a less stressed work life

- Make a (work) budget
- No, really.



https://timeular.com/

- Keep track of how long things *actually* take.
- Get better at estimating, keep iterating. Build in contingency.



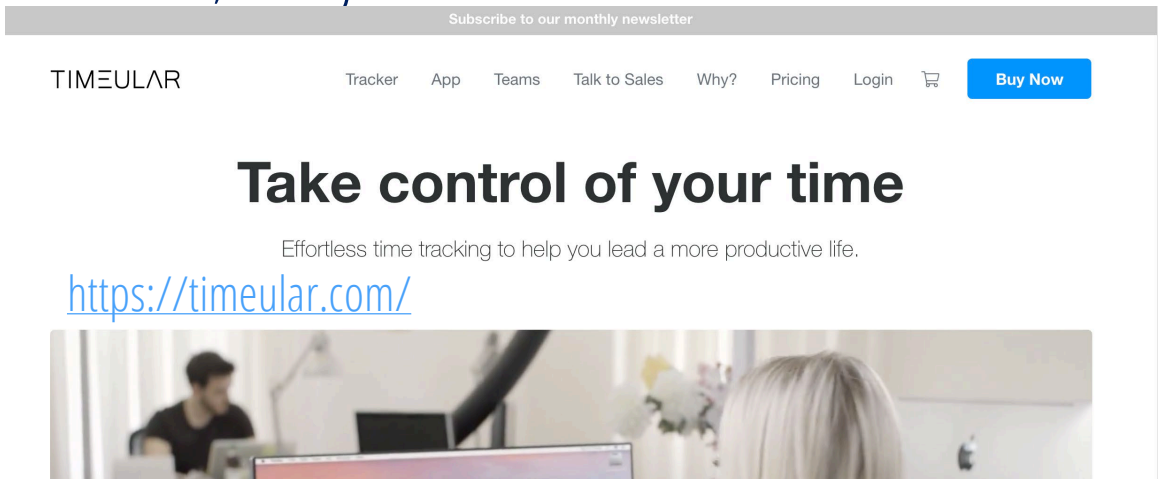
https://tomato-timer.com/

Tips to a less stressed work life

HOT TIP

Try out different tools/software until you find something that 'sticks'. There is no wrong answer if it works for you!

- Make a (work) budget
- No, really.



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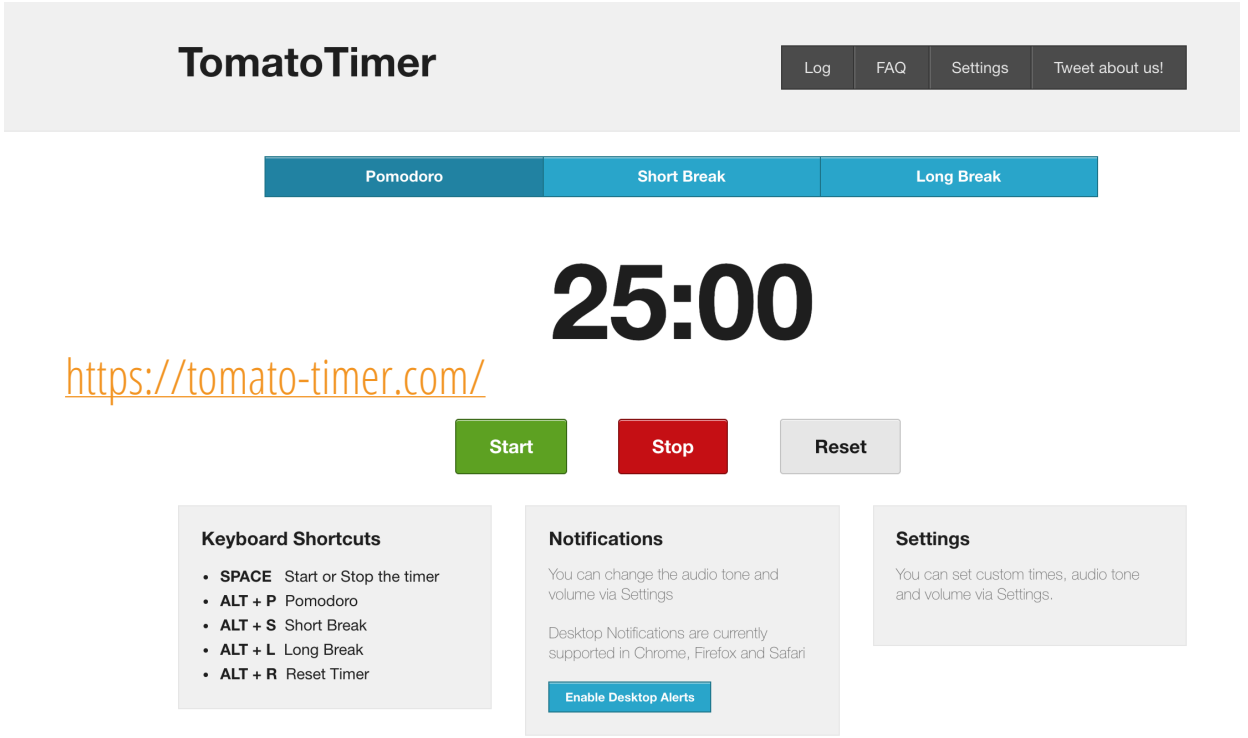

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Stress Happens: How to build Resilience

Case Study

Your laptop fell off your desk and has to be taken in for repairs for a week. You are due to send a draft of your thesis proposal to your committee on Thursday. What now?

Stress Happens: How to build Resilience

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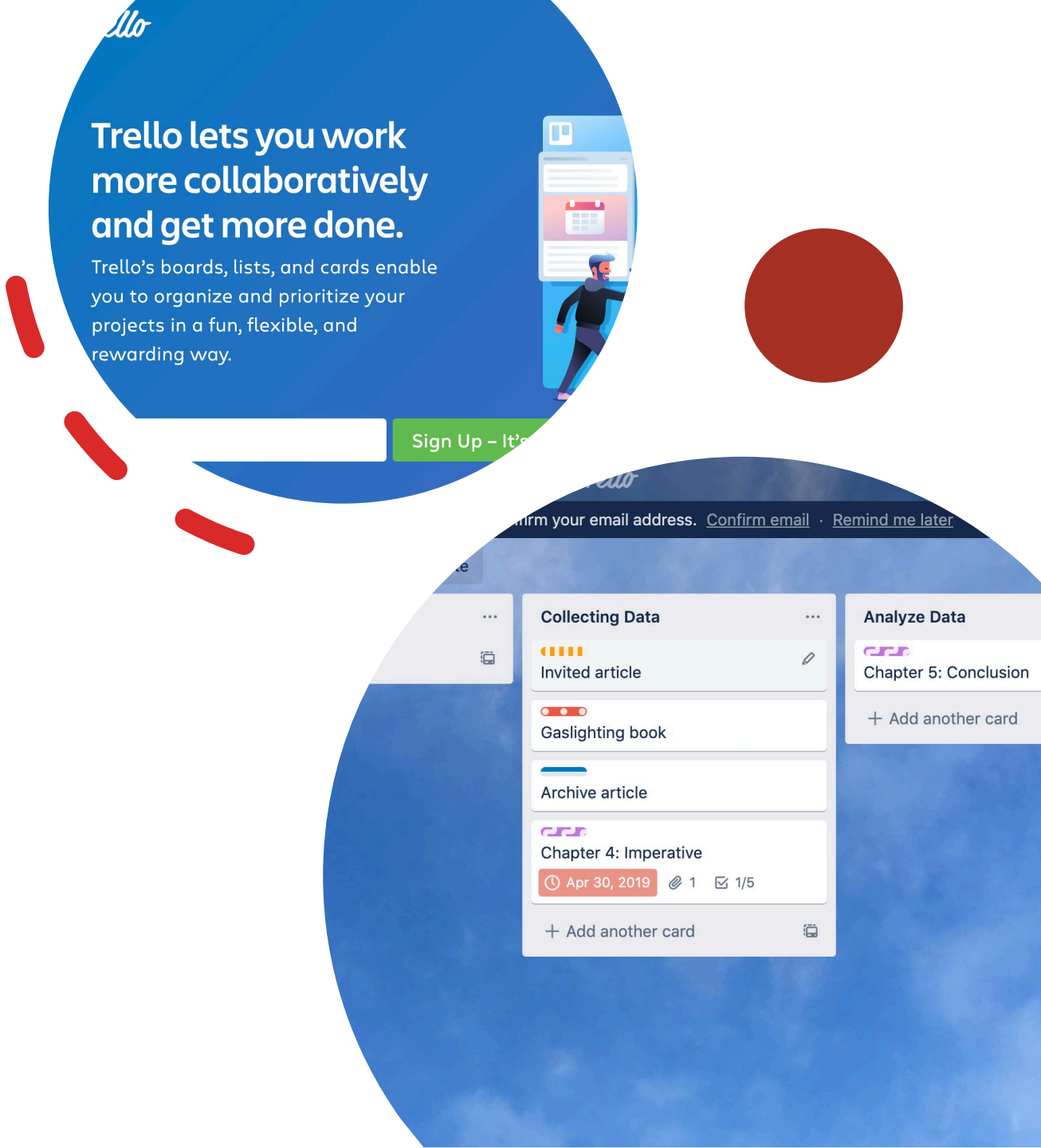
How to avoid decision paralysis:

- How should I prepare for the conversation?
- What are valid/core responsibilities?
  - Who are you responsible to?
  - Who is responsible to you?
- What should your expectations be?
- What can you expect from others/faculty/advisor/etc?
- Can I come up with solutions?

Project Management

- Treat your research like a job, not a 'calling'

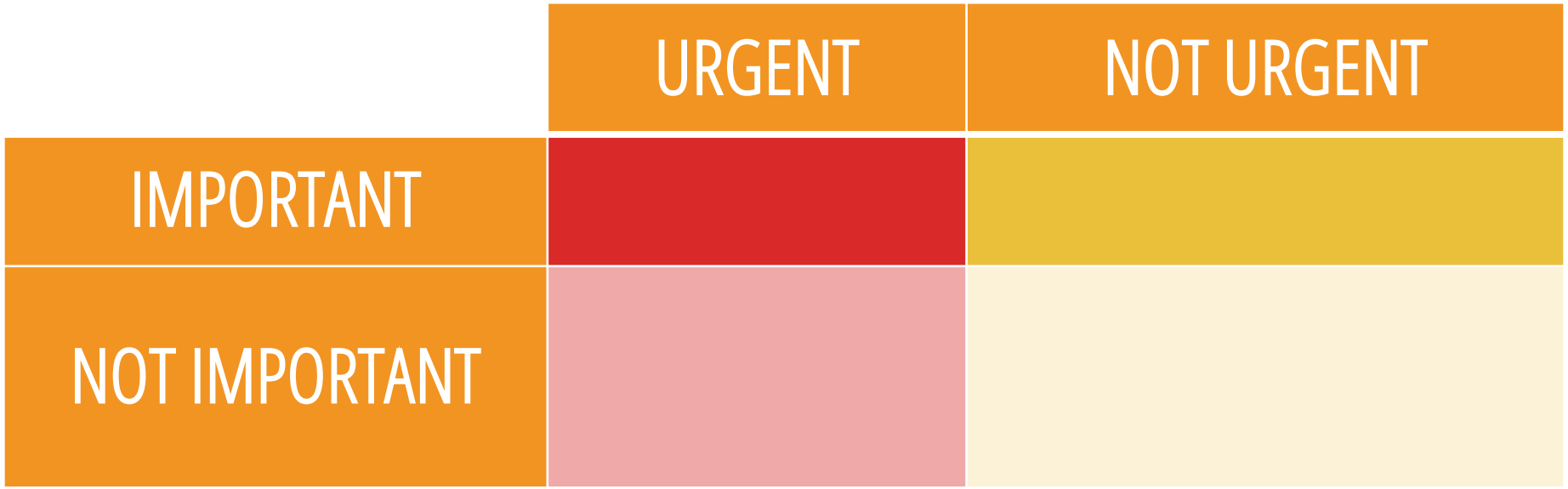


Time management is not optional

- Learning how you work/what works for you takes a while, but be intentional about it. Watch this talk.

- https://www.youtube.com/watch?v=oTugjssqOT0

Covey Quadrants



Covey Quadrants

COOL CATCH

Your advisor will almost always put things in the URGENT quadrant – that's the hardest to separate

	URGENT	NOT URGENT
IMPORTANT		
NOT IMPORTANT		

SMART goals

SPECIFIC

MEASUREABLE

ATTAINABLE

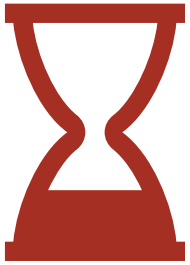
RELEVANT

TIME-BASED

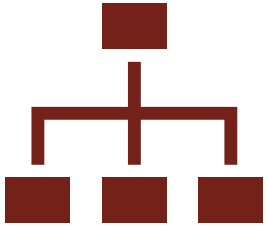
Exercises

- Write down one SMART goal for the coming semester (e.g. submit my AST 1501 proposal by September 25)
- Identify a few specific projects that you can tackle linked to the SMART goals (Write the literature review/introduction, write the methods section, write the proposed results section)
- Identify all the tasks related to those projects (bullet points the literature review, read papers X,Y,Z, write section on analysis of X,Y,Z, make some schematic plots etc.)
- Make a Trello board for your life

Productive Procrastination



When waiting for code to compile... check the ArXiv



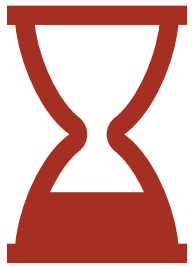
Make sure to get the big things (that you need to wait on other people for) out of the way first, then do plots/fun/email

Take account of your time

Productive Procrastination

COOL CATCH

This does **not** mean working while watching TV! Down time is really important.



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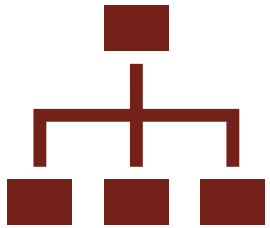
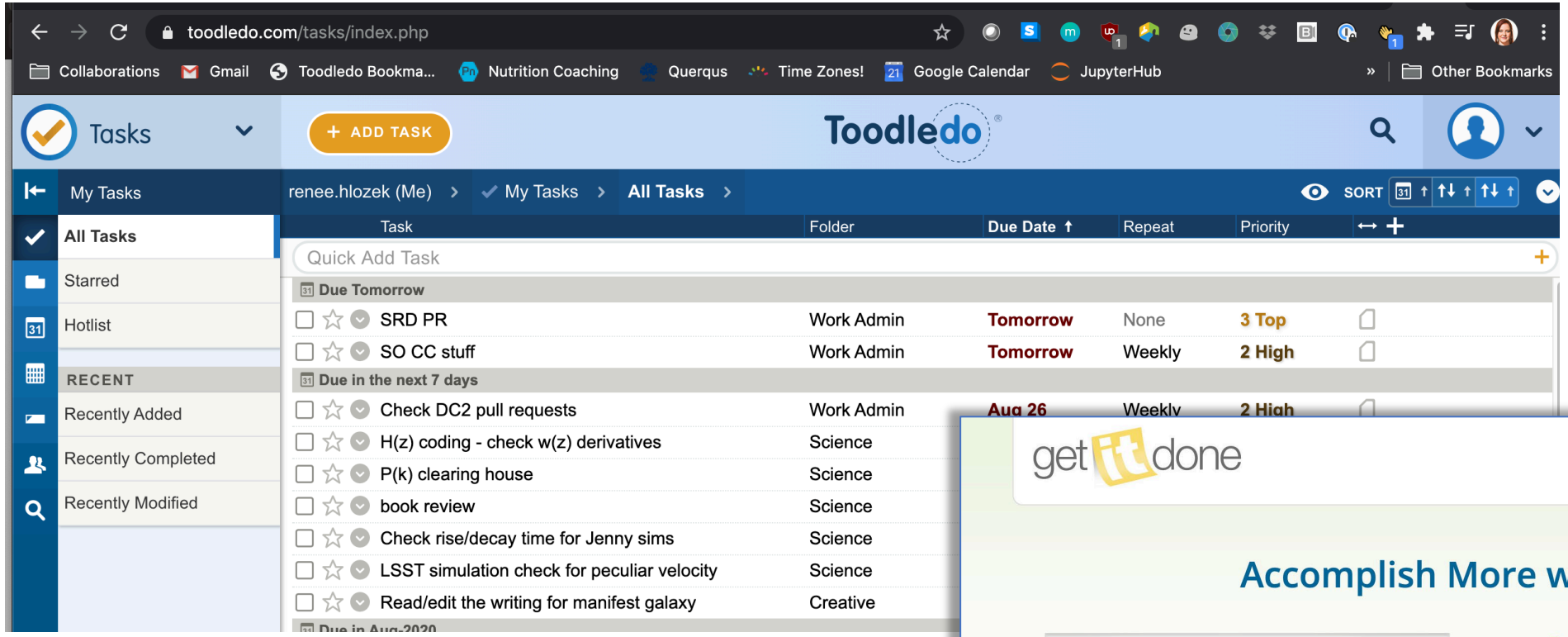
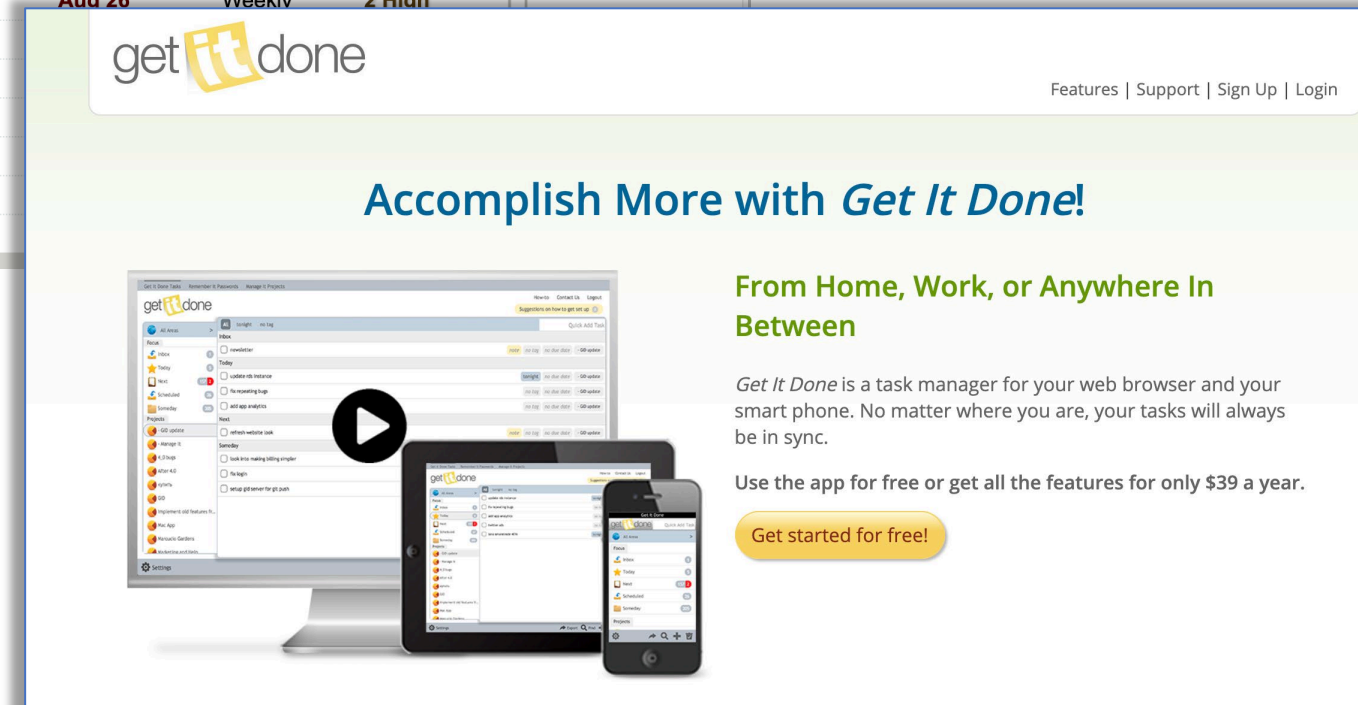


Make sure to get the big things (that you need to wait on other people for) out of the way first, then do plots/fun/email

Take account of your time

(Try not to) let your email/inbox overwhelm you





See Github too

Intentionality

01

Be online when it matters

(not all the time)

02

Communicate your style and talk about it with your advisor

03

Have a buddy system

04

Challenge each other

05

Take *real* breaks

(including between Zooms)

BREAK!

LaTeX and Overleaf

LaTeX intro

- LaTeX is a markup language (think: html), which means you type certain commands around your text/input which control the look and feel of that input.
- If you want to change certain style elements of the document, using pre-existing commands means that all those elements change together.
- It can be clunky at first, but believe me *it will change your life*

LaTeX syntax

- All documents start with some preamble to define document types/formatting

```
\usepackage{lineno}
\linenumbers
\setjournal{\apj}
\documentclass[iop,revtex4-1]{hackemulateapj}

\usepackage{epsfig}
\usepackage{epstopdf}
\usepackage{graphicx}
```

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```

Pre-defined packages that do specific things, like help me include figures (graphics) or add line numbers to my document (lineno)

LaTeX syntax

- All documents start with some preamble to define document types/formatting

define my document class (which is set to something for the Institute of Physics or IOP) and define its style (something I've called hackemulateapj, because I hacked a previous style file called emulateapj which emulates the ApJ style file)

```
\usepackage{lineno}
\linenumbers
\setjournal{\apj}
\documentclass[iop,revtex4-1]{hackemulateapj}

\usepackage{epsfig}
\usepackage{epstopdf}
\usepackage{graphicx}
```

LaTeX syntax

- I then start writing my text, putting various things in special environments (e.g. figure captions, sections, the abstract)

```
\begin{document}
\title{A copy of an actual paper I'm working on}
\input{Starfish_folder/authors}
\input{./PLASTICC_sims_newcommand.tex}


\begin{abstract}
Next-generation surveys like the Legacy Survey of Space and Time (LSST) on the Vera C. Rubin
Observatory will generate orders of magnitude more discoveries of transients and variable
stars than previous surveys. To prepare for this data deluge, we developed \PLASTICC~(\acro),
a competition and associated simulated data set to challenge the community.\acro~took place
between \DATESTART~and \DATESTOP, with 1094 teams participating in the challenge which was
hosted by the data-science platform Kaggle. The aim of \acro~was to develop novel solutions to
the problem of transient classification in a large, non-representative photometric data set
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LaTeX syntax

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Kicks things off

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```

This means I have another file with lots of pre-defined symbols/commands in it

This generates the title and abstract

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hosted by the data-science platform Kaggle. The aim of \acro~was to develop novel solutions to
the problem of transient classification in a large, non-representative photometric data set
```

What it generates...

Draft version September 10, 2020
Preprint typeset using LaTeX style emulateapj v. 01/23/15

A COPY OF AN ACTUAL PAPER I'M WORKING ON

R. Hložek[1, 2]
(A collaboration)

[1] Department of Astronomy and Astrophysics, University of Toronto, 50 St. George St., Toronto, ON M5S 3H4, Canada
[2] Dunlap Institute for Astronomy and Astrophysics, University of Toronto, 50 St. George St., Toronto, ON M5S 3H4, Canada
Draft version September 10, 2020

ABSTRACT

Next-generation surveys like the Legacy Survey of Space and Time (LSST) on the Vera C. Rubin Observatory will generate orders of magnitude more discoveries of transients and variable stars than previous surveys. To prepare for this data deluge, we developed Photometric LSST Astronomical Time Series Classification Challenge (`PLAsTiCC`), a competition and associated simulated data set to challenge the community.`PLAsTiCC` took place between 2018 Sep 28 and 2018 Dec 17, with 1094 teams participating in the challenge which was hosted by the data-science platform Kaggle. The aim of `PLAsTiCC` was to develop novel solutions to the problem of transient classification in a large, non-representative photometric data set. Three winners were announced in February 2019, and a range of classification solutions were produced by the participants. This is a comment I want to insert (Renee) The machine learning techniques utilized by the community included hybrid combinations and ensemble averages of a range of approaches, including boosted decision trees, neural networks and multi-layer perceptrons (MLPs). We summarize the challenge entries and classes of solutions, highlight the performance of the winning solutions, and discuss how combining different approaches leads to further improvement in the performance of the classifiers.

1. INTRODUCTION

The Legacy Survey of Space and Time (LSST, LSST Science Collaboration et al. 2009) of the Vera C. Rubin

SuperNova ANAlysis (`SNANA`) simulation code. We list the validations performed on the simulations below. **Confusing artifacts** – When processing light curves

LaTeX is great for mathematics

- Using pre-defined symbols takes you from this

```
The \acro~metric was a weighted log-loss
\begin{eqnarray}
  \label{eq:logloss}
  L &\equiv & -\sum_{m=1}^{N} w_{m} \sum_{n=1}^{M} \tau_{n, m} \ln[p(m \mid
  d_{n})],
\end{eqnarray}
where
\begin{eqnarray}
  \label{eq:indicator}
  \tau_{n, m} &\equiv&
  \begin{cases}
  0 & m_{n} \neq m \\
  1 & m_{n} = m
  \end{cases}
\end{eqnarray}
```

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\end{eqnarray}
```

HOT TIP

These mathematical symbols/notation will come about in handy later when we use matplotlib

LaTeX is great for mathematics

- To this

The PLAsTiCC metric was a weighted log-loss

$$L \equiv -\sum_{m=1}^{N} w_m \sum_{n=1}^{M} \tau_{n,m} \ln[p(m \mid d_n)], \quad (1)$$

where

$$\tau_{n,m} \equiv \begin{cases} 0 & m_n \neq m \\ 1 & m_n = m \end{cases} \quad (2)$$

If you move this equation around in the text, LaTeX will keep track of its location/numbering

LaTeX is great for mathematics

- To this

HOT TIP

Want a math symbol in LaTeX but don't know what it's called? Detexify it!

http://detexify.kirelabs.org

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$$L \equiv -\sum_{m=1}^{N} w_m \sum_{n=1}^{M} \tau_{n,m} \ln[p(m \mid d_n)], \qquad (1)$$

where

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If you move this equation around in the text, LaTeX will keep track of its location/numbering

Figures and tables exist in environments

- you \begin and \end the environments to start/end a table.

the * will mean it takes up the full page (as opposed to a column)

```
\begin{table*}
\begin{center}
\begin{tabular}{ccccccccc}
    \hline
    \hline
    Name & \multicolumn{3}{c}{Boosted Decision Trees} & &
    \multicolumn{4}{c}{Neural Nets} \\
    \cline{2-4}
    \cline{6-9}
 & LightGBM & CatBoost &  XGBoost &  & NN &  CNN & RNN &
MLP \\
    \hline
    \topplace & \cmark & \xmark & \xmark & & \xmark &
    \xmark & \xmark & \xmark  \\
    \secondplace & \cmark & \xmark & \xmark & & \xmark &
```

Figures and tables exist in environments

- you \begin and \end the environments to start/end a table.

Name	Boosted Decision Trees			Neural Nets			
	LightGBM	CatBoost	XGBoost	NN	CNN	RNN	MLP
Kyle Boone (`avocado`)	✓	✗	✗	✗	✗	✗	✗
Mike & Silogram	✓	✗	✗	✗	✗	✓	✗
Major Tom, mamas & nyanp	✓	✓	✗	✗	✓	✗	✗
Ahmet Erdem	✓	✗	✗	✓	✗	✗	✗
SKZ Lost in Translation	✓	✗	✗	✗	✗	✓	✓
Stefan Stefanov	✗	✗	✗	✓	✗	✗	✗
rapids.ai	✓	✗	✗	✗	✗	✓	✓
Three Muskateers	✓	✓	✓	✗	✓	✗	✗
Simon Chen	✓	✗	✗	✗	✗	✗	✗

References are defined in a bibliography file

This is how the citation defined in a .bib file

```
@ARTICLE{biswas/opsim,
       author = {{Biswas}, Rahul and {Daniel}, Scott F. and {Hlo{\v{z}}ek},
       R. and
        {Kim}, A.~G. and {Yoachim}, Peter and
        {LSST Dark Energy Science Collaboration}},
        title = "{Enabling Catalog Simulations of Transient and Variable
        Sources Based on LSST Cadence Strategies}",
      journal = {\apjs},
     keywords = {Astrophysics - Instrumentation and Methods for
     Astrophysics, Astrophysics - Cosmology and Nongalactic Astrophysics},
         year = 2020,
        month = apr,
       volume = {247},
       number = {2},
          eid = {60},
        pages = {60},
          doi = {10.3847/1538-4365/ab72f2},
archivePrefix = {arXiv},
       eprint = {1905.02887},
 primaryClass = {astro-ph.IM},
       adsurl = {https://ui.adsabs.harvard.edu/abs/2020ApJS..247...60B},
      adsnote = {Provided by the SAO/NASA Astrophysics Data System}
}
```

This is how the citation is referenced in the main text

```
Once the `pure' source model is obtained, it is combined with a noise
model specific to the observational conditions of LSST
\cite{biswas/opsim}, including the cadence information, zero points, sky
noise, and point spread function (PSF) \cite{snana}. The objects have to
```

References are defined in a bibliography file

```
% Include both collaboration papers and external
citations:
\bibliographystyle{apsrev}
\bibliography{results,metric}
```

You define your bibliography style and then also tell LaTeX where to look (here in files results.bib and metric.bib)

Once the 'pure' source model is obtained, it is combined with a noise model specific to the observational conditions of LSST Biswas et al. (2020), including the cadence information, zero points, sky noise, and point

This is how the reference appears in the text (for this particular referencing style)

R. Biswas, S. F. Daniel, R. Hložek, A. G. Kim, P. Yoachim, and LSST Dark Energy Science Collaboration, ApJS **247**, 60 (2020), 1905.02887.

This is what the reference looks like at the end of the file

References are defined in a bibliography file

```
% Include both collaboration papers and external
citations:
\bibliographystyle{plain}
\bibliography{results,metric}
```

If you change the bibliography style file

Once the 'pure' source model is obtained, it is combined with a noise model specific to the observational conditions of LSST (4), including the cadence information, zero points, sky noise, and point spread function (PSF) (16). The objects have to be 'detected' in order

This is how the reference appears in the text (for this particular referencing style)

4]Rahul Biswas, Scott F. Daniel, R. Hložek, A. G. Kim, Peter Yoachim, and LSST Dark Energy Science Collaboration. Enabling Catalog Simulations of Transient and Variable Sources Based on LSST Cadence Strategies. *ApJS*, 247(2):60, April 2020.

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Once the 'pure' source model is obtained, it is combined with a noise model specific to the observational conditions of LSST (4), including the cadence information, zero points, sky noise, and point spread function (PSF) (16). The objects have to be 'detected' in order

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[4]Rahul Biswas, Scott F. Daniel, R. Hložek, A. G. Kim, Peter Yoachim, and LSST Dark Energy Science Collaboration. Enabling Catalog Simulations of Transient and Variable Sources Based on LSST Cadence Strategies. *ApJS*, 247(2):60, April 2020.

This is what the reference looks like at the end of the file

COOL CATCH

LaTeX is great about re-ordering references, but it really doesn't like if you define something twice – so keep that .bib file clean.

References are defined in a bibliography file

```
% Include both collaboration papers and external
citations:
\bibliographystyle{plain}
\bibliography{results,metric}
```

If you change the bibliography style file

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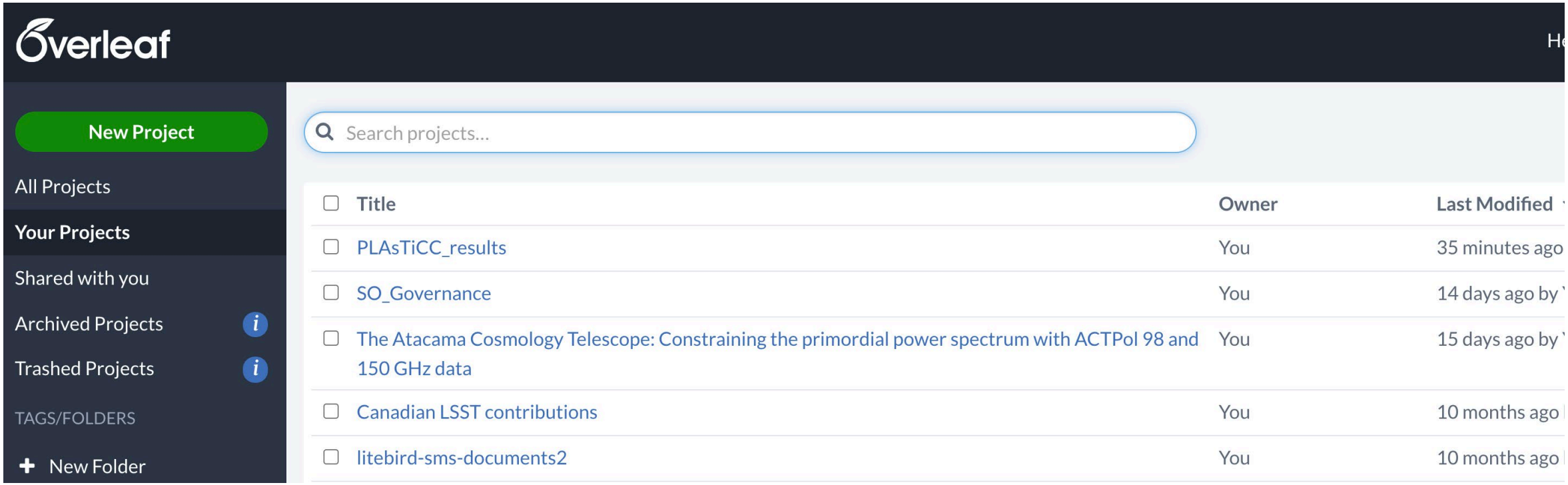
This is what the reference looks like at the end of the file

HELP – this is moving too fast!

- Don't worry – the internet is your friend.
- Google the thing you want to do and there is almost certainly an answer. Also, ask your colleagues/students/mentors for advice.
- Everyone loves teaching people their LaTeX tricks

Overleaf/styles/templates

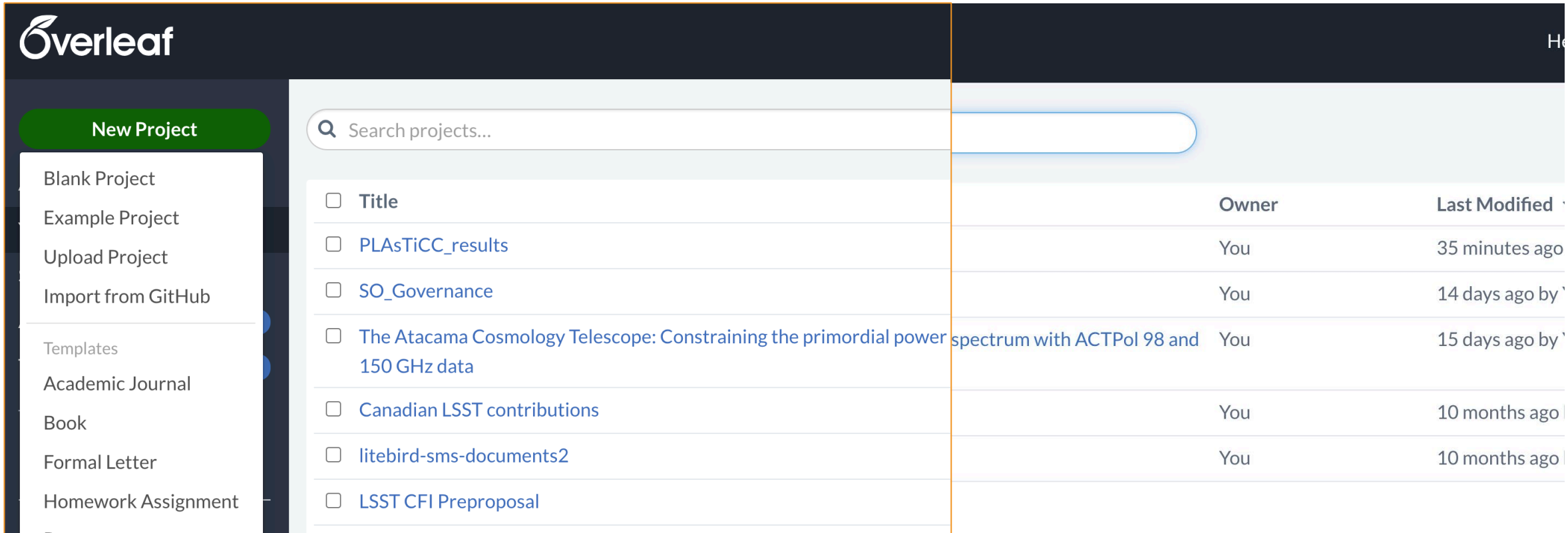
- Overleaf is online LaTeX editing software that you can use to compile LaTeX and collaborate with others.
- LOTS of templates for articles/reports etc. -- check out the AAS template



Overleaf/styles/templates

Demo Time!
Overleaf

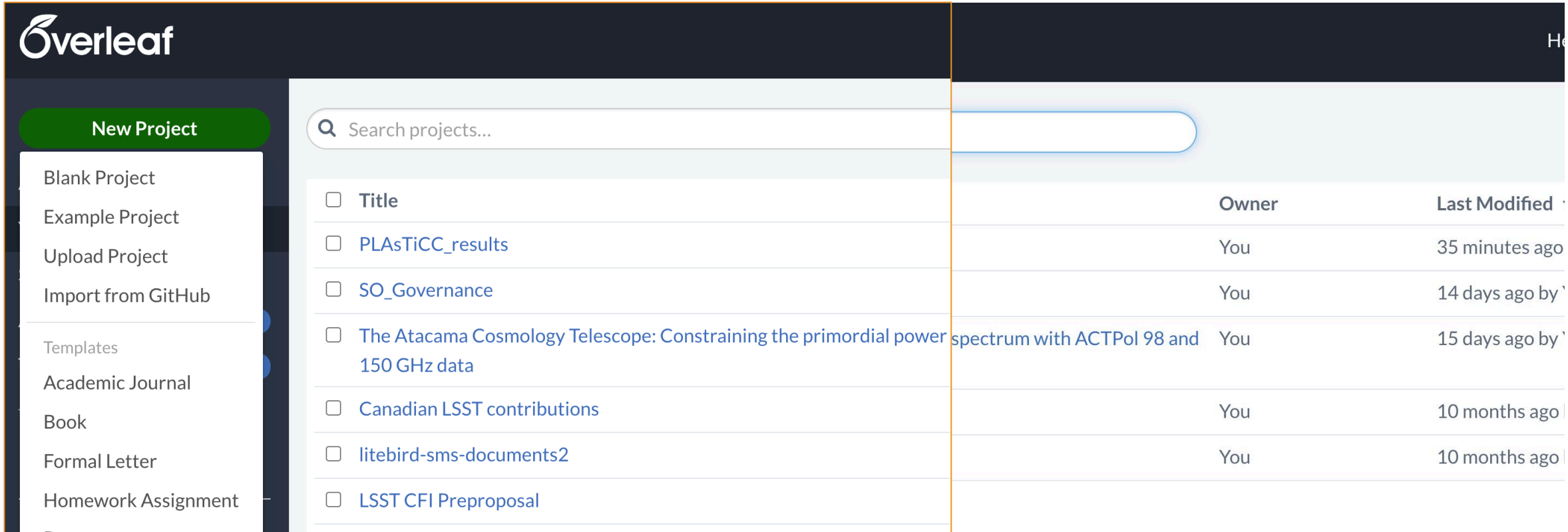
- Overleaf is online LaTeX editing software that you can use to compile LaTeX and collaborate with others.
- LOTS of templates for articles/reports etc.



Overleaf/styles/templates

Demo Time!
Overleaf

https://www.overleaf.com/read/tntwghqvcxzh



Exercises

- Set up an overleaf document with AAS, MNRAS, etc. template

Keeping tidy/sync often

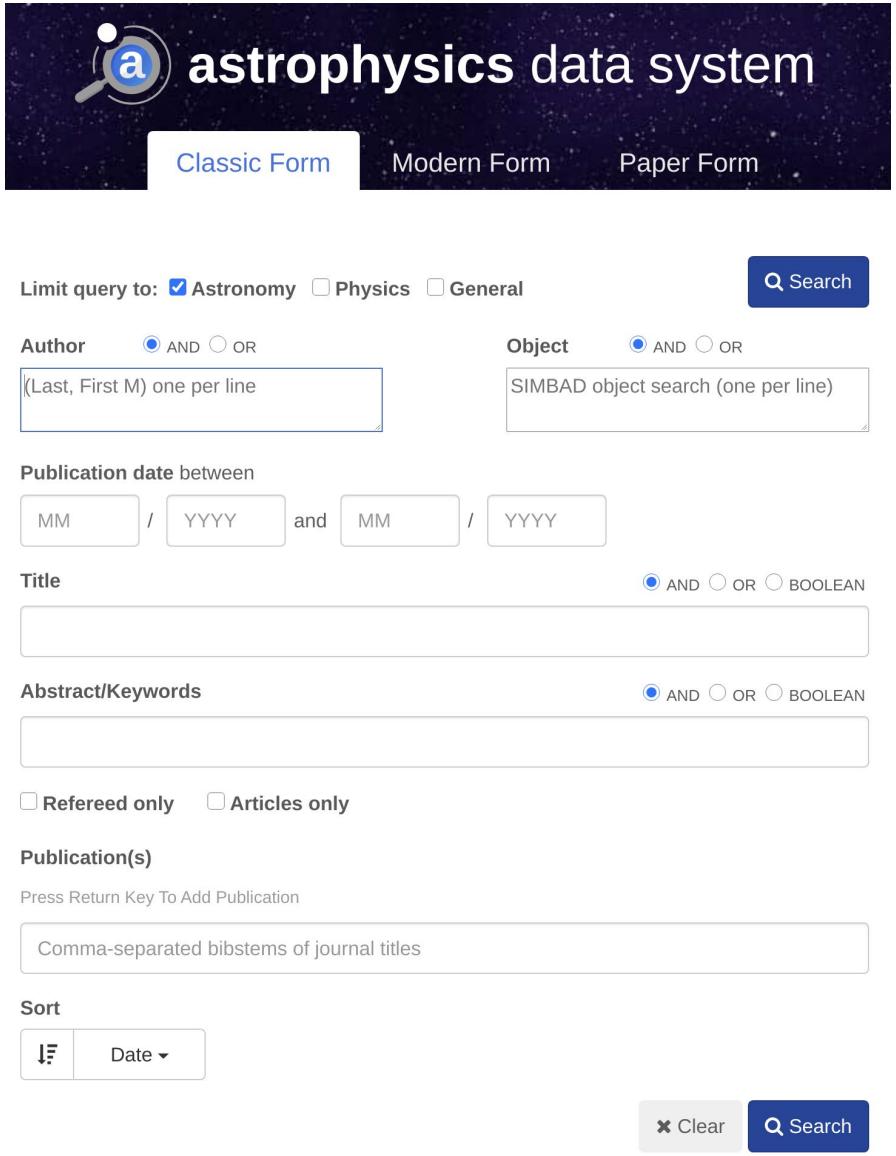
- Backup early and often! UofT gives us all 1TB of OneDrive space
- Overleaf can sync to Dropbox & Github - so you can work offline
- Try keeping the main .tex file bare, keep definitions in their own .input files

Looking at the Literature through ADS

Literature & Research

- Don't expect yourself to understand everything immediately
  - Reading scientific papers is a skill you will develop
- You will read papers, and re-read them, and re-read them...
  - And you'll retain something new each time!
- You will search the literature, then search it again, and again...
  - After all, we are doing **re**search! :)

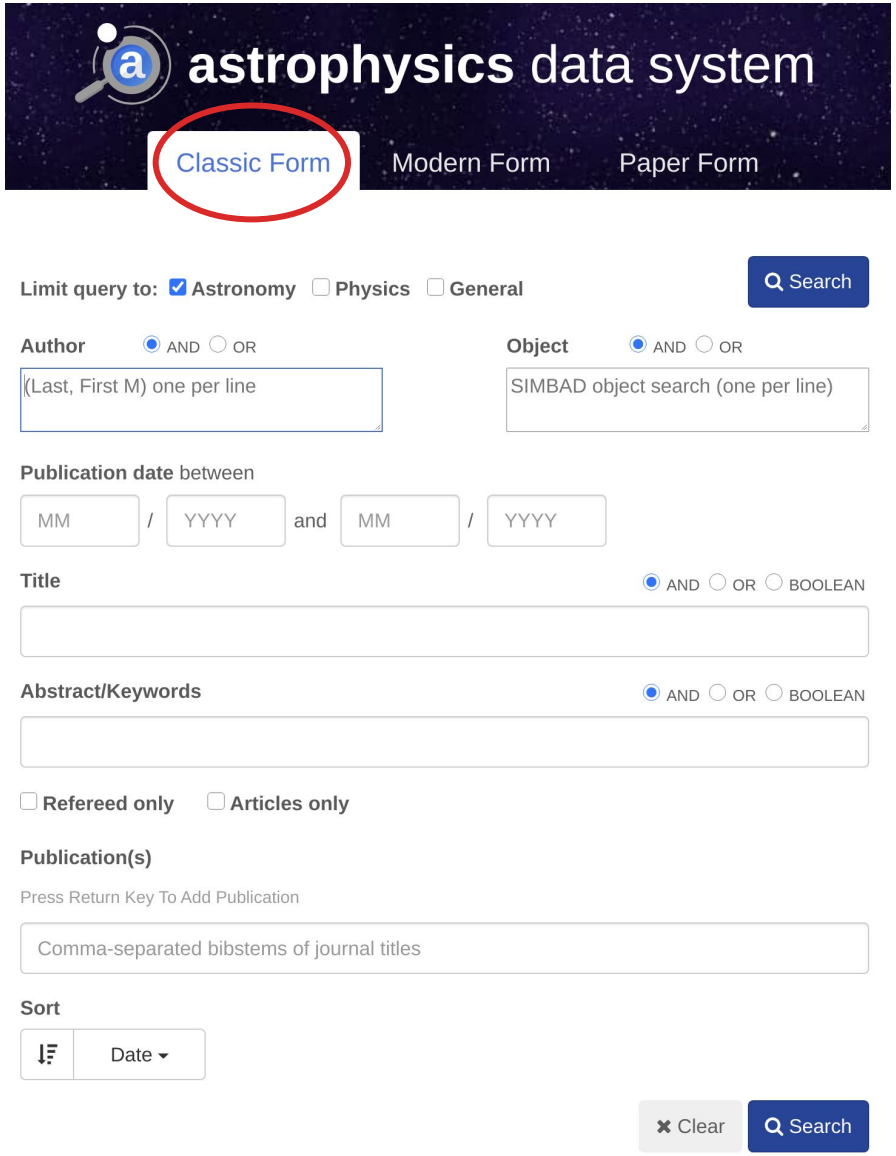
(Re)searching the literature

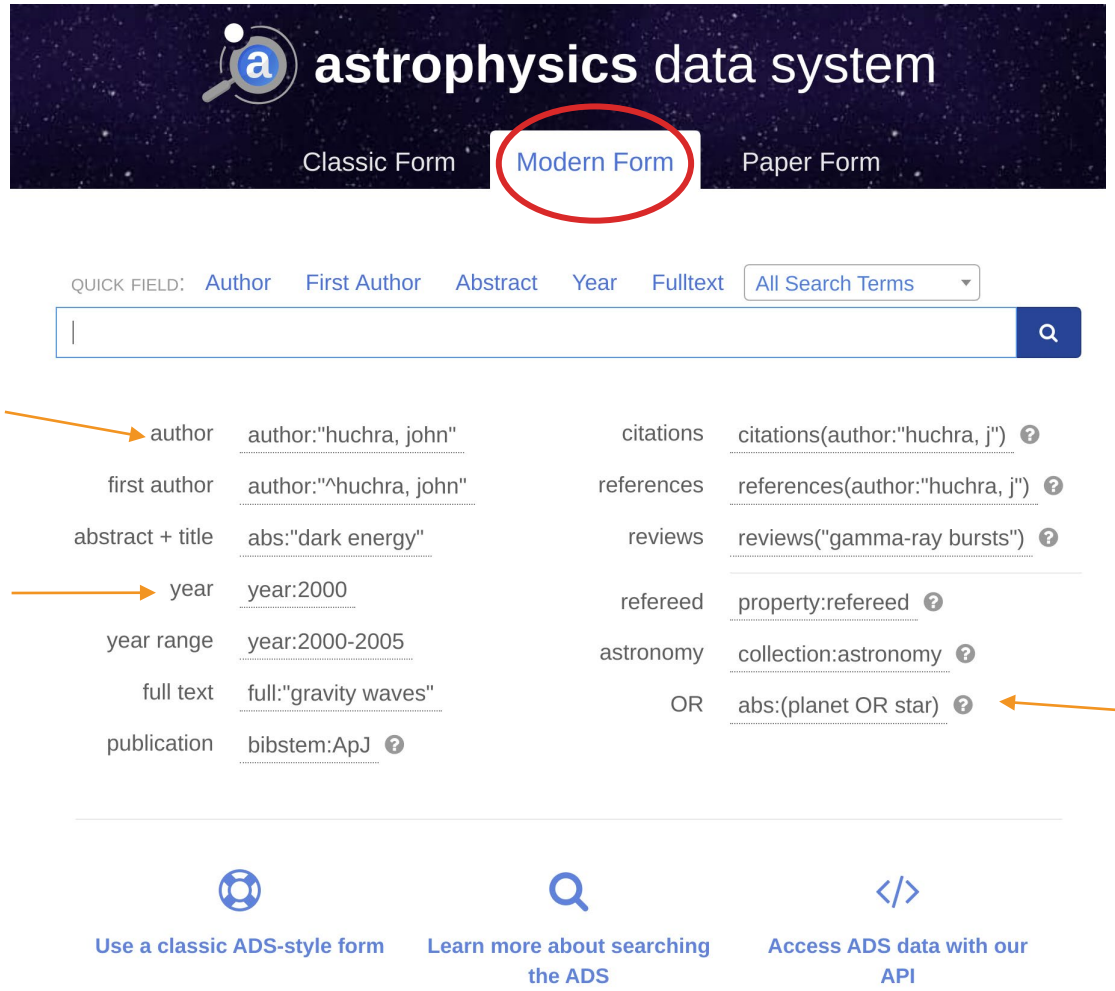


ADS: astrophysics data system (bookmark!)
https://ui.adsabs.harvard.edu/classic-form

(Re)searching the literature

ADS: astrophysics data system (bookmark!)
https://ui.adsabs.harvard.edu/classic-form

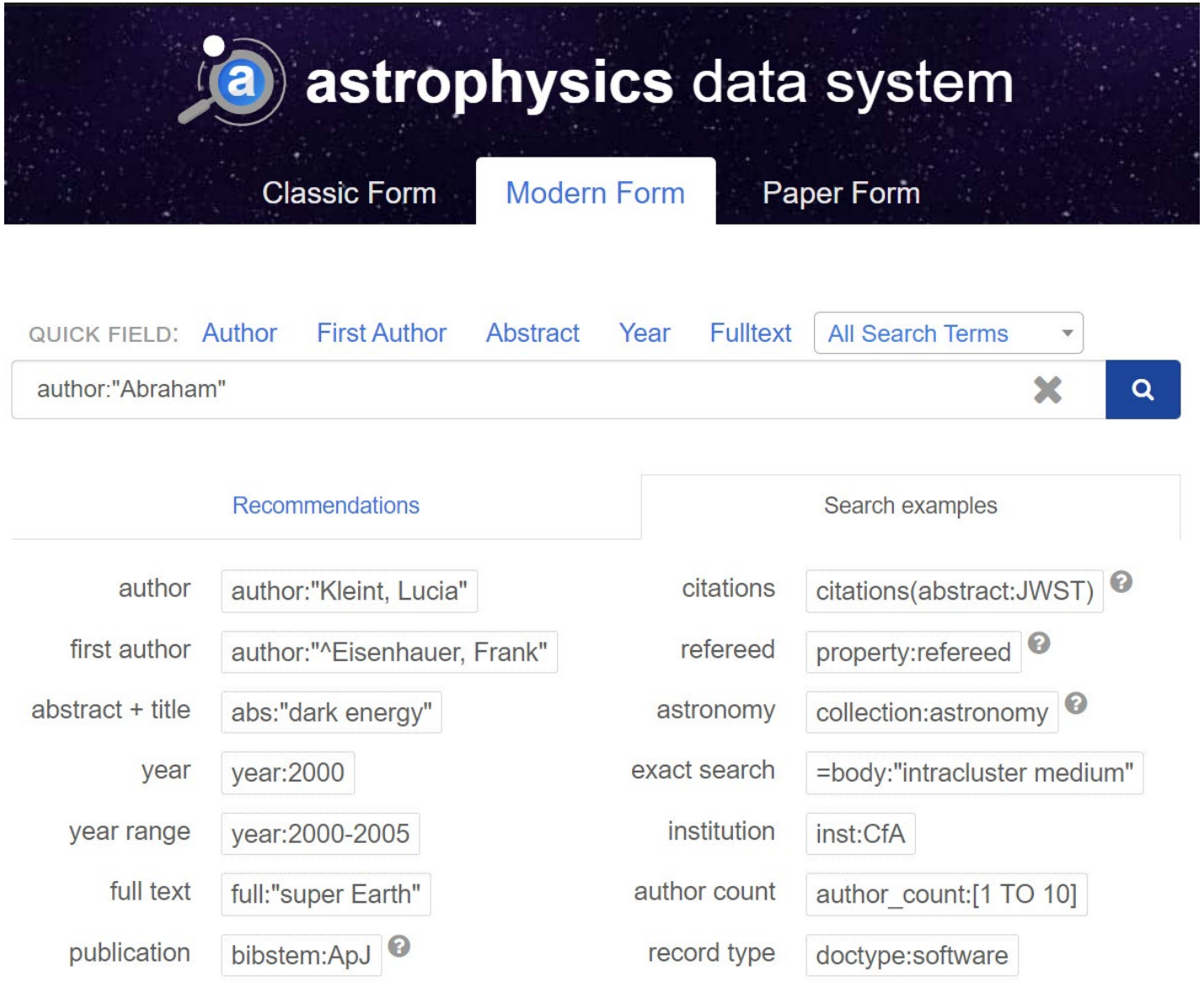




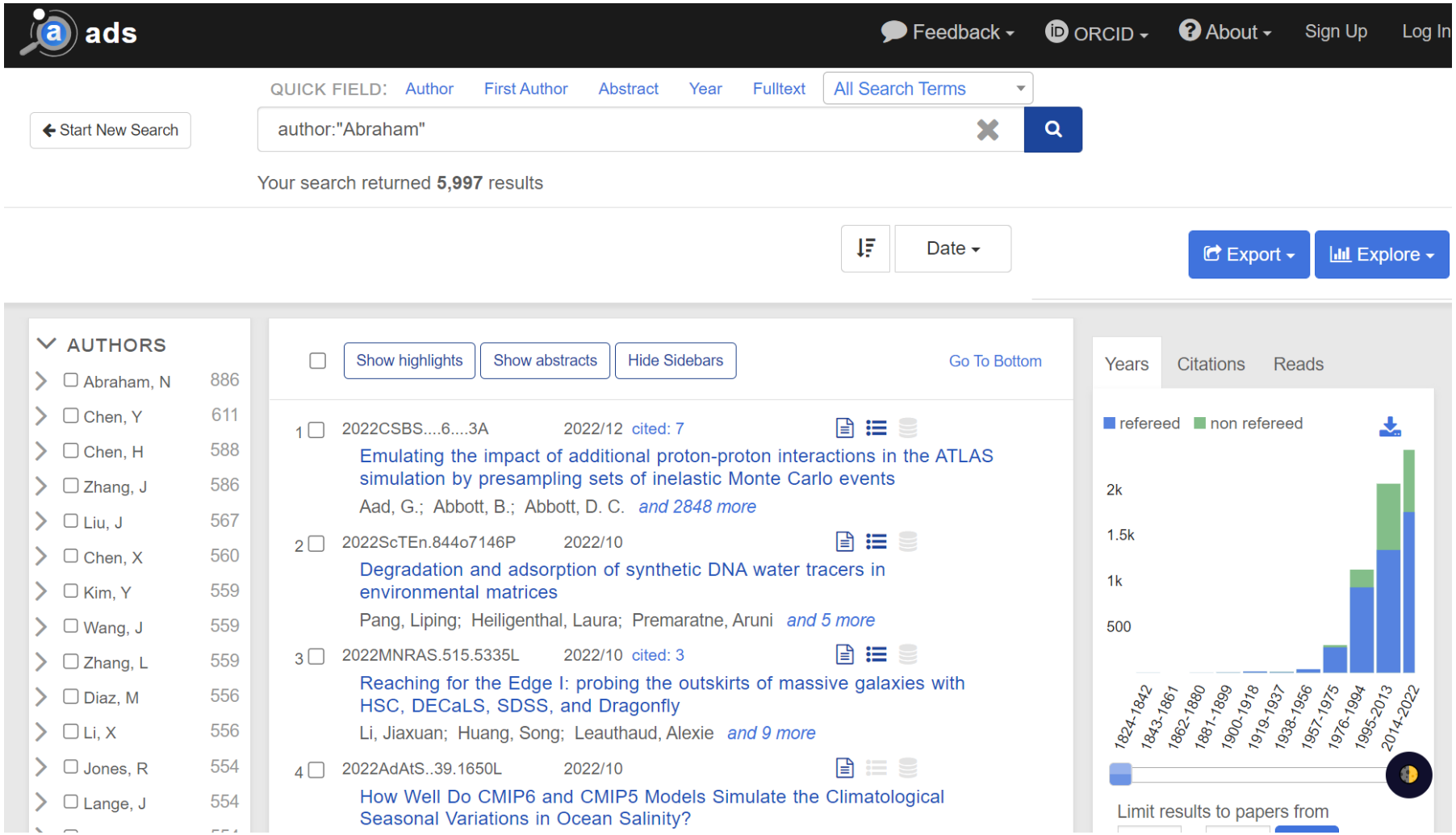
Let's try a simple search:

Searching for papers by our department chair, Roberto Abraham

Here we can choose the *author* option to find the outputs of the person in question

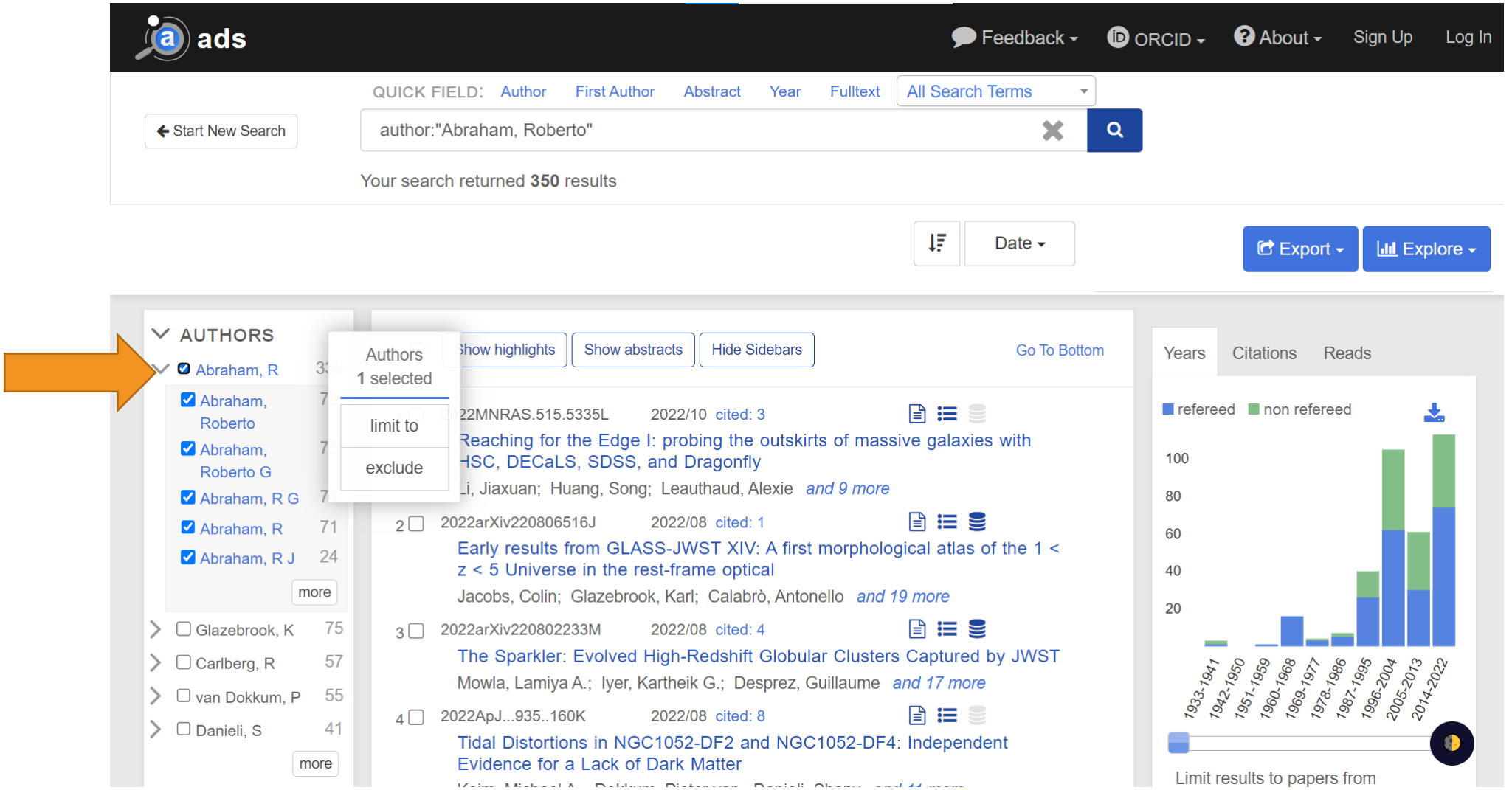


Let's try to be specific with author names, and add their first name or their initial, especially when looking for a person with a common name.
Here I see in my first search, I'm pulling in many people named Abraham, instead of Roberto Abraham.

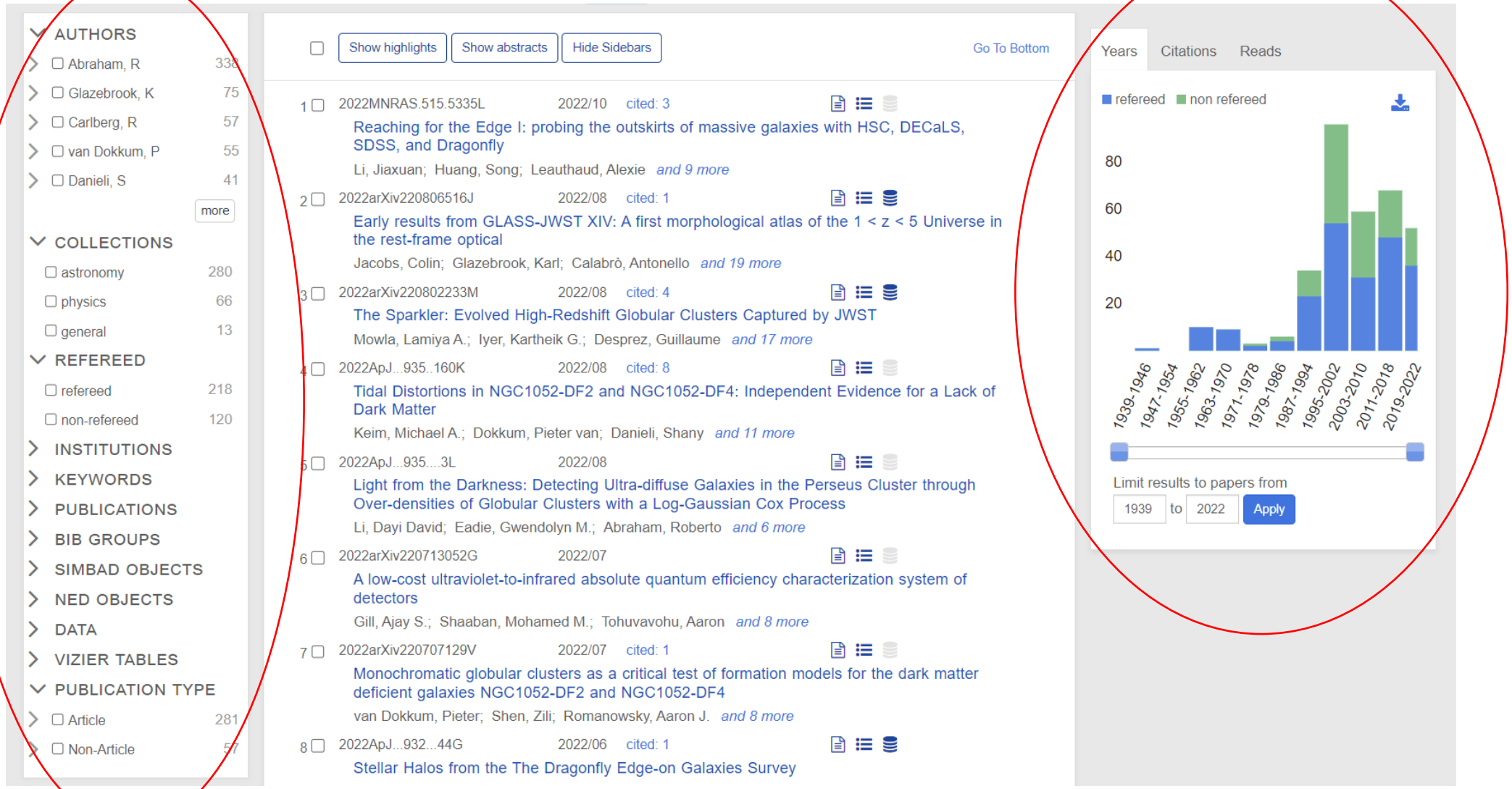


By adding in the first name, I've gotten a tighter search result, which I can specify more by selecting for the specific author's name listed on the left-hand side.

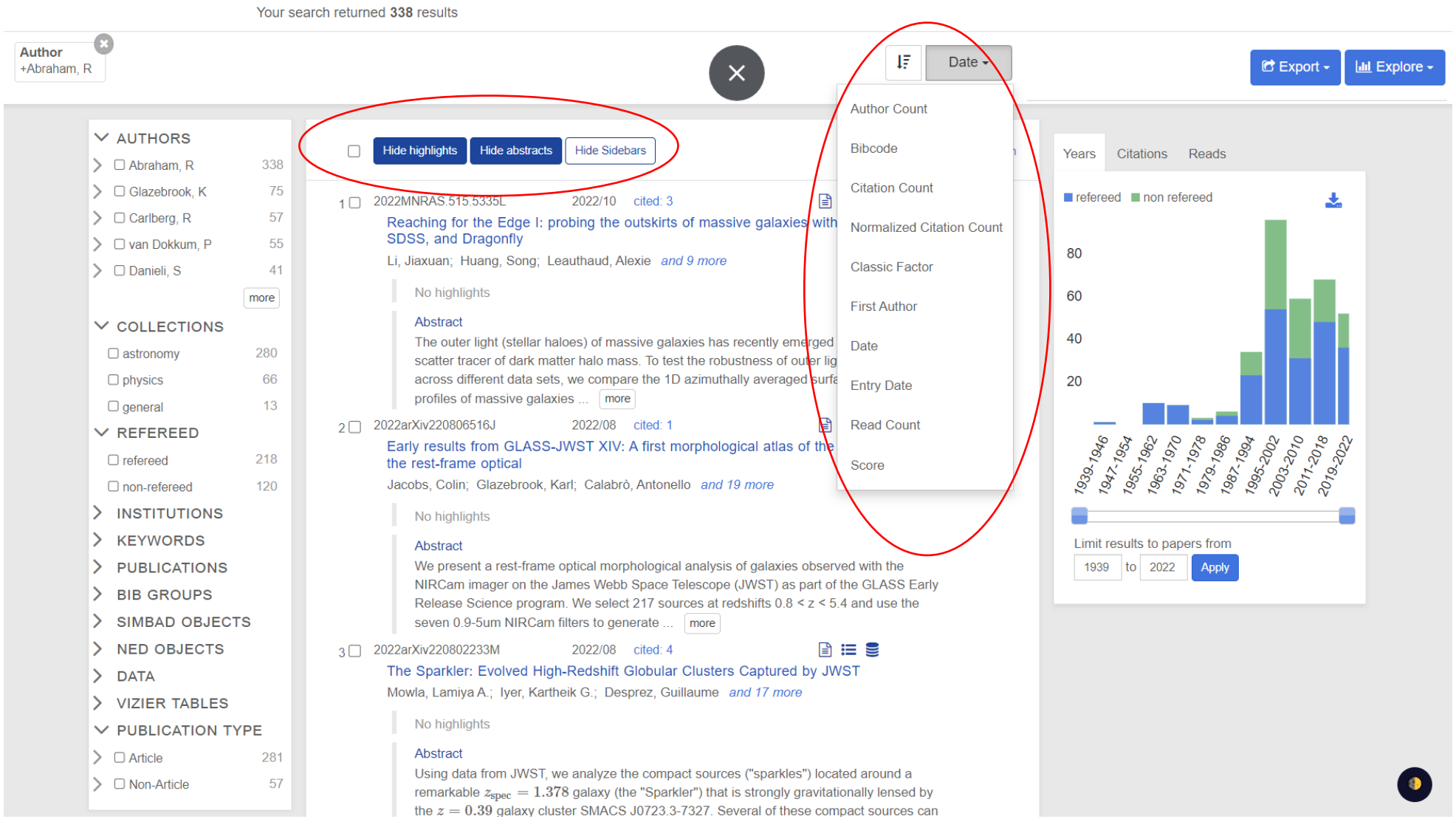
Now I'm getting all publications related to the specific person in question.



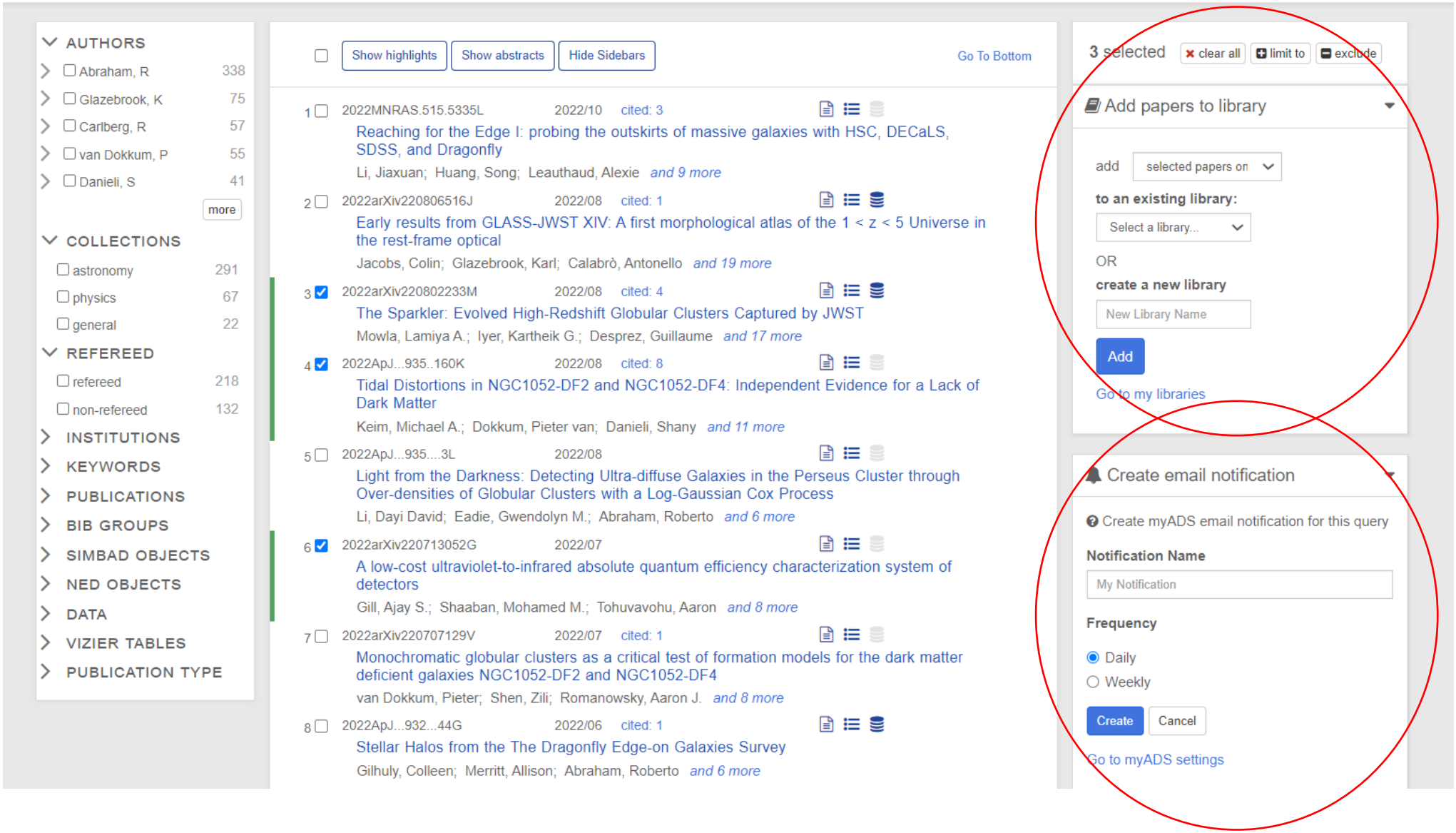
There are other interesting filters that you can use to cut down your search results



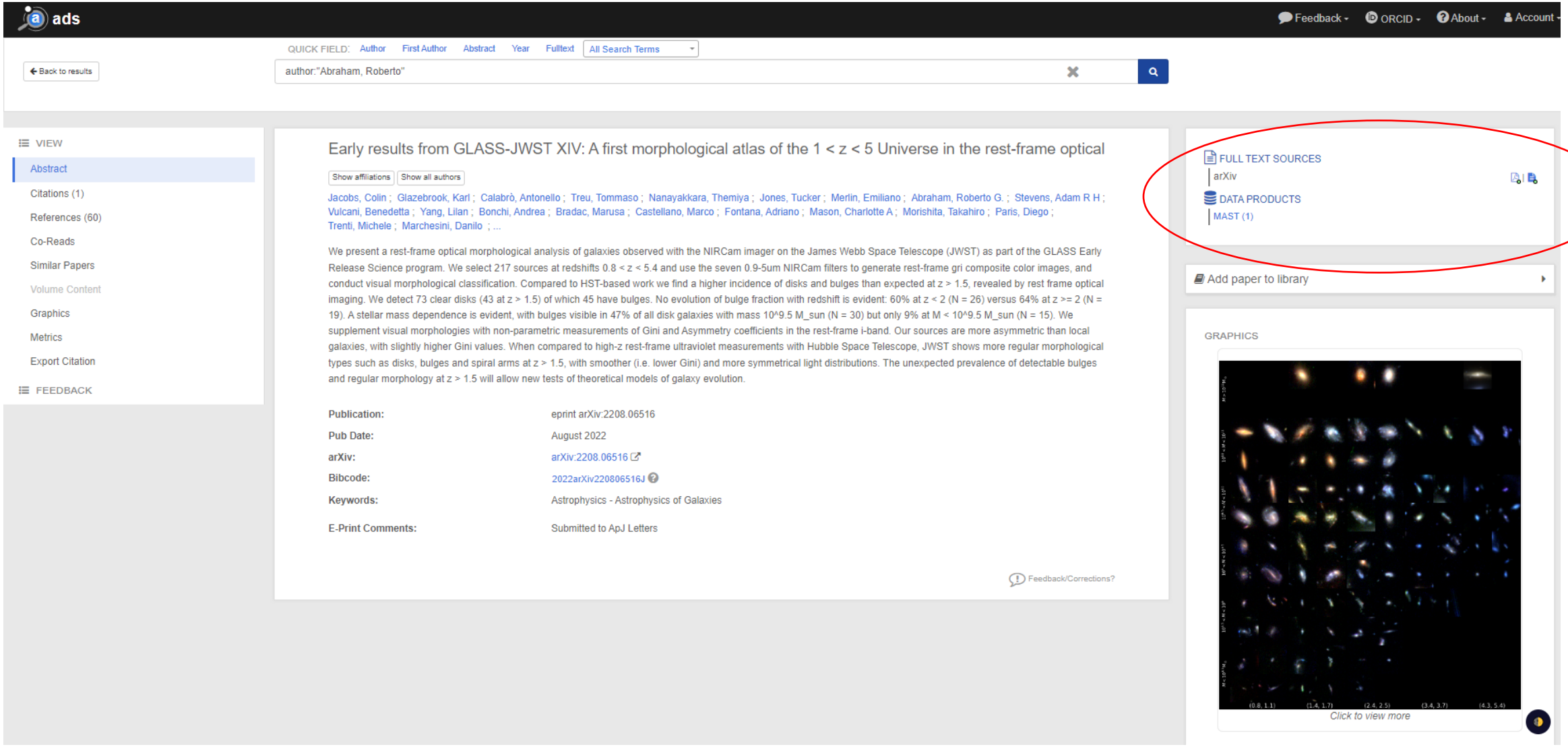
You can select for ***show abstracts*** at the top of the search results if you find that the titles are too vague for you to figure out if the article is something you're interested in. You can also you the drop-down list to sort by parameter that interest you, such as citation count or date.



Other facets you may be interested in is creating a library to save all the citations of interest, and creating an email notification for your search to keep updated on the newest publications related to your search terms.



When you click into an article, there a few things that may be of interest to you. If there is data available, it will be linked in DATA PRODUCTS on the right had side, as well as the FULL TEXT SOURCES which are PDFs or links to the article, if available. You will see that some articles will have two versions, which is the pre-print and the final publisher copy.



You may also be interested in the exporting the citation if you're using LaTeX or a reference management software like Zotero, Endnote or Mendeley. If you're interested in downloading citation information for multiple articles you can do so by putting the articles in a library first. We will see that in the next slide.

ads

Feedback ORCID About Account

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

Back to results

author:"Abraham, Roberto"

VIEW
- Abstract
- Citations (1)
- References (60)
- Co-Reads
- Similar Papers
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- Graphics
- Metrics
- Export Citation

FEEDBACK

Early results from GLASS-JWST XIV: A first morphological atlas of the 1 < z < 5 Universe in the rest-frame optical

Show affiliations Show all authors

Jacobs, Colin ; Glazebrook, Karl ; Calabrò, Antonello ; Treu, Tommaso ; Nanayakkara, Themiya ; Jones, Tucker ; Merlin, Emiliano ; Abraham, Roberto G. ; Stevens, Adam R H ; Vulcani, Benedetta ; Yang, Lilan ; Bonchi, Andrea ; Bradac, Marusa ; Castellano, Marco ; Fontana, Adriano ; Mason, Charlotte A ; Morishita, Takahiro ; Paris, Diego ; Trenti, Michele ; Marchesini, Danilo ; ...

We present a rest-frame optical morphological analysis of galaxies observed with the NIRCam imager on the James Webb Space Telescope (JWST) as part of the GLASS Early Release Science program. We select 217 sources at redshifts 0.8 < z < 5.4 and use the seven 0.9-5um NIRCam filters to generate rest-frame gri composite color images, and conduct visual morphological classification. Compared to HST-based work we find a higher incidence of disks and bulges than expected at z > 1.5, revealed by rest frame optical imaging. We detect 73 clear disks (43 at z > 1.5) of which 45 have bulges. No evolution of bulge fraction with redshift is evident: 60% at z < 2 (N = 26) versus 64% at z >= 2 (N = 19). A stellar mass dependence is evident, with bulges visible in 47% of all disk galaxies with mass 10^9.5 M_sun (N = 30) but only 9% at M < 10^9.5 M_sun (N = 15). We supplement visual morphologies with non-parametric measurements of Gini and Asymmetry coefficients in the rest-frame i-band. Our sources are more asymmetric than local galaxies, with slightly higher Gini values. When compared to high-z rest-frame ultraviolet measurements with Hubble Space Telescope, JWST shows more regular morphological types such as disks, bulges and spiral arms at z > 1.5, with smoother (i.e. lower Gini) and more symmetrical light distributions. The unexpected prevalence of detectable bulges and regular morphology at z > 1.5 will allow new tests of theoretical models of galaxy evolution.

Publication: eprint arXiv:2208.06516
Pub Date: August 2022
arXiv: arXiv:2208.06516
Bibcode: 2022arXiv220806516J
Keywords: Astrophysics - Astrophysics of Galaxies
E-Print Comments: Submitted to ApJ Letters

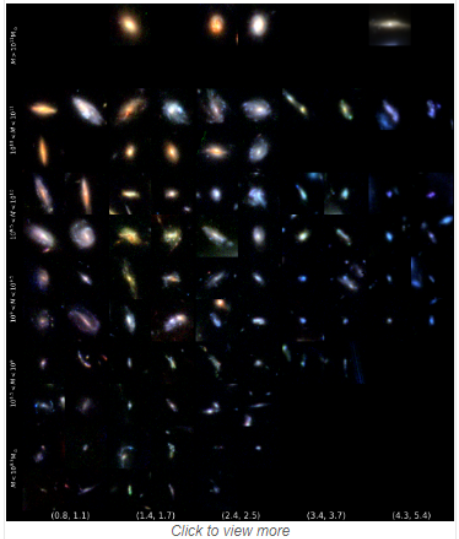
Feedback/Corrections?

FULL TEXT SOURCES
arXiv

DATA PRODUCTS
MAST (1)

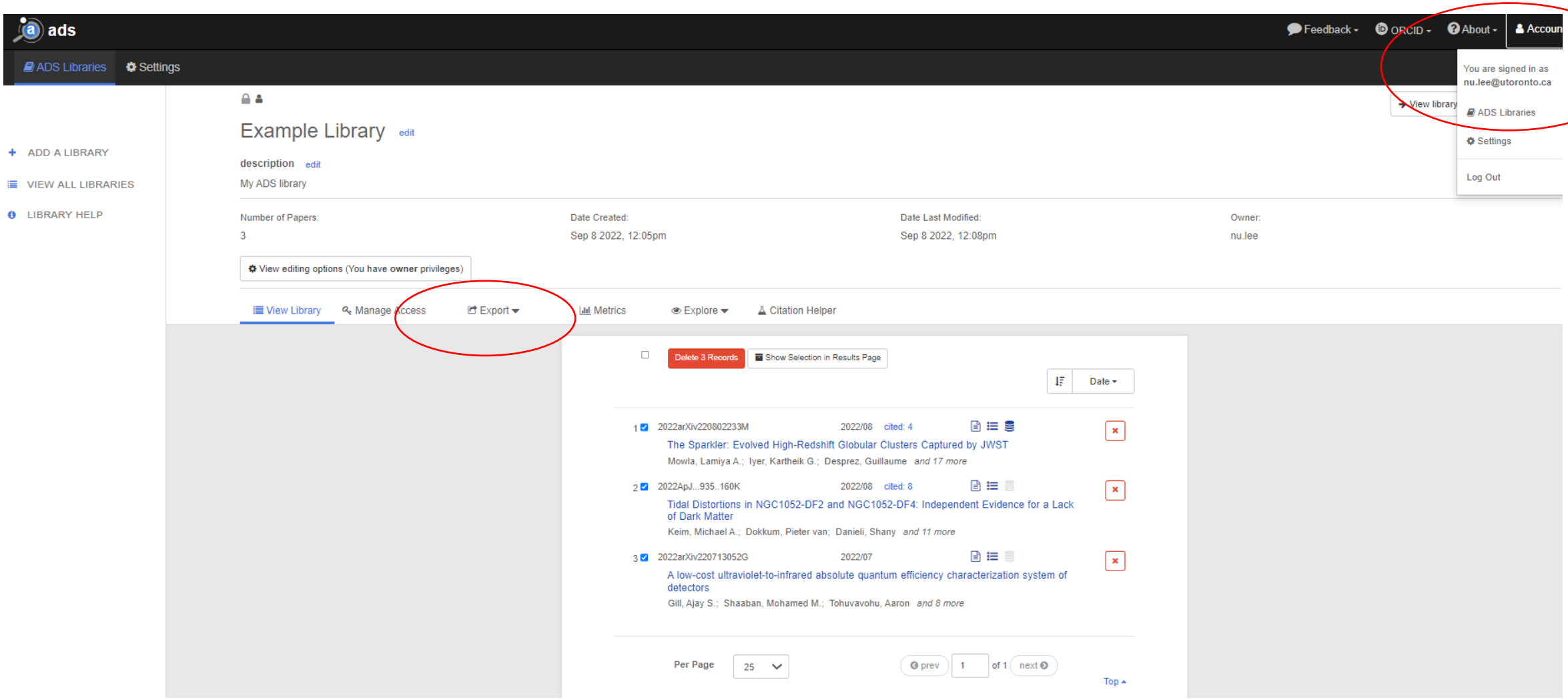
Add paper to library

GRAPHICS



Click to view more

When you click *Account* in the top right corner, you will see an option to ADS Libraries. If you have built a library, you will be able to see it here. To export a batch of citations at once, you can select for them in the library and use the Export dropdown to choose the citation extension (BibTeX, Endnote, RIS etc.)



Why sign up for an ADS account?

- Keep track of papers you read (and write!)
- Organize papers into libraries and share
- Receive email reminders on topics you care about
- easy bibtex output for overleaf and latex
- It's free!

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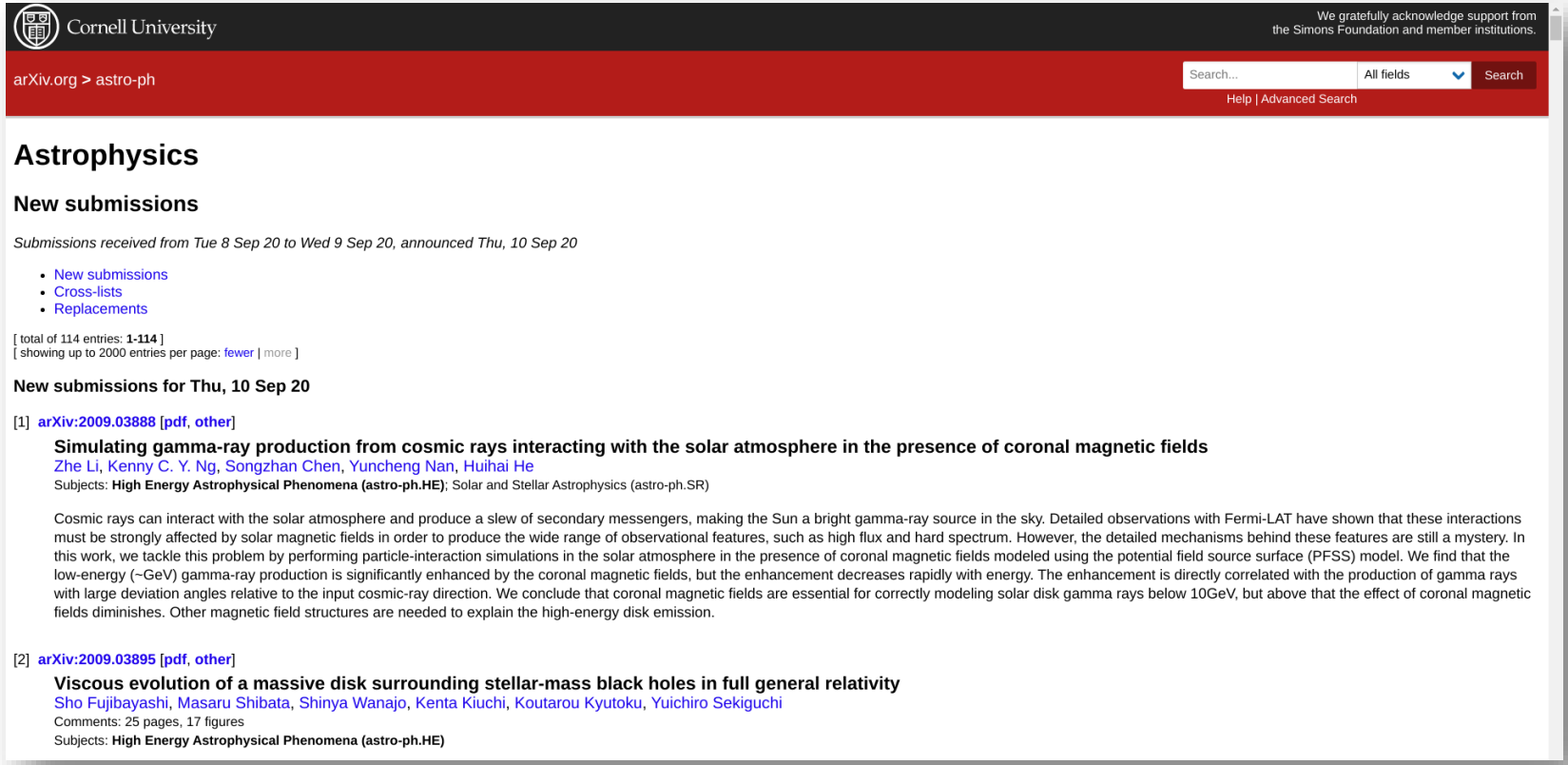
HOT TIP

Go to ui.adsabs.harvard.edu to set up an account. You can link your account to an ORCID account too!

Hot off the press at arXiv

https://arxiv.org/list/astro-ph/new



Cornell University

We gratefully acknowledge support from the Simons Foundation and member institutions.

arXiv.org > astro-ph

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Astrophysics

New submissions

Submissions received from Tue 8 Sep 20 to Wed 9 Sep 20, announced Thu, 10 Sep 20

- New submissions
- Cross-lists
- Replacements

[total of 114 entries: **1-114**]
[showing up to 2000 entries per page: fewer | more]

New submissions for Thu, 10 Sep 20

[1] **arXiv:2009.03888** [**pdf**, **other**]

Simulating gamma-ray production from cosmic rays interacting with the solar atmosphere in the presence of coronal magnetic fields

Zhe Li, Kenny C. Y. Ng, Songzhan Chen, Yuncheng Nan, Huihai He

Subjects: **High Energy Astrophysical Phenomena (astro-ph.HE)**; Solar and Stellar Astrophysics (astro-ph.SR)

Cosmic rays can interact with the solar atmosphere and produce a slew of secondary messengers, making the Sun a bright gamma-ray source in the sky. Detailed observations with Fermi-LAT have shown that these interactions must be strongly affected by solar magnetic fields in order to produce the wide range of observational features, such as high flux and hard spectrum. However, the detailed mechanisms behind these features are still a mystery. In this work, we tackle this problem by performing particle-interaction simulations in the solar atmosphere in the presence of coronal magnetic fields modeled using the potential field source surface (PFSS) model. We find that the low-energy (~GeV) gamma-ray production is significantly enhanced by the coronal magnetic fields, but the enhancement decreases rapidly with energy. The enhancement is directly correlated with the production of gamma rays with large deviation angles relative to the input cosmic-ray direction. We conclude that coronal magnetic fields are essential for correctly modeling solar disk gamma rays below 10GeV, but above that the effect of coronal magnetic fields diminishes. Other magnetic field structures are needed to explain the high-energy disk emission.

[2] **arXiv:2009.03895** [**pdf**, **other**]

Viscous evolution of a massive disk surrounding stellar-mass black holes in full general relativity

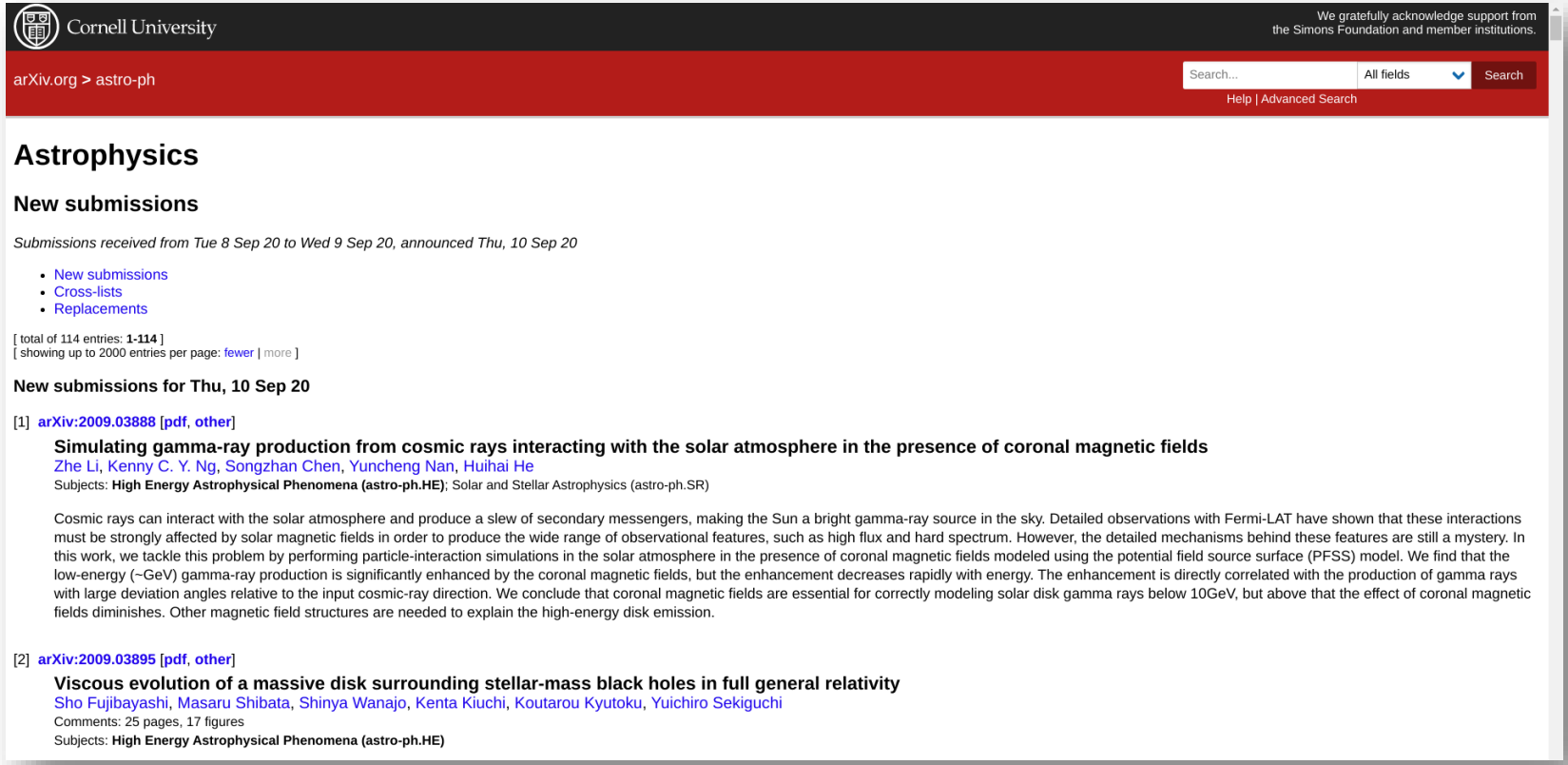
Sho Fujibayashi, Masaru Shibata, Shinya Wanajo, Kenta Kiuchi, Koutarou Kyutoku, Yuichiro Sekiguchi

Comments: 25 pages, 17 figures

Subjects: **High Energy Astrophysical Phenomena (astro-ph.HE)**

Hot off the press at arXiv

https://arxiv.org/list/astro-ph/new



Cornell University

We gratefully acknowledge support from the Simons Foundation and member institutions.

arXiv.org > astro-ph

Search... All fields Search

Help | Advanced Search

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Comments: 25 pages, 17 figures

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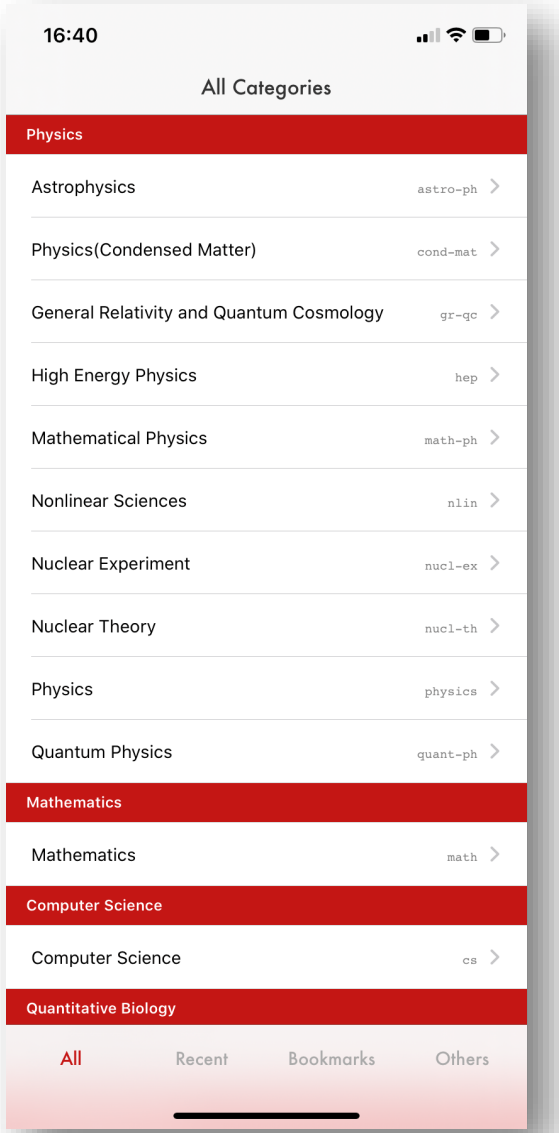
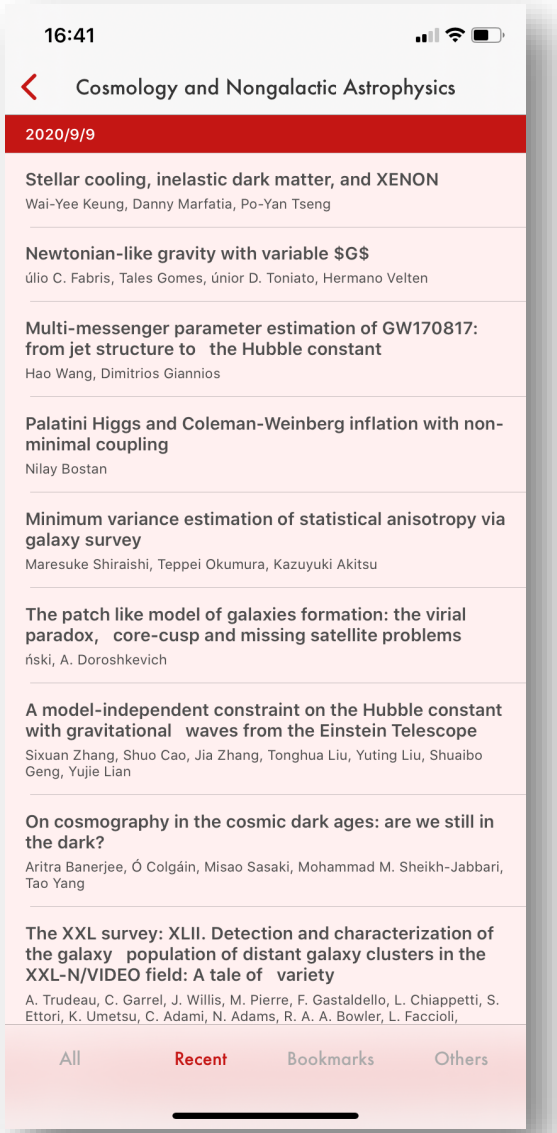
HOT TIP

There is an arXiv *mini-course* offered in the DADDAA!

COOL CATCH

Twitter account @astro-ph-leaks scrapes comments in .tex files uploaded to arXiv ... If you upload a manuscript, then don't leave any comments in it that you don't want broadcast to the world ;)





Phone Apps (e.g. libarxiv)

Accessing Library Services

Searching the UofT Library Website

https://onesearch.library.utoronto.ca/

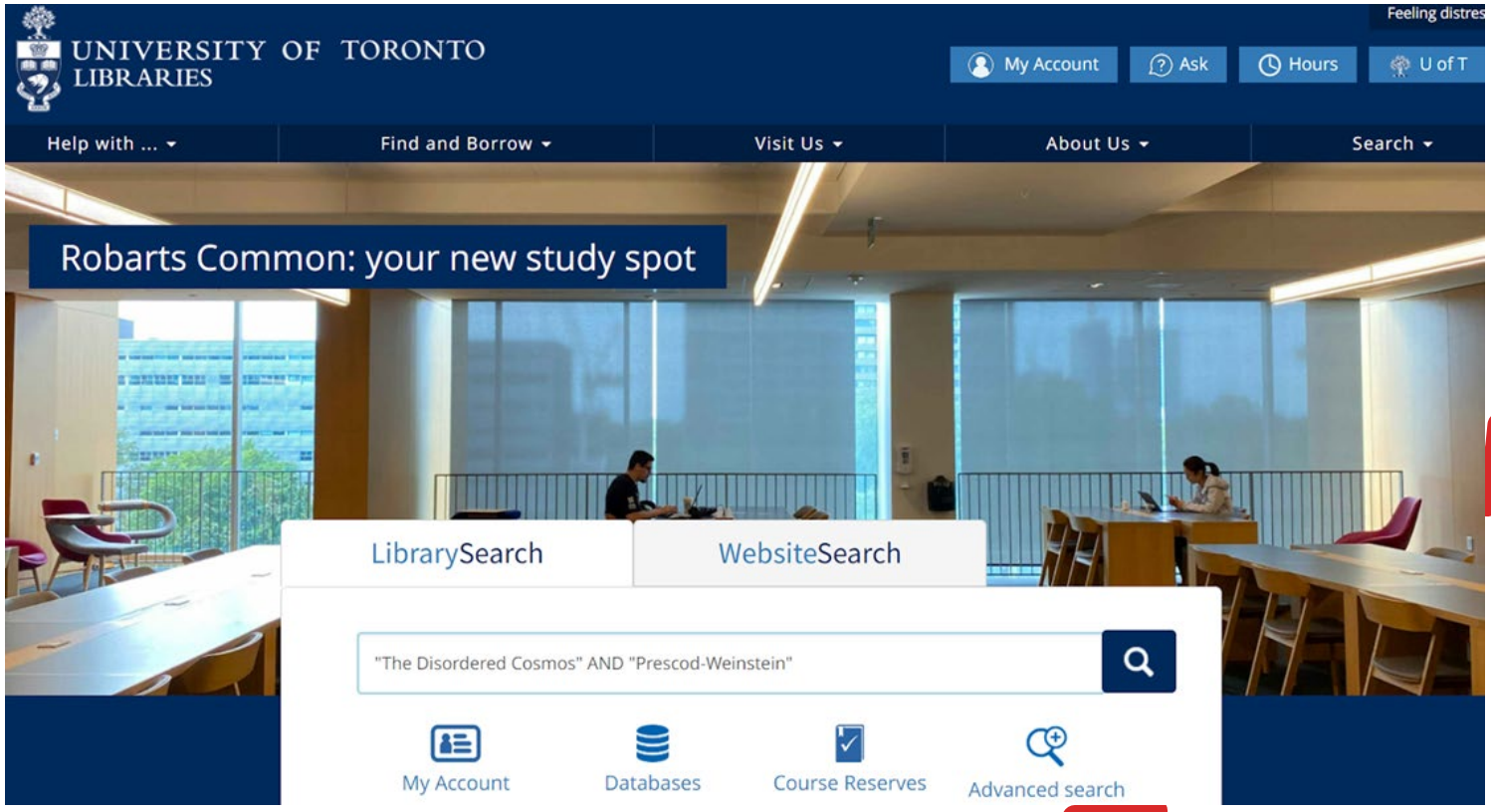
Or Google Search UofT Library

How to find a specific book/item at UofT

The best method to find a book is the **exact title and author surname**. If the patron only has the title or author, it might be a harder search. In that case try Googling the book first to find the title and author.

Example: Looking for *The Disordered Cosmos by Chanda Prescod-Weinstein*

You can search on the library website's main search bar.
Search the title in quotation marks ("") and if you have an author, put AND in capital letters to combine both to try to get a specific search result.



Accessing Library Services

Finding an item for interlibrary loan

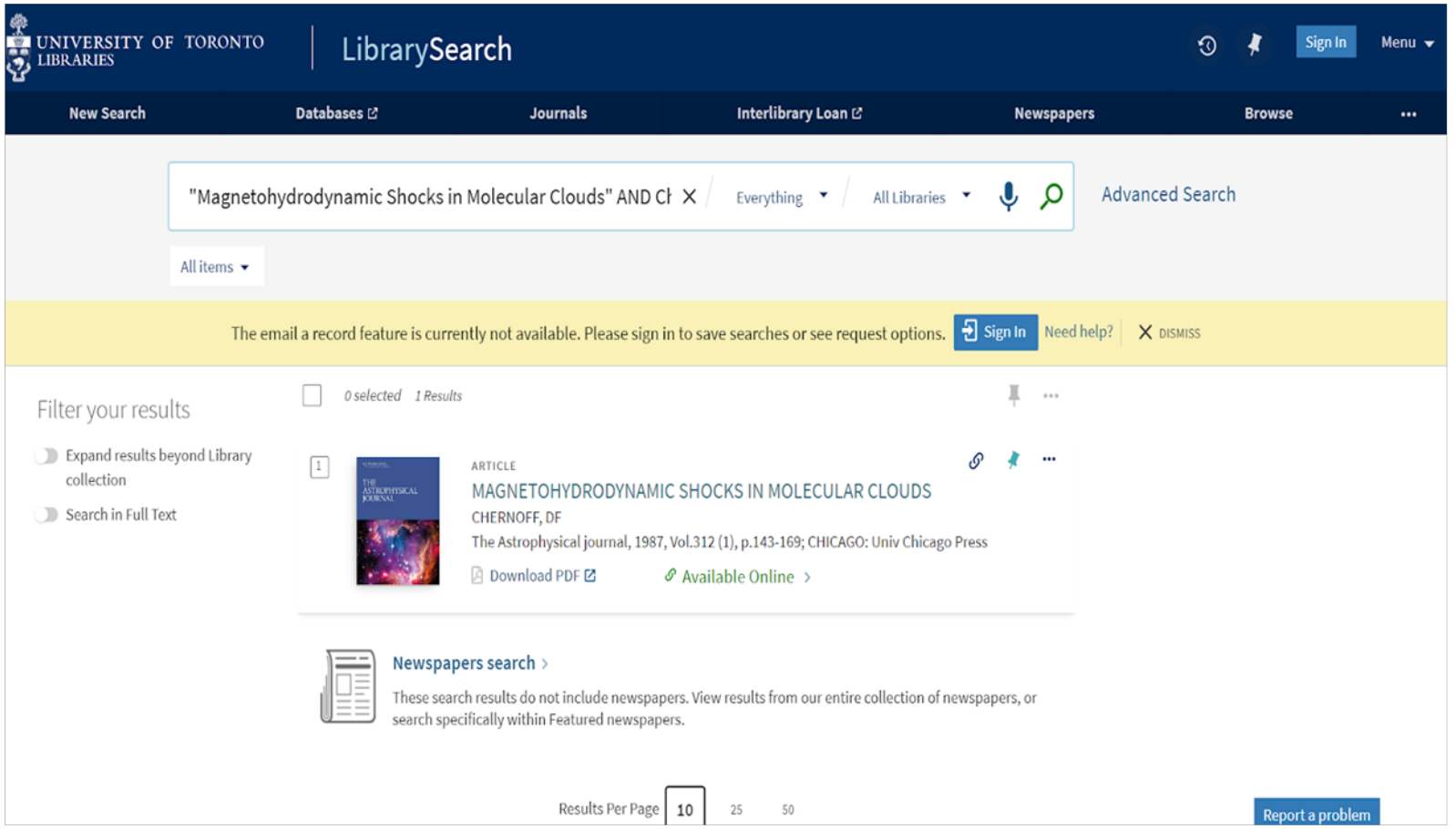
(Borrowing from other universities)

Interlibrary Loan

Example: We're trying to find a thesis titled "Magnetohydrodynamic Shocks in Molecular Clouds" by David F. Chernoff printed in 1985.

Pay attention to this one, as the author wrote an article of the same title AFTER he completed his thesis. Try not to mistake the type of publication when searching for the title in question.

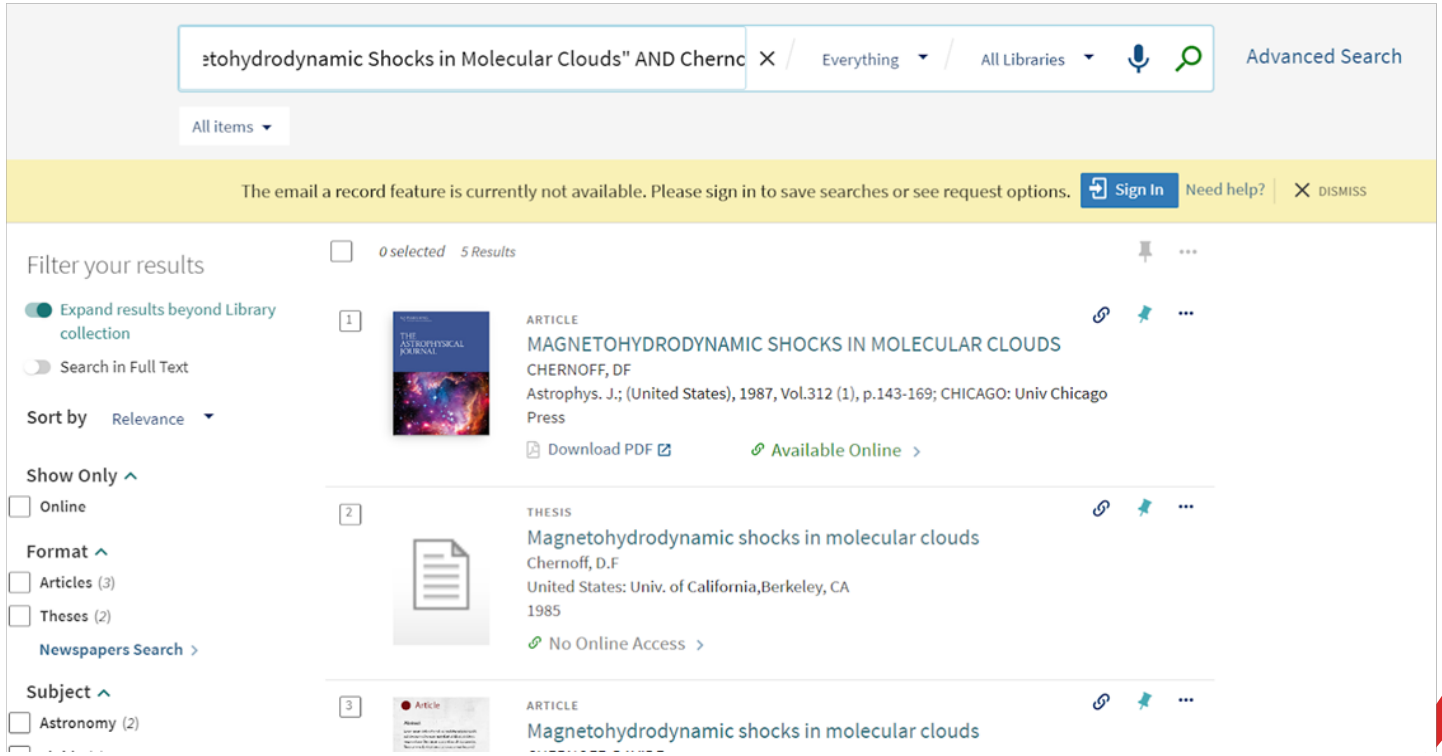
Here it shows that we have access to the ARTICLE, not the thesis.



Interlibrary Loan

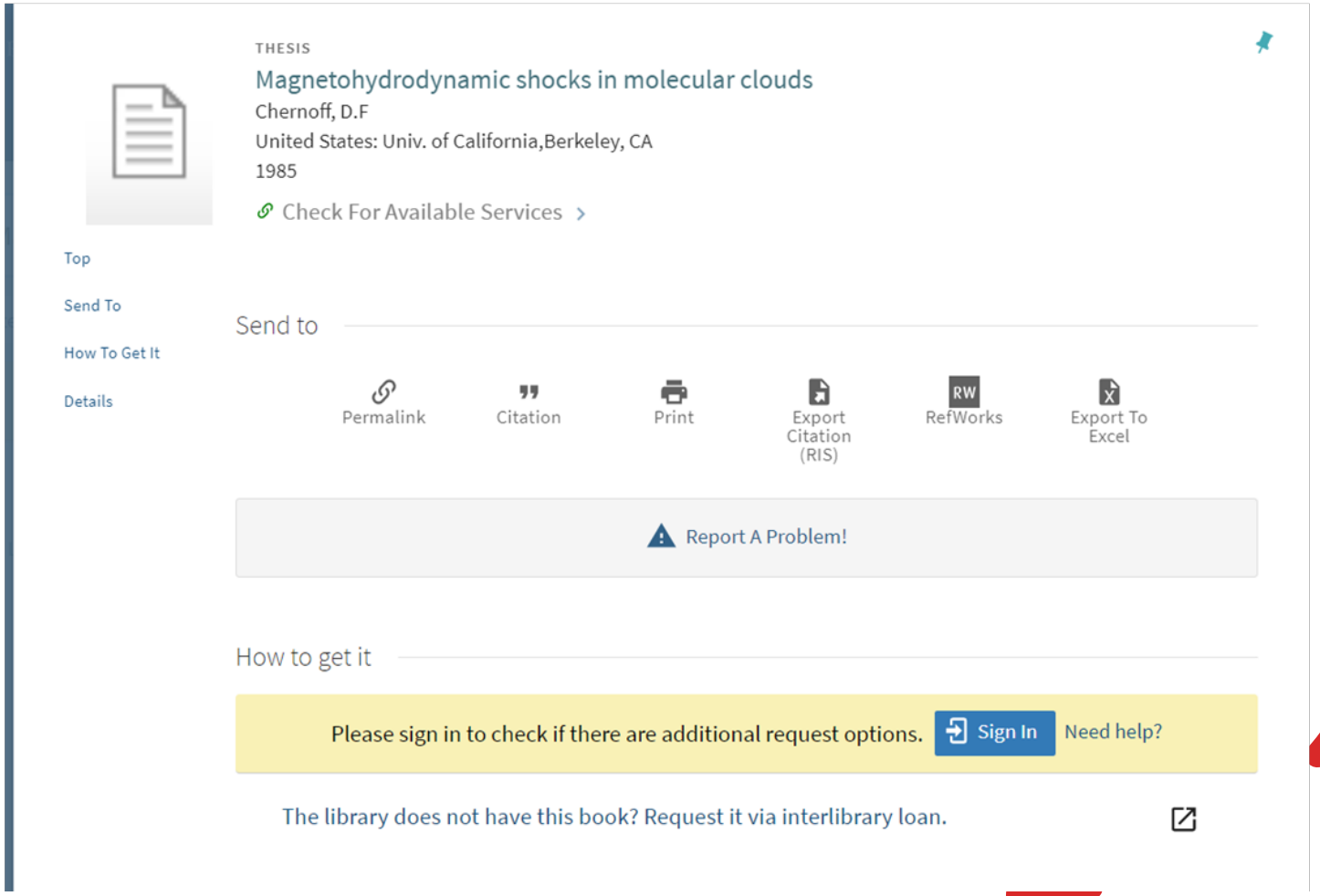
Next, to find out if another university has the thesis available, we're going to toggle on **"Expand results beyond Library collection"** found on the left-hand side of the page.

Here we see that results #2 is the thesis we're looking for.



Interlibrary Loan

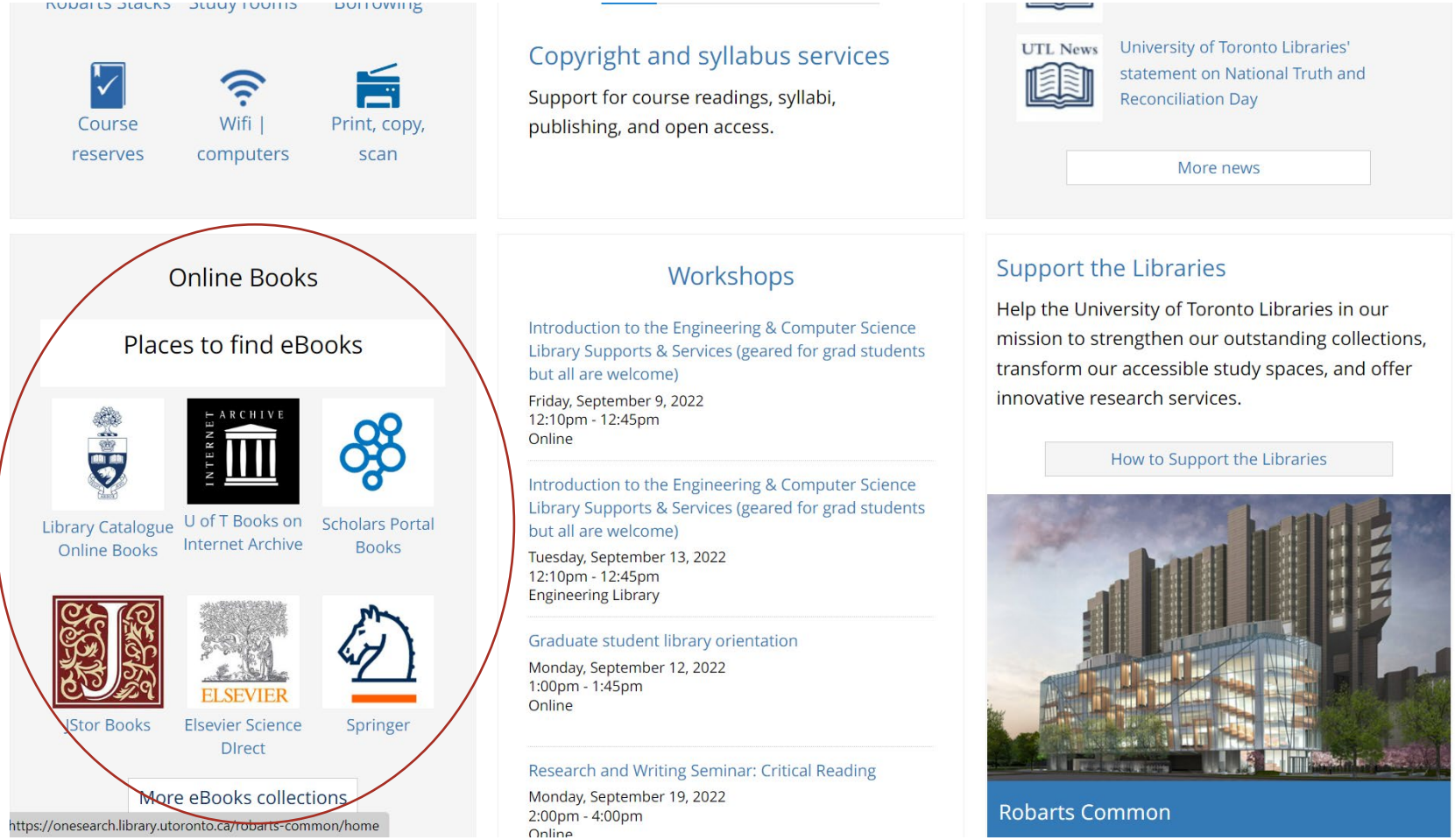
When you click on the thesis, you will see a pop-up showing that we do not have this thesis for access at our university.
Instead, it gives you the option, **The library does not have this book? Request is via interlibrary loan"**
If you click this link, it will direct you to a form which you fill out and submit, which will send a request to the central library system



E-books

If you scroll down the main library page, you will see our e-book collection linked in the bottom-left corner.

Click on the "More eBooks collections" link to see our full list.



E-books

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Some of these are geared toward the sciences, while others may be geared to humanities/social sciences or multidisciplinary.

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- Suggest a title

Ebook platforms and collections

Click on the titles below to learn more about each ebook platform or collection's functionality.

The library doesn't purchase every ebook on every platform, so you might see ebooks to which you don't have access on a publisher's website or platform. The best way to check for access to an ebook is by searching the library catalogue.

If you have the option of downloading a book for offline reading, you may be asked to download Adobe Digital Editions.

If you have questions or need additional help, ask a librarian.

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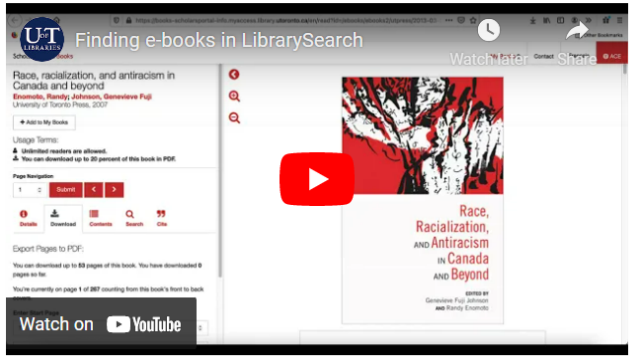
How to find and open an individual ebook



E-books

Some of the e-book publishers you will be interested in will include:

Cambridge Core

Elsevier Science Direct

IOP ebooks

SPIE Digital Library

Springer Books

Accessing Library Services

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Nu.lee@utoronto.ca

- Gerstein Science Library
- Physics Library

- Accessing U of T Library off-campus
  - https://onesearch.library.utoronto.ca/
- Google Scholar account
  - Add U of T in Settings > Library Links

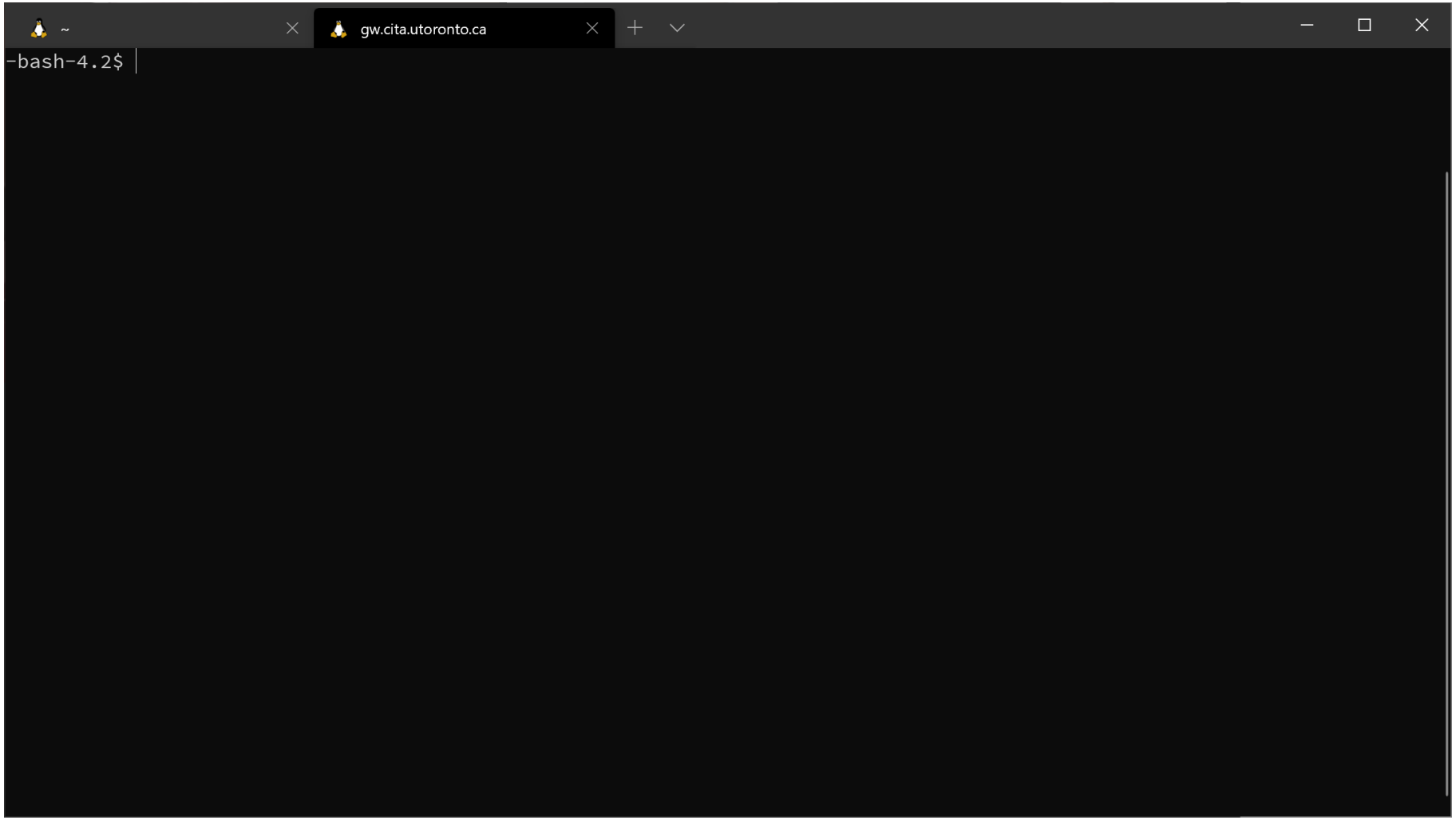
Exercises

- Create an ADS library and cite it within your LaTeX document

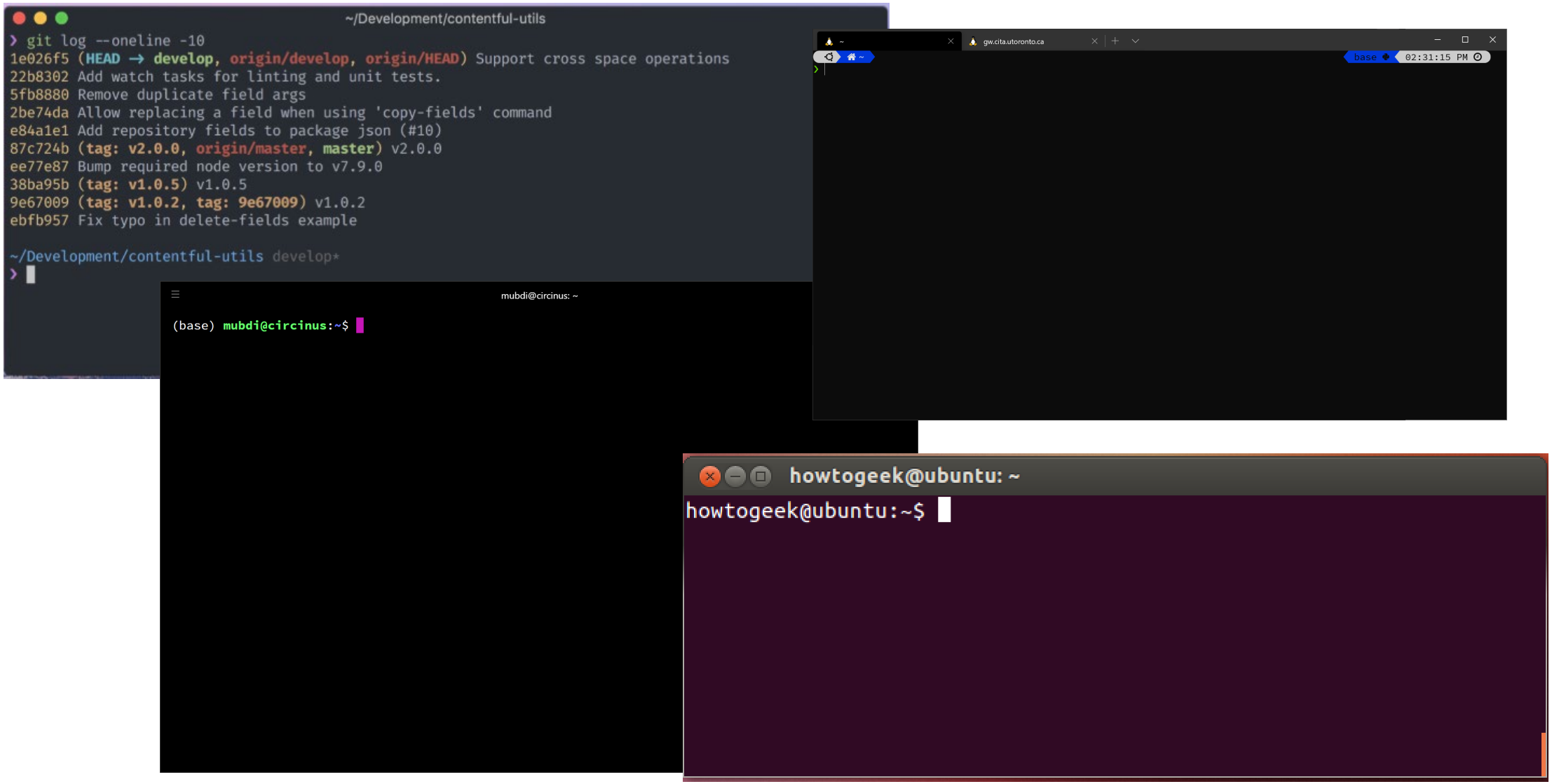
BREAK!

Your friend, the Terminal

This is your terminal. You will come to love this little box!



They come in all sorts of shapes and sizes



What is a Terminal?

A Terminal Program (sometimes also called a “console”) is a way of interacting directly with your computer using text commands. This is an alternative way of interacting with your computer to a mouse, and often, more powerful.

Not all terminals are built the same, and we have the following recommendations for terminal programs:

- **For Windows:** Windows Terminal (available on the Windows Store)
- **For MacOS:** iTerm2 (available on its website: https://iterm2.com)
- **For Linux/or Crossplatform:** Hyper (available on its website: https://hyper.is/)

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HOT TIP

The terminal programs we’re recommending all have the ability to open multiple tabs and panes, and hot keys to switch between them. This makes it easy to compare two things side-by-side.

Some terminal basics...

```
> cd <directory name> # change your current directory to <directory name>

> cd ~ # change your current directory to your home directory

> ls # list all the files in the current directory

> ls -ahl # the same, but show me all the files in a list

> ls <directory name> # list all the files in <directory name>

> mkdir <directory name> # make a directory called <directory name>

> rmdir <directory name> # remove the directory called <directory name>
(only works if it's empty)

> pwd # list what directory you're in
```

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HOT TIP

This is just a very basic list to give you a flavour, and everyone has their own versions/options of these commands that they love. Use what makes the most sense!

Some terminal basics...

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> cd ~ # change your current directory to your home directory

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> ls <directory name> # list all the files

> mkdir <directory name> # make a directory

> rmdir <directory name> # remove the directory
(only works if it's empty)

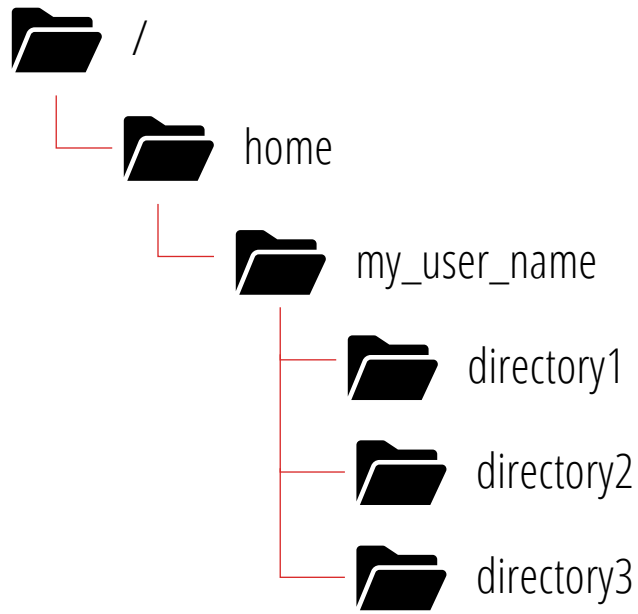
> pwd # list what directory you're in
```

HOT TIP

You can type in "man <command name>" to get the **man**ual page of the command, which shows you all of the options for that command and how to use it.

Navigating your directories

Typically, on your computer, there's a tree of directories:



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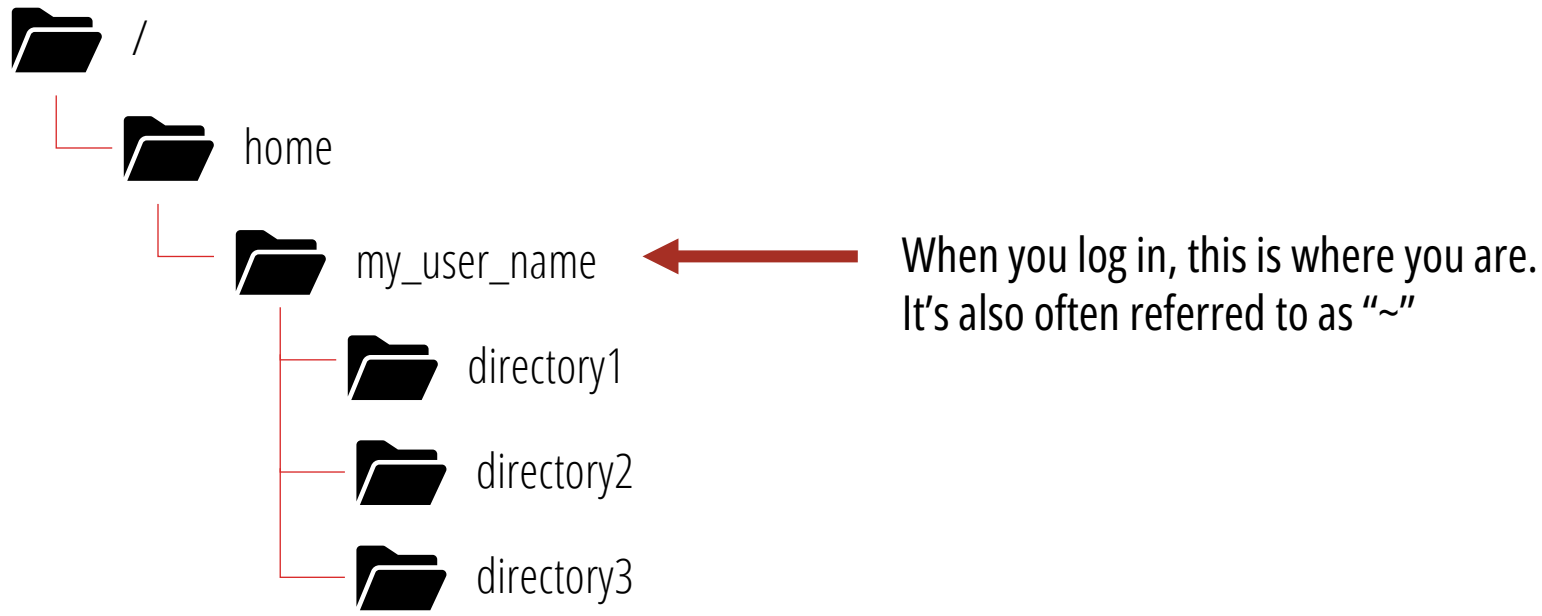

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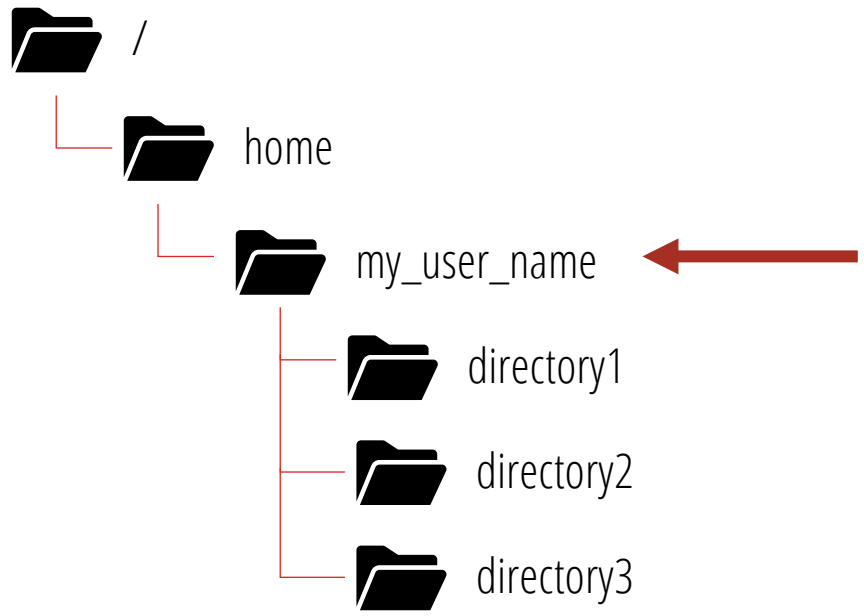

When you log in, this is where you are.
It's a

COOL CATCH

In Windows (not using WSL), this location is usually in your User directory. For instance, for me, it is located in "C:\Users\mubdi"

Navigating your directories

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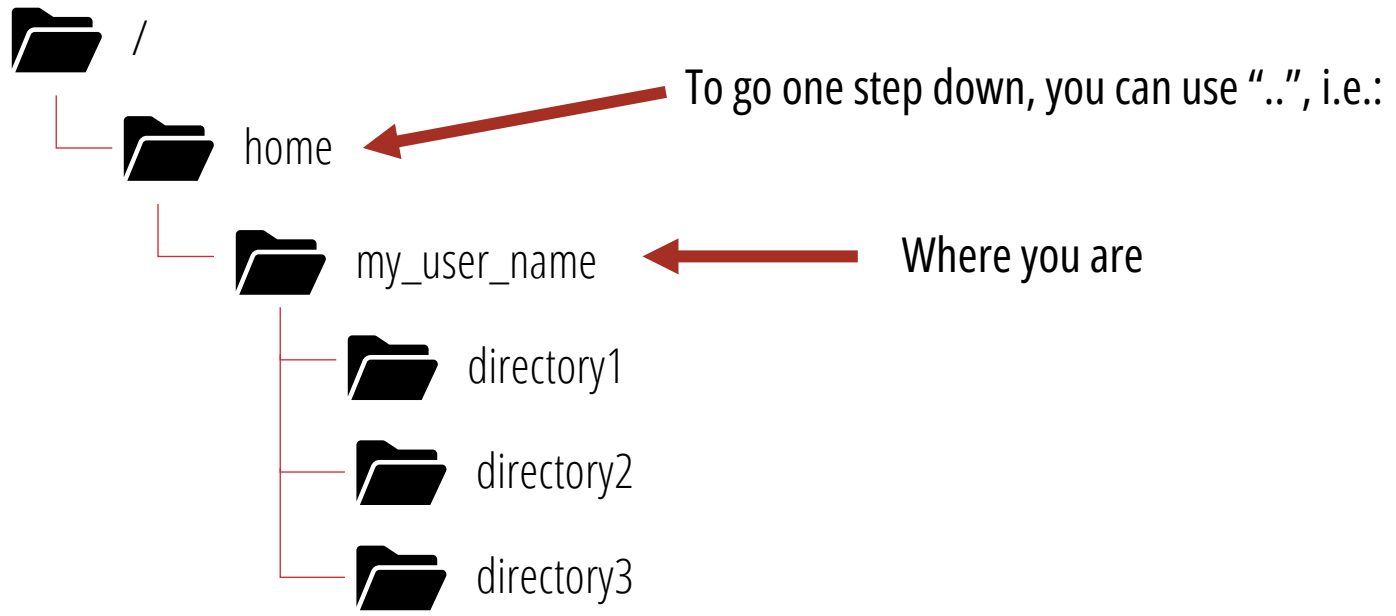


```
cd ..
```

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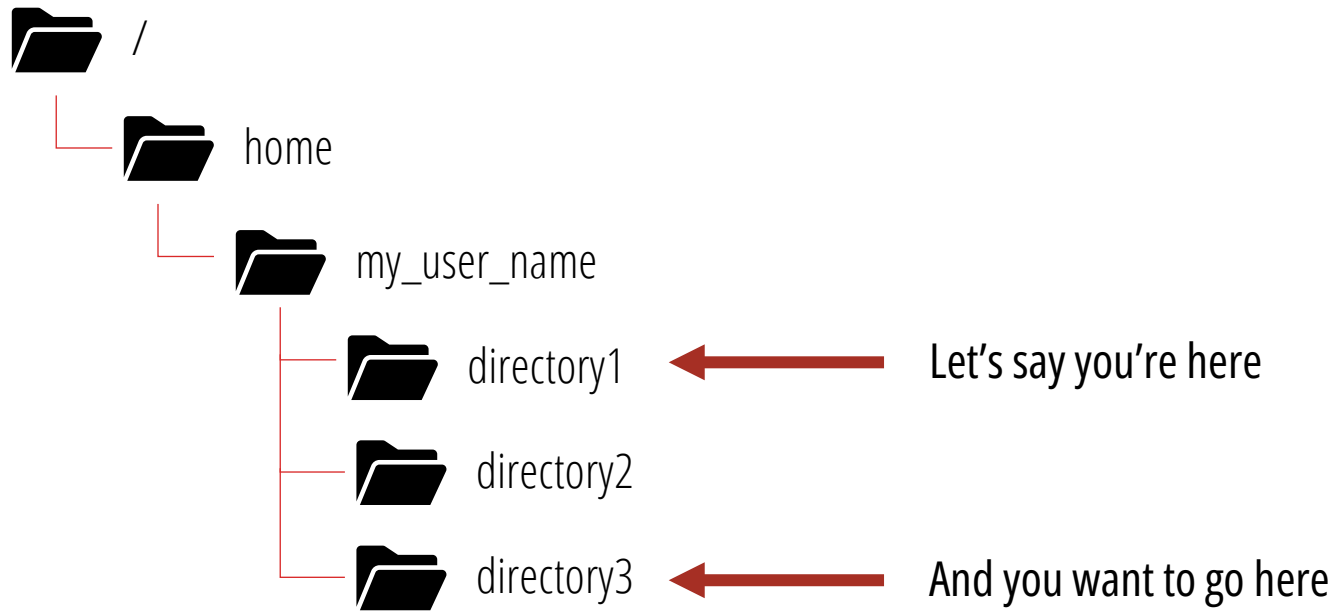

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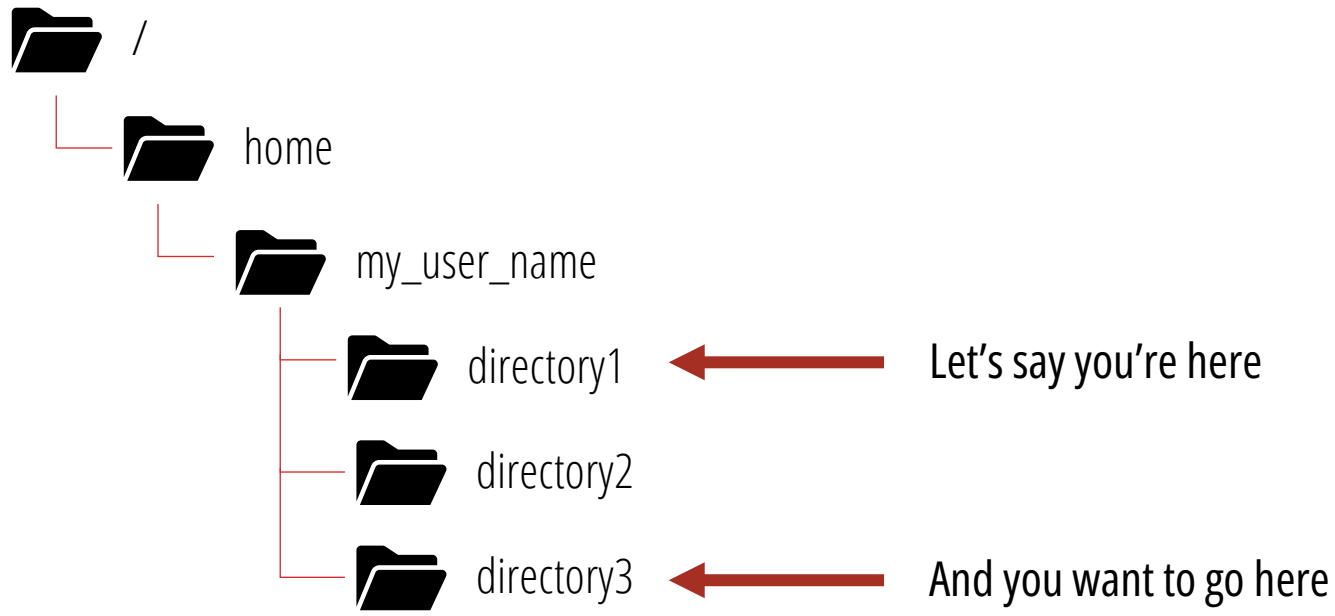
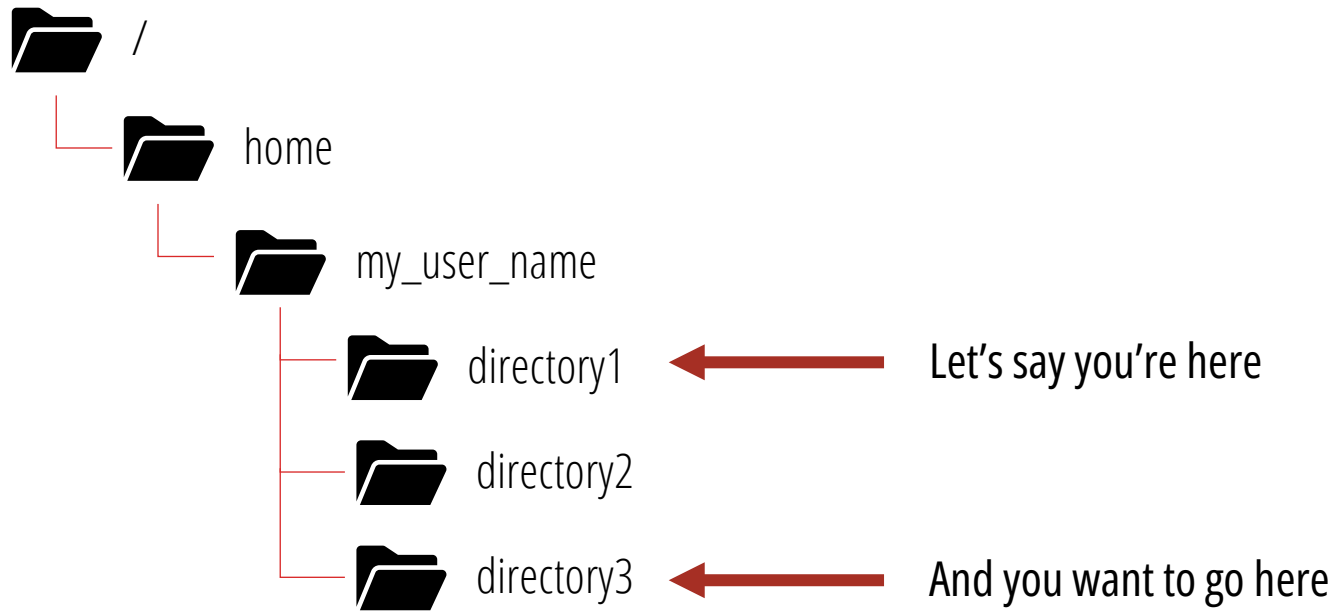



```
cd ../directory3
```

Navigating your directories

Typically, on your computer, there's a tree of directories:



Or you could use absolute paths (i.e., right from the top):

```
cd /home/my_user_name/directory3
```

Navigating your directories

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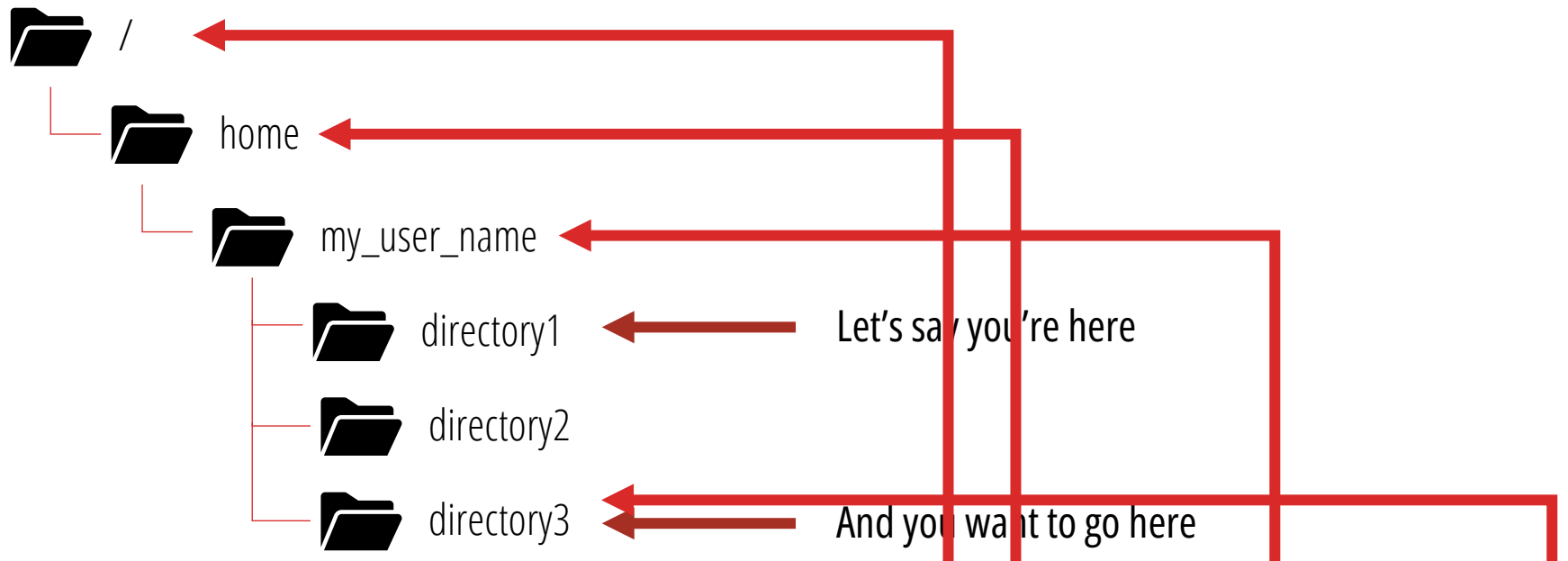

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Navigating your directories

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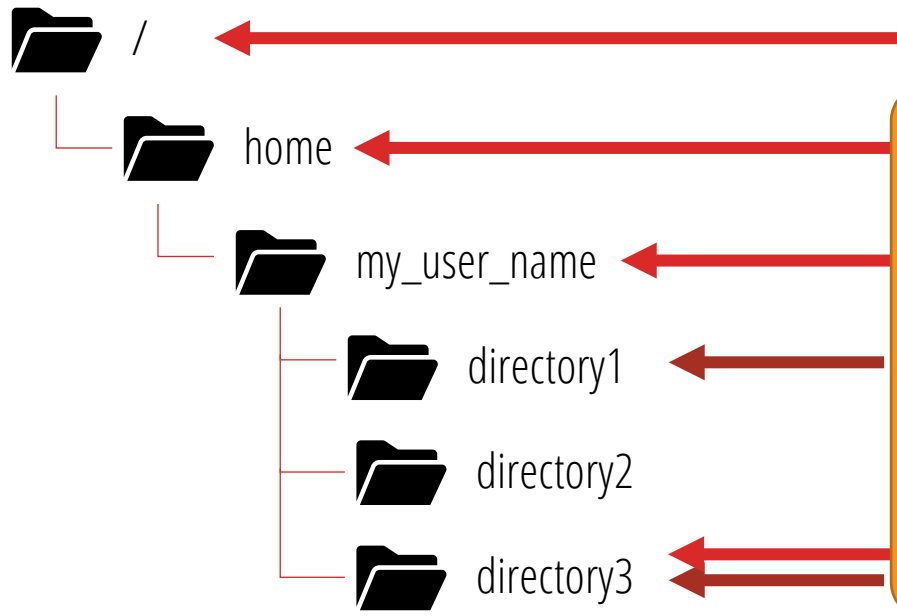


HOT TIP

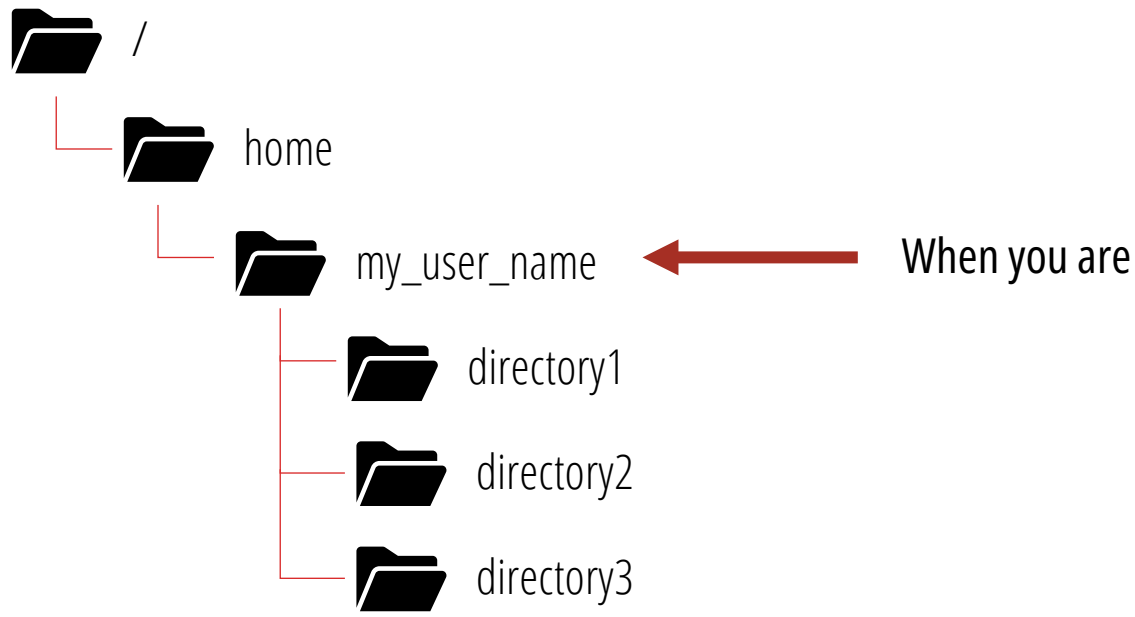
It's okay to be lazy, and something you want to be lazy about is typing. You can usually press "tab" to try to complete the name of directories and/or files, if you start typing the first few letters.

Or you could use absolute paths (i.e., right from the top):

```
cd /home/my_user_name/directory3
```

Hidden Directories

When you run an “ls”, you don’t see everything. In your home directory, try running “ls –a”



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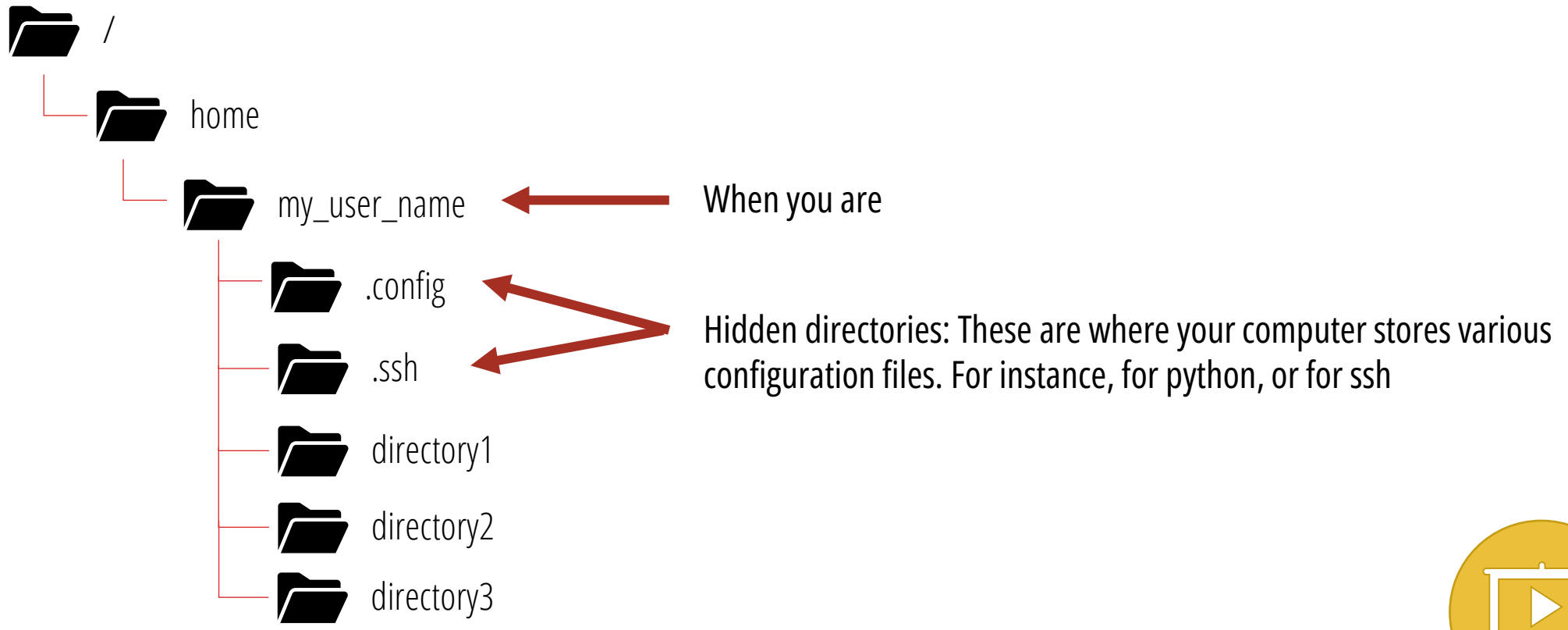

Hidden Directories

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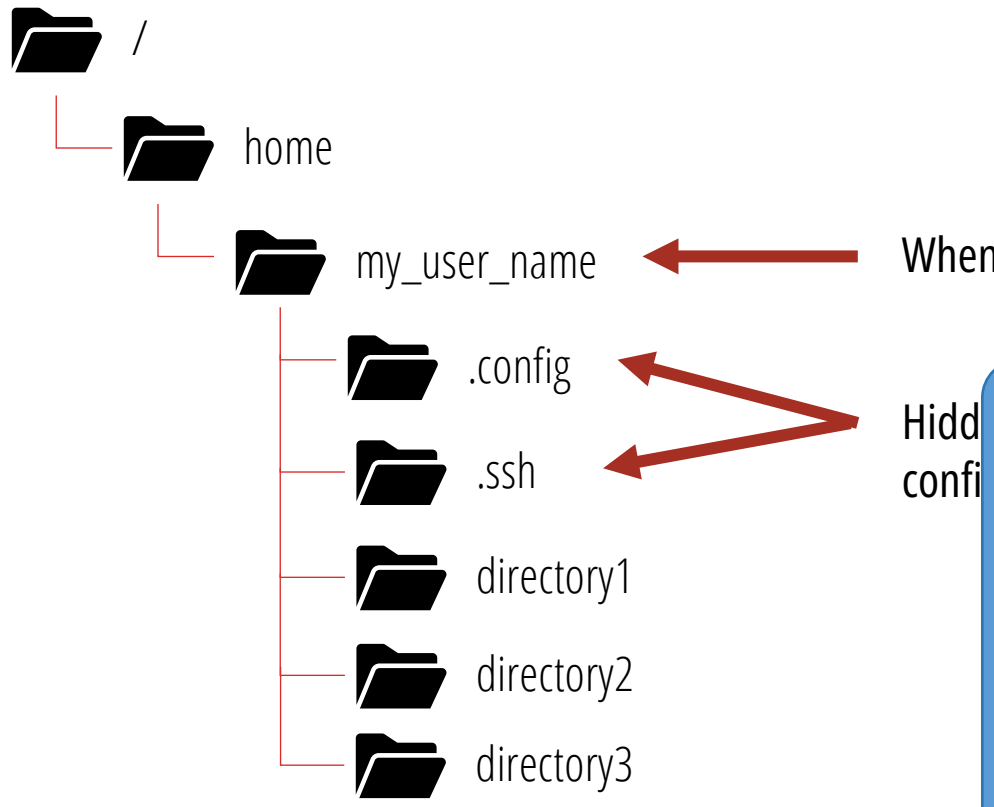
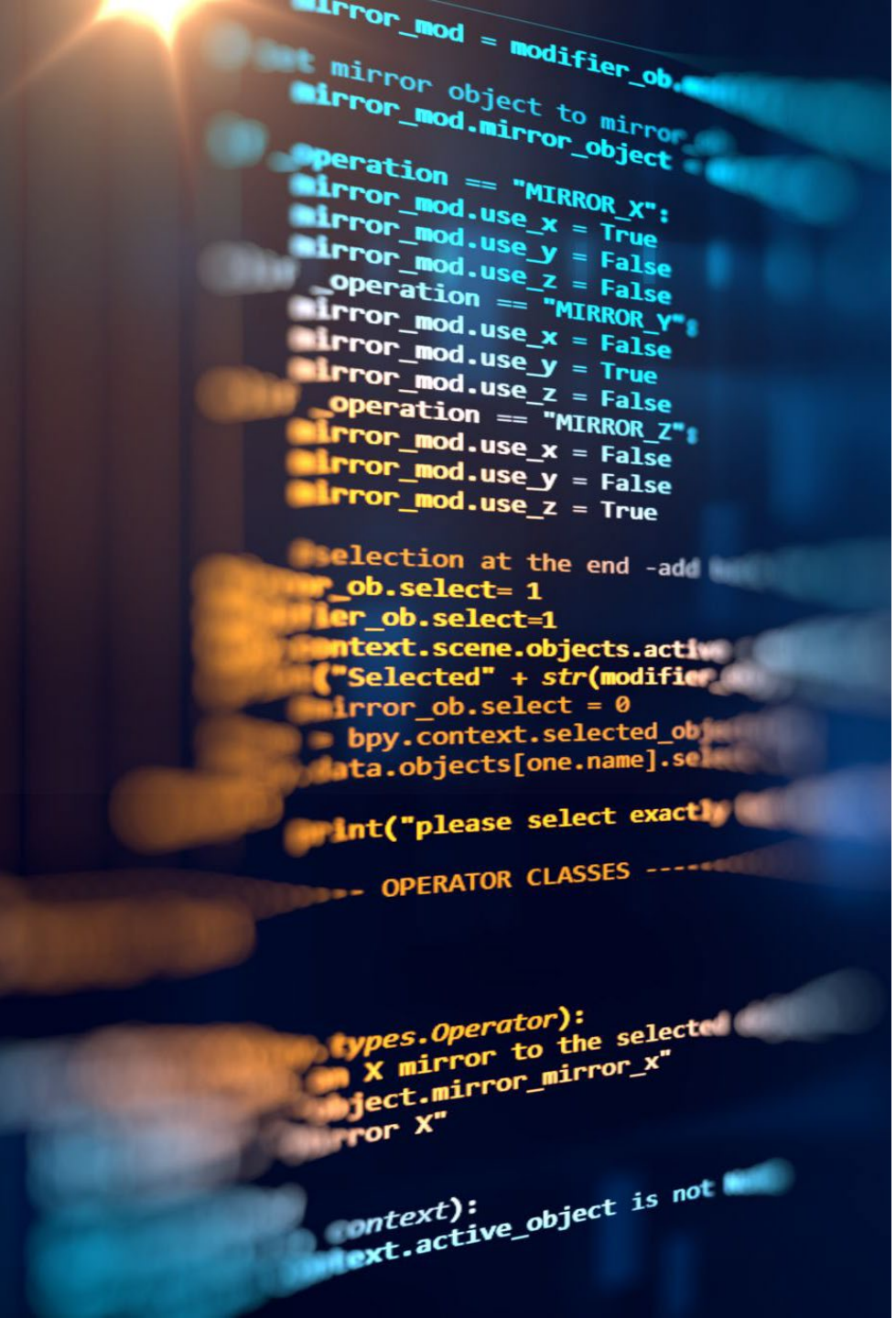


COOL CATCH

If a directory or file starts with a period (.), it is a hidden file, and won’t show up by default with the “ls” command. We’ll be playing with a bunch of such directories and files in this bootcamp.



SSH

One of the most powerful things about computing is often connecting to other computers! The way most computers that you'll encounter doing this is through the command line through a program called "ssh". That stands for "secure shell".

Importantly, anything you communicate across different computers will be encrypted.

If you're going to use a system like Compute Canada/SciNet or CITA, this will be important for you.

Some Basic SSH Commands

```
> ssh <server_name> # ssh into <server_name> with whatever your current
username is

> ssh <username>@<server_name> # ssh into a server with a specific
username

> ssh <server_name> -l <username> # same as above, but longer

> ssh-keygen # generates a security key to allow you to login to places
without a password

> ssh-copy-id <server_name> # copies your generated security key over to
<server_name>
```

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> ssh-keygen # generates a security key to
without a password

> ssh-copy-id <server_name> # copies your
<server_name>
```

HOT TIP

You can save settings for different ssh servers in your ~/.ssh/config file, for instance, if you'd like ports forwarded, or if you'd like to use a specific user name

Some Basic SSH Commands

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> ssh-keygen # generates a security key to
without a password

> ssh-copy-id <server_name> # copies your
<server_name>
```

HOT TIP

If you need to forward a **port** from another computer to yours, you can use the –L flag. For instance, if you wanted to forward port 8888 to your computer's port 8888, you can use the flag:

```
-L 8888:localhost:8888
```

Moving Files around

More often then not, you'll want to move files around a system, or between systems. Here's how to do it on your own computer:

```
> cp <file_name> <destination_name> # copy a single file from one location to another

> cp -r <directory_name> <destination_name> # copy a whole directory (and everything in it) from one location to another

> mv <file_name> <destination_name> # move a file or directory from one location to another
```

Moving Files around

More often then not, you'll want to move files around a system, or between systems.
uter:

```
me> # copy a single file from one location

nation_name> # copy a whole directory (and
tion to another

me> # move a file or directory from one
```

HOT TIP

Wildcards (*) are your friend! If you want to copy a selection of files that match a certain bit of the filename, you can use a wildcard to represent everything that's *not* supposed to match. For instance:

```
*.txt
```

Will match:

```
a.txt, b.txt, c.txt
```

Moving Files around

How about on another system? You can copy over ssh using **scp:**

```
> scp <file_name> <user_name>@<server_name>:<destination_name> # copy a
single file from your computer to a server.

> scp <user_name>@<server_name>:<file_name> <destination_name> # copy a
single file from a server to location on your computer.

> scp -r <user_name>@<server_name>:<directory_name> <destination_name> #
copy a directory from a server to location on your computer.
```

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single file from a server to your computer.

> scp -r <directory_name> <user_name>@<server_name>:<directory_name> <destination_name> #
copy a directory from your computer to a server location on your computer.
```

HOT TIP

For individual files, of if you don't remember exactly what the file was called, don't be a hero – use a GUI. For Windows, I use the WinSCP client. For Mac OSX, Cyberduck is a popular choice.

Moving Files around

How about on another system? You can cop

```
> scp <file_name> <user_name>@<serve
single file from your computer to a

> scp <user_name>@<server_name>:<fil
single file from a server to locatio

> scp -r <user_name>@<server_name>:<
copy a directory from a server to lo
```

HOT TIP

Is the file you want openly available on the internet? If so, an easy way to grab the file is using the command **wget**. If you have a particular URL, you can download the file to your current directory by:

```
wget <url_of_file>
```

#

Moving Files around

How about on another system? You can copy over ssh using **scp:**

```
> scp <file_name> <user_name>@<server_name>:<destination_name> # copy a
single file from your computer to a server.

>                                                  e_name> <destination_name> # copy a
s                                                  n on your computer.

>                                                  directory_name> <destination_name> #
c                                                  cation on your computer.
```

HOT TIP

Do you have a more complicated/larger transfer that you need to complete? Perhaps you need to run it regularly? Take a look at **rsync** which is beyond the scope of this bootcamp, but will help you immensely. There's a lot of options, so best to Google/Search for what you'd like to do for the correct command.