Dr. Sahar Said Allam (1964-2022): A Memoriam

Douglas L. Tucker (Fermilab)

243rd Meeting of the American Astronomical Society

Institutions

Projects

Publications

Author on 556 papers.

Cited 37,461 times.
SURFACE DISTRIBUTION OF DARK CLOUDS IN M31
ABSORPTION GRADIENT ALONG THE MINOR AXIS AND IN THE $R$ AND $\theta$ DIRECTIONS, II

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(Received 11 May, 1990)

Abstract. Absorption and absorption gradient is studied along the minor axis of M31 and as a function of the angle measured from the minor axis with the center of the galaxy as origin. The radial distribution of these phenomena is studied also. The counts of dark clouds averaged over all in each case assumes periodical changes. In some cases systematic changes are shown also. The fraction of the volume occupied by these clouds is smaller by an order than that introduced by the standard cloud model.
Allam 1998, Ph. D. Dissertation:  
“IRAS Study of Interacting Galaxies”

• The Data Set:  IRAS far-infrared satellite (1983)  
  – 12 μm, 25 μm, 60 μm, 100 μm images

• The Sample:  
  – Isolated galaxies  
  – Merging galaxies  
  – Hickson Compact Group galaxies

• The Method:  Maximum Entropy (“MaxEnt”) technique  
  – c. 5 arcmin resolution → c. 1 arcmin resolution

• The Main Results:  
  – “The major -- and unexpected -- result from this dissertation research is that for the pairs and groups of galaxies the FIR to optical luminosity ratio is not enhanced with respect to isolated galaxies. This means that there is no enhancement in star formation rates.”
MERGING GALAXIES IN THE SLOAN DIGITAL SKY SURVEY EARLY DATA RELEASE

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ABSTRACT

We present a new catalog of merging galaxies obtained through an automated systematic search routine. The 1479 new pairs of merging galaxies were found in ≈462 square degrees of the Sloan Digital Sky Survey Early Data Release (SDSS EDR) photometric data, and the pair catalog is complete for galaxies in the magnitude range $16.0 \leq g^* \leq 20$. The selection algorithm, implementing a variation on the original Karachentsev criteria, proved to be very efficient and fast. Merging galaxies were selected such that the intergalaxy separations were less than the sum of the component galaxies’ radii. We discuss the characteristics of the sample in terms of completeness, pair separation, and the Holmberg effect. We also present an on-line atlas of images for the SDSS EDR pairs obtained using the corrected frames from the SDSS EDR database. The atlas images also include the relevant data for each pair member. This catalog will be useful for conducting studies of the general characteristics of merging galaxies, their environments, and their component galaxies. The redshifts for a subset of the interacting and merging galaxies and the distribution of angular sizes for these systems indicate the SDSS provides a much deeper sample than almost any other wide-area catalog to date.
THE 8 O’CLOCK ARC: A SERENDIPITOUS DISCOVERY OF A STRONGLY LENSED LYMAN BREAK GALAXY IN THE SDSS DR4 IMAGING DATA

Sahar S. Allam,1,2 Douglas L. Tucker,1 Huan Lin,1 H. Thomas Diehl,1 James Annis,1 Elizabeth J. Buckley-Geer,1 and Joshua A. Frieman1,3

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ABSTRACT

We report on the serendipitous discovery of the brightest Lyman break galaxy (LBG) currently known, a galaxy at \( z = 2.73 \) that is being strongly lensed by the \( z = 0.38 \) luminous red galaxy (LRG) SDSS J002240.91+143110.4. The arc of this gravitational lens system, which we have dubbed the “8 o’clock arc” due to its time of discovery, was initially identified in the imaging data of the Sloan Digital Sky Survey Data Release 4; followup observations on the Astrophysical Research Consortium (ARC) 3.5 m telescope at Apache Point Observatory confirmed the lensing nature of this system and led to the identification of the arc’s spectrum as that of an LBG. The arc has a spectrum and a redshift remarkably similar to those of the previous record-holder for brightest LBG (MS 1512–cB58, also known as cB58), but, with an estimated total magnitude of \((g, r, i) = (20.0, 19.2, 19.0)\) and surface brightness of \((\mu_g, \mu_r, \mu_i) = (23.3, 22.5, 22.3)\) mag arcsec\(^{-2}\), the 8 o’clock arc is thrice as bright. The 8 o’clock arc, which consists of three lensed images of the LBG, is 162° (9.6") long and has a length-to-width ratio of 6 : 1. A fourth image of the LBG—a counterimage—can also be identified in the ARC 3.5 m g-band images. A simple lens model for the system assuming a singular isothermal ellipsoid yields an Einstein radius of \( \theta_{\text{Ein}} = 3.32'' \pm 0.16'' \), a total mass for the lensing LRG (within the 12.1 \pm 0.6 \( h^{-1} \) kpc enclosed by the Einstein radius) of \( 1.35 \times 10^{12} \ h^{-1} M_\odot \), and a magnification factor for the LBG of \( 12.3^{+15.0}_{-3.6} \). The LBG itself is intrinsically quite luminous (\( \approx 11L_\odot \)) and shows indications of massive recent star formation, perhaps as high as \( 160 \ h^{-1} M_\odot \ yr^{-1} \).

Fig. 1.—SDSS gri color image showing the location of three lensed images (A1, A2, A3), the position of the LRG, and a faint background LRG (B1) at photometric redshift of 0.35.

Fig. 2.—The co-added ARC 3.5 m SPICAM g-band image clearly shows the three components of the arc (A1, A2, A3) as well as the counterimage (A4); the center of the LRG is also shown.

Fig. 3.—Discovery spectrum taken with the DIS III spectrograph on the ARC 3.5 m telescope (red). The SDSS spectrum of cB58, a strongly lensed LBG at \( z = 2.72 \), is plotted in blue, and a composite LBG spectrum (Shapley et al. 2003) in green. Several important absorption lines are marked.

HST Proposal 11167
PI: Allam
LIGO localization region was in the far West and set ~1.5 hours after twilight.

Started observing as soon as it gets dark: 8:13 pm Chile time (23:13 UT), 10.5 hours after GW event.

Team in place to eyeball the images; Remote observing team at Fermilab

Credit: Marcelle Soares-Santos
Several teams independently discovered the source within minutes from each other! DESGW had the 2nd announcement to the network of teams.

Credit: Marcelle Soares-Santos, with some minor updates.
Several teams independently discovered the source within minutes from each other! DESGW had the 2nd announcement to the network of teams.

Credit: Marcelle Soares-Santos, with some minor updates.
SOAR/Goodman Spectroscopic Assessment of Candidate Counterparts of the LIGO/Virgo Event GW190814*


Abstract

On 2019 August 14 at 21:10:39 UTC, the LIGO/Virgo Collaboration (LVC) detected a possible neutron star–black hole merger (NSBH), the first ever identified. An extensive search for an optical counterpart of this event, designated GW190814, was undertaken using the Dark Energy Camera on the 4 m Victor M. Blanco Telescope at the Cerro Tololo Inter-American Observatory. Target of Opportunity interrupts were issued on eight separate nights to observe 11 candidates using the 4.1 m Southern Astrophysical Research (SOAR) telescope’s Goodman High Throughput Spectrograph in order to assess whether any of these transients was likely to be an optical counterpart of the possible NSBH merger. Here, we describe the process of observing with SOAR, the analysis of our spectra, our spectroscopic typing methodology, and our resultant conclusion that none of the candidates corresponded to the gravitational wave merger event but were all instead other transients. Finally, we describe the lessons learned from this effort. Application of these lessons will be critical for a successful community spectroscopic follow-up program for LVC observing run 4 (O4) and beyond.

AT2019noq

Fit to SN spectrum templates

Fit to KN spectrum models
Many Other Contributions to Astronomy

- **SDSS Photometric Calibrations team member (2000-2008*)**
  - Extension of SDSS Standard Star Network
- **SNAP Photometric Calibrations member (2004-2009*)**
  - SNAP → JDEM → WFIRST → Nancy Grace Roman Space Telescope
- **DES Photometric Calibrations team member (2007-2022*)**
  - Filter-to-filter calibrations based on DA white dwarf observations
- **Hubble Source Catalog (HSC) team member (2012-2014*)**
  - [https://archive.stsci.edu/hst/hsc/](https://archive.stsci.edu/hst/hsc/)
- **Rubin LSST Data Preview 0 Delegate and “in-kind” contributor (2021-2022)**
- **... and much more...**

*Dates approximate*
Some Lessons on Scientific Research I Learned from Dr. Allam

• Be Adventurous:
  
  Don’t be afraid to try new things!

• Be Confident:
  
  Don’t let the opinions of others stop you!

• Be Persistent:
  
  Never ever give up!
Dr. Sahar Said Allam (1964-2022): A Memoriam
Extra Slides
Dr. Sahar Said Allam (1964-2022): A Memoriam

Douglas L. Tucker (Fermilab)
243rd Meeting of the American Astronomical Society
9 January 2024

Abstract: In this short talk, we memorialize the scientific life of AAS member Dr. Sahar Said Allam (1964-2022), an alumna of Cairo University and the National Research Institute of Astronomy & Geophysics (NRIAG). Her scientific career took her to the Universität Potsdam (Germany), New Mexico State University (USA), the Space Telescope Science Institute (USA), and the Fermi National Accelerator Laboratory (Fermilab; USA), as well as to astronomical observatories in New Mexico, Arizona, Hawaii, Chile, and Australia. Among other projects, she worked on the Sloan Digital Sky Survey (SDSS) and the Dark Energy Survey (DES), achieving the coveted “Builders” status on both these projects. She was the discoverer of the (at the time) brightest known Lyman Break Galaxy, the strongly lensed “8 O’Clock Arc”, and played an important role in the discovery of the optical counterpart to the gravitational wave event GW170817. During her final illness, she began work as a Data Preview 0 (“DP0”) Delegate for the Vera C. Rubin Legacy Survey of Space & Time (LSST) and was even the Principal Investigator on a successful observing proposal submitted posthumously. The asteroid “135979 Allam” is named after her.

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