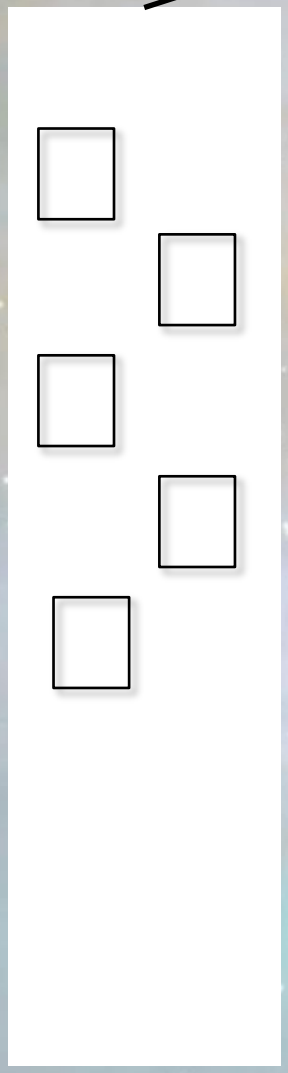
Universiteit Leiden

Crowdsourcing Science Communication, Outreach and Education

Sarah Kendrew, Leiden Observatory

AstroInformatics 2010, Pasadena



“Ivory Tower”

Outreach
Communication
Education

Economic Impact

Scientific literacy

Inspiration

Justification of resources

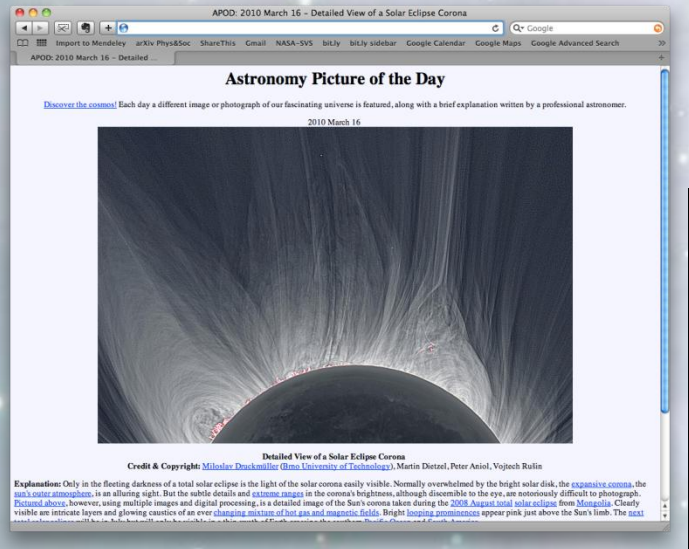
Trust!

The Jodcast

365 DAYS OF ASTRONOMY
DAILY PODCAST OF THE IYA

TEAPOTS FROM SPACE

UNIVERSE TODAY



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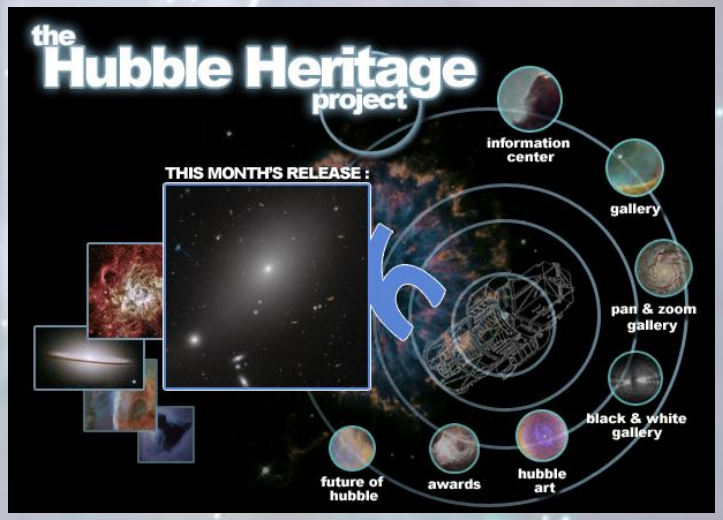

HEAVENS ABOVE

FROM PUBLIC UNDERSTANDING TO PUBLIC ENGAGEMENT OF ASTRONOMY

Science and the Mainstream Media: Critical Reporting or Churnalism?

$Z \sim 7$ GALAXIES IN THE HUDF: FIRST EPOCH WFC3/IR RESULTS [1]

P. A. Oesch[2], R. J. Bouwens[3,4], G. D. Illingworth[3], C. M. Carollo[2], M. Franx[4], I. Labbé[5], D. Magee[3], M. Stiavelli[6], M. Trenti[7], P. G. van Dokkum[8]

Draft version September 10, 2009

ABSTRACT

We present a sample of 16 robust $z \sim 7$ z_{850}-dropout galaxies detected by the newly installed WFC3/IR camera on the Hubble Space Telescope. Our analysis is based on the first epoch data of the HUDF09 program covering the Hubble Ultra Dee
H_{160} observations. These remarkable data cover 4.7 arcn
taken, reaching to ~ 29 mag AB (5σ). The 16 $z \sim 6.5$ –
the Lyman Break technique utilizing ($z_{850} - Y_{105}$) vs. (Y

Public release date: 8-Dec-2009
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Contact: Colleen Sharkey
csharkey@eso.org
49-893-200-6306
ESA/Hubble Information Centre

Hubble's deepest view of universe unveils never-before-seen galaxies

In 2004, Hubble created the Hubble Ultra Deep Field (HUDF), the deepest visible-light image of the Universe, and now, w
visible HUDF, but is taken at longer wavelengths. Hubble's newly installed Wide Field Camera 3 (WFC3) collects light fron
from hot young stars in these very distant galaxies is stretched out of the ultraviolet and visible regions of the spectrum
into how galaxies grew in their formative years early in the Universe's history.

A boon to astronomers worldwide, the new WFC3 data — taken by the HUDF09 team — have set a multitude of teams t
scientific papers on these new data have been submitted.

This image was taken by the HUDF09 team [1], which has made it available for research by astronomers worldwide. The
days of pointing for 173 000 seconds of total exposure time. Infrared light is invisible to the human eye and therefore dc
wavelengths are represented as blue and the longer wavelengths as red. The faintest objects are about one billion time

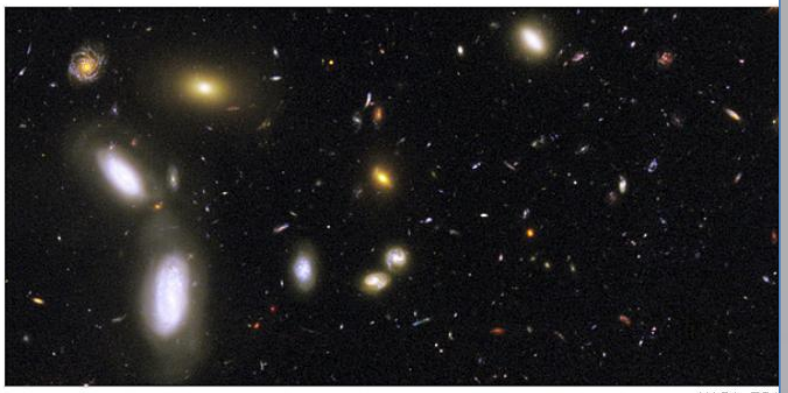
These Hubble observations are blazing a trail for Hubble's successor, the NASA/ESA James Webb Space Telescope (JWS
planned for 2014.

###

Notes for editors:

[1] The HUDF09 team members are Garth Illingworth (University of California Observatories/Lick Observatory and the Uni
and Leiden University), Pascal Oesch and Marcella Carollo (Swiss Federal Institute of Technology, Zurich (ETH)), Marijn
California, Santa Cruz), Massimo Stiavelli (Space Telescope Science Institute), Michele Trenti (University of Colorado, B

With Updated Hubble Telescope, Reaching Farther Back in Time



NASA, ESA

THROUGH THE AGES Using old and new cameras, the Hubble Space Telescope recorded thousands of galaxies, some dating back more than 12 billion years.

By DENNIS OVERBYE
Published: January 11, 2010

Astronaut repairmen had hardly finished tightening the last stubborn bolts on the Hubble Space Telescope last summer when astronomers set the controls on the refurbished telescope to the dim and distant past.

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Science & The Media: Securing the Future (BIS, 2010):

"…we feel that there is an unprecedented level of debate taking place at the moment about science and the media."

"While there are tremendous pressures on science reporters many would concede that this results from an ever-growing appetite for science in all sections of news"

BUT:

"Curt Supplee: 60-70% of the weekly quota of science stories comes straight from the pages of four or five big journals including Science, Nature, the BMJ and the Lancet"

"…at a time when the internet has effectively removed all the barriers to publication, trust – a key issue in science reporting – becomes more of an issue than ever"

Traditional news vs. Good science reporting

- Need for headline-grabbing stories not well suited to balanced discussion of science
- Not much published science represents a “big step”
- Over-hyping by science journals creates contradictions, confusion and fatigue.
- Poor understanding in the media leads to bad science getting a voice

ResearchBlogging: What are scientists talking about?

Research Blogging

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June 17, 2010
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11 views

Neury Thursday: Novel Molecular Techniques to Disentangle Novel Neuronal Circuitry

by Allison in Dormivigilia

This week's Neury Thursday is a challenge to write because it features a fabulously comprehensive research study using methodologies that I'm still, as a novice, struggling to understand (Wikipedia isn't much help); San Franciscan researchers utilized optogenetics, the combination of genetic (i.e. knock-outs) and channelrhodopsin to elucidate co-expressing dopaminergic and glutamatergic brain centers implicated with drug [...] Read more »

Health
Public Health
Behavioral Neuroscience
Systems Biology
Cognitive Psychology

1. **Informative for scientists**
2. **Helps interested members of the public trace back the original work**

Astrophysics > Cosmology and Extragalactic Astrophysics

Constraints on the First Galaxies: z~10 Galaxy Candidates from HST WFC3/IR

R.J. Bouwens (UC Santa Cruz), G.D. Illingworth (UC Santa Cruz), I. Labbe (Carnegie Observatories), P.A. Oesch (ETH Zurich), M. Carollo (ETH Zurich), M. Trenti (U Colorado), P.G. van Dokkum (Yale), M. Franx (Leiden), M. Stiavelli (STScI), V. Gonzalez (UC Santa Cruz), D. Magee (UC Santa Cruz)

(Submitted on 22 Dec 2009 (v1), last revised 14 May 2010 (this version, v3))

The first galaxies likely formed a few hundred million years after the Big Bang. Until recently, it has not been possible to detect galaxies earlier than ~750 million years after the Big Bang. The new HST WFC3/IR camera changed this when the deepest-ever, near-IR image of the universe was obtained with the HUDF09 program. Here we use this image to identify three redshift z~10 galaxy candidates in the heart of the reionization epoch when the universe was just 500 million years old. These would be the highest redshift galaxies yet detected, higher than the recent detection of a GRB at z~8.2. The HUDF09 data previously revealed galaxies at z~7 and z~8. Galaxy stellar population models predict substantial star formation at z>9-10. Verification by direct observation of the existence of galaxies at z~10 is the next step. Our conservative search and extensive testing for contamination and spurious images suggests that we can set reliable constraints based upon our 3 z~10 candidates, unlike a recent claim of 20 z~10 sources which appear to be spurious. The detection of galaxies at z>8 is further enhanced by our detailed analysis of 2 other faint sources likely at z~8.4 and z~8.7. Our z~10 sample suggests that the luminosity function and star formation rate density evolution found at lower redshifts continues to z~10, and pushes back the timescale for early galaxy buildup to z>10, increasing the likely role of galaxies in providing the UV flux needed to reionize the universe. The true nature of these galaxies, at just 4% of the age of the universe, will remain hidden until JWST is launched.

Comments: 35 pages, resubmitted to Nature, after responding to the referee reports
Subjects: **Cosmology and Extragalactic Astrophysics (astro-ph.CO)**
Cite as: arXiv:0912.4263v3 **[astro-ph.CO]**

All papers

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STORY TRACKER

The genetics of autism

Nature has published a paper on the genetics of autism, which we report here. Over the coming days and weeks, we will post updates on this important story and links to sources of further information

- Story summary
- Email us an update or other useful links
- Parents' autism questions answered
- Recent Guardian stories related to autism
- *Nature has made this paper available in its entirety*

- Jump to latest comment

Alok Jha, science correspondent
guardian.co.uk, Wednesday 9 June 2010 19.09 BST
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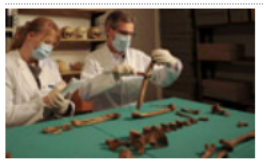

1. The life of an Anglo-Saxon princess

2. How the study of teeth is revealing our history

Mendeley: What are Scientists reading?

MENDELEY
RESEARCH NETWORKS BETA 0.9

Organises literature database on desktop

"Last.fm for researchers", Literature-based social networking →knowledge discovery

Creating public literature lists for sharing, teaching, collaboration

Keeps charts and statistics for papers

Searchable!

Searchable, with reader ranking

MENDELEY
RESEARCH NETWORKS BETA 0.9

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UPGRADE

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Empowering Einstein: PolyMath

Gowers's Weblog | A combinatorial appr...

Gowers's Weblog

Mathematics related discussions

« Questions of procedure Why this particular problem? »

A combinatorial approach to density Hales-Jewett

By gowers

Here then is the project that I hope it might be possible to carry out by means of a large collaboration in which no single person has to work all that hard (except perhaps when it comes to writing up). Let

- Basic rules of participation
- No one was specifically invited to contribute

- Solution found in < 3 months
- 27 contributors, 800 comments

- 2 peer-reviewed papers

A new proof of the density Hales-Jewett theorem

D. H. J. Polymath

(Submitted on 20 Oct 2009 (v1), last revised 16 Feb 2010 (this version, v2))

The Hales-Jewett theorem asserts that for every r and every k there exists n such that every r-colouring of the n-dimensional grid {1,...,k}^n contains a combinatorial line. This result is a generalization of van der Waerden's theorem, and it is one of the fundamental results of Ramsey theory. The theorem of van der Waerden has a famous density version, conjectured by Erdos and Turan in 1936, proved by Szemeredi in 1975, and given a different proof by Furstenberg in 1977. The Hales-Jewett theorem has a density version as well, proved by Furstenberg and Katznelson in 1991 by means of a significant extension of the ergodic techniques that had been pioneered by Furstenberg in his proof of Szemeredi's theorem. In this paper, we give the first elementary proof of the theorem of Furstenberg and Katznelson, and the first to provide a quantitative bound on how large n needs to be. In particular, we show that a subset of {1,2,3}^n of density delta contains a combinatorial line if n is at least a tower of 2's of height O(1/delta^3). Our proof is reasonably simple: indeed, it gives what is arguably the simplest known proof of Szemeredi's theorem.

365 Days of Astronomy: Community Podcasting

Every day a different podcast by volunteers around the world

Supported with minimal funding

Continued beyond IYA2009

Ongoing source of astronomy-based entertainment

Creating a platform: .Astronomy

- Bringing together astronomers and enthusiasts active in astronomy via new media
- Aims:
  - Create a community and foster collaborations
  - Explore potential of new technologies
  - Raise profile of activities, get recognition
  - Organise activities, leverage financial support

Crowdsourcing Education: Universe Awareness

Expose very young (4 - 10 years), underprivileged children to the inspirational aspects of astronomy

- Broaden young formative minds
- Awaken curiosity in science
- Stimulate world citizenship

UNAWE

Based in Leiden

Running for 5 years

Focused on developing countries and underprivileged communities

Crowdsourcing model

- UNAWE don’t determine the content of their programmes
- Create connections around the world between children & teachers
- Help train teachers, help with leverage of funds
- Production, translation, dissemination

→ Ideas and projects come from the UNAWE community

UNAWE

Universe Awareness for Young Children

< Tools Home
< Send us your requests
<< UNAWE Home
<< UNAWE Materials Home

Online tools

- Scale the solar system
- Your age on other planets
- Your weight elsewhere in the universe
- Draw a Star Chart
- Telescope magnification calculator
- Pinhole camera calculator

Animations

- Libration of the Moon visualisation
- Animation explaining eclipses

Live data

- Phase of the Moon
- Satellite Tracking
- Star Chart (Above Leiden)
- Live Solar System I
- Live Solar System II

"I wish I had something to calculate this quickly..."

The purpose of this website is to offer certain reference tools that should be part of a reference kit of astronomy outreach - but cannot simply be printed on paper, as they are calculators, animated tools or live visualisations.

If you have any comments, remarks, or requests for other tools, don't hesitate to ask us. You can email us at carolina.odman at unawe.org. We will try to make it available for you here as quickly as possible.

Thank you and Enjoy!

Your Universe Awareness team.

WARNING: NEVER LOOK DIRECTLY AT THE SUN - ESPECIALLY NOT WITH A TELESCOPE!
Send all questions, remarks and bugs to UNAWE - Thanks!

New Media, New Questions

- Channels of communication, previously well defined, now increasingly blurred
  - Who are we talking to? (cf. critical assessment by Kouper, 2010)
  - What do we want to convey?

- Increased presence of science/scientists on the web allows more engagement of public with science
  - How do we maximise this engagement?
  - Citizen science -> citizen-led science?
  - How do we safeguard this evolution via policy? (Stodden, 2010)
  - How do we broaden the reach?

- What's in the future? What are the new technologies and opportunities?