

Status of the Open Universe Initiative

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Subject Global Development of Astronomy and Space Science Archives

18/02/2015 12:29

To Simonetta.DiPippo@unoosa.org ☆

Cc Paolo Giommi ★, Andy.Pollock@xuvair.com ★, Sally ★

Dear Director Di Pippo,

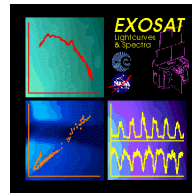
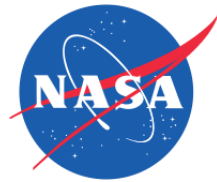
Paolo Giommi and I have been discussing for several years the developing global cultural role of astronomy and space-science data archives. While significant progress has been made in optimising the scientific value of the archives offered by ESA, ESO, ASI, HST and data providers in general, there is still work to do in ensuring the availability of science-ready products as opposed to raw data to the widest possible community of investigators. As well as presenting data in a proper scientific context, this implies recognition of the central and separate role of data science to complement hardware construction.

Paolo and I have been imagining the establishment of an independent office to define standards of best practice and make assessments against these standards of the services offered by data providers in order to promote the widest exploitation of these resources by a global community reaching far beyond the necessarily more limited interests of hardware experts. The United Nations Office for Outer Space Affairs would seem a completely natural location for such an organisation in both physical and intellectual terms.

Paolo and I have been involved for many years in astronomy archives in particular since the first steps in this direction taken by ESA in the 1980s through the very latest developments. As you know, Paolo is Director of the ASDC while I worked at ESA in Madrid until the end of 2014 where I initiated and led the complete redesign of the archive interfaces currently underway.

We would be very grateful for your opinion on how such a global initiative could be undertaken.

Best wishes – Andy Pollock



EXOSAT database

The *EXOSAT database system* utilises the recent expansion of computer networks and advances in database management techniques to provide on-line access to EXOSAT data and results. World-wide, real-time access is provided by the Space Physics Analysis Network (SPAN), the Internet (TCP/IP) and public X.25 connections. Ultimately the EXOSAT database will become a node within the European Space Information System (ESIS).

White & Giommi (1990)

2017 *This Is What Happens In An Internet Minute*



- [illegible]

30 BILLION

Sensor enabled objects
connected to networks
by 2020



212 BILLION

Total number of
available sensor
enabled objects by
2020

212B is **28x** the
total population of
the world



PHILIP N. HOWARD
Pax Technica

Profit \Leftrightarrow Cure \Leftrightarrow Science

Knowledge for everyone

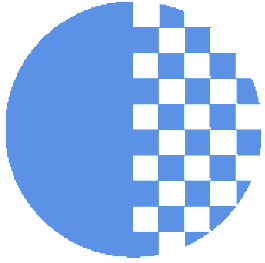
**open
data
institute**



**The
Alan Turing
Institute**

Preliminary objectives

The preliminary objectives of the Open Universe Initiative can be summarized into three broad priorities:



INCREASE TRANSPARENCY of already accessible resources: including promoting FAIR (Findable, Accessible, Interoperable, Reusable) guiding principles, promoting the adoption of widely-used standards, processing from raw data to web-ready products, enhanced data-mining and integration solutions, interfacing and facilitating cooperation between data providers and data centres and archives...



RESURFACE DATA and other hidden or otherwise hardly accessible resources: by identifying inaccessible data and working with national and regional entities to solve the challenges to make them public, including legacy data, as well as bringing new main players and actors in the international space science arena into the Initiative and in contact with other public data access solutions.



BROADEN THE USER-BASE of astronomy and space science data: to include as well the rapidly growing community of citizen scientists, by providing the necessary tools to use astronomy and space science data for a range of target groups, including educators and students, planetariums, amateur scientists or other potential end-users; and by promoting STEM education, particularly among women and youth in developing countries.

Gaia Data Release 1

Documentation release 1.1

European Space Agency
and
Gaia Data Processing and Analysis Consortium

17 February 2017

Executive summary

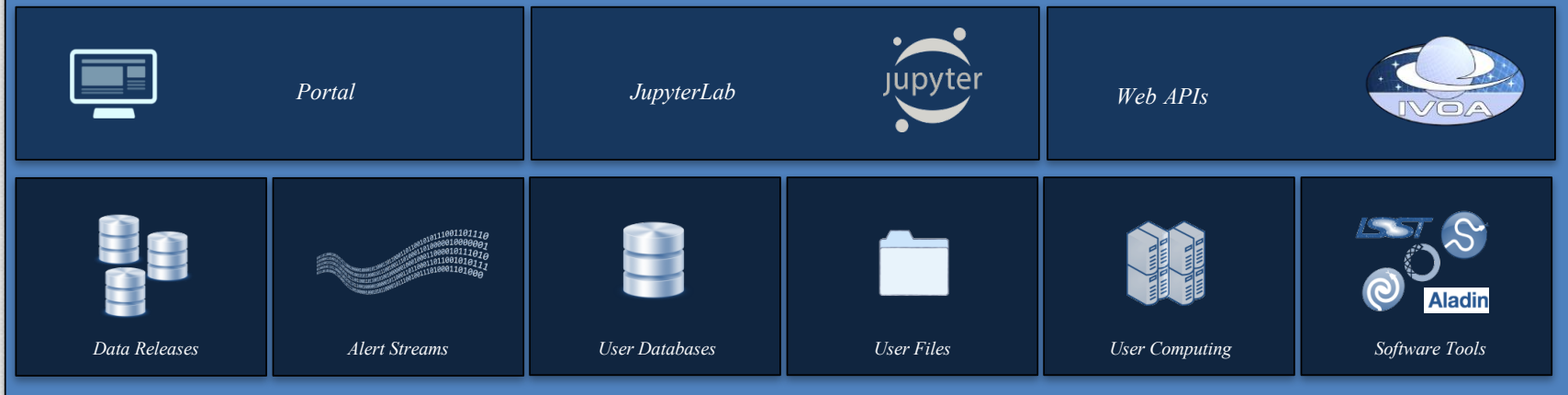
We present the first Gaia data release, Gaia DR1, consisting of astrometry and photometry for over 1 billion sources brighter than magnitude 20.7 in the white-light photometric band G of Gaia. The Gaia Data Processing and Analysis Consortium (DPAC) processed the raw measurements collected with the Gaia instruments during the first 14 months of the mission, and turned these into an astrometric and photometric catalogue.

Gaia DR1 consists of three parts: an astrometric data set which contains the positions, parallaxes, and mean proper motions for about 2 million of the brightest stars in common with the Hipparcos and Tycho-2 catalogues (the primary astrometric data set) and the positions for an additional 1.1 billion sources (the secondary astrometric data set). The primary set forms the realisation of the Tycho-Gaia Astrometric Solution (TGAS). The second part of Gaia DR1 is the photometric data set, which contains the mean G -band magnitudes for all sources. The third part consists of the G -band light curves and the characteristics of ~ 3000 Cepheid and RR Lyrae stars observed at high cadence around the south ecliptic pole.

The LSST Science Platform: Accessing LSST Data and Enabling LSST Science



LSST Science Platform

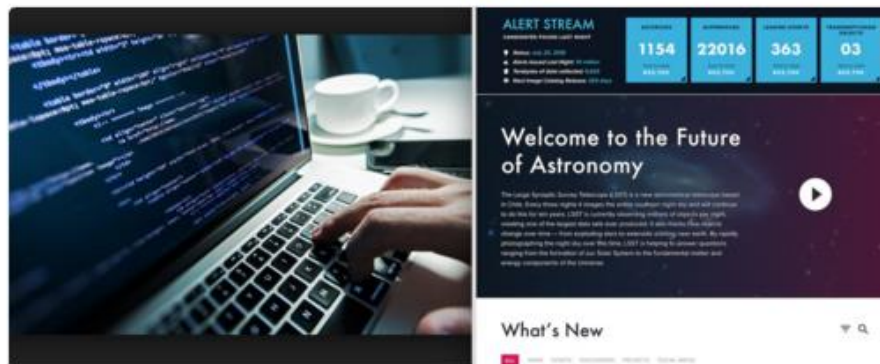


The **LSST Science Platform** is a set of integrated web applications and services deployed at the **LSST Data Access Centers (DACs)** through which the scientific community will access, visualize, subset and perform next-to-the-data analysis of the data.



★ amanda bauer ★ @astropixie · Oct 5

Web Developers! Join our Education & Public Outreach Team to bring @LSST astro data to the world in beautiful ways! ls.st/chh



1 21 33



★ amanda bauer ★

@astropixie

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The @lsstepo Portal: Mobile friendly, Astro imagery viewer, Multimedia gallery, dynamic content, citizen science, edu materials for teachers

11:47 AM - 5 Oct 2017

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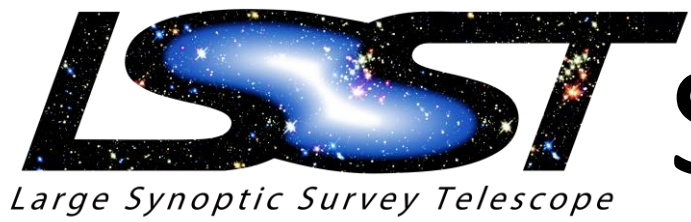
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Education and Public Outreach (EPO) Completes a Milestone Review

October 3, 2017 - LSST is a revolutionary project for a number of reasons, one of which is its commitment to building an Education and Public Outreach (EPO) program as novel and robust as LSST itself. The EPO team (pictured in the accompanying photo) is currently developing the infrastructure for the program to be delivered during operations; this process that is occurring in tandem with the construction of LSST's observational facility and other subsystem components. This long lead time allows for thoughtful and thorough prototyping, testing, and evaluation of EPO products so they'll be ready when LSST Operations begin in 2022.



Dr. Bauer also gave a talk on LSST EPO's developing partnership with Zooniverse[®], represented in the review by Founder Dr. Chris Lintott, who participated remotely from Oxford, UK. During LSST Operations, EPO will provide LSST data and support for principal investigators using Zooniverse's Project Builder tool to create citizen science projects. Anyone can be a citizen scientist; the partnership between LSST EPO and Zooniverse will enable countless opportunities to contribute to real science and discoveries during LSST Operations.

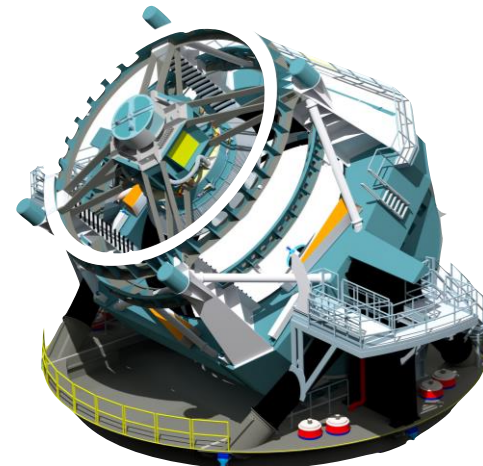


Software Stack

- The Large Synoptic Survey Telescope: The next-generation in astronomical surveys.
- Will take 5.5 million images; detect 37 billion stars and galaxies.
- Huge data processing and analysis challenge; software development started long before the first bricks laid.

LSST software:

- All versions of software publicly available via GitHub.
- Anyone can download, run and, crucially, edit this code.
- Code development centrally managed, but through GitHub, anyone is able to make changes and submit them for consideration centrally.
- Public availability enables use for other astronomical surveys (e.g., Subaru HyperSupremeCam, [GOTO@Sheffield](#)).
- Public access allows distributed development.
- But central management ensures key goals are reached and consistency maintained.
- Current major downside: a major lack of official documentation.
- LSST realise this, and offer effective community support via their open-access Community Forum.



NASA's James Webb Space Telescope

Developed in partnership with ESA and CSA. Operated by AURA's Space Telescope Science Institute

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Selections Made for the JWST Director's Discretionary Early Release Science Program

News Feature • November 13, 2017

Following the recommendation of the Time Allocation Committee and a thorough technical review, the Space Telescope Science Institute (STScI) Director Ken Sembach has selected 13 science programs for the JWST Director's Discretionary Early Release Science Program (DD-ERS). It is anticipated that the DD-ERS observations will take place during the first 5 months of JWST science operations, following the 6-month commissioning period.

With a total award of 460 hours of JWST observing time, the selected programs span a wide range of science areas as well as instrument modes, such as surveys of galaxies and their nuclei, stellar clusters and star formation near and far, the chemistry of interstellar and circumstellar matter, and the characterization of exoplanets. The successful programs include 16 Principal investigators (PIs) and co-PIs from North America and 6 from Europe, with broad world-wide participation.

Additional statistics:

- The selected programs represent participation by 253 investigators from 18 countries, 22 U.S. states, and 106 unique institutions.
- Of the 253 investigators, 157 are based in the U.S., 84 are from ESA countries, 7 are from Canada, and 5 are from other countries (Australia and Chile), with 248 unique investigators.
- There are an additional 449 science collaborators involved in the programs.
- The three largest teams have combined totals of 138, 105, and 80 investigators and collaborators.

The successful DD-ERS teams are now tasked with developing "science-enabling products," such as documentation for their programs, scientific software, and data products — all designed to help the full astronomical community maximize the science output of the JWST mission.

Open Universe is about data, services and science.

- Technical, social and economic conditions are such that archive services in astronomy and space science will expand rapidly in the immediate future.
- Not only will life become easier for professional and student scientists but many new people across the world should be able actively to participate - within their own cultural contexts - in the work of cosmic discovery.
- Smart mobile apps are going to be central to this.
- Hardware and software are equally important to the success of a project.
- Computer resource limitations are no longer an issue.
- The road there and back is long and complicated between instrumental raw data and an app running on someone's phone in an unusual part of the world.
- Collective imagination can devise best how this exciting work can be done.