CURRICULUM VITAE

Name: Rogier Arnold Windhorst

Address: School of Earth & Space Exploration
Arizona State University, Box 871404
450 E. Tyler Mall, PSF-686 Office: 550 E. Tyler Mall, GWC-508
Tempe, AZ 85287-1404, USA

Tel.: +1-480-965-7143 or 9416 (office);+1-480-965-6362 (FAX); or +1-480-540-0816 (cell)
E-mail: Rogier.Windhorst@asu.edu
WWW: http://sese.asu.edu/ http://www.asu.edu/clas/hst/www/midUV.html
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, 346 refereed papers published or in press, 15 papers (re)submitted, several in preparation; 34 review papers; 137 non-refereed papers; and 264 published abstracts (see App. 6 of CV). In total, https://ui.adsabs.harvard.edu/classic-form lists $\gtrsim$21,300 current citations with h-index$\simeq$75. Also, http://scholar.google.com lists $\gtrsim$26,800 citations with h$\simeq$84.

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 μm 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 shorter CV is on: http://www.asu.edu/clas/hst/CV/windhorstCV.pdf

My full CV is on: http://www.asu.edu/clas/hst/CV/windhorstCV_full.pdf

REFERENCES

Dr. John C. Mather, Senior Project Scientist & Nobel Laureate
James Webb Space Telescope
NASA Goddard Space Flight Center
Mail Code 443, Building 22, Room 332
Greenbelt, MD 20771
USA
Tel. 1 301 286 6885 or 8720 or 8528 or 5770, FAX: 1 301 286 1753 or 7021
Email: John.C.Mather@nasa.gov or ebarnes@hst.nasa.gov (Ms. Eileen Barnes).

Prof. Dr. Harry van der Laan, Emeritus Director General of ESO
Schoener 18
NL-3961 KZ, Wijk bij Duurstede
The Netherlands
Tel. +31 343 579 186
E-mail: astrolaan@icloud.com

Dr. Barry G. Ritchie, Emeritus, Professor and Vice Provost for Academic Personnel
Department of Physics
Arizona State University
P. O. Box 871504
Tempe, AZ 85287-1504
USA
Tel: 1 480-965-4707 FAX: 1 480-965-7954
E-mail: Barry.Ritchie@asu.edu

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 Lyα 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≃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-λ 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-α Blobs at z=0.6
Sub-total	5,620,136	*(Grants Funded for FY≤10)*		

(Continued on next page)

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 $5.7\lesssim z\lesssim 7$ SDF galaxies
HST/GO-12616	104,455	Jiang	07/12-06/13(10)	Near-IR imaging of $z\gtrsim 6$ 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 $z\simeq 2$ black-hole growth?
Swift/8110151	20,000	Windhorst	07/12-06/13(05)	Follow-up of Lyman-α 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 $z\simeq 2$ 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)		

(Continued on next page)

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$\sim$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 I

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	Hongyu Yu 07/17	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 181st 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 ($z \simeq 1$–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 $\lesssim 0''.1$ 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) (each proposal typically few 100 k$)	50
National Science Foundation — Referee of Large proposals (including one ~120 M$ 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 ΛCDM 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 Lyα 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 Lyα Blobs	PHY graduate in industry
R. Morgan[5]	08/02-05/12	Numerical ΛCDM 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 Lyα 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 $z\simeq2$–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	05/20-5/20	Star-formation in Nearby Galaxy WLM	Staff at Lowell Observatory
Graduate Students currently being supervised at ASU Physics or SESE:			
R. O'Brien	05/20-present	SKYSURF: HST Zodi & EBL Legacy Archive	ASU undergraduate student
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-α 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-α 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$\simeq$6 Galaxies	UT Austin graduate student
S. Sherman	01/20-08/21	SKYSURF: HST Zodi & EBL Legacy Archive	ASU graduate
J. Berkheimer	01/20-08/21	SKYSURF: HST Zodi & EBL Legacy Archive	ASU SESE graduate student
C. Rogers	01/20-08/21	SKYSURF: HST Zodi & EBL Legacy Archive	AZ industry
S. Tompkins[1]	05/18-05/21	Evolution of Solar-mass Population III Stars	W. Australia graduate student
L. Nolan[1]	08/18-05/22	HST Studies of NEP Time Domain Field	Graduate student in Illinois
I. Huckabee	08/19-08/22	SKYSURF: HST Zodi & EBL Legacy Archive	Graduate student in Santa Cruz
K. Ganzel	08/21-08/22	JWST Image Simulations and Pipelines	AZ industry
C. Ramirez	12/21-12/22	SKYSURF: HST Zodi & EBL Legacy Archive	AZ industry
A. Blanche[1]	08/19-05/23	HST Lyman Continuum Studies at z$\simeq$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 Λ 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 Λ. 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), Lyα "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 Lyα 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 Lyα 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-Λ 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 Lyα , 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 μm) to JWST images that will cover $\lambda\simeq$0.7–5 μm 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 μm) that provide the essential complement the JWST that we will get at $\lambda\simeq$0.7–5.0 μm 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
- https://hubblesite.org/contents/news-releases/2003/news-2003-05
- https://hubblesite.org/contents/news-releases/2004/news-2004-07
- https://hubblesite.org/contents/news-releases/2004/news-2004-28
- https://hubblesite.org/contents/news-releases/2006/news-2006-04
- https://hubblesite.org/contents/news-releases/2009/news-2009-25
- https://hubblesite.org/contents/news-releases/2009/news-2009-29
- https://hubblesite.org/contents/news-releases/2009/news-2009-32
- https://hubblesite.org/contents/news-releases/2010/news-2010-01
- https://hubblesite.org/contents/news-releases/2010/news-2010-22
- https://hubblesite.org/contents/news-releases/2010/news-2010-38
- https://hubblesite.org/contents/news-releases/2011/news-2011-04
- https://asunews.asu.edu/20120821_3dimagine
- https://hubblesite.org/contents/news-releases/2014/news-2014-27
- 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/
- https://asunow.asu.edu/20201014-discoveries-simulations-show-nasa-james-webb-space-telescope-can-uncover-hidden-galaxies
- https://hubblesite.org/contents/news-releases/2022/news-2022-003
- https://blogs.nasa.gov/webb/2022/10/05/webb-hubble-team-up-to-trace-interstellar-dust-within-a-galactic-pair/
- https://news.asu.edu/20221005-discoveries-webb-images-reveal-interstellar-discovery
- https://www.cnn.com/2022/10/05/world/webb-telescope-galaxy-pair-hubble-scn/index.html
- https://hubblesite.org/contents/news-releases/2022/news-2022-050
- 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

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

- 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
- https://hubblesite.org/contents/news-releases/2023/news-2023-146
- https://www.nasa.gov/missions/webb/nasas-webb-hubble-combine-to-create-most-colorful-view-of-universe/
- https://esawebb.org/news/weic2327/?lang
- https://news.asu.edu/20231107-hubble-and-jwst-synergy-reveals-vivid-landscape-galaxies
- 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
- https://news.asu.edu/20240424-science-and-technology-celebrating-34-years-space-discovery-nasa?%7B_src%7D=news-story
- https://esawebb.org/news/weic2418/
- https://news.asu.edu/20240625-science-and-technology-webb-telescope-reveals-star-clusters-cosmic-gems-arc
- https://www.quantamagazine.org/the-webb-telescope-further-deepens-the-biggest-controversy-in-cosmology-20240813/
- https://webbtelescope.org/contents/early-highlights/webb-researchers-discover-lensed-supernova-confirm-hubble-tension
- https://blogs.nasa.gov/webb/2024/10/01/webb-researchers-discover-lensed-supernova-confirm-hubble-tension/
- https://news.asu.edu/20241001-science-and-technology-webb-scientists-confirm-hubble-tension-through-lensed-supernova
- https://news.asu.edu/20241028-science-and-technology-robotic-eyes-help-researchers-explore-big-bang-reverse
- https://www.youtube.com/watch?app=desktop&v=tKNv0HfUmo8
- https://www.sciencealert.com/black-holes-could-be-the-mysterious-force-expanding-the-universe
- https://scitechdaily.com/dark-energy-mystery-mounting-evidence-points-to-black-holes-as-hidden-source/
- 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/
- https://www.iflscience.com/black-holes-could-be-churning-out-dark-energy-potentially-solving-cosmological-mystery-77264
- 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
- https://news.asu.edu/20250312-science-and-technology-nasa-launches-space-telescope-chart-sky-and-millions-galaxies

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:

- 336 refereed papers published or in press since 1981;
- 134 conference papers and 258 AAS abstracts since 1983.