

Restoring reproducibility: Making scientist software discoverable

Alice Allen

Astrophysics Source Code Library
ascl.net

Research software

Integrity of research depends on
transparency and reproducibility

“... anything less than release of
actual source code is an indefensible
approach for any scientific results
that depend on computation...”

Ince, Hatton, & Graham-Cumming, *The case for open
computer programs*, Nature, v. 482, Feb. 23, 2012



ASCL

A brief history

Code entry, 1999



Astrophysics Source Code Library
Archive Page: CHIANTI

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CHIANTI: A database for astrophysical emission line spectroscopy

[The CHIANTI Consortium](#)

Abstract: CHIANTI consists of a critically evaluated set of atomic data necessary to calculate the emission line spectrum of astrophysical plasmas. The data consists of atomic energy levels, atomic radiative data such as wavelengths, weighted oscillator strengths and A values, and electron collisional excitation rates. A set of programs that use these data to calculate the spectrum in a desired wavelength range as a function of temperature and density are also provided. These programs have been written in Interactive Data Language (IDL) and the below linked html document provides a description of these various programs.

Subject headings: astronomical data bases: miscellaneous, atomic data, atomic processes, stars: atmospheres, Sun: atmosphere, techniques: spectroscopic, ultraviolet: general

Latest Version: 1.0.3 (1999 April 2)

Archived: 1999 November 23

Papers: [multiple](#), representative: [Landi, E., Landini, M., Dere, K. P., Young, P. R., & Mason, H., 1999A&AS..135..339L](#)

Languages: [IDL](#)

External Explanatory Pages: <http://wwwsolar.nrl.navy.mil/chianti.html>

Source Code: multiple, representative: [CHIANTI_1.03_pro.tar.Z](#), [CHIANTI_2.0_data.tar.Z](#)

Code entry, present

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ASCL Code Record

[**ascl:9911.004**] [CHIANTI: A database for astrophysical emission line spectroscopy](#)

[Del-Zanna, Giulio](#); [Young, Peter](#); [Dere, Ken](#); [Landini, Massimo](#); [Landi, Enrico](#); [Mason, Helen](#)

CHIANTI consists of a critically evaluated set of atomic data necessary to calculate the emission line spectrum of astrophysical plasmas. The data consists of atomic energy levels, atomic radiative data such as wavelengths, weighted oscillator strengths and A values, and electron collisional excitation rates. A set of programs that use these data to calculate the spectrum in a desired wavelength range as a function of temperature and density are also provided. These programs have been written in Interactive Data Language (IDL) and the below linked html document provides a description of these various programs.

Website: <http://www.chiantidatabase.org/chianti.html>

Appears in: <http://adsabs.harvard.edu/abs/1997A%26AS..125..149D>

Bibcode: [1999ascl.soft11004D](#)

[Explain these fields?](#)

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Home page, 2003



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ASCL.net Archive

[New Editor-in-Chief wanted](#) for ASCL.net.

This archive is indexed by [subject headings approved](#) by the major journals in astronomy and astrophysics. A single code may be listed under multiple subject headings.

accretion disks

DUSTY: Radiation transport in a dusty environment

Ivezic, Z., Nenkova, M., & Elitzur, M.

<http://ascl.net/dusty.html>

XSTAR: A program for calculating conditions and spectra of photoionized gases

Kallman, T.

<http://ascl.net/xstar.html>

Home page, present

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Welcome to the ASCL

The Astrophysics Source Code Library (ASCL) is a free online registry for source codes of interest to astronomers and astrophysicists and lists codes that have been used in research that has appeared in, or been submitted to, peer-reviewed publications. The ASCL is indexed by the [SAO/NASA Astrophysics Data System](#) (ADS) and is [citable](#) by using the unique ascl ID assigned to each code. The ascl ID can be used to link to the code entry by prefacing the number with ascl.net (*i.e.*, [ascl.net/1201.001](#)).

Most Recently Added Codes

2016 Apr 07

[submitted] [PHOTOMETRYPIPELINE](#)

Mommert, Michael

PHOTOMETRYPIPELINE provides calibrated photometry from imaging data obtained with small to medium-sized observatories. PP is coded in Python 2.7 and uses freely available data processing software, namely Source Extractor and SCAMP, to register the image data and perform aperture photometry. Calibration is obtained through matching of field stars with reliable photometric catalogs. PP has been specifically designed for the measurement of asteroid photometry, but it can also be used to obtain photometry of fixed sources.

2016 Apr 04

Browse, present

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Order

Title



Date



Mode

Abstract

Compact

Per Page

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250 All

- [[ascl:9903.001](#)] [LENSKY: Galactic Microlensing Probability](#)
- [[ascl:9904.001](#)] [BSGMODEL: The Bahcall-Soneira Galaxy Model](#)
- [[ascl:9905.001](#)] [CONSKY: A Sky CCD Integration Simulation](#)
- [[ascl:9905.002](#)] [ICOSAHEDRON: A package for pixelizing the sphere](#)
- [[ascl:9906.001](#)] [SLOPES: Least-squares linear regression lines for bivariate datasets](#)
- [[ascl:9906.002](#)] [EXTINCT: A computerized model of large-scale visual interstellar extinction](#)
- [[ascl:9909.001](#)] [PMCode: Particle-Mesh Code for Cosmological Simulations](#)
- [[ascl:9909.002](#)] [ANGSIZ: A general and practical method for calculating cosmological distances](#)
- [[ascl:9909.003](#)] [ISIS: A method for optimal image subtraction](#)
- [[ascl:9909.004](#)] [CMBFAST: A microwave anisotropy code](#)



Looking around and back

- Why didn't this work initially?
- Who else has tried this?
- What other similar efforts exist?
- What can I learn from them?

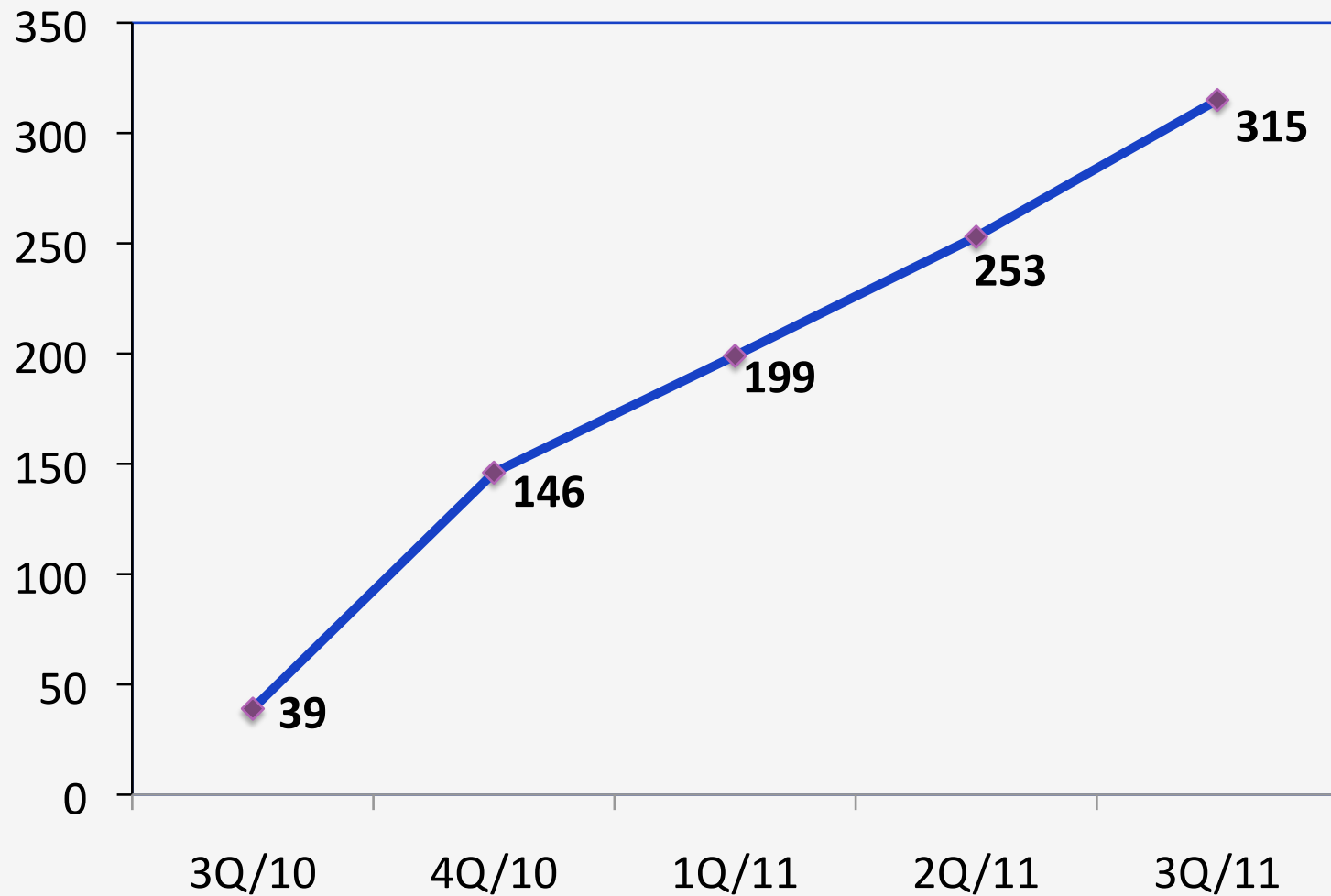
Lessons learned

- People don't want to deposit their codes/like to keep their codes nearby
 - Little incentive to register software
 - Don't want to go first
 - Don't want to have another site to update
- Funding cycle not long enough to get uptake by community
- Authors will not update metadata
- Limited marketing limited growth

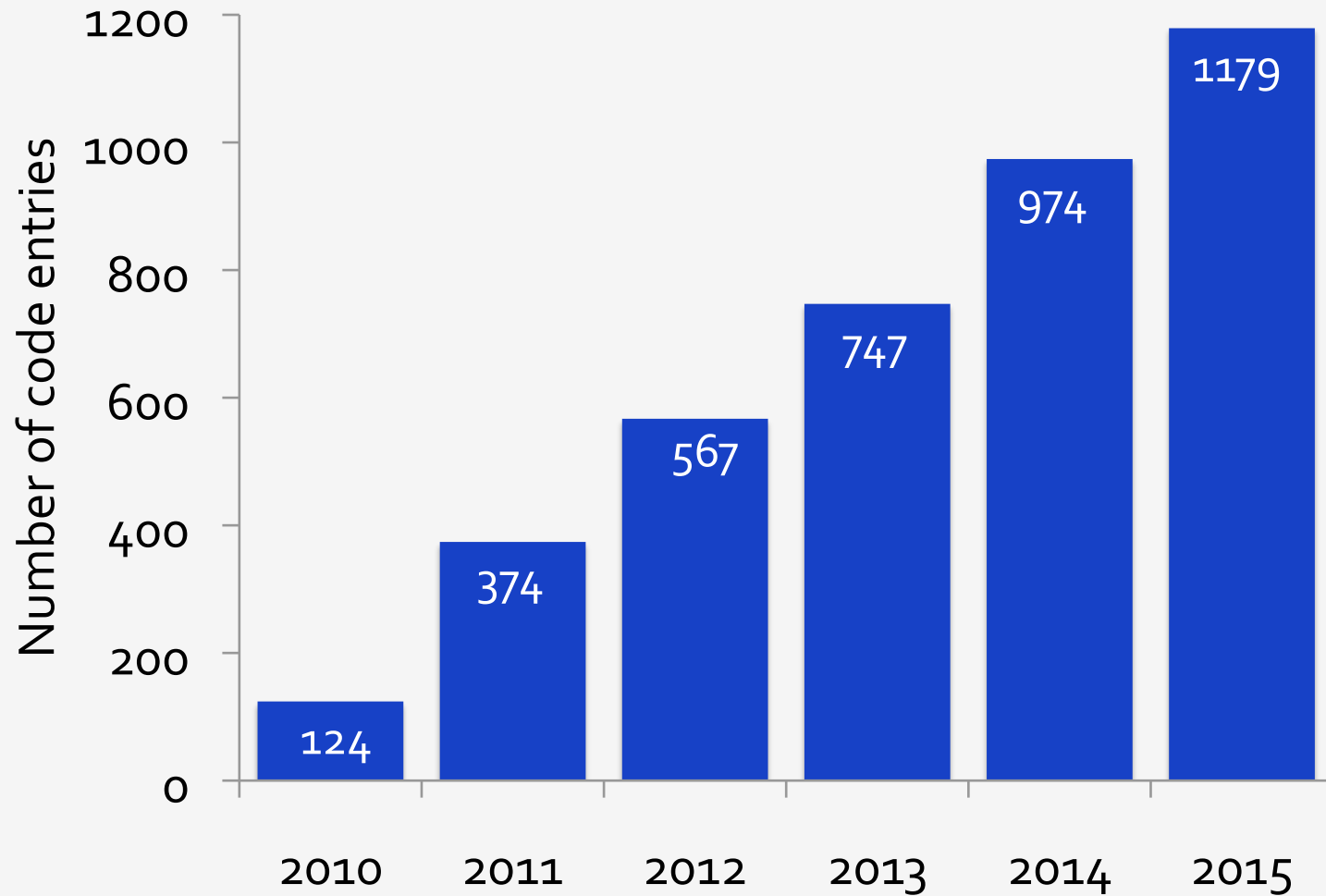
To bring about change...

- Build it
- Enlist/involve others
- Market, market, market
- Engage the community
 - Learn what barriers and incentives exist
 - Mitigate barriers and nurture incentives
- Be patient

Total code entries by quarter July, 2010 - September, 2011



Number of code entries at year end, 2010 - 2015





Advisory Committee



Get the word out



Community work



No one can assume that valuable innovations will pop up magically in the public domain if their inventors received no reward for their labor and capital.

–Richard Epstein



francesco mistrulli 2010



Are we having any effect?

Submit a Code

The ASCL gladly accepts submitted codes meeting our criteria. Your code will show up immediately for public viewing but will be subject to moderation. Entries are examined by an editor for completion and suitability and may be edited; entries meeting our criteria will be assigned an ASCL ID and indexed in ADS.

Title

No HTML.

Credit



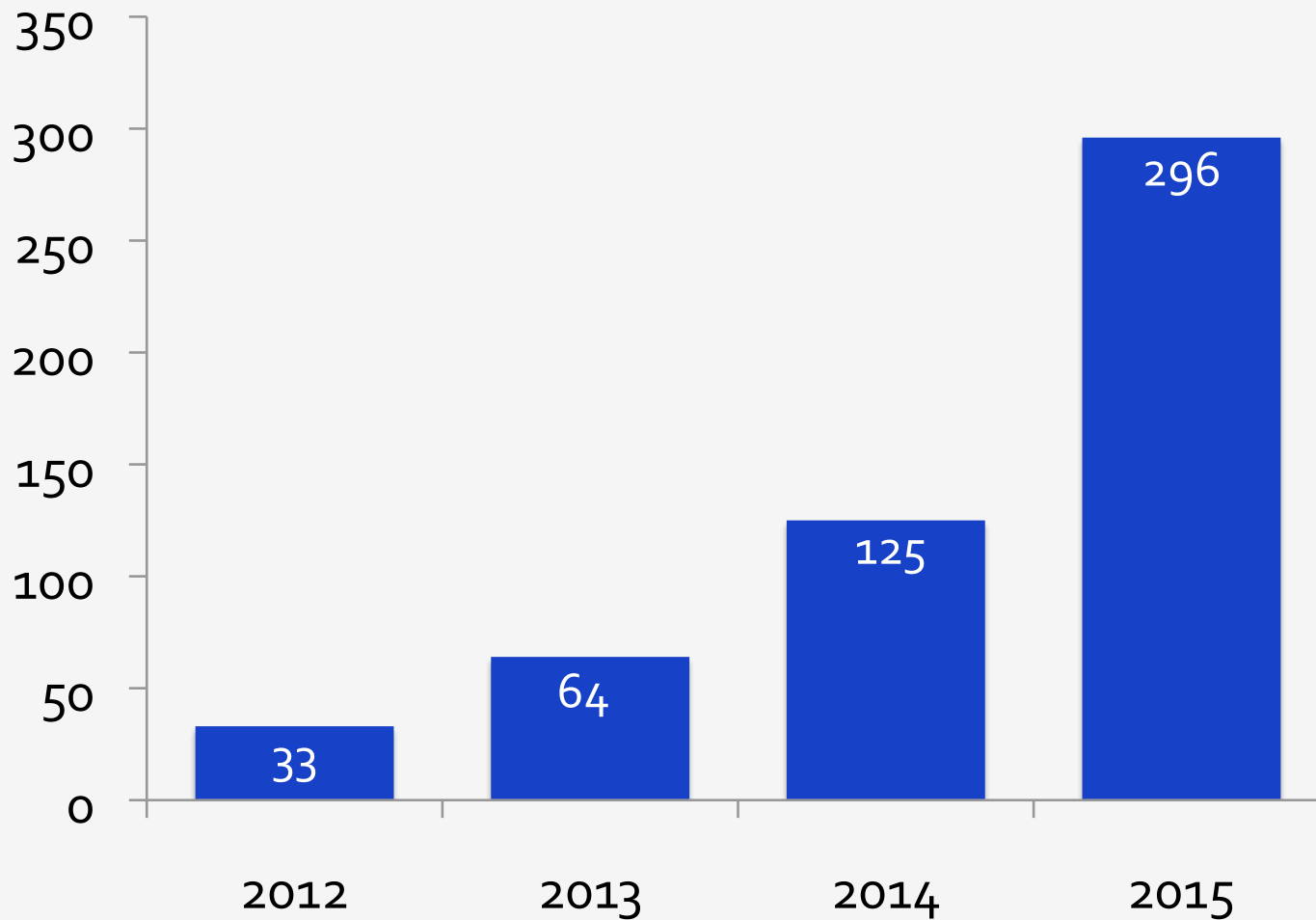
Astronomy and Computing

Volume 9, March 2015, Pages 40–48

parameters can be used to control placement within a viewport and how auto-scaling is handled. The system currently supports GAIA (Draper et al., 2009; ascl:1403.024) and KAPPA (Cuddeback et al., 2009; ascl:1403.022) as well as the historical P4 tool (part of CGS4DR (Daly, 1996) and an in



Citations to ASCL entries by year



Things I didn't say but would have with more time...

We have automated some manual processes and will automate others as time/volunteer work/ideas/funding allow, but ASCL will always need human editors.

ASCL has had little funding in the past; \$5K from AAS for outreach one year, and for this year, [Heidelberg Institute for Theoretical Studies](#) (HITS) has provided €6K in (unsolicited!) funding. (We're very grateful!) Consistent funding is on my to do list, and we are looking at perhaps gathering small amounts of funding annually (\$500-\$1000) from broad group of organizations.

ASCL is built using open source technologies: MySQL, CodeIgniter, phpbb, WordPress

Can be cloned; see [offer here](#) and an [empty\(ish\) site here](#). I've had requests from physicists to create a physics source code library, and we are looking at other fields, including economics.

I get to meet the *best* people by working on this project! Thank you for being among them!

Template image credit and information:

This image is an average of the central 10 velocity planes of a mosaic of five data cubes released as part of the Galactic Arecibo L-band Feed Array HI (GALFA-HI) survey (Peek et al., 2011, Ap J Suppl, 194, 20; DOI 10.1088/0067-0049/194/2/20; ADS Bibcode 2011ApJS..194...20P). The mosaic was with computed version 4.0 of the Montage Image Mosaic Engine. Image courtesy John Good and Bruce Berriman, California Institute of Technology.