# CURRICULUM VITAE


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hubblesite.org/news/2011/04 http://hubblesite.org/news/2010/01
hubblesite.org/news/2004/28 http://hubblesite.org/news/1996/29


**Education:**

| | | |
|---|---|---|
| June 6, 1984: | University of Leiden | Ph.D. in Astronomy |
| Sep. 26, 1979: | University of Leiden | M.Sc. in Astronomy and Physics |
| Feb. 10, 1976: | University of Leiden | B.Sc. in Astronomy, Physics and Mathematics |

**Professional Experience:**

| | | |
|---|---|---|
| 2008-present: | Arizona State University | Co-Director, ASU Cosmology Initiative |
| 2008-present: | Arizona State University | Foundation Professor of Astrophysics |
| 2006-present: | Arizona State University | Regents' Professor of Astronomy |
| 1997-present: | Arizona State University | Professor of Physics and Astronomy |
| 1994-2000: | Arizona State University | Associate Chair, Department of Physics and Astronomy |
| 1987-present: | University of Arizona | Adjunct Astronomer, Steward Observatory |
| 1991-1997: | Arizona State University | Associate Professor of Physics and Astronomy |
| 1987-1991: | Arizona State University | Assistant Professor of Physics and Astronomy |
| 1986-1987: | California Institute of Technology (Pasadena) | Project Scientist in the Space Telescope Wide Field/ Planetary Camera Instrument Definition Team |
| 1984-1986: | Carnegie Observatory (Pasadena) | Carnegie Postdoctoral Research Fellow |
| 1979-1984: | University of Leiden, (the Netherlands) | Ph.D. Research Assistant employed by the Netherlands Foundation for the Advancement of Pure Research (ZWO) |

**Memberships:**

| | | |
|---|---|---|
| 1988-present: | International Astronomical Union | Comm. 9 (instrum.); 28 (galaxies); 40 (radio); 47 (cosmology) |
| 1984-present: | American Astronomical Society | (USA) |
| 1984-present: | Astronomical Soc. of the Pacific | (USA) |
| 1980-present: | Royal Astronomical Society | (United Kingdom) |
| 1979-present: | Nederlandse Astronomen Club | (The Netherlands) |

**Honors/Awards:**

| | | |
|---|---|---|
| 1984-1986: | Carnegie Fellow | Carnegie Institution of Washington |
| 1989-1993: | Alfred P. Sloan Research Fellow | Alfred P. Sloan Foundation |
| 2002-2021: | Interdisciplinary Scientist for the | James Webb Space Telescope (NASA/JWST) |
| 2003: | Outstanding Teacher Award | Department of Physics and Astronomy, ASU |
| 2006: | Regents' Professor of Astronomy | Arizona State University |
| 2006: | Distinguished Faculty Award | College of Liberal Arts and Sciences, ASU |
| 2008: | Foundation Professor | Arizona State University |
| 2014: | Honors College Faculty | Arizona State University |

| | | |
|---|---|---|
| **Languages:** | Dutch | (Reading, speaking, writing) |
| | English | (Reading, speaking, writing) |
| | French, German | (Reading, speaking) |
| | Latin, Greek | (Reading) |
| | Fortran, Html | (Reading, writing) |

## SUMMARY OF EXPERIENCE

## RESEARCH, NASA PROJECTS AND INSTRUMENTS

**Publications:** In total, 360 refereed papers published or in press, 20 papers (re)submitted, several in preparation; 34 review papers; 137 non-refereed papers; and 267 published abstracts (see App. 6 of CV). In total, https://ui.adsabs.harvard.edu/classic-form lists $\gtrsim$21,900 current citations with h-index$\simeq$76. Also, http://scholar.google.com lists $\gtrsim$27,200 citations with h$\simeq$85.

**Federal Grants:** Since 1989, I have brought in $\sim$14.4 M$ in federal grants from NASA and the NSF through over 100 different research projects, including three large HST and JWST projects for FY20–FY27.

**Hubble Space Telescope (HST) projects:** Since 1990, I have been involved in 80 funded projects with HST, which have used all HST instruments: WF/PC-1, FOC, FOS, GHRS, WFPC2, NICMOS, STIS, ACS and WFC3 (with FGS for guiding only). I was Co-I of the HST Medium Deep Survey Key Project in Cycles 1–5. I have collaborated with over 150 astronomers, more than 60 from over 15 different countries.

**(a) The HST Wide Field Camera 3 (WFC3):** I have been a key member of the Scientific Oversight Committee (SOC) of HST's Wide Field Camera 3 (WFC3) since 1998. The SOC oversaw the design and construction of the 130 M$ WFC3, which was successfully launched towards Hubble by the Space Shuttle astronauts in May 2009, and will enable HST to do front line science well into the 2020's. I led the far extragalactic WFC3 Early Release Science program, which led to $\gtrsim$70 refereed papers since 2009.

**(b) HST Archival Legacy Project SKYSURF:** In 2019, this largest HST Archival project ever proposed was approved for FY20–FY22. I am leading the international SKYSURF team of more than 40 scientists spread over 20 time-zones, including several research scientists, postdocs, graduate students and 10 UG students at ASU. SKYSURF will measure the panchromatic sky-surface brightness and discrete object counts across 248,000 ACS and WFC3 exposures in more than 1100 independent HST fields. SKYSURF will map over 2 million faint stars and galaxies at UV–near-IR wavelengths all across the sky. SKYSURF will also accurately measure and model the Zodiacal belt brightness at 0.2–1.7 $\mu$m in wavelength, set constraints to comet trails, the faint Kuiper Belt Object population, the Diffuse Galactic Light, measure the panchromatic discrete Extragalactic Background Light (EBL), and set much better limits to the diffuse EBL, which will constrain the formation of galaxies since the epoch of First Light a billion years after the Big Bang.

**(c) James Webb Space Telescope:** I am one of the six Interdisciplinary Scientists worldwide for NASA's James Webb Space Telescope (JWST), and active member of the JWST Flight Science Working Group (SWG). JWST is the 6.5 meter sequel to Hubble that was launched successfully on Dec. 25, 2021. My responsibilities since 2002 are to define the best JWST science, help the JWST Project define the optimal telescope and instrument performance, simulate JWST's actual performance, and monitor the design, integration and testing phases of JWST. This included regularly informing the astronomical community, the public, and Congress about JWST. Since 2002, I have led my JWST Guaranteed Time Observers (GTO) team, that has includes 130 scientists across 18 time zones worldwide, including Nobel Laureates. We plan to use our 110 hours of guaranteed observing time starting in summer 2022 to carry out a vigorous research program to make a detailed study of the epoch of First Light, when the universe was less than one billion years old. We aim to observe the First Stars directly during the first 500 Myr via cluster caustic transits, where gravitational lensing can temporarily produce extreme magnifications (Windhorst et al. 2018). We also plan to monitor the best survey field at the North Ecliptic Pole (NEP) to find the first supernovae with JWST in the first billion years (*e.g.*, Jansen & Windhorst 2018). My JWST work in these peer-reviewed projects is supported by NASA grants for 23 years.

**NASA:** I have over 35 years experience with NASA through HST (as part of WF/PC-1 since 1986, and WFC3 since 1998) and JWST (since 2001). In 1994, I chaired the STUC review of the entire HST Project budget for 1991–1999 ($\sim$240 M$/year). My extensive experience with NASA has resulted in a significant number of successful NASA projects.

## TEACHING, OUTREACH, PERSONNEL and MANAGEMENT

**Teaching:** Extensive experience as faculty in teaching 12 different undergraduate astronomy lecture courses and lab courses, and 5 different astronomy graduate courses. I have taught over 14,500 students at ASU since 1987, or about 400 per year on average.

**Public Outreach:** Give several public lectures to the community each year. Organize regular NASA press releases, Space Science Updates, or Science Writers Workshops on new HST results (see URL's below).

**Colloquia and Symposia:** I gave over 420 colloquia or seminars worldwide since 1981, including over 75 invited reviews. I gave over 350 colloquia that included HST and/or JWST science. I attended over 105 international Symposia in more than 15 different countries. Details are in App. 7–8 of my full CV.

**Personnel Management:** In my research group at ASU, I have supervised 21 Research Scientists and post-docs, 62 graduate, 114 undergraduate, and 16 exceptional high-school students doing research at ASU. As associate chair from 1994–2000, I helped run a Department of 40 faculty and 100 graduate students, carry out the hiring of over 50 teaching assistants each year, and help the Department stay within a budget of ∼500 k$/year. I have been on the Dean's Council from 1997-2000, and chaired it from 1999-2000. Each year, this Council reviewed typically 50-75 tenure and promotion cases and I advised the Dean about these. I was President of the CLAS Senate from 2017–2018, coaching the Senate to help the dean with a contentious issue about courses in a new ASU school.

**Personal Skills:** My biggest strengths are to listen, and motivate people to bring out the best in themselves.

## OBSERVING, DATA PROCESSING AND ANALYSIS

**Direct CCD-Imaging:** Extensive experience with CCD-arrays on large telescopes (several 100 nights in total): Palomar 200 inch Four-shooter, KPNO and CTIO 4m MOSAIC, MMT 6.5m MegaCam and Magellan 6.5m IMACS, and smaller telescopes. Experience with CCD data reduction (IRAF, STSDAS and their sequels). Extensive experience with HST UV-optical–near-IR imaging, which we pioneered with WFPC2 and WFC3.

**CCD-Spectroscopy:** Experience with CCD-spectrographs (over 100 nights): KPNO 4m (Cryocam, HYDRA), Palomar 200 inch (Four-shooter and its Spectrograph), Las Campanas 100 inch, MMT 6.5m Red & Blue Spectrographs. Extensive experience with HST grism spectroscopy, including the STIS and ACS optical and WFC3 IR grisms.

**Photometry:** Considerable experience with two-dimensional photometry. Developed and tested code to accurately remove cosmic rays, and large scale gradients from CCD-frames (at the level of $10^{-4}\times$sky).

**Radio Astronomy:** Extensive experience with the Westerbork Synthesis Radio Telescope and the Very Large Array ($\gtrsim$1000 hours), and their calibration, FFT, reduction and analysis software (AIPS).

**Computer Experience:** IBM, DEC/VMS, and UNIX mainframes; UNIX & Linux workstations (DEC, SUN, Mac's, PC's). FORTRAN, IRAF, STSDAS, AIPS, SAOImage, etc., for data reduction & analysis. Windows tasks on Mac or Linux platform (ppt, xls, Word).

My CV is on: https://rogierwindhorst.github.io/windhorstCV/

**REFERENCES**

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## APPENDIX 1. FUNDED RESEARCH AND PATENTS

### 1.a External funding of Windhorst's research projects at ASU

| Source/Grant No. | Total $ [1] | PI/*Status:* | Period(% effort)[2] | Project title |
|---|---|---|---|---|
| | | *Grants Funded between FY89≤FY≤01:* | | |
| AAS/Travel | 2,575 | Windhorst | 03/89-12/89(20) | Morphological evolution of gE's |
| NSF/Ast8821016 | 67,200 | Windhorst | 04/89-09/92(40) | Studies of faint radio galaxies |
| Sloan/BR-2848 | 25,000 | Windhorst | 09/89-09/93(10) | Alfred P. Sloan Research Fellowship |
| IUE/Nag5-1172 | 10,900 | Keel | 07/89-09/90(30) | UV spectra of nearby/high-z radio galaxies |
| IUE/Nag5-1465 | 4,650 | Keel | 10/90-09/91(20) | UV spectra of nearby/high-z radio galaxies |
| Rosat/Nag-1455 | 41,970 | Windhorst | 10/90-09/91(30) | The US ROSAT Deep X-ray Survey Part I |
| HST/GO-2405 | 142,876 | Windhorst | 10/91-09/92(30) | Morphology of gE radio galaxies (Cycle 1) |
| HST/GO-2684 | 44,811 | Griffiths | 10/91-09/92(20) | The HST Medium Deep Survey (Cycle 1) |
| HST/GO-2684 | 88,819 | Griffiths | 10/92-09/93(40) | The HST Medium Deep Survey (Cycle 2) |
| HST/GO-3545 | 107,523 | Windhorst | 10/92-06/94(30) | UV-spectral evol. of gE's to z=0.5 (Cy 2) |
| Rosat/Nag-2322 | 15,000 | Windhorst | 10/93-06/94(05) | The US ROSAT Deep X-ray Survey Part II |
| HST/AR-4936 | 30,677 | Windhorst | 10/93-06/94(10) | Light-profiles of high z Archival gE's |
| HST/GO-2684 | 105,395 | Griffiths | 10/93-06/94(50) | The HST Medium Deep Survey (Cycle 3) |
| NSF/Int9301805 | 9,281 | Burstein | 10/93-06/96(05) | Beijing-Arizona Color (BATC) sky-survey |
| HST/GO-5308 | 83,504 | Windhorst | 07/94-06/95(45) | PC imaging of a collapsing z=2.4 galaxy |
| HST/GO-2684 | 97,385 | Griffiths | 07/94-06/95(50) | The HST Medium Deep Survey (Cycle 4) |
| HST/GO-5985 | 56,711 | Windhorst | 07/95-06/96(50) | WFPC2 imaging of a z=2.4 galaxy cluster |
| HST/GO-2684 | 82,409 | Griffiths | 07/95-06/96(45) | The HST Medium Deep Survey (Cycle 5) |
| HST/AR-6385 | 39,039 | Odewahn | 07/96-06/97(15) | ANN classification of WFPC2 Arch. images |
| HST/AR-6948 | 11,821 | Kellermann | 07/96-06/97(10) | VLA Observations of the Hubble Deep Field |
| HST/GO-6609 | 68,652 | Windhorst | 07/96-06/97(45) | The WFPC2 B-Band parallel survey |
| HST/GO-6610 | 33,799 | Windhorst | 07/96-06/97(30) | WFPC2 Ly-alpha imaging of z=2.4 clusters |
| HST/ED-90113 | 12,050 | Windhorst | 07/97-06/98(20) | Astronomy Education at Jordan Elt. School |
| NASA/Nag-6740 | 50,152 | Windhorst | 10/97-06/98(30) | A systematic study of galaxy evolution |
| HST/AR-7534 | 24,890 | Odewahn | 07/97-06/98(20) | Fourier analysis of galaxy asymmetry vs z |
| HST/GO-7280 | 49,007 | Peacock | 07/97-06/98(30) | NIC2 imaging of the oldest z=1.5 galaxies |
| HST/GO-7452 | 66,657 | Windhorst | 07/98-06/99(50) | NIC2 imaging of radio sources with R>29 |
| HST/GO-7459 | 33,920 | Keel | 07/98-06/99(20) | Age and content of a z=2.4 galaxy cluster |
| NSF/Ast9802963 | 35,492 | Windhorst | 07/98-06/99(20) | Medium-band imaging of faint galaxies |
| HST/AR-8388 | 20,046 | Windhorst | 07/98-06/99(10) | Analysis of compact Ly$\alpha$ galaxies at z=2–3 |
| HST/AR-8357 | 49,217 | Waddington | 07/99-06/00(25) | Galaxy evol. through restframe morphology |
| HST/HF-1123 | 81,425 | Windhorst[3] | 07/99-06/00(05) | Hubble Fellowship at ASU for Eric Richards |
| HST/GO-8203 | 68,748 | Odewahn | 07/99-06/00(10) | Morphological Luminosity Function of A868 |
| HST/GO-8260 | 107,845 | Windhorst | 07/99-06/00(60) | A STIS search for the H-edge of the Universe |
| HST/AR-8765 | 32,682 | Chiarenza | 07/00-06/01(10) | Mid-UV structure of nearby early-type gxys |
| HST/AR-8768 | 49,796 | Windhorst | 07/00-06/01(20) | The morphological mix of faint radio sources |
| HST/GO-8645 | 99,797 | Windhorst | 07/00-06/01(70) | Mid-UV morphology survey of nearby galaxies |
| Sub-total | 1,951,721 | *(Grants Funded for FY≤01)* | | |

*(Continued on next page)*

*Notes:*

[1] Award amounts are totals received by or approved for my group at ASU, and reflect ASU's part of the project only.

[2] Percentage effort is fraction of research time spent by Windhorst on each funded project, as active in each FY.

[3] Administrative PI for this project at ASU is Rogier Windhorst. Fellowship was for Eric Richards.

**1.a External funding of Windhorst's research projects at ASU (continued)**

| Source/Grant No. | Total $ [1] | PI/*Status:* | Period(% effort)[2] | Project title |
|---|---|---|---|---|
| | | *Grants Funded between FY02≤FY≤10:* | | |
| HST/GO-9066 | 117,190 | Windhorst | 07/01-06/03(30) | Closing in on the Hydrogen Reionization edge |
| HST/GO-9124 | 108,146 | Windhorst | 07/01-06/03(30) | Mid-UV morphology survey of nearby irregulars |
| HST/GO-9174 | 12,357 | Chapman | 07/01-06/02(40) | Optically faint radio sources and protogalaxies |
| AAS/Travel | 1,430 | Windhorst | 07/02-06/03(05) | Natural Confusion Limit for NGST and SKA |
| NASA/JWST | 1,290,390 [3] | Windhorst | 07/02-06/14(35) | Interdisciplinary Scientist for the JWST |
| HST/GO-9824 | 80,535 | Windhorst | 07/03-06/04(25) | NICMOS SNAPshot survey of nearby galaxies |
| HST/AR-9955 | 22,497 | Windhorst | 07/03-06/04(15) | Archival zodiacal background: KBO constraints |
| HST/GO-9892 | 73,195 | Jansen | 07/03-06/04(05) | $H\alpha$ SNAPshots of Nearby Galaxies |
| HST/GO-9793 | 10,970 | Malhotra | 07/03-06/04(05) | Grism-ACS program for extragalactic science |
| HST/GO-9780 | 43,671 | H.J. Yan | 07/03-06/04(15) | Nic3 imaging of z$\simeq$6 objects in a deep acs field |
| HST/AR-10298 | 48,733 | Cohen | 07/04-06/05(10) | Structural evol. of galaxies in GOODS & UDF |
| HST/GO-10180 | 130,996 | Corbin | 07/04-06/05(20) | ultracompact blue dwarfs: local galaxy form. |
| GALEX/1036 | 30,000 | Windhorst | 07/04-06/05(10) | GALEX Far-UV Imaging of Nearby Irregulars |
| Banner/ASU | 69,489 [4] | Windhorst | 07/04-06/05(10) | Classifying Neurons in Pre-Diabetic Patients |
| TGEN/ASU | 15,660 [5] | Windhorst | 07/04-06/05(10) | Classifying Cancer Cells in various Tumors |
| NASA/GSFC | 34,913 | Morse | 07/04-06/05(05) | HORUS: High Orbit Ultraviolet-Visible Satellite |
| NASA/JPFP | 72,000 | Straughn | 07/05-06/08(05) | Graduate Fellowship: Tracing Galaxy Assembly |
| HST/GO-10530 | 41,829 | Malhotra | 07/05-06/06(40) | Probing Evolution & Reionization by Spectra |
| Banner Health | 19,865 | Windhorst | 07/05-06/06(20) | Classifying Neurons in Pre-Diabetic Patients |
| HST/ED14-975 | 50,173 | Windhorst | 01/06-06/07(30) | Cycle 14 EPO project: Hubble at Hyperspeed |
| HST/AR-10974 | 50,000 | Ryan | 07/06-06/07(25) | Unresolved Stellar Populations in the HUDF |
| HST/GO-10843 | 29,257 | Corbin | 07/06-06/07(10) | Deep imaging of extremely metal-poor galaxies |
| NASA/ADP | 77,687 | Cohen | 07/07-06/08(15) | SEDs and Ages of Weak AGN Hosts |
| NASA/ADP | 69,237 | Windhorst | 07/07-06/08(15) | Multi-$\lambda$ Study of Nearby Late-type Galaxies |
| HST/AR-11287 | 85,348 | Windhorst | 07/07-06/08(10) | Fundamental Limitations in Deep HST Fields |
| HST/AR-11258 | 179,935 | Jansen | 07/07-06/08(20) | Reprocessing **all** STIS Side-2 CCD data |
| DOE/C10581A | 26,400 | Windhorst | 07/07-06/08(05) | Concept Study for JDEM DESTINY Mission |
| HST/DD-11359 | 291,487 | Windhorst | 07/08-06/12(35) | Wide Field Camera 3 Early Release Science |
| Banner Health | 15,416 | Herman | 09/08-08/09(10) | Classifying Neurons in Pre-Diabetic Patients |
| NASA/ASMCS | 105,335 | Scowen | 02/08-12/09(20) | The Star-Formation Observatory |
| HST/GO-11702 | 56,866 | Yan | 07/09-06/10(05) | High Redshift Galaxy WFC3 Parallel Survey |
| HST/AR-11772 | 59,131 | Ryan | 07/09-06/10(05) | The Epoch Dependent Major Merger Rate |
| NASA/ADP | 328,277 | Windhorst | 12/09-06/12(15) | Seyfert/AGN—Starformation Connection |
| Swift/6090606 | 20,000 | Windhorst | 07/09-06/10(05) | A Census of Lyman-$\alpha$ Blobs at z=0.6 |
| Sub-total | 5,620,136 | *(Grants Funded for FY≤10)* | | |

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*Notes:*

[1] Award amounts are totals received at or requested by my group at ASU, and reflect ASU's part of the project only.

[2] Percentage effort is fraction of research time spent by Windhorst on each funded project, as active in each fiscal year. Approximately this fraction of time is spent on each project during the academic year, as well as during the summers.

[3] This 14-year (FY01-FY14) NASA grant supports my work as Interdisciplinary Scientist for the Webb Telescope (JWST), launched in Dec. 2021. It comes in installments of about 100,000 $ per FY, not including the ASU match.

[4] This is the ASU part of a larger grant between Good Samaritan Hospital (Banner Health) and ASU.

[5] This is the ASU part of a larger grant between the Translational Genomics Research Institute (TGEN) and ASU.

**1.a External funding of Windhorst's group research projects at ASU (continued)**

| Source/Grant No. | Total $ [1] | PI/*Status:* | Period(% effort)[2] | Project title |
|---|---|---|---|---|
| | | *Grants Funded between FY10≤FY≤21:* | | |
| HST/GO-12286 | 78,659 | Yan | 07/10-06/11(15) | High Redshift Galaxy WFC3 Parallel Survey |
| HST/GO-12332 | 58,379 | Windhorst | 07/10-06/11(15) | WFC3/IR Imaging of z=6 QSO Host Galaxies |
| HST/GO-12190 | 16,690 | Koekemoer | 07/11-06/12(10) | WFC3/IR Spectra of High-z Black Holes |
| HST/HF-51291 | 321,081 | Jiang | 07/11-06/14(10) | Hubble Fellowship at ASU for Dr. L. Jiang |
| JPL/1444481 | 39,641 | Jiang | 07/11-06/12(10) | Physical Properties of 5.7≲z≲7 SDF galaxies |
| HST/GO-12616 | 104,455 | Jiang | 07/12-06/13(10) | Near-IR imaging of z≳6 SDF galaxies |
| HST/GO-12500 | 34,350 | Kaviraj | 07/12-06/13(05) | WFC3 UV studies of SAURON galaxies |
| NASA/ADP | 380,936 | Jansen | 07/12-12/13(10) | Spatially-resolved galaxy extinction Corrections |
| HST/GO-12613 | 69,353 | Jahnke | 07/12-06/13(10) | Do mergers trigger z≃2 black-hole growth? |
| Swift/8110151 | 20,000 | Windhorst | 07/12-06/13(05) | Follow-up of Lyman-$\alpha$ Blobs at z=0.6 |
| HST/GO-12332 | 42,870 | Windhorst | 07/12-06/13(05) | WFC3/IR imaging of z=6 QSO Host Galaxies |
| HST/GO-12974 | 152,152 | Mechtley | 07/12-06/14(20) | WFC3/IR imaging of uv-faint z=6 QSO hosts |
| HST/AR-13241 | 124,221 | Cohen | 07/13-06/14(10) | Pixel-by-pixel Resolved Stellar Populations |
| HST/AR-13266 | 11,676 | Ryan | 07/13-06/14(30) | Distant Ultracool-Dwarfs from WISPS, 3DHST |
| HST/AR-13364 | 52,469 | H. Kim | 07/13-06/14(05) | ExtraGalactic UV Survey (Admin PI) |
| HST/EO-13241 | 58,199 | Windhorst | 01/14-09/15(10) | 3D-IMAGINE: AST 100 Classes for the Blind |
| NASA/JWST | 295,555 [3] | Windhorst | 10/14-09/16(50) | Galaxy Assembly and First Light with JWST |
| HST/AR-13877 | 109,971 | Windhorst | 10/14-09/15(25) | Project ALCATRAZ: archival Ly-cont. studies |
| HST/GO-13779 | 57,603 | Malhotra | 10/14-09/15(15) | Faint Infrared Grism Survey (FIGS) |
| HST/GO-14262 | 93,398 | Jahnke | 10/15-09/16(20) | Fast growing z≃2 black holes by mergers? |
| JWST/NIRCam | 50,000 | Windhorst | 10/15-03/16(10) | JWST CryoVac 3 Shifts & Test Data Analysis |
| NASA/JWST | 506,896 [3] | Windhorst | 10/16-09/18(50) | Galaxy Assembly and First Light with JWST |
| HST/AR-14591 | 103,735 | Windhorst | 10/16-09/18(10) | Project ALCATRAZ2: Escaping LyC Radiation |
| HST/GO-15137 | 76,227 | Windhorst | 10/17-09/18(10) | z>6 Galaxies with Extremely Blue UV Slopes |
| HST/GO-15278 | 286,026 | Jansen | 10/17-09/19(30) | HST UVis imaging of JWST time-domain field |
| NASA/JWST | 262,821 [3] | Windhorst | 10/18-09/19(50) | Galaxy Assembly and First Light with JWST |
| HST/GO-15647 | 139,953 | Teplitz | 10/18-09/21(10) | UVCANDELS: UV Legacy Survey Fields |
| HST/GO-15187 | 89,289 | Tilvi | 10/18-09/20(02) | Confirmation of the Most Distant Quasar |
| NASA/JWST | 301,084 [4] | Windhorst | 10/19-09/20(50) | Galaxy Assembly and First Light with JWST |
| HST/GO-15810 | 932,133 | Windhorst | 01/20-12/22(30) | SKYSURF: All-Sky EBL & Zodi Constraints |
| NASA/JWST | 327,582 [4] | Windhorst | 10/20-09/21(50) | Galaxy Assembly and First Light with JWST |
| Sub-total | 10,817,540 | (Grants Funded for FY≤21 ) | | |

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*Notes:*

[1] Award amounts are totals received at or requested by my group at ASU, and reflect ASU's part of the project only.

[2] Percentage effort is fraction of research time spent by Windhorst on each funded project, as active in each fiscal year. Approximately this fraction of time is spent on each project during the academic year, as well as during the summers.

[3] These NASA grants continued my work as Interdisciplinary Scientist in FY15–FY16 and FY17–FY19 for the James Webb Space Telescope (JWST), launched on Dec. 25, 2021. It came in installments of about 150–250 k$ per FY.

[4] These NASA grants continued my work as Interdisciplinary Scientist in FY20–FY21 for the James Webb Space Telescope (JWST), launched on December 25, 2021. It comes in installments of about 300–325 k$ per FY.

**1.a External funding of Windhorst's group research projects at ASU (continued)**

| Source/Grant No. | Total $ [1] | PI/*Status:* | Period(% effort)[2] | Project title |
|---|---|---|---|---|
| | | *Grants Funded between FY21≤FY≤24:* | | |
| HST/GO-16252 | 163,948 | Jansen | 10/20-09/22(05) | Treasurehunt: Cy 28 Imaging of the JWST TDF |
| NSF/Ast1907493 | 191,167 | Hunter | 10/20-09/23(05) | Starformation at low metallicity (for H. Archer) |
| NASA/JWST | 330,819 | Windhorst | 10/21-09/22(40) | Galaxy Assembly and First Light with JWST |
| HST/GO-16604 | 96,377 | Carleton | 01/22-12/23(02) | Resolved Stellar Populations in Dwarf Galaxies |
| HST/GO-16605 | 98,900 | Carleton | 01/22-12/23(03) | HST: Hot or Cold? WFC3 Thermal Foreground |
| HST/GO-16793 | 251,833 | Jansen | 01/22-12/23(10) | Treasurehunt: Cy 29 Imaging of the JWST TDF |
| HST/GO-16621 | 291,577 | Koekemoer | 01/22-12/25(03) | Supercal: AR Legacy of HST Cosmology Fields |
| NASA/JWST | 342,514 | Windhorst | 10/22-09/23(60) | Galaxy Assembly and First Light with JWST |
| JWST/GO-01813 | 171,129 | Marshall | 01/23-12/25(02) | Unveiling Stellar Light from z∼6 QSO Hosts |
| JWST/DD-4446 | 9,965 | Frye | 04/23-09/24(02) | SN H0pe: $H_o$, Time Delay of Lensed z=1.78 SN |
| NASA/JWST | 302,693 | Windhorst | 10/23-09/24(60) | Galaxy Assembly and First Light with JWST |
| HST/GO-17068 | 125,254 | Archer | 10/23-09/25(02) | Young Stars in the Dwarf Irregular Galaxy WLM |
| JWST/GO-2883 | 83,133 | F. Sun | 10/23-09/25(05) | MAGNIF: NIRCam Grism in Frontier Fields |
| NRAO/ALMA | 27,317 | N. Foo | 01/24-12/25(03) | ALMA images of Lensed Dusty SF Webb Galaxies |
| HST/GO-17563 | 80,188 | Ryan | 10/24-09/26(03) | HST Cy 31 AR project ArchExtract (pending) |
| JWST/AR-4695 | 699,537 | Windhorst | 10/24-09/27(50) | JWST Cycle 3 AR Legacy project DARK-SKY |
| NASA/JWST | 307,290 | Windhorst | 10/24-09/25(30) | Galaxy Assembly and First Light with JWST |
| JWST/DD-6549 | 11,992 [3] | Pierel | 01/24-12/25(02) | SN Encore: $H_o$, Time Delay of Lensed z=1.9 SN |
| | | *Grants Approved or Pending for FY≥25:* | | |
| HST/GO-17624 | 25,000 [3] | Smith | 01/25-12/26(02) | Treasuretrove: BH & Bulge Growth: NEP TDF |
| JWST/GO-Cy4 | 400,000 [3] | Various | 01/24-12/25(02) | SN Encore: $H_o$, Time Delay of Lensed z=1.9 SN |
| Total | 14,828,173 | (Grants Funded, Approved, or Pending as of FY25) | | |

*Notes:*

[1] Award amounts are totals received at or requested by my group at ASU, and reflect ASU's part of the project only.

[2] Percentage effort is fraction of research time spent by Windhorst on each funded project, as active in each fiscal year. Approximately this fraction of time is spent on each project during the academic year, as well as during the summers.

[3] NASA proposals pending peer-review for HST Cycle 32 or JWST Cycle 4 (FY≥25), budgets to be determined in Phase II.

### 1.b Internal Funding of Windhorst's Research Projects at ASU

| Source/Grant No. | Total $ [1] | ASU-PI | Period(% effort)[2] | Project title |
|---|---|---|---|---|
| VP-Res/CLAS | 50,333 | Windhorst | 07/87-06/89(40) | Studies of faint radio galaxies [startup |
| Phys. Dept. | 20,333 | Windhorst | 07/88-06/90(40) | Studies of faint radio galaxies -funds] |
| RIA/Phys match | 5,394 | Windhorst | 07/88-06/90(40) | Studies of faint radio galaxies |
| Grad. College | 10,500 | Windhorst | 07/88-06/89(10) | Studies of distant protogalaxies |
| CLAS Minigrant | 500 | Windhorst | 07/88-06/89(10) | Studies of distant protogalaxies |
| CLAS/Phys match | 6,420 | Windhorst | 07/88-06/90(10) | Studies of distant protogalaxies |
| FGIA | 3,000 | Windhorst | 11/88-06/89(30) | UV spectra of nearby/high-z radio gxys |
| Grad. College | 10,500 | Windhorst | 07/89-06/90(30) | UV spectra of nearby/high-z radio gxys |
| Grad. College | 10,500 | Windhorst | 07/90-06/91(40) | Studies of faint radio gxys/clustering |
| CRAY Inc. | 140 hrs | Windhorst[3] | 07/90-06/91(40) | Studies of faint radio gxys/clustering |
| VP/Res match | 9,636 | Windhorst | 10/90-09/91(30) | The US ROSAT Deep X-ray Survey Part I |
| CRAY Inc. | 300 hrs | Windhorst[3] | 10/91-09/92(30) | Morphology of gE radio galaxies (Cy 1) |
| VP/Res match | 27,631 | Windhorst | 10/91-09/92(30) | Morphology of gE radio galaxies (Cy 1) |
| VP/Res match | 8,750 | Windhorst | 10/92-06/94(30) | UV-spectral evol of gE's to z=0.5 (Cy 2) |
| CLAS/Physics | 7,000 | Windhorst | 07/94-06/95(45) | PC imaging of a collapsing z=2.4 galaxy |
| VP/Res match | 7,000 | Windhorst | 07/94-06/95(50) | The HST Medium Deep Survey (Cycle 4) |
| CLAS/Physics | 10,000 | Windhorst | 07/95-06/96(50) | WFPC2 imaging of a z=2.4 galaxy cluster |
| VP/Res match | 9,000 | Windhorst | 07/95-06/96(45) | The HST Medium Deep Survey (Cycle 5) |
| CLAS/Physics | 3,766 | Windhorst | 07/96-06/97(30) | WFPC2 Ly-alpha imaging of z=2.4 clusters |
| VP/Res match | 3,600 | Windhorst | 07/96-06/97(45) | The WFPC2 B-Band parallel survey (Cy 6) |
| CLAS/Physics | 2,525 | Windhorst | 07/97-06/98(25) | NIC2 imaging of radio sources with R>29 |
| CLAS/Physics | 2,525 | Windhorst | 07/97-06/98(30) | NIC2 imaging of the oldest z=1.5 gxys |
| VPR/CLAS/Dept | 22,400 | Windhorst | 07/98-06/99(25) | Medium-band imaging of faint galaxies: filters |
| VPR/CLAS/Dept | 5,000 | Windhorst | 07/00-06/01(70) | Mid-UV HST morphology of nearby galaxies |
| VPR/CLAS/Dept | 5,181 | Windhorst | 07/00-06/01(25) | Mid-UV morphology survey of nearby irregulars |
| VPR/CLAS/Dept | 6,031 | Windhorst | 07/00-06/01(30) | Closing in on the Hydrogen Reionization edge |
| VPR/CLAS/Dept | 262,202 | Windhorst | 07/02-06/14(40) | Interdisciplinary Scientist for JWST |
| VPR/CLAS/Dept | 69,489 | Windhorst | 07/04-06/05(10) | Classifying Neurons in Pre-diabetic Patients |
| ASU/CLAS/Dept | TBD | Windhorst | 07/08-06/06(13) | ASU Presidential Cosmology Initiative |
| ASU/CLAS/SESE | 20,000 | Windhorst | 01/13-12/14(20) | 3DIMAGINE: STEM classes for blind students |

*Notes:*

[1] Award amounts are totals received at or requested by ASU, and reflect ASU's part of the project only.

[2] Percentage effort is fraction of research time spent by Windhorst on each funded project, as active in each fiscal year.

[3] In the early 1990's, the ASU CRAY X/MP time was equivalent to about $ 300 per hour.

### 1.c Patents of Windhorst's research group at ASU

| Patent No. | Date filed | PI | Patent title |
|---|---|---|---|
| US Patent office # 21304US01 | 08/09 | Windhorst | Using Hubble Space Telescope Object Finding and Classification Software as Detection Method of Early-stage Diabetes Mellitus Type II |
| US Patent office #PCT/US2013/070969 #US 9,711,065 B2 | 11/12 07/17 | Hongyu Yu | A Responsive Dynamic 3D Tactile Display System using Hydrogel Publ.#: WO2014081808 A1; International Classif: G06F3/14, G06F3/01 United State Patent Office |

## APPENDIX 2. SERVICE

### 2.a Astronomy Committees and Other Service to the Astronomical Community

| Period | Committee |
|---|---|
| 1986-1989 | Adjunct to the Hubble Space Telescope Wide Field/Planetary Camera Instrument Definition Team (PI: J. Westphal, Caltech). |
| 1987-1990 | Adjunct to the Columbus Telescope Scientific Advisory Committee (Chair: R. Kron). |
| 1986-1995 | Co-I of the Hubble Space Telescope Medium-Deep Survey (PI: Griffiths, STScI). The MDS was one of the three long-term Key Projects on HST in Cycles 1–5. |
| 1991-1995 | Hubble Space Telescope Users Committee (Chair: J. Hutchings). STUC Liaison to the STSDAS Users Committee (Chair: C. Christian). |
| 1993 | Review Committee of the HST/WFPC-2 Thermal Vacuum Tests (Chair: K. Horne). |
| 1993-1994 | NASA's HST/STUC Independent Budget Review Committee (Chair: R. Windhorst). Reviewed the entire 10-year 240 M$/year HST Project budget at GSFC and STScI. |
| 1995 | Hubble Space Telescope Cycle 6 Time Allocation Committee. (Galaxy Panel; Chair: P. T. de Zeeuw). |
| 1991-1994 | Steward Observatory and MMT Time Allocation Committee (Chair: M. Rieke). |
| 1992-1993 | Local Organizing Cmtee of $181^{st}$ AAS meeting in Phoenix (Chair: D. Burstein). |
| 1993-1997 | National Radio Astronomy Observatory Users Committee (Chair: R. Brown). |
| 1995-1997 | National Radio Astronomy Observatory VLA Sub-Committee (Chair: J. van Gorkom). |
| 1993-1996 | Oversight Committee for the VLA All-Sky Surveys (Chair: F. Owen). |
| 1997-2001 | Hubble Space Telescope Parallel Working Group (Chairs: F. D. Macchetto & J. Frogel). This Committee is responsible for the planning of the entire set of (simultaneous) HST parallel observations with WFPC2, NICMOS, STIS and ACS in Cycles 7–11. |
| 1998 | National Science Foundation CAREER Review Panel (Chair: J. P. Wright). |
| 1999-2005 | Large Binocular Telescope Optical/UV Spectrograph Working Group (Chair: B. Peterson). Oversees design and construction of the Optical/UV Spectrograph on the 11.3 meter LBT. |
| 1999-2009 | Steward Observatory Telescope/Instrument Review Committee (Chair: P. Strittmatter). Reviews overall strategies for Steward Observatory telescope use and instrumentation. |
| 1999 | Hubble Space Telescope Cy 9 Time Allocation Committee (Exgal. Panel; Chair: J. Huchra). |
| 1999-2001 | National Radio Astronomy Observatory: Reviewer for VLA, VLBA, and VLBI interferometers (VLA TAC Chair: M. Goss). |
| 2000-2001 | Steward Observatory and MMT Time Allocation Committee (Chair: J. Holberg). |
| 2001-2002 | Steward Observatory and Magellan Time Allocation Committee (Chair: D. Zaritsky). |
| 2002-2003 | Steward Observatory and Magellan Time Allocation Committee (Chair: R. Windhorst). |
| 2000-2001 | Hubble Space Telescope – Hubble Fellowship Selection Panel (Chair: A. Filippenko). |
| 2000-2001 | Scientific Organizing Cmtee; STScI ACS Surveys Workshop (Chair: S. Beckwith). |
| 2001 | NSF Peer Review (Clusters and Large Scale Structure Panel; Chair: R. Barvainis). |
| 2001 | Hubble Space Telescope Time Cy 11 Allocation Cmtee (Exgal. Panel; Chair: R. Windhorst). |
| 2001-2003 | National Optical Astronomy Observatories Time Allocation Cmtee (Chair: D. de Young). |
| 2002 | Scientific Organizing Cmtee; Hubble Space Telescope treasury workshop (S. Beckwith). |
| 2003 | Hubble Space Telescope Cycle 12 Time Allocation Cmtee (Cosmo. panel; Chair: R. Green). |
| 2004 | Spitzer Space Telescope Cycle 1 Review (Cosmology panel; Chair: M. Strauss). |
| 2003-2004 | Scientific Organizing Cmtee; South Africa Galaxy Workshop (Chair: D. Block). |

**2.a Astronomy Committees and Other Service to the Astronomical Community (continued)**

| Period | Committee |
|---|---|
| 1998-present | Scientific Oversight Committee (SOC) member of HST's Wide Field Camera 3 (WFC3). Supervises the design and construction of this camera launched and installed into HST in May 2009, and is planned to be operational through 2020 (Chair: R. O'Connell). This is a 120 M$ project that I am very closely involved with, resulting in about 4 meetings per year in MD, and a considerable amount of document writing for NASA. I do this to help assure a great science future for HST well into the 2020's, and to be actively involved with the James Webb Space Telescope after its 2021 launch. I led part II of the Early Release Science Program (ERS) that is using the HST/WFC3 right after its May 2009 launch to carry out a panchromatic UV-optical-near–IR survey of cosmic star-formation at intermediate redshifts (z≃1–5). |
| 1999-2008 | WFC3 SOC Filter Subcommittee (Chair: J. Trauger). |
| 1999-2008 | WFC3 SOC CCD-Detector Subcommittee (Chair: G. Luppino). |
| 2000-2008 | WFC3 SOC Post-Observations Subcommittee to design WFC3 Pipeline (Chair: C. Lisse). |
| 2002-2008 | WFC3 SOC Subcommittee for Science Calibration and Thermal Vacuum (Chair: N. Reid). |
| 2002-2004 | Scientific Advisory Committee of the HST Ultra Deep Field Survey (Chair: S. Beckwith). |
| 2001 | Consultant for the Next Generation Space Telescope (NGST) project. Specific focus on predicting galaxy morphology as seen by NGST at redshifts z=1–20, and on optimizing its performance for Hydrogen reionization edge studies at z=6–20. |
| 2002-present (planned to run through 2025) | Interdisciplinary Scientist for the James Webb Space Telescope (JWST) — formerly known as Next Generation Space Telescope — the 6.5 meter sequel to the Hubble Space Telescope. JWST is built by Northrop-Grumman Space Technologies (formerly TRW), which was successfully launched in Dec. 2021. My responsibilities are to assist the JWST Project with defining the best JWST science, help define the optimal telescope and instrument performance, simulate JWST's actual performance, and follow the design, integration and testing phases of JWST. With JWST, we will carry out a vigorous research JWST program in 2022–2025 using our 110 guaranteed hours of observing time, in which I plan to study the structure and evolution of galaxies at redshifts z=1–6, search for the first galaxies and star clusters at z=6–20, and study the reionization epoch when the first stars and star clusters started shining. Funding to ASU by NASA HQ is over 250 k$/year through 2025. The JWST Flight Science Working Group (SWG) chair is Dr. John C. Mather (NASA/GSFC), senior Project Scientist and Nobel Laureate. |
| 2004-2005 | Co-Chair, James Webb Space Telescope Science Working Group (Chair: John Mather) |
| 2002-2005 | Co-Investigator of the NASA Roadmap Vision study proposal for Generation-X. This is the next generation X-ray telescope with $\gtrsim 100$ m$^2$ collecting area and $\lesssim 0\farcs1$ resolution, which is being studied by NASA for launch after 2020. PI is Dr. Roger Brissenden from the Harvard Smithsonian Center for Astrophysics. My role is to make the connection between Generation-X and JWST, address the role of (obscured) AGN in the reionization epoch at at redshifts $z \gtrsim 6$ and during subsequent galaxy assembly, and the natural confusion limit. |
| 2006 | Reviewer for the NASA Postdoctoral Program (NPP) c/o Oak Ridge Associated Universities |
| 2006 | NASA ATP/Beyond Einstein Panel Review (Chair: M. Stiavelli). |
| 2008 | Reviewer for the NASA Postdoctoral Program (NPP) c/o Oak Ridge Associated Universities |
| 2008 | Hubble Space Telescope Cycle 16S Time Allocation Cmtee (Cosmo. panel; Chair: N. Reid). |
| 2009-2010 | Scientific Organizing Cmtee; UT Workshop on "The First Stars &and Galaxies" (V. Bromm) |
| 2009-2015 | Steward Observatory and Magellan Time Allocation Committee (Chair: D. Zaritsky). |

**2.a Astronomy Committees and Other Service to the Astronomical Community (continued)**

| Period | Committee |
|---|---|
| 2003-2010 | Co-Investigator of the science team of the Star-Formation Camera ("SFC"), formerly called the ORION and HORUS mission concepts. SFC is a concept study for a wide-field UV–optical Camera on the 4 G$ 4-meter UV-optical space telescope "THEIA". The main science focus of THEIA/SFC is to study star-formation over cosmic time, starting in our own Galaxy, the neighboring Magellanic Clouds, in other nearby galaxies up to the most distant galaxies. With the arrival of the 2.4 meter NRO spare mirrors in 2012, the HORUS mission (PI Dr. Paul Scowen, ASU) has been revived via the NASA SALSO opportunity in 2012/2013. My role in HORUS was to help define and write the nearby and far extragalactic science cases, together with Dr. Rolf Jansen (ASU). is the HORUS Project Scientist. Starting in 2014, this work is being refocused to position the community in the 2020 Decadal for a large UV-optical–near-IR sequel (e.g. a 11-16 meter HDST or ATLAST) to start after HST, JWST and WFIRST. |
| 2010 | Hubble Space Telescope Cycle 18 Time Alloc. Cmtee (TAC; Chair: N. Bahcall) |
| 2010 | Hubble Space Telescope Cycle 18 Time Alloc. Cmtee (Galaxies panel; Chair: R. Windhorst) |
| 2010-2012 | ESA Herschel Observatory Time Allocation Cmtee (Cosmology panel; Chair: G. Zamorani) |
| 2012 | Spitzer Space Telescope Cycle 9 TAC (Cosmology large proposal panel; Chair: A. Dey) |
| 2012 | Spitzer Space Telescope Cycle 9 TAC (Cosmology small proposal panel; Chair: S. Malhotra) |
| 2012 | Scientific Organizing Cmtee, IAU Symp 289: Physics of Cosmic Distances (Chair: R. deGrijs) |
| 2014 | Scientific Organizing Cmtee, Yale Hubble Frontier Fields Workshop (Chair: P. Natarajan) |
| 2014–present | Copag Science Analysis Group 7: Science Enabled by HST/JWST Overlap (Chair: J. Green) |
| 2014–present | Copag Science Analysis Group 9: Spitzer observations supporting JWST (Chair: D. Calzetti) |
| 2014–present | Copag Science Interest Group 2: Science & Technology needs for UV/Vis (Chair: P. Scowen) |
| 2014–present | NRAO VLA All Sky Survey Review Panel of the 5500-hr VLASS (Chairs: A.Baker; G.Bower) |
| 2015–present | Hubble Space Telescope Cycles and Mid-Cycle Time Alloc. Cmtees (Chair: B. Peterson) |
| 2015-present | Co-Investigator of the NASA Wide Field Infrared Survey Telescope (WFIRST) Science Investigation Team (SIT) to study Cosmic Dawn (PI: Dr. J. Rhoads, NASA GSFC). The WFIRST Cosmic Dawn team is investigating what survey parameters and science requirements this next NASA Flagship mission — that comes after the Hubble and Webb Space Telescopes — needs to have to survey the entire sky in the near-IR after 2025. The main science goal of the WFIRST mission is to accurately measure the main cosmological parameters. Our ASU team specifically focuses on how the first galaxies and quasars reionized the universe during the first billion years after the Big Bang. |
| 2016-present | Co-Investigator of the JPL SPHEREx MIDEX mission proposed to NASA. SPHEREx is an all-sky near-infrared spectroscopic survey addressing all three NASA astrophysics science goals. It probes the origin of the Universe by improving constraints on inflationary non-Gaussianity by more than 10× through a large-volume galaxy redshift survey. SPHEREx investigates the origin of water and biogenic molecules from interstellar ices in the early phases of planetary system formation. SPHEREx charts the origin and history of galaxy formation, from light produced by the first galaxies that ended the cosmic dark ages to the present day. SPHEREx provides a rich public spectral archive for diverse investigations ranging from X-ray astronomy to exoplanet characterization. My role in SPHEREx is to use it data to select the best lensing clusters for JWST. |
| 2018-2022 | ASU Founders Representative at the Giant Magellan Telescope (GMT) (Chair: R. Shelton) |

## 2.b Department, College and University Committees and Service

| Period | Committee |
|---|---|
| | **Department Committees and Other Departmental Service:** |
| 1988-1991 | Department's Liaison for Public Relations (Chair: R. Windhorst). |
| 1988-1989 | Graduate Exam Committee (Chair: R. Marzke). |
| 1988-1990 | Personnel Committee (Chair: R. Jacob). |
| 1989-1990 | Astronomy Faculty Search Committee (Chair: H. Voss). |
| 1989-1991 | Department Computer Advisory Committee (Chair: R. Windhorst). |
| 1989-1991 | Refurbishing Committee for H-wing (Chair: R. Hanson). |
| 1990-1991 | Graduate Program Committee (Chair: D. Benin). |
| 1991-1993 | Budget and Policy Committee (Chair: S. Wyckoff). |
| 1994-2000 | (Non-voting on) Budget and Policy Committee (Chair: H. Voss). |
| 1992-1993 | Undergraduate Program Committee (Chair: J. Comfort). |
| 1992-1993 | Bylaws Committee (Chair: J. Comfort). |
| 1996 | Computer System Manager Search Committee (Chair: B. W. Tillery). |
| 1994-2000 | Associate Department Chair (Chair: H. Voss). |
| 1998-1999 | Colloquium Committee (Chair: R. Windhorst). |
| 1999-2000 | Colloquium Committee (Chair: N. Herbots). |
| 2001-2002 | Graduate Exam Committee (Chair: J. Drucker). |
| 2001-2003 | Department Computer Committee (Chair: J. Shumway). |
| 2002-2006 | Braeside Observatory Time Allocation Committee (Chair: R. Windhorst). |
| 2002-2003 | Astrobiology Search Committee (Chair: J. Hester). |
| 2002-2003 | Undergraduate Advisor (Chair: R. Jacob). |
| 2002-2004 | Personnel Committee (2003 Chair: R. Windhorst). |
| 2003-2005 | Space Committee (Chair: J. Dow). |
| 2003-2004 | Braeside Observatory Manager Search Cmtee (Chair: P. Scowen). |
| 2003-2004 | Academic Research Scientist Search Cmtee (Chair: R. Windhorst). |
| 2003-2004 | Postdoctoral Research Associate Search Cmtee (Chair: R. Windhorst). |
| 2004-2005 | Extragalactic/Theory Faculty Search Committee (Chair: R. Windhorst). |
| 2004-2005 | New Physics Steering Committee (Chair: P. Bennett). |
| 2004-2006 | Undergraduate Program Committee (Chair: M. Treacy). |
| 2005-2006 | Physics Graduate Curriculum Committee (Chair: T. Newman). |
| 2005-2006 | Physics Colloquium Committee (Chair: M. Treacy). |

**2.b Department, College and University Committees and Service (continued)**

| Period | Committee |
|---|---|
| | **School of Earth and Space Exploration (SESE) Committees and Service:** |
| 2005-2006 | SESE Astrophysics Graduate Program Proposal (with R. Greeley). |
| 2005-2006 | SESE Founding Director Search Committee (Chair: D. Young). |
| 2005-2006 | SESE Engineering Faculty Search Committee (Chair: P. Christensen). |
| 2005-2006 | Bylaws Committee for School of Earth and Space Exploration (Chair: E. Stump). |
| 2006-2008 | Personnel Committee for School of Earth and Space Exploration (Chair: T. Sharp). |
| 2008-present | Co-Director, ASU Cosmology Initiative, School of Earth & Space Exploration |
| 2008-2009 | Cosmology Theory Faculty Search (Chair: L. Krauss). |
| 2009-2010 | Observational Cosmology Faculty Search (Chair: R. Windhorst). |
| 2009-2010 | Instrumental Cosmology Faculty Search (Chair: R. Windhorst). |
| 2010-2011 | Observational Cosmology Faculty Search (Chair: R. Windhorst). |
| 2010-2011 | Experimental Cosmology Faculty Search (Chair: L. Krauss). |
| 2009-2012 | Museum and Planetarium Committee (Chair: S. Semken). |
| 2009-2013 | SESE Promotion & Tenure Committee (Chair: R. Windhorst). |
| 2012-2014 | SESE Awards Committee (Chair: R. Windhorst). |
| 2013-2018 | CLAS Senator for SESE (excluding a 2014–2015 sabbatical) |
| 2018-2021; 2024- | ASU Academic Senator for SESE |
| 2020-2023 | SESE Annual Evaluation Committee (Chair: E. Garnero) |
| 2023-present | SESE Undergraduate Committee (Chair: A. Heimsath) |
| | **College Committees and Other College Service:** |
| 1990-1992 | College Liaison for Academic Computing (Chair: R. Windhorst). |
| 1990-1992 | Research Computing Subcommittee of Academic Computing Advisory Cmtee (ACAC). |
| 1995-present | The NASA Arizona Space Grant Consortium CLAS Sub-Committee (Chair: T. Sharp). |
| 1997-1998 | The Dean's Faculty Advisory Council (Chair: N. Russo). |
| 1998-1999 | The Dean's Faculty Advisory Council (Chair: T. Richards). |
| 1999-2000 | The Dean's Faculty Advisory Council (Chair: R. Windhorst). |
| 2000-2001 | Post Tenure Review Committee (Chair: R. Windhorst). |
| 2013-2018 | CLAS Senate (2017–2018 President: R. Windhorst) |
| | **University Committees and Other University Service:** |
| 1990-1992 | Academic Computing Advisory Committee (ACAC; Chair: A. Philippakis). |
| 1987-1993 | DEC Users Group (Chair: N. Armann). |
| 1988-1992 | CRAY Users Group (Chair: S. West). |
| 1995-present | The NASA Arizona Space Grant Consortium Steering Committee (Chair: T. Sharp). |
| 2007-2009 | Regents' Professors Selection Committee (Chair: Prof. R. Denhardt). |
| 2006-2013 | Regents' Advisory Group (Chair: ASU Provost Dr. E. Capaldi). |
| 2011-2015 | University Faculty Achievement Awards Committee (Chair: A. Blakemore). |
| 2006-present | ASU Academic Council (Chair: ASU President Dr. M. Crow). |
| 2006-present | ASU Federal Relations Working Group (Chair: S. Hadley; M. Salmon) |
| 2018-2021; 2024- | ASU Academic Senate (President: Prof. S. Levinson; E. Kawam). |
| 2018-2020; 2024- | ASU Senate Facilities Committee (Chair: Prof. B. Welfert). |

**2.c Refereeing research papers and proposals**

| Journal/Agency | Approx. Number Refereed per Year |
|---|---|
| **Journal Articles Refereed per year:** | |
| Astrophysical Journal + Astrophysical Journal Letters | $\lesssim$2–3 |
| Astronomical Journal | $\lesssim$1 |
| Astronomy and Astrophysics (+Letters) | 1 |
| Astrophysics and Space Science | 1 |
| Monthly Notice Royal Astronomical Society | 1–2 |
| Nature/Science | 1 |
| Publ. of the Astron. Soc. of the Pacific | $\lesssim$1 |
| Academic Publishers (Book Reviews) | 1–2 |
| **Grant or Observing Proposals Refereed:** | |
| National Science Foundation (1998 and 2001)<br>(each proposal typically few 100 k$) | 50 |
| National Science Foundation — Referee of Large proposals<br>(including one ∼120 M$ proposal in 2004) | 1/every few yrs |
| Lawrence Livermore National Laboratories (1990's) | 1 |
| Canada National Science/Engineering Research Council (2012, 2014) | 2 |
| Netherlands Organization for Scientific Research (NWO) | 1 |
| Israel Science Foundation (ISF; 2004, 2015) | 1 |
| Canada French Hawaiian Telescope (1996–1998) | 6 |
| National Radio Astronomy Observatory (three times a year in 1990's) | ∼50–100 |
| NASA Hubble Space Telescope (1996, 1999, 2001, 2003, 2008, 2015–2020) | $\lesssim$125 |
| NASA Spitzer Space Telescope (2004, 2012, 2015) | ∼100 |
| NASA/STScI Hubble Fellowship Program (2001) | 124 |
| NASA ATP/Beyond Einstein Panel Review (2006) | ∼50 |
| NASA Postdoctoral Program (2006, 2012, 2014, 2015) | 12 |
| U. S. Civilian Research and Development Foundation (2008) | 1 |
| Canada Foundation for Innovation (CSI; 2012, 2015) | 10 M$ proposals |
| Steward Observatory Time Allocation Committee (1991–1994; 2000–2003; 2009–2015) | ∼200 |
| NRAO Very Large Array Sky Survey (9000 hr proposal; 2015) | 1 |
| **Other Refereeing Activities:** | |
| Ph.D. Dissertations (ASU and for universities abroad) | $\lesssim$4 |
| Reference letter for ex students and postdocs | ∼100 |
| Reference for tenure/promotion of candidates worldwide | ∼12 |

## APPENDIX 3. TEACHING

### 3.a Undergraduate Lecture Courses Taught at ASU

| Course | Year | Title | Student Evaluation[a] Item 10 | Avg. 1-10 | Total nr of Students |
|---|---|---|---|---|---|
| AST 111 | Fall 88 | Introduction to Solar System Astronomy | 1.92 | 1.77 | 143 |
| AST 111 | Fall 90 | Introduction to Solar System Astronomy | 1.84 | 1.88 | 144 |
| AST 111 | Fall 91 | Introduction to Solar System Astronomy | 1.93 | 1.87 | 243 |
| AST 111 | Fall 92 | Introduction to Solar System Astronomy | – | – [b] | 141 |
| AST 111 | Summer 96 | Introduction to Solar System Astronomy | 1.74 | 1.64 | 057 |
| AST 111 | Fall 97 | Introduction to Solar System Astronomy | 1.80 | 1.80 | 134 |
| AST 111 | Fall 98 | Introduction to Solar System Astronomy | 2.03 | 2.08 | 140 |
| AST 111 | Fall 01 | Introduction to Solar System Astronomy | 1.81 | 1.89 [c] | 140 |
| AST 111 | Fall 03 | Introduction to Solar System Astronomy | 1.98 | 1.87 [c] | 140 |
| AST 111 | Fall 04 | Introduction to Solar System Astronomy | 1.40 | 1.53 [c] | 092 |
| AST 112 | Spring 89 | Introduction to Stars, Galaxies and Cosmology | 1.68 | 1.73 | 134 |
| AST 112 | Spring 92 | Introduction to Stars, Galaxies and Cosmology | – | – [b] | 127 |
| AST 112 | Spring 93 | Introduction to Stars, Galaxies and Cosmology | 2.09 | 2.14 | 130 |
| AST 112 | Spring 96 | Introduction to Stars, Galaxies and Cosmology | 1.97 | 1.90 | 212 |
| AST 112 | Spring 02 | Introduction to Stars, Galaxies and Cosmology | 1.68 | 1.71 [c] | 144 |
| AST 112 | Spring 05 | Introduction to Stars, Galaxies and Cosmology | 2.12 | 2.01 [c] | 200 |

*Notes:*

[a] Teaching evaluation by students on scale of 1–5 (1 being best). Item 10 gives overall rating by students.

[b] Student survey was not done because Department changed (temporarily) to reviews every three years.

[c] This section contained one or several Barrett Honors College students.

**3.a Undergraduate Lab Courses Taught at ASU (continued)**

| Course | Year | Title | Student Evaluation[a,b] Item 10 | Avg. 1-10 | Total nr of Students |
|---|---|---|---|---|---|
| AST 125 | Fall 87 | Astronomy Lab I | – | – | 043 |
| AST 126 | Spring 88 | Astronomy Lab II | – | – | 049 |
| AST 125 | Fall 89 | Astronomy Lab I | – | – | 140 |
| AST 126 | Spring 90 | Astronomy Lab II | – | – | 208 |
| AST 125 | Fall 94 | Astronomy Lab I | – | – | 309 |
| AST 126 | Spring 95 | Astronomy Lab II | – | – | 352 |
| AST 125 | Fall 95 | Astronomy Lab I | – | – | 350 |
| AST 113 | Fall 05 | Astronomy Lab I | – | – [c] | 384 |
| AST 114 | Spring 06 | Astronomy Lab I | – | – [c] | 384 |
| SES 103 | Fall 06 | Space Exploration Lab I | 1.31 | 1.67 [c] | 024 |
| SES 104 | Spring 07 | Space Exploration Lab II | 2.87 | 1.67 [c] | 024 |
| AST 113 | Fall 08 | Astronomy Lab I | – | – [c] | 384 |
| AST 113 | Fall 09 | Astronomy Lab I | – | – [c] | 550 |
| AST 113 | Fall 10 | Astronomy Lab I | – | – [c] | 550 |
| AST 113 | Fall 11 | Astronomy Lab I | – | – [c] | 550 |
| AST 113 | Fall 12 | Astronomy Lab I | – | – [c,d] | 525 |
| AST 113 | Fall 13 | Astronomy Lab I | – | – [c,d] | 450 |
| AST 113 | Fall 15 | Astronomy Lab I | – | – [c,d] | 432 |
| AST 113 | Fall 16 | Astronomy Lab I | – | – [c,d] | 408 |
| AST 113 | Fall 17 | Astronomy Lab I | – | – [c,d] | 408 |
| AST 113 | Fall 18 | Astronomy Lab I | – | – [c,d] | 408 |
| AST 113 | Fall 19 | Astronomy Lab I | – | – [c,d] | 375 |
| AST 113 | Fall 20 | Astronomy Lab I | – | – [c,d] | 375 |
| AST 111L | Fall 21 | Astronomy Lab I | – | – [c,d] | 375 |
| AST 111L | Fall 23 | Astronomy Lab I | – | – [c,d] | 288 |
| AST 114 | Spring 09 | Astronomy Lab II | – | – [c] | 500 |
| AST 114 | Spring 10 | Astronomy Lab II | – | – [c] | 550 |
| AST 114 | Spring 13 | Astronomy Lab II | – | – [c,d] | 450 |
| AST 114 | Spring 14 | Astronomy Lab II | – | – [c,d] | 425 |
| AST 114 | Spring 16 | Astronomy Lab II | – | – [c,d] | 432 |
| AST 114 | Spring 17 | Astronomy Lab II | – | – [c,d] | 408 |

*Notes:*

[a] Teaching evaluation by students on scale of 1–5 (1 being best). Item 10 gives overall rating by students.

[b] I'm involved in teaching several Lab sections myself, but student survey is only done by the unit for TA's. Faculty peer-reviews of my teaching are on file (with very good to excellent reviews).

[c] This section contained one or several Barrett Honors College students.

[d] This section used the 3D-tactiles for visually impaired or blind students.

**3.b Upper Division and Graduate Courses Taught at ASU**

| Course | Year | Title | Student Evaluation[a] Item 10 | Avg. 1-10 | Total nr of Students |
|---|---|---|---|---|---|
| AST 422 | Spring 03 | Cosmology | 1.14 | 1.43 [b] | 007 |
| AST 422 | Spring 07 | Cosmology | 2.00 | 1.57 [b] | 006 |
| AST 500 | Fall 95, 06 | Astron. Techniques (w/ Scowen) | 1.75 | 1.83 | 012 |
| AST 598 | Fall 00 | Astron. Techniques (w/ Odewahn) | 2.00 | 1.86 | 007 |
| AST 598 | Spring 97 | Observational Cosmology | 2.13 | 1.94 | 008 |
| AST 598 | Spring 99 | Observational Cosmology | 1.56 | 1.47 | 009 |
| AST 598 | Spring 00 | Extragalactic Astronomy | 2.20 | 2.16 | 005 |
| AST 598 | Fall 02 | Galaxies III: Observational cosmology | 1.25 | 1.28 | 005 |
| AST 533 | Spring 04 | Galaxies III: Observational cosmology | 1.63 | 1.62 | 008 |
| AST 492/592 | 1987-present | Astrophysics Undergrad Research | – | – [b,c] | 112 |
| AST 599 | 1987-present | Astrophysics Master Thesis | – | – [c] | 045 |
| PHY 500 | 2008-present | Physics Research Rotation | – | – [c] | 020 |
| AST 792 | 1987-present | Astrophysics Graduate Research | – | – [c] | 056 |
| AST 799 | 1987-present | Astrophysics Ph.D. Dissertation | – | – [c] | 056 |
| AST491/591 | Spring 91 | Astronomy Journal Club | – | – | 012 |
| AST491/591 | Spring 98 | Astronomy Journal Club | – | – | 012 |
| AST491/591 | Fall 99 | Astronomy Journal Club | 1.00 | 1.00 | 008 |
| AST491/591 | Fall 02 | Astronomy Journal Club | 1.00 | 1.03 | 010 |
| AST491/591 | Fall 06 | Astronomy Journal Club | 1.00 | 1.50 | 010 |
| AST491/591 | Fall 08 | Astronomy Journal Club | – | – | 010 |
| AST491/591 | Spring 10 | Astronomy Journal Club | – | – | 012 |
| AST491/591 | Fall 10 | Astronomy Journal Club | – | – | 012 |

*Notes:*

[a] Teaching evaluation by students on scale of 1–5 (1 being best). Item 10 gives overall rating by students.

[b] This section contained one or several Barrett Honors College students.

[c] I meet with all students in my research group once a week (Fr. pm) to assign projects, train all students, monitor progress, and discuss specific research aspects, skills, and progress on papers and proposals. Daily training further occurs in the Lab, and/or in personal meetings with the students.

**3.c Lower and Upper Division Courses Taught at ASU (different evaluation scale starting in 2011)**

| Course | Year | Title | Student Evaluation[a] Item 1 | Avg. 1-5 | Total nr of Students |
|---|---|---|---|---|---|
| AST 112 | Spring 14 | Introduction to Stars, Galaxies and Cosmology | 3.2/5 | 3.2/5 [b,c] | 195 |
| AST 112 | Spring 17 | Introduction to Stars, Galaxies and Cosmology | 3.5/5 | 3.5/5 [b,c] | 150 |
| AST 422 | Spring 11 | Cosmology | 4.3/5 | 4.3/5 [b] | 010 |
| AST 422 | Spring 12 | Cosmology | 4.0/5 | 3.9/5 [b] | 010 |
| AST 322 | Spring 18 | Galaxies and Cosmology | 3.8/5 | 4.0/5 [b] | 049 |
| AST 322 | Spring 19 | Galaxies and Cosmology | 3.4/5 | 3.4/5 [b] | 046 |
| AST 322 | Spring 20 | Galaxies and Cosmology | 4.4/5 | 4.5/5 [b] | 049 |
| AST 322 | Spring 21 | Galaxies and Cosmology | 3.9/5 | 4.0/5 [b] | 071 |
| AST 322 | Spring 22 | Galaxies and Cosmology | 4.0/5 | 4.1/5 [b] | 048 |
| AST 322 | Spring 24 | Galaxies and Cosmology | 4.1/5 | 4.2/5 [b] | 055 |
| AST 322 | Spring 25 | Galaxies and Cosmology | 4.0/5 | 4.0/5 [b] | 060 |

*Notes:*

[a] Starting in 2011, the teaching evaluation scale **changed to 1–5 with 5 being best**. Item 1 is overall rating.

[b] This section contained one or several Barrett Honors College students.

[c] This section used the 3D-tactiles for visually impaired or blind students.

**3.d Class Webpages of Courses Taught at ASU**

| Course | Title | URL of Class Website |
|---|---|---|
| SES 103 | Space Exploration Lab I | http://windhorst103.asu.edu/ |
| SES 104 | Space Exploration Lab II | http://windhorst104.asu.edu/ |
| AST 111 | Intro to Solar System Astronomy | http://windhorst111.asu.edu/ |
| AST 112 | Intro to Stars, Galaxies & Cosmology | http://windhorst112.asu.edu/ |
| AST 111L | Astronomy Lab I | http://windhorst111lab.asu.edu/ |
| AST 113 | Astronomy Lab I | http://windhorst113.asu.edu/ |
| AST 114 | Astronomy Lab II | http://windhorst114.asu.edu/ |
| AST 125 | Astronomy Lab I | http://windhorst113.asu.edu/ |
| AST 126 | Astronomy Lab II | http://windhorst114.asu.edu/ |
| AST 322 | Galaxies & Cosmology | http://windhorst322.asu.edu/ |
| AST 422 | Cosmology | http://windhorst422.asu.edu/ |
| AST 500 | Astron. Techniques (w/ Scowen) | http://windhorst500.asu.edu/ |
| PHY 500 | Astrophysics Research Rotation | http://windhorst500.asu.edu/ |
| AST 598 | Astron. Techniques (w/ Odewahn) | http://windhorst598.asu.edu/ |
| AST 598 | Observational Cosmology | http://windhorst598.asu.edu/ |
| AST 598 | Extragalactic Astronomy | http://windhorst598.asu.edu/ |
| AST 532 | Galaxies II: Galaxies | http://windhorst532.asu.edu/ |
| AST 533 | Galaxies III: Cosmology | http://windhorst533.asu.edu/ |

## APPENDIX 3. TEACHING (continued)

### 3.e Postdocs and Research Scientists mentored at ASU

The following postdocs and students have been on my payroll, and/or did research with me at ASU (some students are from other Universities). For details, see my bibliography or list of grants.

| Name | Period | Research topic | Current or last known position |
|---|---|---|---|
| S. Driver | 05/94-08/95 | Faint Galaxy Evolution with HST | Faculty at U. Perth (Australia) |
| S. Odewahn | 07/95-04/97 | Faint Galaxy Classifications with HST | |
| | 08/99-11/03 | Faint Galaxy Studies & Image Processing | Resident Astronomer at UT Austin |
| M. Corbin | 06/04-06/06 | Dwarf galaxy formation in the local universe | Research Scientist at USNO |
| P. Eskridge | 09/01-09/06 | Sabbatical visit: HST nearby galaxy studies | Faculty at Minnesota State Univ. |
| E. Richards | 08/99-07/00 | Hubble Fellow: Faint Radio Sources | Dept. Chair at Talladega Coll. (AL) |
| P. Schmidtke[1] | 06/92-06/95 | The HST Medium Deep Survey | Faculty at ASU West |
| I. Waddington | 01/98-09/00 | HST/NICMOS imaging of high z Galaxies | Research in Industry (Sussex, UK) |
| K. Tamura | 01/10-01/11 | Seyfert/AGN—Starformation Connection | Faculty at Naruto University (Japan) |
| L. Jiang | 09/11-02/15 | Hubble Fellow on z$\simeq$6 Galaxies | Faculty at Kavli Inst. (Beijing, China) |
| H. Kim | 08/13-07/14 | WFC3 Nearby Galaxy Stellar Populations | IGRINS Postdoc at UT Austin (TX) |
| M. Mechtley | 12/15-01/17 | Host Galaxies of z$\simeq$2 & z$\simeq$6 QSOs | Software Industry |
| K. Olsen | 08/15-08/18 | Interstellar Gas in Young Galaxies & AGN | Postdoc in Copenhagen |
| R. Morgan | 06/12-08/20 | Numerical $\Lambda$CDM Cosmological Models | Retired from Industry |
| R. Jansen | 10/01-present | Galaxy Studies with HST and JWST | Senior Research Scientist at ASU |
| S. Cohen | 06/03-present | Distant Galaxies with HST and JWST | Research Scientist at ASU |
| B. Smith | 01/20-present | HST Lyman Continuum Studies at z$\sim$2–3 | Software Industry in Phoenix |
| T. Carleton | 05/20-present | SKYSURF: HST Zodi & EBL Legacy Archive | SKYSURF Postdoc at ASU SESE |
| P. Kamieneski | 09/22-present | Study High Redshift Lensed Dusty Galaxies | SESE Fellow at ASU |
| C. Cain | 08/23-present | Reionization with Galaxies & Black Holes | Beus Fellow at ASU |
| K. Croker | 07/24-present | Black Holes in a Cosmological Context | SESE Fellow at ASU |
| V. Estrada | 08/24-present | Galaxy Assembly: HST+JWST grism spectra | Beus Fellow at ASU |

*Notes:*

[1] Postdoc shared with Prof. A. Cowley.

### 3.f Graduate Students supervised in ASU Physics or SESE

| Name | Period [1] | Research topic [1] | Current or last known position |
|---|---|---|---|
| A. Ferro[2] | 07/90-06/93 | HST Imaging of Faint Radio Galaxies | NICMOS Programmer at UofA |
| D. Mathis | 05/88-04/91 | Imaging of Radio Galaxies (Masters) | |
| | 05/91-09/98 | The US ROSAT Deep Survey (Ph.D.) | S/W specialist at Lockheed (AZ) |
| S. Mutz | 01/93-12/98 | Evolution of Galaxy Light-Profiles (Ph.D.) | Faculty, Scottsdale Com. Col. (AZ) |
| L. Neuschaefer | 05/88-12/92 | Evolution of Galaxy Clustering (Ph.D.) | Software Specialist at IIS (CO) |
| S. Pascarelle | 05/92-08/97 | HST Imaging of z=2.4 Clusters (Ph.D.) | Research Scientist at AACISD (MD) |
| J. Ponder[3] | 08/95-01/98 | The Evolution of Barred HST Galaxies | IBM scientist in Columbus (OH) |
| A. Ponder | 08/96-01/98 | Internet deployment in elementary education | Teacher in Columbus (OH) |
| C. Chiarenza | 08/96-07/01 | UV-imaging of Nearby Early-Type galaxies | Faculty at Stark College (OH) |
| S. Cohen | 04/96-05/03 | B-band Counts vs. Morphological Type | Senior Research Scientist at ASU |
| H.-J. Yan | 01/99-05/03 | The LF of Galaxies around Reionization | Faculty at Univ. of Missouri (MO) |
| V. Taylor | 01/99-12/05 | UV-imaging of Nearby Late-Type galaxies | Faculty at U. Kentucky (KY) |
| J. Russell | 08/02-11/06 | HST Imaging of milliJansky Radio Sources | US Army Material Fellow |
| S. Finkelstein[4] | 05/06-07/08 | Studies of High Redshift Ly$\alpha$ Emitters | Faculty at UT Austin (TX) |
| N. Hathi | 01/02-05/08 | HST Studies of Galaxies at Redshifts z=1–6 | Research Staff at STScI |
| R. Ryan | 08/03-07/08 | The Epoch Dependent Merger Rate | Research Staff at STScI |
| A. Straughn | 01/03-07/08 | HUDF Tadpole Galaxies & Star-Formation | Civil Servant at NASA GSFC |
| A. Mott | 05/06-12/08 | The Evolution of Faint Radio Sources | Industry in Tempe AZ |
| M. Horning | 08/08-05/09 | UV Instrument Calibration (w/ R. Jansen) | Industry in Arizona |
| L. Echevarria | 08/00-08/08 | Shapelet studies of Galaxy Structure | Highschool Teacher in Tempe |
| K. Tamura | 01/02-11/09 | UV–near-IR Studies of Nearby Galaxies | Faculty at Naruto University |
| R. Behkam[4] | 01/03-12/10 | Theoretical Cosmology with GRBS's | Postdoc at UC Davis (CA) |
| B. Gleim | 08/08-05/10 | ASU Planetarium Outreach | Highschool Teacher in AZ |
| K. Kaleida | 08/07-09/11 | SF in Nearby Galaxies (w/ P. Scowen) | Scientific Staff at CTIO (Chile) |
| B. Regan | 08/10-05/11 | Seyfert/AGN—Starformation Connection | PHY graduate in industry |
| S. Moffet | 08/10-05/11 | Seyfert/AGN—Starformation Connection | PHY graduate in industry |
| Z. Yun | 08/10-05/11 | NASA SWIFT Imaging of Ly$\alpha$ Blobs | PHY graduate in industry |
| R. Morgan[5] | 08/02-05/12 | Numerical $\Lambda$CDM Cosmological Models | Retired from Industry |
| H. Kim | 08/05-12/12 | WFC3 Nearby Galaxy Stellar Populations | Scientific Staff at Gemini (HI) |
| T. Veach | 08/07-12/12 | Space Instrumentation (w/ P. Scowen) | Technical Staff at NASA JPL |
| P. Hegel | 01/11-12/12 | NASA SWIFT Imaging of Ly$\alpha$ Blobs | Industry in Arizona |
| M. Rutkowski | 08/08-05/13 | UV Properties of High-z Early-type Galaxies | Faculty at MN State U. |
| M. Mechtley | 08/09-01/14 | Host Galaxies of z$\simeq$2 & z$\simeq$6 QSOs | Software Industry |

*Notes:*

[1] Students with a Ph.D. topic or degree (defense date is at the end of the indicated Period).

[2] Student supervised together with Prof. S. Wyckoff.

[3] Student supervised together with Prof. D. Burstein.

[4] Student supervised together with Prof. J. Rhoads & S. Malhotra.

[5] Student supervised together with Prof. E. Scannapieco.

**3.f Graduate Students supervised at ASU SESE (continued)**

| Name | Period [1] | Research topic [1] | Current or last known position |
|---|---|---|---|
| *Graduate Students supervised at ASU Physics or SESE:* | | | |
| P. Nguyen | 08/12-05/15 | HST studies of High Redshift Galaxies | Outreach faculty, Ariz. Sc. Center |
| K. Emig[2] | 08/13-07/15 | Cosmic Sources of IceCube neutrinos | Senior Graduate student, Leiden U. |
| T. Shin | 08/13-05/15 | HST studies of High Redshift Clusters | Senior Graduate student at U. Penn. |
| E. Buie[3] | 08/16-08/17 | Identification of double-lobed LOFAR sources | SESE Graduate student at ASU |
| T. Ashcraft | 08/08-05/18 | Best seeing U-band images with LBT | Faculty at Michigan State |
| R. Sarmento[3] | 08/12-08/18 | HST studies of High Redshift Galaxies | Iridium Systems Engineer (Boeing) |
| N. Mahesh[4] | 08/16-08/18 | Identification of double-lobed LOFAR sources | SESE Graduate student at ASU |
| R. Holton[5] | 08/16-08/19 | 3D Tactiles for Blind Students | SESE Graduate student at ASU |
| D. Kim[6] | 08/12-10/19 | Detailed Dust studies in Nearby Galaxies | KASI postdoc, Seoul, Korea |
| B. Smith | 08/12-11/19 | HST Lyman Continuum Studies at z$\simeq$2–3 | ASU post doc; Phoenix industry |
| K. Kim[7] | 01/17-05/20 | Solar gravitational field from VLBI sources | NASA postdoc at GSFC |
| B. Joshi | 08/13-06/20 | HST Grism Studies of High Redshift Galaxies | NASA postdoc at STScI |
| G. Vance[2] | 05/16-05/22 | Cosmic Sources of IceCube neutrinos | SESE Graduate student at ASU |
| T. McCabe[8] | 08/18-08/24 | Best seeing U-band images with LBT | Internet security at Carvana |
| I. McIntyre | 08/22-10/24 | HST's Thermal Behavior & Dark Signal | Medical industry in Boston |
| H. Archer | 05/20-05/25 | Star-formation in Nearby Galaxy WLM | Staff at Lowell Observatory |
| R. O'Brien | 05/20-06/25 | SKYSURF: HST Zodi & EBL Legacy Archive | ASU undergraduate student |
| *Graduate Students currently being supervised at ASU Physics or SESE:* | | | |
| D. Carter | 05/21-present | SPHEREx: Mission Scheduling & Calibration | ASU SPHEREx graduate student |
| S. Tompkins | 05/21-present | SKYSURF: HST Zodi & EBL Legacy Archive | U. West. Australia graduate student |
| D. Kramer[9] | 05/21-present | Replicating HUDF images to Constrain EBL | ASU SESE graduate student |
| T. Dimitrova[7] | 05/22-present | The North Ecliptic Pole Time Domain Field | ASU SESE graduate student |
| A. Pigarelli[10] | 05/22-present | Study of Gravitationally Lensing Clusters | ASU SESE graduate student |
| J. Berkheimer[11] | 08/22-present | JWST Study of Distant Globular Clusters | ASU SESE graduate student |
| N. Foo[10] | 08/23-present | Study of Gravitationally Lensing Clusters | ASU SESE graduate student |
| R. Ortiz | 08/24-present | Active Galaxies in JWST NIRCam images | ASU SESE graduate student |

*Notes:*

[1] Students with a Ph.D. topic or degree (defense date is at the end of the indicated Period).

[2] Student supervised together with Prof. P. Young (SESE) and C. Lunardini (ASU Physics).

[3] Student supervised together with Prof. E. Scannapieco.

[4] Student supervised together with Prof. J. Bowman

[5] Student supervised together with Dr. P. Scowen

[6] Student supervised together with Dr. R. A. Jansen.

[7] Student supervised together with Prof. N. Butler

[8] Student supervised together with Prof. S. Borthakur

[9] Student supervised together with Prof. A. van Engelen

[10] Student supervised together with Prof. A. Noble

[11] Student co-supervised with primary advisor Prof. K. Bossert

**3.g Undergraduate Students mentored at ASU**

| Name | Period [1] | Research topic [1] | Current or last known position |
|---|---|---|---|
| *Undergraduate Students supervised at ASU Physics or SESE:* | | | |
| J. Ensworth | 05/91-08/92 | HST Images of Distant Radio Galaxies | ASU graduate in education |
| L. Schroeder | 05/92-08/92 | Image processing for Medium Deep Survey | ASU graduate in industry |
| J. Gordon | 05/91-08/93 | Deconvolution of HST Galaxy images | ASU graduate in industry |
| E. Ostrander[1] | 08/93-12/94 | The HST Medium Deep Survey | ASU graduate at Intel |
| B. Franklin[1] | 08/91-07/95 | Evolution of the Galaxy Merger Rate | ASU graduate private sector |
| D. Kasen[1] | 08/97-12/97 | Spectroscopy of faint HST-galaxies | Faculty at Stanford (CA) |
| C. Barragan | 08/97-05/98 | UV-imaging of nearby galaxies | ASU graduate in industry |
| J. Goodwin | 05/98-08/98 | Faint HST Galaxy images | ASU graduate in industry |
| T. Keck[1] | 01/96-05/01 | The HST B-band Parallel Survey | ASU graduate private sector |
| J. Johnson | 01/03-05/04 | UV-imaging of nearby HST galaxies | ASU graduate in industry |
| J. Bruursema[1] | 08/03-12/04 | HST Zodi Background and the Kuiper Belt | Graduated at JHU |
| A. Aloi | 05/03-01/05 | HST Zodi Background and the Kuiper Belt | ASU graduate in industry |
| J. Rogers[1] | 08/03-01/05 | HST Zodi Background and the Kuiper Belt | Graduated at JHU |
| C. Ellinger | 05/04-05/05 | Magellan Imaging of Distant Galaxies | ASU graduate in industry |
| A. Mott[1] | 05/04-05/05 | Surface Photometry of Edge-on Bulges | ASU graduate in industry |
| S. Bennett | 08/05-05/06 | Ground-based Imaging of Dwarf Galaxies | ASU graduate in industry |
| R. Jarnagin | 08/05-05/06 | HST Imaging of Dwarf Galaxies | ASU graduate in industry |
| K. Schneider | 08/05-05/07 | Spacecraft design for NASA Missions | ASU graduate in industry |
| M. Mechtley[1] | 07/06-05/08 | Appreciating Hubble at Hyperspeed | Software Industry |
| D. Cox | 08/07-05/08 | C-fibers in Diabetic Type II patients | ASU graduate in industry |
| M. Jenners | 08/07-05/08 | Early Stages of the Universe | ASU graduate in industry |
| C. Rider | 08/07-05/08 | UV Properties of Nearby Galaxies | ASU graduate in industry |
| G. Hintzen[1] | 08/05-05/09 | IR Studies of High-z Galaxies | ASU graduate at Lockheed |
| D. Blyth | 08/08-05/09 | UV Studies of Nearby Galaxies | ASU graduate in industry |
| J. Wilenchik | 08/08-05/09 | Alternative Cosmological Models | ASU graduate in industry |
| S. Dunn | 08/09-08/10 | UV Studies of Nearby Galaxies | ASU graduate in industry |
| M. Benton[1] | 08/10-06/11 | NASA SWIFT Imaging of Lyman-$\alpha$ Blobs | Faculty at Community College |
| I. Blackburn | 08/10-06/11 | HST studies of High Redshift Galaxies | ASU graduate in industry |
| P. Hegel[1] | 05/10-07/12 | NASA SWIFT Imaging of Lyman-$\alpha$ Blobs | ASU graduate in industry |
| B. Smith | 05/11-07/12 | High Redshift Gravitational Lensing Bias | Community College Faculty |
| R. Sarmento | 05/11-07/12 | HST studies of High Redshift Galaxies | ASU graduate in U.S. Navy |
| M. Hellman | 04/12-12/12 | HST studies of High Redshift Galaxies | ASU graduate in industry |
| T. Woyner | 04/12-05/13 | HST studies of High Redshift Galaxies | ASU graduate in industry |
| C. Ignatowski | 04/13-01/14 | HST studies of High Redshift Galaxies | ASU graduate in industry |
| H. Hutchison[1] | 04/12-05/14 | HST studies of the Zodiacal Light | ASU graduate in industry |
| M. Mein[1] | 04/12-05/14 | HST studies of High Redshift Galaxies | ASU graduate in industry |
| A. Brokaw[1] | 12/12-08/14 | HST studies of High Redshift Galaxies | ASU graduate in industry |
| J. Trahan | 01/14-12/14 | HST studies of High Redshift Galaxies | ASU graduate in industry |
| M. Lopes-alves | 05/14-12/14 | HST studies of High Redshift Galaxies | ASU graduate in Brazil |

*Notes:*

[1] Students with a (Honors) Thesis topic or degree (completion date is at the end of the indicated Period).

**3.g Undergraduate Students mentored at ASU (continued)**

| Name | Period [1] | Research topic [1] | Current or last known position |
|---|---|---|---|
| *Undergraduate Students supervised at ASU Physics or SESE:* | | | |
| J. Dietrich | 05/14-09/14 | LBT U-band Imaging of CANDELS Fields | Harvard graduate student |
| F. de Souza | 05/14-12/14 | HST studies of High Redshift Galaxies | ASU graduate in industry |
| T. Shewcraft | 04/12-05/15 | Spatially-resolved LMC extinction corrections | ASU graduate in industry |
| S. Burkhart | 04/13-05/15 | HST studies of High Redshift Galaxies | ASU graduate in industry |
| I.Meisenheimer | 01/14-05/15 | HST studies of Escaping LyC Radiation | ASU graduate in industry |
| A. Abul-Haj | 01/14-05/15 | HST studies of High Redshift Galaxies | ASU graduate in industry |
| E. Hasper[1] | 08/11-07/15 | 3D Tactiles for Blind Students | High school teacher, Phoenix |
| A. Aubry | 08/14-07/15 | 3D Journey in the Hubble UltraDeep Field | Grad student, Embry-Riddle |
| A. Warren | 04/13-12/15 | WFC3 Nearby Galaxy Stellar Populations | ASU graduate in industry |
| B. Monus | 01/15-08/15 | HST studies of High Redshift Galaxies | ASU graduate; HS teacher |
| K. Poetch[1] | 08/14-08/16 | HST studies of Nearby Stellar Populations | Qwaltec industry, Tempe |
| J. Vehonsky[1] | 01/15-05/16 | LBT U-band Imaging of CANDELS Fields | ASU graduate in industry |
| S. Zhang | 01/15-08/16 | HST studies of High Redshift Galaxies | ASU graduate |
| S. Stawinski[1] | 08/15-05/17 | Identification of double-lobed LOFAR sources | ASU graduate at SDSU |
| J. Robinson | 08/15-05/17 | HST studies of z$\simeq$2 Quasars | ASU graduate in industry |
| J. Trenter | 05/16-05/17 | HST studies of Escaping LyC Radiation | ASU graduate |
| J. Blackburn | 08/16-05/18 | HST studies of High Redshift Galaxies | ASU graduate |
| C. Companik | 05/17-12/17 | Predictions for Cluster Caustic Transits | ASU graduate in industry |
| K. Blomquist | 08/17-05/18 | Predictions for Cluster Caustic Transits | ASU graduate |
| N. Mains[1] | 08/17-05/18 | U-band imaging of the Andromeda Galaxy | ASU graduate in industry |
| G. Rand | 08/17-05/18 | Detailed Dust studies in Nearby Galaxies | ASU graduate in industry |
| H. Tamayo | 08/17-05/18 | HST studies of High Redshift Galaxies | ASU graduate |
| P. Rybak | 05/16-05/19 | HST studies of Escaping LyC Radiation | ASU graduate |
| V. Jones[1] | 08/15-07/19 | Variability in the NEP Time Domain Field | UofA graduate student |
| C. White[1] | 08/15-07/19 | Studies of Faint AGN in the NEP Field | UofA graduate student |
| G. Huckabee[1] | 05/16-07/19 | LOFAR Observations of Nearby Galaxies | UCSC graduate student |
| T. Tyburczy | 05/17-07/19 | Faint Radio Sources in JWST NEP Field | ASU graduate |
| K. Horn[1] | 05/18-12/18 | HST studies of High Redshift Galaxies | ASU graduate |
| H. Dromiack | 05/18-08/19 | HST studies of High Redshift Galaxies | ASU graduate |
| L. Whitler[1] | 05/17-05/21 | LOFAR Observations of Nearby Galaxies | UofA graduate student |
| J. Chambers | 05/19-08/20 | SKYSURF: HST Zodi & EBL Legacy Archive | ASU graduate |
| K. Webber | 05/19-08/20 | SKYSURF: HST Zodi & EBL Legacy Archive | Texas A&M ASU graduate student |
| H. Abate | 05/19-08/21 | SKYSURF: HST Zodi & EBL Legacy Archive | Graduate student in Germany |
| D. Carter[1] | 05/19-05/21 | SKYSURF: HST Zodi & EBL Legacy Archive | ASU SPHEREx graduate student |
| C. Gelb | 05/19-05/21 | SKYSURF: HST Zodi & EBL Legacy Archive | ASU Physics graduate student |
| L. Otteson[1] | 05/19-08/21 | VLT U-band Imaging of CANDELS Fields | ASU Physics graduate student |

*Notes:*

[1] Students with a (Honors) Thesis topic or degree (completion date is at the end of the indicated Period).

**3.g Undergraduate Students mentored at ASU (continued)**

| Name | Period [1] | Research topic [1] | Current or last known position |
|---|---|---|---|
| *Undergraduate Students supervised at ASU Physics or SESE:* | | | |
| T. Patel | 05/19-05/21 | SKYSURF: HST Zodi & EBL Legacy Archive | ASU graduate |
| J. Jeon[1] | 08/19-08/21 | Modeling SED-slopes of z≃6 Galaxies | UT Austin graduate student |
| S. Sherman | 01/20-08/21 | SKYSURF: HST Zodi & EBL Legacy Archive | ASU graduate |
| J. Berkheimer | 01/20-08/21 | SKYSURF: HST Zodi & EBL Legacy Archive | ASU SESE graduate student |
| C. Rogers | 01/20-08/21 | SKYSURF: HST Zodi & EBL Legacy Archive | AZ industry |
| S. Tompkins[1] | 05/18-05/21 | Evolution of Solar-mass Population III Stars | W. Australia graduate student |
| L. Nolan[1] | 08/18-05/22 | HST Studies of NEP Time Domain Field | Graduate student in Illinois |
| I. Huckabee | 08/19-08/22 | SKYSURF: HST Zodi & EBL Legacy Archive | Graduate student in Santa Cruz |
| K. Ganzel | 08/21-08/22 | JWST Image Simulations and Pipelines | AZ industry |
| C. Ramirez | 12/21-12/22 | SKYSURF: HST Zodi & EBL Legacy Archive | AZ industry |
| A. Blanche[1] | 08/19-05/23 | HST Lyman Continuum Studies at z≃2–3 | NASA JPL |
| D. Henningsen[1] | 05/21-05/23 | SKYSURF: HST Zodi & EBL Legacy Archive | AZ industry |
| A. Swirbul | 05/21-08/23 | SKYSURF: HST Zodi & EBL Legacy Archive | NASA GSFC |
| C. Redshaw[1] | 05/21-08/23 | LBT U-band Imaging of CANDELS Fields | Graduate student at Stanford |
| H. Andras | 05/22-08/23 | JWST Pipeline and Image Analysis | Graduate student at UofA |
| B. Brinkman | 05/22-05/23 | SKYSURF: Drizzling, Catalogs and Counts | AZ industry |
| H. Huang | 05/22-05/23 | SKYSURF: Drizzling, Catalogs and Counts | Graduate student in China |
| P. Porto | 05/22-08/23 | JWST Pipeline and Image Analysis | AZ industry |
| R. Ortiz[1] | 01/23-08/24 | Active Galaxies in JWST NIRCam images | ASU graduate student |
| C. Jeffries[1] | 08/23-12/24 | Automated JWST NIRCam PSF identification | ASU graduate student |
| D. Gapinski[1] | 01/24-12/14 | Java tool: Hyper-Zoom into JWST images | ASU graduate student |
| N. McLeod[1] | 08/23-05/25 | JWST Dwarf Galaxy studies | ASU graduate student |
| J. Summers[1] | 12/21-present | JWST Stars in Magellanic Spurs & Models | ASU undergraduate student |
| J. Colborn | 05/22-present | SKYSURF: Drizzling, Catalogs and Counts | ASU undergraduate student |
| Z. Goisman[1] | 05/22-present | SKYSURF: HST Zodi & EBL Legacy Archive | ASU undergraduate student |
| R. Honor[1] | 05/22-present | JWST Pipeline and Image Analysis | ASU undergraduate student |
| T. Acharya[1] | 08/22-present | JWST NIRCam PSF fitting | ASU undergraduate student |
| L. Conrad | 05/23-present | JWST NIRCam image analysis | ASU undergraduate student |
| A. Gahlot | 05/23-present | JWST NIRCam image analysis | ASU undergraduate student |
| T. Hinrichs[1] | 05/23-present | JWST NIRCam globular cluster analysis | ASU undergraduate student |
| H. Ingram | 08/23-present | HST SKYSURF: Star Count Modeling | ASU undergraduate student |
| A. Nelander[1] | 01/24-present | AGN Reionization Models and 21cm imprints | ASU undergraduate student |
| J. Perivolotis[1] | 01/24-present | High-z Caustic Transits with JWST NIRCam | ASU undergraduate student |
| A. Cardona[1] | 05/24-present | JWST NIRCam image analysis | ASU undergraduate student |
| M. Miller[1] | 05/24-present | HST SKYSURF: Zodiacal Modeling | ASU undergraduate student |
| G. Bowling[1] | 08/24-present | Active Galaxies in JWST NIRCam images | ASU undergraduate student |

*Notes:*

[1] Students with a (Honors or Senior) Thesis topic or degree (completion date is at the end of the indicated Period).

**3.g Undergraduate Students mentored at ASU (continued)**

| Name | Period [1] | Research topic [1] | Current or last known position |
|---|---|---|---|
| K. Johnston | 08/24-present | The JWST NIRCam Natural Confusion Limit | ASU undergraduate student |
| R. Griffin | 01/25-present | JWST NIRCam image analysis | ASU undergraduate student |
| E. Moreno | 01/25-present | JWST NIRCam image analysis | ASU undergraduate student |
| E. Weissbluth | 01/25-present | JWST NIRCam image analysis | ASU undergraduate student |

*Notes:*

[1] Students with a (Honors or Senior) Thesis topic or degree (completion date is at the end of the indicated Period).

**3.g Undergraduate Students mentored at ASU (continued)**

| Name | Period [1] | Research topic [1] | Current or last known position |
|---|---|---|---|
| *Graduate Students co-supervised in other ASU Departments or Schools:* | | | |
| A. Casano | 08/05-05/09 | C-fibers in Diabetic Type II patients | Postdoc at UCLA (CA) |
| J. Brower | 08/07-05/09 | C-fibers in Diabetic Type II patients | Postdoc at Banner Health |
| L. Burnett | 05/04-08/07 | C-fibers in Diabetic Type II patients | Postdoc at UWash Medical Center |
| L. Harris | 05/12-08/14 | 3D Tactiles for Blind Students | ASU graduate in military |
| A. Gonzales | 05/12-05/15 | 3D Tactiles for Blind Students | ASU graduate in education |

*Notes:*

[1] Students with a (Honors or Senior) Thesis topic or degree (completion date at the end of the indicated Period).

**3.h Phoenix Area Highschool Students supervised for research at ASU**

| Name | Period [1] | Research topic [1] | Current or last known position |
|---|---|---|---|
| *Phoenix Area Highschool Students supervised for Research at ASU:* | | | |
| K. von Beringe | 01/12-05/13 | HST studies of High Redshift Galaxies | ASU graduate |
| M. Stephens | 08/12-05/13 | HST studies of High Redshift Galaxies | ASU graduate |
| N. Turley | 01/12-05/13 | HST studies of High Redshift Galaxies | Caltech graduate |
| G. Mooney | 08/12-05/14 | 3D Tactiles for Blind Students | ASU graduate |
| J. Dowell | 12/12-05/15 | HST studies of High Redshift Galaxies | ASU graduate |
| D. Rivera | 05/14-05/15 | HST studies of High Redshift Galaxies | ASU graduate |
| H. Bradley | 05/17-05/19 | HST studies of High Redshift Galaxies | ASU graduate |
| A. Twibell | 08/17-05/19 | HST studies of High Redshift Galaxies | Stanford graduate |
| M. Rizzo | 05/18-05/19 | HST studies of High Redshift Galaxies | ASU graduate |
| Z. Goisman | 08/20-05/22 | SKYSURF: HST Zodi & EBL Legacy Archive | ASU graduate student |
| H. Andras | 01/21-08/21 | SKYSURF: HST Zodi & EBL Legacy Archive | UofA undergraduate student |
| S. Scheller | 12/21-present | SKYSURF: HST Zodi & EBL Legacy Archive | BASIS School student |
| P. Bahtia | 08/22-05/23 | SKYSURF: Bright end of HST Galaxy Counts | BASIS School student |
| R. Layton | 08/22-05/23 | SKYSURF: HST Zodi & EBL Legacy Archive | BASIS School student |
| V. Long | 05/23-08/24 | JWST NIRCam image analysis | BASIS School student |
| A. Calcaterra | 05/24-present | JWST NIRCam image analysis | BASIS School student |

*Notes:*

[1] High school students did supervised research in my group preparing to go to top universities.

### 3.i Graduate Students supervised at other Universities

| Name | Period [1] | Research topic [1] | Current or last known position |
|---|---|---|---|
| *Graduate Students mentored at other Universities:* | | | |
| M. Oort | 01/83-09/87 | Deep Radio Surveys (Ph.D. at Leiden) | Mgr. at Fokker Aerospace (NL) |
| J. Lowenthal | 01/90-08/92 | Ultradeep VLA Surveys (Ph.D. at UofA) | Faculty at Amherst (MA) |
| E. Richards | 08/93-05/99 | Ultradeep VLA Surveys (Ph.D. at UVa) | Dept. Chair, Talladega Coll. (AL) |
| S. Caddy[2] | 10/20-08/23 | SKYSURF: HST Zodiacal Sky Brightness | Research Staff, Macquarie U. (OZ) |
| S. Tompkins[3] | 05/21-present | SKYSURF: HST Zodi & EBL Legacy Archive | Grad. Student U. West. Australia |

*Notes:*

I co-supervised these students with close collaborators in these countries.

[1] Students with a Ph.D. topic or degree (defense date is at the end of the indicated Period).

[2] Student co-supervised with Prof. L. Spitler (Macquarie U., Sydney, Australia).

[3] Student co-supervised with Prof. S. Driver (U. Western Australia), where he now resides.

## APPENDIX 4. SIGNIFICANT CONTRIBUTIONS TO TEACHING & PROFESSIONAL SERVICE

• **(1) General Philosophy for Undergraduate Teaching:** I believe that it is our critical mission to provide high quality teaching in science, astronomy and cosmology to undergraduate students. My main goal is to provide them with a basic understanding of the cosmos through the application of simple principles of Physics and Mathematics, and boost the students' interest in science and how science applies to daily life. I believe that our undergraduate students need to receive a thorough training in all aspects of cosmology: observations, data processing, analysis, modeling and interpretation. I greatly enjoyed developing several new undergraduate courses and Labs to give our undergraduate students a very high quality training in this. I am also committed to train our undergraduate students in independent, world-class cosmology research, through weekly research meetings, seminars, journal clubs, and one-to-one work. Our undergraduate students are regular co-authors on our group research papers in top-ranked journals (see over 550 papers incl. Windhorst on https://ui.adsabs.harvard.edu/classic-form) and get in general excellent jobs. In total, I taught over 12,800 students at ASU since 1987, or on average about 375 students per year. Details are below and in my full CV (see URLs in §2):

• **(1a) Introductory Astronomy AST 113/114 Labs:** I very much enjoy developing and teaching the undergraduate astronomy Labs, which enroll 400–550 students per semester. Since I came to ASU, I increased the AST Lab enrollment 10-fold, which was direly needed because of the enormous demand on these classes. I streamlined the AST 113/114 Labs to make them much more resource efficient. In total, the AST Labs are taught each semester to 375–432 undergraduate students. I got over a dozen Honors students involved in both the AST 113/114 Labs, the AST 111/112 and 322 lecture classes, and in my AST 495/499 UG research.

• **(1b) Upper division Galaxies and Cosmology course AST 322:** I taught this course starting in Spring 2018, and spend a significant amount of time and effort to completely design it using the modern Cosmological framework and data. The course is taught to over 55–60 upper division undergraduate students in astrophysics, physics and materials science, mathematics, computer science, and in aerospace, environmental, electrical, and mechanical engineering. The mix of students is quite different from when I last taught such a course before (AST 422, 533, or 598). This required striking a delicate balance, as the physics and math background varied a lot between all the students. I therefore developed a completely new set of home-work questions and term projects for this course, that were doable for all students. AST 322 typically covers the main framework of Special and General Relativity during the first part of the semester (with a build-up of homework that culminates in letting the students solve the Friedmann equation that Einstein never could solve). In the second part of the semester, the students then write a term-project, with a choice of topics like the latest cosmological results from the Planck 2018 Cosmic Microwave Background mission, the recent Riess et al. high-redshift supernovae and Hubble Constant work, the latest LIGO stellar mass black-hole and neutron-star merger discovery, as well as the latest HST gravitational lensing results, or the stunning 2019 Event Horizon Telescope (EHT) black-hole shadow images. My AST 322 website also presents our "*AHaH*" Java tool — "Appreciating Hubble at Hyperspeed", that lets the students travel 3D through the Hubble galaxy images in a relativistically expanding universe. Almost all students passed or will pass the AST 322 course with good-excellent grades. Past teaching evaluations were 3.4–3.8 out of 5 (5 being best). I also tremendously enjoyed teaching this class, and hope to teach it for several more years.

• **(2a) Shepard students under extreme distress:** Having taught over 12,800 students at ASU during my career, and mentored more than 130 of them in research, fate will sometimes strike. In 2017, I had to provide special guidance and suicide watch for an AST 113 student who was present during the September 2017 mass shooting in Las Vegas. While unhurt himself, he left the scene covered by the blood of others who he saw die around him. Then in fall 2018, two other AST 113 students were affected by shootings. One was shot during a fraternity party but survived, the other had his brother murdered during the mass shooting in Jacksonville (FL) in September 2018. Again, I pulled out all the stops to provide these students with counseling and help during the semester. Fortunately, all three succeeded in completing the Labs with good grades, and we made sure that their continued well-being is closely monitored by ASU. In addition, I made sure that two of my graduate students who fell gravely ill succeeded in their

PhD work. One coped with and survived cancer, and the other needed kidney dialysis and a kidney transplant. Both have published papers. One defended in summer 2018 and the other in fall 2019.

• **(2b) Help our students cope with COVID19:** Given the rapid spread of COVID19 world-wide, on Monday March 2, ASU Provost Mark Searle asked for volunteers to start teaching ASU in-person classes. I started teaching my AST 322 class via Zoom the next day, Tuesday March 3, and send a list of lessons learned to the ASU administration. I then continued to teach AST 322 via Zoom after Spring break, by which time the students were all used to it. It was a relatively smooth and painless transition.

• To help our UG students cope with COVID19, we had a "Bring your pet to School day" in AST 322 in April 2020. In the context of the AST 322 Cosmology chapter on "Cold Dark Matter" (CDM), students were asked to show their favorite pet on camera from home during the Zoom class. Students were given a way to vote on each other's pet with the requirement that the pet should have properties in common with CDM: Cold (nearly zero velocity and Temperature), Dark (no interaction with photons), and Matter (has significant mass and gravity), or they could show pets that clearly violated the properties of cosmological CDM. In either case, they needed to motivate their choice of pet well. The class voting resulted in up to 10 extra credit points for the best motivated CDM (or non-CDM) pets. Winners were big CDM dogs, sleepy cats, a curled-up snake, and a non moving cold temperature dark gecko, and a clearly highly volatile non-CDM parakeet.

• **(3) Honors projects in AST classes and Labs:** During my AST classes, I made special efforts to increase the interest students have in the lower division courses, including students who want to do extra work for Barrett Honors credit. The students take these classes or Labs only to fulfill a science requirement, so most are at first poorly motivated. I catch their interest by announcing at the start of each semester that we will have special Honors projects during the semester.

• **(3a) For Honors projects in the AST 111/112 courses:** I very much enjoy teaching the large astronomy undergraduate courses (140–240 students per semester). Every semester of AST 111/112, I hold a "Great Debate on Extra-Terrestrials". Students can participate in this debate in either the "Pro-ET" or "Con-ET" team. Only one rule governs the Debate: students *must* use the scientific method, no matter which side of the debate they argue. During the semester, I point out every time a law of physics or an astronomical principle is relevant to the question as to whether or not ET's may exist, or may have visited the Earth. The students then prepare this Great Debate during the entire semester, and two groups (a "Pro-ET" and "Con-ET" group) lead out the discussion during the Great Debate, while presenting their materials for extra credit or Barrett Honors credit (*i.e.*, written reports, Web-sites, and/or Power-Point presentations). This has been a significant success: it has boosted the students interest in science, since the students now relate to something they care about or have always wondered about, and their average grades have increased as a result. For the AST 113/114 Labs, other Honors projects can be done on the planets, our Moon, etc, usually in conjunction with a current NASA Mission.

• **(3b) Honors or Senior Thesis credit from Hubble Archival Legacy Project SKYSURF:** In 2019, this largest HST Archival project ever proposed was approved for FY20–FY22. I am leading the international SKYSURF team of more than 40 scientists spread over 20 time-zones, including several research scientists, postdocs, graduate students and 10 UG students at ASU. SKYSURF project gives AST 322 and other students the opportunity for Honors or Senior Thesis credit. *We pulled out all the stops this semester to make sure all UGs and other SKYSURF scientists could remain working on SKYSURF despite COVID19 — we made it possible to run SKYSURF from everyone's home computers on our ASU servers and via Zoom. Hence, all SKYSURFers remain employed during COVID19.* Project SKYSURF will measure the panchromatic sky-surface brightness and discrete object counts over 248,000 ACS and WFC3 exposures in more than 1100 independent HST fields. It will map over 2 million faint stars and galaxies at UV–near-IR wavelengths all across the sky. For further details on Project SKYSURF, see §2b.

• **(3c) Efficiently catching cheaters in AST 111/112 Exams:** I used and refined my software package that allows to delete ambiguous questions in AST 111/112 tests, and find possible cheaters from suspiciously large numbers of wrong answers in common between students who were sitting close together on the seating charts, and/or who were seen to have communicated by voice, paper, cell-phone or internet during the exam. Most students who are caught copying at a significant level confess in my office, and

are given the appropriate warning and grade in the exam or the course, typically several students every semester. I tell students that I do this to help make honest citizens out of them, and many of them appreciate that.

• **(4) 3D-tactiles for visually impaired/blind students:** Five years ago, I had a NASA Hubble Education grant to introduce 3-dimensional (3D) tactile images into the AST 113/114 Lab and AST 111/112 Lecture classroom to help blind or visually impaired (BVI) students learn to use real images in STEM courses at ASU. This project has been very successful, and the first paper on its results was published by my undergraduate student E. Hasper, Windhorst, et al. (2015, J. of College Science Teaching, 44, 82). This project is called 3D-IMAGINE, or "3D IMage Arrays to Graphically Implement New Education". 3D-IMAGINE's focus is to increase the participation and performance of BVI students by providing a multi-modal tactile approach to learning image-rich material. We explored the use of various tactile image formats and activity sets to evaluate how well these assist students in Lab exercises. We evaluated these haptic tools in classes that had *both* sighted *and* BVI students, as well as in a participation study of students with vision impairment. Our study clearly showed that the use of 3D tactile images are very helpful to both sighted and vision-impaired students, and should be used further for enhanced educational benefits (see Figures in Hasper et al. 2015).

• **(5a) Graduate teaching:** I believe that graduate students need to receive a thorough training in all aspects of cosmology: observations, data processing, analysis, modeling and interpretation. I very much enjoyed developing new graduate courses to give the students world-class training in this.

• **(5b) Graduate student training:** I am committed to train graduate and undergraduate students in independent, world-class cosmology research, through weekly research meetings, seminars, journal clubs, and one-to-one work. They regularly publish their Ph. D. work in top-ranked journals (see over 520 papers incl. Windhorst on https://ui.adsabs.harvard.edu/classic-form ), including a number of Dissertation papers in the prestigious journal Nature.

• **(6) Public outreach:** It is critical for a University to reach out to the local community, and help the general public understand the importance of the University and the value of science education. Hence, I enjoy giving popularizing lectures on campus or elsewhere in the valley each year. I involve my student in regular press releases, mostly related to the NASA/Hubble research in my group (see hubblesite.org/news/2018/23, ../2014/27, ../2011/04, ../2010/01, ../2004/28, ../2001/04, ../2001/37, ../1996/29, and ../1995/08). I did a live KTAR radio talk-show during my AST 112 class on a NASA press release that day.

• **(7) Departmental, School College, and University Service and Personnel Management:** I have been actively involved in helping the Department, School, College, and University function optimally, and advance their goals in various areas of operation. In particular, I served as at ASU as Associate Department Chair for six years, helping the Chair run the Department of Physics and Astronomy. In this position, I was responsible for: (a) assignment of all 50 graduate teaching assistants each semester; (b) making the teaching assignments of 40 faculty; (c) assist and advise the Chair in the daily operation of the Department, and resolve personnel conflicts; (d) run various Departmental Committees; (e) manage all Astronomy related issues in the Department.

• **(8) Service to the Astronomical Community:** I want to advance the cause of astronomy in the USA by being actively involved in various astronomy committees at the national and international level. I serve, and will continue to serve on several key committees in the astronomical community:

• **(8a) Ground-based Observatories:** I was member of the National Radio Astronomy Observatory Users Committee, which helps NRAO obtain optimal use of their radio telescopes, interferometry software, and their future facilities. I served on the NRAO Oversight Committee for the VLA All-Sky Surveys (1993–1996 and 2014–present), which advised NRAO on the operation, reduction and analysis of their two 5000-hr VLA All Sky Surveys.

• **(8b) The Hubble Space Telescope (HST):** I was particularly active in the Hubble Space Telescope Users Committee (STUC), which is a watch-dog of HST's reliability, efficiency, health, and budget. Here,

I chaired the HST/STUC Independent Budget Review Committee, which reviewed the entire NASA HST-budget (240 M$/year) for 10 years. I was an active member of the HST Parallel Working Group, who advises STScI how to best take (parallel) observations with all the Hubble instruments. I am a key member the Scientific Oversight Committee (SOC) of HST's Wide Field Camera 3 (WFC3), which closely monitored the design and construction of the 130 M$ WFC3 to make sure WFC3 could fully carry out its intended science. WFC3 was successfully launched towards Hubble by the Space Shuttle astronauts in May 2009 to help keep Hubble operational till well beyond 2020, possibly until 2025. I lead the WFC3 far-extragalactic Early Release Science (ERS) program, which led to $\gtrsim$65 refereed papers since 2009.

• **(8c) The James Webb Space Telescope (JWST):** I am one of the world's six Interdisciplinary Scientists for the James Webb Space Telescope. JWST is the 6.5 meter sequel to Hubble that was successfully launched in Dec. 2021. My responsibilities are to define the best JWST science, help the JWST Project define the optimal telescope and instrument performance, simulate JWST's actual performance, monitor the entire design, integration and testing phases of JWST, and after its launch carry out a vigorous research JWST program in 2022–2025 using our 110 guaranteed hours of observing time (GTO time). Starting in summer 2022, I will lead JWST studies on the assembly of galaxies at redshifts z=1–5, when the universe was a few billion years old, and lead a search for the first stars and star clusters that started shining at redshifts z=6–20, when the universe was less than one billion years old. My JWST work in these peer-reviewed projects is supported by NASA grants since 2002, and planned to last through 2025.

• **(8d) ASU Founders Representative at the Giant Magellan Telescope Board:** Since 2018, I have been the ASU Representative at the GMT Founders Board, after ASU joined the 25 meter Giant Magellan Telescope project in late 2017. This board meets several times a year. The GMT Organization president is Dr. R. Shelton in Pasadena. I am actively involved in the ASU fundraising for this project, as well as recruiting a senior astronomer to ASU who can build a next generation instrument for GMT.

## APPENDIX 5. HIGHLIGHTS OF MAIN RESEARCH

Here I review the highlights of my research, and give references to the relevant journal papers or review papers listed in my bibliography. By the nature of the field, many of my papers are multi-authored. Hence, I will summarize those projects and papers where I was the science lead, or where one of the 20 postdocs or 56 graduate students (see App. 3.e–f) in my group at ASU was first author (see App. 6), and/or when I had otherwise a significant impact on the science results:

### (1) The Nature and Evolution of Faint Radio Source Populations

• **Multi-frequency radio surveys down to milliJansky levels:** Starting in the 1980's, I carried out deep radio-optical surveys of the sky to delineate the cosmological evolution of the radio source population (in luminosity, space density, and linear size) and trace its physical cause: Why were active galactic nuclei much more numerous and luminous in the past? In the first set of sub-milliJansky surveys with the Westerbork Radio Synthesis Telescope and the Very Large Array, I discovered the upturn in the milliJansky source counts (Windhorst et al. 1984, 1985, 1990), which heralded a different population of radio faint sources than the canonical giant ellipticals and quasars, whose central engines are supermassive black holes.

• **Ultradeep microJansky radio surveys of selected areas:** I carried out or was involved in systematic radio surveys at microJansky levels with the VLA and Westerbork, which confirmed the upturn in the milliJansky source counts over almost 1 dex in frequency and greatly improved its significance (Windhorst et al. 1985, 1993, 1995, 2003; Oort & Windhorst 1985; Oort et al. 1988; Donnelly, Partridge, & Windhorst, 1987; Katgert, Oort, & Windhorst, 1988; Fomalont et al. 1991, 2003, 2004; Hopkins et al. 2000).

• **Limits to fluctuations in the Cosmic Background Radiation at cm wavelengths:** I was involved in using these microJansky surveys to set meaningful upper limits to possible fluctuations in the Cosmic Background Radiation on arcsec–subarcmin scales at cm wavelengths (Fomalont et al. 1988; Windhorst et al. 1995; Richards et al. 1997; Partridge et al. 1997; Campos et al. 1999).

• **High resolution imaging of faint radio sources:** I was involved in systematic high-resolution VLA imaging of the nature of milliJansky and microJansky radio sources. These sources are a mixture of classical FR-II/FR-I sources, starburst-driven compact radio sources, and sources with weak compact AGN (Oort et al. 1987). We measured the size evolution of the FR-II sources (Oort, Katgert, & Windhorst, 1987). These results led to papers to simulate the nanoJansky radio universe with the Square Kilometer Array ("SKA", Hopkins et al. 2000; Kawata, Gibson, & Windhorst, 2004) and a review paper on the natural confusion limit at radio and optical–IR wavelengths (Windhorst et al. 2005).

• **HST imaging, multicolor photometry and spectroscopy of faint radio galaxies:** I led or was closely involved in a number of projects to delineate the true nature and evolution of faint radio galaxies, which provided solid UV-optical evidence of a mixture of early-type galaxies, starbursting and post-starburst galaxies, and weak AGN, where the starburst galaxies cause the upturn in the milliJansky source counts (Windhorst et al. 1984b, 1985, 1991, 1992, 1994a, 1994b, 1998; Oort & Windhorst 1985; Kron, Koo, & Windhorst, 1985; Keel, & Windhorst, 1993, Fomalont et al. 1997; 1997, 2003, 2004; Scoville et al. 1997; Richards et al. 1998, 1999; Haarsma et al. 2000; Waddington et al. 1999, 2000, 2001, 2002).

• **In summary:** The above work was described in a number of review papers (van der Laan & Windhorst 1982; Windhorst 1985, 1986; Windhorst et al. 1990, 1999a, 1999b, 2000a, 2000b, 2001, 2003). In Windhorst et al. (1985, 1995), we identify the microJansky sources as a population dominated by double, interacting and merging sources, and suggest that these objects are gradually forming giant early-type galaxies through repeated hierarchical merging. In Windhorst (2003), I suggested that the Cosmological Constant $\Lambda$ may have played a role in driving the strong cosmological evolution of faint radio sources by winding down the strongly epoch-dependent merger rate and gas infall for $z \lesssim 0.5$–1. This same process may also cause the transition between the merger/infall-driven universe of interacting/peculiar galaxies that we see with HST at $z \gtrsim 1$ and the universe that is mostly passively evolving at $z \lesssim 0.5$–1, as described in later HST papers (*e.g.*, Cohen et al. 2003, Windhorst et al. 2004).

### (2) The Faint Galaxy (two-point) Correlation Function and the Evolution of Galaxy Clustering

• These deep radio-optical surveys were also used to delineate the faint galaxy two-point correlation function for V $\lesssim$ 26 mag on 0.5° scales (Neuschaefer, Windhorst, & Dressler, 1991; Neuschaefer, & Windhorst, 1995a, 1995b). This showed a significantly lower amplitude of galaxy clustering at faint fluxes (z $\gtrsim$ 1), and set limits to the possible evolution of the correlation function slope, which are important constraints to large scale structure formation.

### (3) HST Surveys to Trace the Nature and Evolution of Faint Galaxies

I led or was closely involved in a significant number of HST projects to delineate the nature and evolution of faint galaxies:

• **HST mid-UV imaging of nearby galaxy morphology and structure as benchmark for reliable high redshift classifications:** The key to address the nature and evolution of faint field galaxies is to understand the rest-frame UV morphology and structure of nearby galaxies. This we begun to do in Keel & Windhorst (1991, 1993) and Windhorst et al. (1994a, 1994b). A significant step forward came from recent systematic HST imaging projects in the rest-frame mid-UV of nearby galaxies (Windhorst et al. 2002; Eskridge et al. 2003; de Grijs et al. 2003; Taylor-Mager et al. 2005, 2007, 2018; Windhorst et al. 2011). The main findings were that at high redshift, true early-type galaxies are more likely to be misclassified than true late-type galaxies, although early-types do not usually get misclassified at late-type galaxies (Windhorst et al. 2002). See also: *hubblesite.org/news/2001/04 and 2001/37.*

• **Accurate quantitative classification of faint galaxies:** My group at ASU classified faint galaxies using Artificial Neural Networks (Odewahn et al. 1996, 1997) and Fourier decomposition methods (Odewahn et al. 2002), resulting in more robust classification of the faint blue galaxy population seen by HST.

• **The nature of faint galaxies seen in deep HST surveys:** I led a group at ASU to do systematic deep HST surveys — even before the Hubble Deep Fields came out — and was actively involved in the HST Medium-Deep Survey Key Project to image many more fields with HST/WFPC2 in parallel mode. Even before HST's spherical aberration was fixed, this led to some ability to classify faint galaxies as bulge-dominated or disk-dominated (King et al. 1991; Windhorst et al. 1992, 1994a, 1994b; Casertano et al. 1995; Griffiths et al. 1994a; Phillips et al. 1995). The most significant results from this work came after HST's image quality was fixed in late 1993: we used the HST images to show that faint blue field galaxies are dominated by late-type/irregular or peculiar/merging and actively star-forming galaxies (Driver, Windhorst et al. 1995a, 1995b, 1996, 1998, 2003; Mutz et al. 1994, 1997; Schmidtke et al. 1997, and review papers by Windhorst et al. 1996, 1998, 1999a, 1999b, 2000b, 2003). See also: *hubblesite.org/news/1995/08.*

• **The evolution of faint galaxies seen in HST surveys:** My group at ASU used these deep HST images and the Medium-Deep Survey images to constrain the metric sizes and size evolution of faint galaxies (Mutz et al. 1994), and to delineate the evolution of faint galaxies across the Hubble sequence (Driver et al. 1995b, 1996, 1998; Griffiths et al. 1994b; Cohen et al. 2003). The most important result from this work appeared in Driver et al. (1995, 1998), Odewahn et al. (1996) and Cohen et al. (2003): the dominant class of late-type/irregular and peculiar/merging galaxies at z $\gtrsim$ 1–2 is in the gradual process of hierarchically growing the giant early-type galaxies, which dominate the Hubble sequence that we see at z $\lesssim$ 1.

• **HST imaging of other classes of objects:** My groups was also involved in constraining the epoch-dependent merger rate from the HST images (Burkey et al. 1994), and set limits to the Cosmological Constant from the counts of well-classified early-type HST galaxies (Driver et al. 1996; Phillips et al. 2000) before the SN and WMAP results yielded an accurate value of $\Lambda$. I was also involved in HST studies of the nature of specific classes of high redshift sources, such as sub-mm sources (Chapman et al. 2003a, 2003b, 2004b; Conselice et al. 2003), Lyman Break Galaxies (Chapman et al. 2002), Ly$\alpha$ "Blobs" (Chapman et al. 2004a), faint X-ray sources (Nandra et al. 2002; Yan et al. 2002), and faint high redshift radio galaxies (Windhorst et al. 1998, Keel et al. 1999, 2002). A number of the latter objects have weak AGN that were identified through faint Ly$\alpha$ AGN-reflection cones.

### (4) Distant Groups or Proto-Clusters of Young Sub-galactic Sized Objects

• One of the dramatic discoveries with HST was that one high redshift radio galaxy at z=2.39 that my group had studied — including with HST (Windhorst et al. 1991, 1992, 1998) — was surrounded by

a significant number of faint Ly$\alpha$ emitting candidates, which were very blue and compact in the HST images. These objects were identified at z$\simeq$2.4 in papers by Pascarelle et al. (1996a, 1996b, 1998) and Keel et al. (1999, 2002, 2004). In total, three weak radio AGN were found at z$\simeq$2.39 with faint AGN reflection cones shining off to one side. The most significant result was that the faint surrounding z$\simeq$2.4 objects are clearly sub-galactic in size and mass (M$\simeq 10^8$–$10^9$ $M_\odot$ ), and as a group had a small enough velocity dispersion to allow for subsequent merging at z$\gtrsim$2, resulting in the giant galaxies that we see today at z$\lesssim$1. This is thus a direct manifestation of the hierarchical galaxy growth that is implicitly visible in the evolution of the Hubble sequence in the HST field galaxy surveys described above. See also: *hubblesite.org/news/1996/29.*

### (5) Nature and Evolution of the Oldest or Reddest Galaxies at High Redshifts

As a spin-off of the deep radio-optical surveys, I was involved in finding a number of optically very faint or unidentified radio sources, whose nature only became clear through careful collaborative studies involving the worlds largest telescopes:

• **Ages of the oldest galaxies at high redshifts:** In Dunlop et al. (1996) and Spinrad et al. (1997), this work identified two milliJansky radio sources through Keck spectroscopy as ∼3.5-Gyr old galaxies z$\simeq$1.43-1.55, which were the oldest known galaxies known at high redshifts at that time. In Peacock et al. (1998), we summarized the constraints that these old high redshift galaxies provided on the primordial density fluctuation spectrum. These old ages at high redshift posed an immediate problem for high redshift galaxies in the then-popular zero-$\Lambda$ cosmologies, and was foreboding the need for a Dark Energy dominated cosmology (Driver et al. 1996; Phillips et al. 2000).

• **Sizes of the oldest galaxies at high redshifts:** In Waddington et al. (2002), we presented HST/NICMOS images of these two old galaxies at z$\simeq$1.5, which clearly showed dominant $r^{1/4}$-laws and which constrained the Kormendy relation at that redshift.

### (6) Studies of the Cosmic Reionization Epoch

Recently, part of my group at ASU has been involved in delineating the population that was responsible for completing the epoch of cosmic reionization at z$\simeq$6:

• **The population of objects that completed cosmic reionization at z$\simeq$6:** In papers led by Haojing Yan, we summarized all available constraints to the surface density and LF of objects at z$\simeq$6 (Yan et al. 2002). Next, these were supplemented with samples of z$\simeq$6 dropouts from HST/ACS parallel fields (Yan, Windhorst, & Cohen 2003) and the Hubble Ultra Deep Field (Yan, & Windhorst 2004a, 2004b). The fraction of bogus detections and lower-redshift interlopers is generally small enough that at the faint-end (AB$\simeq$27–29.5 mag) i-band dropouts are largely genuine z$\simeq$6 objects. Their number density is large enough and their faint-end LF-slope is steep enough that the collective UV-output of dwarf galaxies likely ended the process of cosmic reionization at z$\simeq$6 (Yan & Windhorst 2004a, 2004b, 2010). If true, this has dramatic consequences for the formation of objects at z$\gtrsim$6–7 and the design of surveys with James Webb Space Telescope (JWST). See also: *hubblesite.org/news/2004/28 and hubblesite.org/news/2003/05* .

• **The HST ACS and WFC3 Grism Surveys:** Through the HST "GRAPES", "PEARS" and "FIGS" grism surveys, I was involved in getting ACS and WFC3 grism redshifts for faint objects in the Hubble Ultra Deep Field and the GOODS fields to AB=27–27.5 mag. This resulted in $\gtrsim$28 papers by Pirzkal et al., Rhoads et al., Malhotra et al., and other collaborators since 2004. These projects showed that i-band dropouts to AB=27.5 mag have a 80–93% spectroscopic confirmation rate at z$\simeq$6, thereby validating the Yan et al. (2004) reionization results, and that the number of LT-dwarfs stars among the i-band dropouts is small.

• **Indirect constraints to reionization:** In a paper by Shaver, Windhorst, Madau, & de Bruyn (1999), we investigated if the reionization epoch can be detected as a global signature in the cosmic background — both in redshifted HI and redshifted Ly$\alpha$ , and delineated how these features may be constrained with Low Frequency Array ("LOFAR") and HST/STIS. This is now being implemented as science requirements for the next generation radio telescopes LOFAR and the SKA. As of 2018, this prediction has been verified by a first observation of the global redshifted neutral hydrogen (or HI) signal with the EDGES experiment of Bowman et al. (2018), although this feature occurs at a higher redshift than predicted.

**(7) Applying Astronomical Image Analysis Software to Improve Diagnosis in Medical Images:**

I led a team of people to systematically apply astronomical image analysis and classification software to a variety of medical images with as main goal to help more accurately to produce fast, reliable, and user-friendly methods to diagnose various diseases in an early stage. Critical for this work are the algorithms that we use for faint HST galaxy detection, object deblending, unsharp masking, surface photometry, asymmetry analysis, and galaxy classification. This research is in progress and includes:

• **Finding the onset of Type 2 diabetes in an early stage:** This is done by delineating and quantitatively measuring the surface density of C-fibers in skin-biopsies of healthy, pre-diabetic and diabetic Type 2 patients. The goal is to identify pre-diabetic patients in an early stage, *i.e.*, when the onset of the disease may still be prevented or delayed through natural means. In Burnett et al. (2004) we present the first results. A patent for this diagnostic method has been granted, and we published the method in Tamura et al. (2009, J. of Neuroscience Methods, 185, 325).

• **Recognizing deficiencies in glucose cells:** This is done by quantitatively measuring the density of defects on top of glucose cell images. Goal is to identify glucose deficiencies in an early stage.

• **Quantitatively measuring the spreading of tumor cells:** This will be done by quantitatively measuring the distribution of tumor cells in images of various kinds of cancer tissue. Goal is to measure the spread of tumors in the earliest possible stage.

**In summary:** After some initial startup issues related to dealing with human subjects and human tissue, the unique combination of medical imaging and HST faint galaxy classification and image analysis software offers a significant area of potential growth.

**(8) 3D Tactiles to Help Blind/Visually Impaired Students Study STEM Materials and Images:** Starting in 2012, I led a team a group of faculty and researchers in ASU Life Sciences, ASU Engineering and SESE to use 3D tactile surfaces to help blind and visually impaired students study STEM materials from images. This includes a concept to make a fully movable 3D tactile surface that fits on top of iPhones or iPads using temperature/current sensitive Hydrogel pixels. Details on this 3D tactile project can be found on: http://windhorst113.asu.edu/ (see Syllabus) ; https://asunews.asu.edu/20120821_3dimagine ; and https://asunews.asu.edu/20120827_windhorst . We published details on this project in Hasper et al. (2015, J. of College Science Teaching, 44, 82), and it led to another patent.

**(9) The HST WFC3 Early Release Science (ERS) survey:** The extragalactic part of our HST WFC3 ERS survey resulted in $\gtrsim$65 papers since 2009 on targets ranging from nearby galaxies to early objects in the epoch of reionization at redshifts z$\gtrsim$6, when the universe was less than 1 billion years old. The unique UV–near-IR capabilities of WFC3 that we designed in the SOC were essential to trace the star-formation from today all the way back to redshifts z$\simeq$8–10, when the universe less than 650 million yrs old. In the areas surveyed, the unique HST WFC3 data provide the essential UV–optical complement (at wavelengths $\lambda\simeq$0.2–0.7 $\mu$m) to JWST images that will cover $\lambda\simeq$0.7–5 $\mu$m and longwards starting in 2021.

**(10) Papers in preparation of our JWST GTO surveys:** In preparation for our JWST GTO survey that will start in 2021, we have published $\gtrsim$30 HST papers since 2010 that were written in support for JWST. Only Hubble can provide the unique short wavelength data (at $\lambda\simeq$0.2–0.7 $\mu$m) that provide the essential complement the JWST that we will get at $\lambda\simeq$0.7–5.0 $\mu$m and beyond starting in 2021. Noteworthy here are the following: (a) We aim to observe the First Stars directly during the first 500 Myr via cluster caustic transits, where gravitational lensing can temporarily produce extreme magnifications (*e.g.*, Windhorst et al. 2018); (b) We also plan to monitor the best survey field at the North Ecliptic Pole (NEP) to find the first supernovae with JWST (*e.g.*, Jansen & Windhorst 2018).

**(11) Selected Web-sites of NASA Hubble Press Releases on my Research:**

- https://hubblesite.org/contents/news-releases/1995/news-1995-08
- https://hubblesite.org/contents/news-releases/1996/news-1996-29
- https://hubblesite.org/contents/news-releases/2001/news-2001-04
- https://hubblesite.org/contents/news-releases/2001/news-2001-37
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- https://webbtelescope.org/contents/news-releases/2018/news-2018-23/
- https://asunow.asu.edu/20180425-discoveries-see-first-born-stars-universe
- https://www.nasa.gov/feature/goddard/2020/simulations-show-webb-telescope-can-reveal-distant-galaxies-hidden-in-quasars-glare/
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- https://hubblesite.org/contents/news-releases/2022/news-2022-003
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- https://www.cnn.com/2022/10/05/world/webb-telescope-galaxy-pair-hubble-scn/index.html
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- https://news.asu.edu/20221208-hubble-detects-faint-ghost-light-around-our-solar-system-skysurf
- https://webbtelescope.org/contents/early-highlights/webb-glimpses-field-of-extragalactic-pearls-studded-with-galactic-diamonds
- https://blogs.nasa.gov/webb/2022/12/14/webb-glimpses-field-of-extragalactic-pearls-studded-with-galactic-diamonds/
- https://esawebb.org/images/pearls1/zoomable/
- https://news.asu.edu/20221213-jwst-pearls-project-unveils-exquisite-views-distant-galaxies
- https://www.cnn.com/2022/12/14/world/webb-telescope-galactic-diamonds-scn/index.html
- https://www.quantamagazine.org/astronomers-say-they-have-spotted-the-universes-first-stars-20230130/
- https://webbtelescope.org/contents/news-releases/2023/news-2023-119

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- https://www.nasa.gov/feature/goddard/2023/webb-spotlights-gravitational-arcs-in-el-gordo-galaxy-cluster
- https://news.asu.edu/20230801-jwsts-gravitational-lens-reveals-distant-objects-behind-el-gordo-galaxy-cluster
- https://news.asu.edu/20230802-global-engagement-asu-webb-telescope-einstein-werner-salinger-holocaust
- https://www.space.com/james-webb-telescope-einstein-general-relativity-galaxy-warps
- https://cnnespanol.cnn.com/video/nasa-galaxias-imagenes-telescopio-espacio-redaccion-buenos-aires/
- https://webbtelescope.org/contents/news-releases/2023/news-2023-146
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- https://www.cnn.com/2023/11/09/world/webb-hubble-colorful-galaxy-cluster-scn/index.html
- https://www.nytimes.com/2023/12/19/science/christmas-stars-galaxies-webb-nasa.html?
- https://bigthink.com/starts-with-a-bang/triple-lens-supernova-jwst/
- https://news.asu.edu/20240131-science-and-technology-team-astronomers-led-asu-scientist-discovers-galaxy-shouldnt-exist
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- https://news.asu.edu/20240625-science-and-technology-webb-telescope-reveals-star-clusters-cosmic-gems-arc
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- https://earthsky.org/space/black-holes-as-the-source-dark-energy/
- https://cosmosmagazine.com/space/astrophysics/black-holes-dark-energy-big-bang/
- https://www.earth.com/news/new-evidence-suggests-that-dark-energy-comes-from-black-holes/
- https://www.astronomy.com/science/could-black-holes-create-dark-energy/
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- https://news.asu.edu/20250106-science-and-technology-beyond-dragon-arc-unveiling-treasure-trove-hidden-stars
- https://www.space.com/space-exploration/james-webb-space-telescope/james-webb-space-telescope-spots-record-breaking-collection-of-stars-in-far-flung-galaxy
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- https://phys.org/news/2025-08-black-holes-universe-dark-energy.html
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- https://www.nature.com/articles/d41586-025-02720-6
- https://www.eurekalert.org/news-releases/1095541
- https://www.space.com/astronomy/black-holes-that-transform-matter-into-dark-energy-could-solve-cosmic-hiccups-mystery
- https://www.newswise.com/articles/dark-energy-filled-black-holes-plus-desi-data-give-neutrino-masses-that-make-sense
- https://gizmodo.com/black-holes-are-the-elusive-source-of-the-universes-dark-energy-study-argues-2000646919

*Total internet reads or hits from press releases since 1995: over 10 billion* [1].

[1] (These numbers are estimates provided by NASA and/or https://app.criticalmention.com , *e.g.*, https://app.criticalmention.com/cm/report/66f7d9ce-28be-4b53-89bd-420e6e15621b ).

## APPENDIX 6. BIBLIOGRAPHY

All my papers can be found on: https://ui.adsabs.harvard.edu/classic-form , or in my full resume on: http://www.asu.edu/clas/hst/CV/windhorstCV_full.pdf . In summary:

- 359 refereed papers published or in press since 1981;
- 137 conference papers and 267 AAS abstracts since 1983.