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EDUCATION

1994 PhD	Astronomy	University of Cambridge, UK.
1989 BSc (Hons)	Physics & Theoretical Physics	Durham University, UK.

PROFESSIONAL HISTORY

2005-present	Director of Astrobiology, Columbia University
2010-present	Research Scientist and Adjunct Associate Professor, Columbia Univ.
2002-2010	Associate Research Scientist and Adjunct Assistant Professor, Columbia Univ.
2000-2002	Post-Doctoral Research Scientist, Columbia University.
1997-2000	STScI Research Associate, Space Telescope Science Institute, Baltimore.
1996-1997	Research Associate, University of Maryland and NASA GSFC.
1994-1996	National Research Council Fellow, NASA GSFC

PROFESSIONAL ACTIVITIES (MOST RELEVANT/RECENT)

- Writer, presenter, and promoter of science to a general audience (see below).
- Founder of the Columbia Astrobiology Center, 2005. Membership in 2013 was over 40 scientists and students from Columbia University, the NASA Goddard Institute for Space Studies, and the American Museum of Natural History.
- 1997-present Panel member multiple times for NASA ADP, NASA NAI Directors Fund, NASA Postdoctoral Fellowships, ASCA, Chandra, and ASTROE-2/SUZAKU peer reviews.
- Initiated, and funded, a 4-year education and public outreach activity at the American Museum of Natural History on exoplanets and exomoons 2005-2009.
- Invitee to Google Sci-Foo science conference, Mountain View, CA in 2012, 2013, a unique gathering of scientists, computer scientists, and innovators.
- Personal blog at *Scientific American* on astronomy, planetary, and exoplanetary science received over 350,000 visitors in 2013 (see below).

AWARDS, HONORS

2011 Chambliss Medal/Award for Astronomical Writing, American Astronomical Society

GRADUATE AND UNDERGRADUATE SUPERVISION

1998-present co-supervisor for 5 graduate student thesis projects and 4 undergraduate projects.
Three PhD students now graduated: D. Spiegel (postdoc Princeton), T. Mroczkowski (postdoc U. Penn), D. Horner (staff, NASA/GSFC), one current, A. Veicht.
2000-present PhD thesis committee member for 7 students at Columbia University.
2000-present Member of PhD thesis examination committee for 7 Astronomy students and one Physics (topic – LIGO gravitational wave observatory).

TEACHING

12 years teaching experience.

1 Semester upper-level Science of Space Exploration course (Columbia Astronomy).

3 Semesters upper-level Stellar Structure and Evolution course (Columbia Astronomy).

4 Semesters upper-level Extrasolar Planets and Astrobiology course (Columbia Astronomy).

Guest lecturer in undergraduate and graduate classes multiple times at Columbia (2000-present).

PUBLICATION SUMMARY

Over 100 research publications in astronomy & astrophysics, 46 in refereed journals. One 500 page textbook. Two popular science books (2012, and 2014 forthcoming). Multiple review/opinion articles in (e.g.) *Science*, *Nature*, *Scientific American*, *New Scientist* (see below).

REFEREED PROFESSIONAL PUBLICATIONS (CHRONOLOGICAL)

Current h-index for impact: 29

1. "The WARPS Survey. VIII. Evolution of the Galaxy Cluster X-ray Luminosity Function", Koens, L. A.; Maughan, B. J.; Jones, L. R.; Ebeling, H.; Horner, D. J.; Perlman, E. S.; Phillipps, S.; Scharf, C. A., arXiv:1210.5282
2. "Possible Constraints on Exoplanet Magnetic Field Strengths from Planet-star Interaction", C. Scharf, *The Astrophysical Journal*, 722, 1547, 2010.
3. "Generalized Milankovitch Cycles and Long-Term Climatic Habitability", Spiegel, David S.; Raymond, Sean N.; Dressing, Courtney D.; Scharf, Caleb A.; Mitchell, Jonathan L., *The Astrophysical Journal*, 721, 1308, 2010.
4. "Habitable Climates: The Influence of Eccentricity", Dressing, Courtney D.; Spiegel, David S.; Scharf, Caleb A.; Menou, Kristen; Raymond, Sean N., *The Astrophysical Journal*, 721, 1295, 2010.
5. "A 100 kpc Inverse Compton X-Ray Halo Around 4C 60.07 at $z = 3.79$ ", Smail, Ian; Lehmer, B. D.; Ivison, R. J.; Alexander, D. M.; Bower, R. G.; Stevens, J. A.; Geach, J. E.; Scharf, C. A.; Coppin, K. E. K.; van Breugel, W. J. M., *The Astrophysical Journal Letters*, vol 702, 114, 2009.
6. "The Chandra Deep Protocluster Survey: Ly-alpha Blobs are powered by heating, not cooling", J. E. Geach, D. M. Alexander, B. D. Lehmer, I. Smail, Y. Matsuda, S. C. Chapman, C. A. Scharf, R. J. Ivison, M. Volonteri, T. Yamada, A. W. Blain, R. G. Bower, F. E. Bauer, A. Basu-Zych, *The Astrophysical Journal*, 700, 1, 2009.
7. "Long-Period Exoplanets from Dynamical Relaxation", C. A. Scharf, K. Menou, *The Astrophysical Journal Letters*, 693, L113, 2009.
8. "Habitable Climates: The influence of obliquity", D. Spiegel, K. Menou, C. A. Scharf, *The Astrophysical Journal*, 691, 596, 2009.
9. "The Chandra Deep Protocluster Survey: Evidence for an Enhancement in the AGN Activity in the SSA22 Protocluster at $z = 3.09$ ", B. Lehmer, D. Alexander, J. Geach, I. Smail, A. Basu-Zych, F. Bauer, S. Chapman, Y. Matsuda, C. A. Scharf, M. Volonteri, *The Astrophysical Journal*, 691, 687, 2009.
10. "A low redshift galaxy cluster X-ray temperature function incorporating SUZAKU data", C. Shang, C. A. Scharf, *The Astrophysical Journal*, 690, 879, 2009.

11. "Habitable Climates", D. Spiegel, K. Menou, C. A. Scharf, *The Astrophysical Journal*, 681, 1609, 2008.
12. "The WARPS Survey. VII. The WARPS-II Cluster Catalog", D. Horner, E. Perlman, H. Ebeling, L. Jones, C. A. Scharf, G. Wegner, M. Malkan, B. Maughan, *The Astrophysical Journal*, 176, p 374, 2008
13. "Exoplanet Transit Parallax" by C. A. Scharf, *The Astrophysical Journal*, Vol 661, 1218, 2007.
14. "A Possible Dearth of Hot Gas in Galaxy Groups at Intermediate Redshift", D. Spiegel, F. Paerels, C. A. Scharf, *The Astrophysical Journal*, Vol 658, 288, 2007
15. "The potential for habitable moons around known exoplanets", C. A. Scharf, *The Astrophysical Journal*, Vol 648, p1196, 2006.
16. "The evolution of the cluster X-ray scaling relations in the Wide Angle ROSAT Pointed Survey sample at $0.6 < z < 1.0$ ", B. Maughan, L. Jone, H. Ebeling, C. A. Scharf, *Monthly Notices of the Royal Astronomical Society*, 365, 509, 2006
17. "The Chandra Fornax Cluster Survey I: The cluster environment", C. Scharf. D. Zurek, M. Bureau, *The Astrophysical Journal*, Vol. 633, November 2005
18. "On Detecting the X-Ray Silhouette of a Damped Lyalpha System", M. Dijkstra, Z. Haiman, C. Scharf, *The Astrophysical Journal*, Vol. 624, p85, 2005
19. "X-Ray Detection of an Obscured Active Galactic Nucleus in a $z=3.09$ Radio-quiet Ly-alpha Nebula", A. Basu-Zych, C. A. Scharf, *The Astrophysical Journal Letters*, 615, 85, 2004.
20. "An XMM-Newton observation of the massive, relaxed galaxy cluster ClJ1226.9+3332 at $z=0.89$ ", B. Maughan, L. Jones, H. Ebeling, C. A. Scharf, *Monthly Notices of the Royal Astronomical Society*, 351, 1193, 2004.
21. "Chandra Detections of SCUBA Galaxies around High- z Radio Sources", I. Smail, C. A. Scharf, R. Ivison, J. Stevens, R. Bower, J. Dunlop, *The Astrophysical Journal*, 599, 86, 2003.
22. "Extended X-Ray Emission around 4C 41.17 at $z = 3.8$ ", C.Scharf, I. Smail, R. Ivison, R. Bower, W. van Breugel, M. Reuland, *The Astrophysical Journal*, Vol.596, p 105, 2003.
23. "A Statistical Detection of Gamma-Ray Emission from Galaxy Clusters: Implications for the Gamma-Ray Background and Structure Formation", C. Scharf, R. Mukherjee, *The Astrophysical Journal*, Vol. 580, p 154, 2002.
24. "The WARPS Survey. VI. Galaxy Cluster and Source Identifications from Phase I", E. Perlman, D. Horner, L. Jones, C. A. Scharf, H. Ebeling, G. Wegner, M. Malkan, *The Astrophysical Journal Supplement Series*, 140, 265, 2002.
25. "Optimal Chandra and XMM-Newton Bandpasses for Detecting Low-Temperature Groups and Clusters of Galaxies", C. A. Scharf, *The Astrophysical Journal*, 572, 157, 2002.
26. "Distant Cluster Hunting. II. A Comparison of X-Ray and Optical Cluster Detection Techniques and Catalogs from the ROSAT Optical X-Ray Survey", M. Donahue, C. A. Scharf, J. Mack, P. Lee, M. Postman, P. Rosati, M. Dickinson, M. Voit, J. Stocke, *The Astrophysical Journal*, 569, 689, 2002.
27. "Distant Cluster Hunting: A Comparison Between the Optical and X-Ray Luminosity Functions from an Optical/X-Ray Joint Survey", M. Donahue, J. Mack, C. A. Scharf, P. Lee, M. Postman, P. Rosati, M. Dickinson, M. Voit, J. Stocke, *The Astrophysical Journal*, 552, 93, 2001.

28. "Discovery of a Very X-Ray Luminous Galaxy Cluster at $Z=0.89$ in the Wide Angle ROSAT Pointed Survey", H. Ebeling, L. Jones, B. Fairley, E. Perlman, C. A. Scharf, D. Horner, *The Astrophysical Journal Letters*, 548, 23, 2001.
29. "The 2-10 keV X-Ray Background Dipole and Its Cosmological Implications", C. A. Scharf, K. Jahoda, M. Treyer, O. Lahav, E. Boldt, T. Piran, *The Astrophysical Journal*, 544, 49, 2000.
30. "Detection of the Entropy of the Intergalactic Medium: Accretion Shocks in Clusters, Adiabatic Cores in Groups", P. Tozzi, C. A. Scharf, C. Norman, *The Astrophysical Journal*, 542, 106, 2000.
31. "The WARPS survey - IV. The X-ray luminosity-temperature relation of high-redshift galaxy clusters", B. Fairley, L. Jones, C. A. Scharf, H. Ebeling, E. Perlman, D. Horner, G. Wegner, M. Malkan, *Monthly Notices of the Royal Astronomical Society*, 315, 669, 2000.
32. "The WARPS Survey. III. The Discovery of an X-Ray Luminous Galaxy Cluster at $z=0.833$ and the Impact of X-Ray Substructure on Cluster Abundance Measurements", H. Ebeling, L. Jones, E. Perlman, C. A. Scharf, D. Horner, G. Wegner, M. Malkan, B. Fairley, C. Mullis, *The Astrophysical Journal*, 534, 133, 2000.
33. "Evidence for X-Ray Emission from a Large-Scale Filament of Galaxies?", C. Scharf, M. Donahue, G. M. Voit, P. Rosati, M. Postman, *The Astrophysical Journal Letters*, Vol. 528, p 73, 2000.
34. "The Second Most Distant Cluster of Galaxies in the Extended Medium Sensitivity Survey", M. Donahue, M. Voit, C. A. Scharf, I. Gioia, C. Mullis, J. Hughes, J. Stocke, *The Astrophysical Journal*, 527, 525, 1999.
35. "Observational Tests of the Mass-Temperature Relation for Galaxy Clusters", D. Horner, C. A. Scharf, R. Mushotzky, *The Astrophysical Journal*, 520, 78, 1999.
36. "Large-Scale Fluctuations in the X-Ray Background", M. Treyer, C. A. Scharf, O. Lahav, K. Jahoda, E. Boldt, T. Piran, *The Astrophysical Journal*, 509, 531, 1998.
37. "The WARPS Survey. II. The $\log N$ -- $\log S$ Relation and the X-Ray Evolution of Low-Luminosity Clusters of Galaxies", L. Jones, C. A. Scharf, H. Ebeling, E. Perlman, G. Wegner, M. Malkan, D. Horner. *The Astrophysical Journal*, 495, 100, 1998.
38. "The Galaxy Cluster Luminosity-Temperature Relationship and Iron Abundances: A Measure of Formation History?", C. A. Scharf, R. Mushotzky, *The Astrophysical Journal Letters*, 485, 65, 1997.
39. "The Wide-Angle ROSAT Pointed X-Ray Survey of Galaxies, Groups, and Clusters. I. Method and First Results", C. Scharf, L. Jones, H. Ebeling, E. Perlman, M. Malkan, G. Wegner, *The Astrophysical Journal*, Vol 477, p 79, 1997.
40. "The Luminosity-Temperature Relation at $z=0.4$ for Clusters of Galaxies", R. Mushotzky, C. Scharf, *The Astrophysical Journal Letters*, Vol 482, p 13, 1997.
41. "On the Measurement of a Cosmological Dipole in the Photon Number Counts of Gamma-Ray Bursts", C. A. Scharf, K. Jahoda, E. Boldt, *The Astrophysical Journal*, 454, 573, 1995.
42. "Wiener Reconstruction of All-Sky Galaxy Surveys in Spherical Harmonics", O. Lahav, K. Fisher, Y. Hoffman, C. A. Scharf, S. Zaroubi, *The Astrophysical Journal*, 423, 93, 1994.

43. "A spherical harmonic approach to redshift distortion and a measurement of $\Omega(0)$ from the 1.2-Jy IRAS Redshift Survey", K. Fisher, C. A. Scharf, O. Lahav, *Monthly Notices of the Royal Astronomical Society*, 266, 219, 1994.
44. "Spherical Harmonic Analysis of the 2-JANSKY IRAS Galaxy Redshift Survey", C. A. Scharf, O. Lahav, *Monthly Notices of the Royal Astronomical Society*, 264, 439, 1993.
45. "The Puppis cluster of galaxies behind the Galactic plane and the origin of the 'Local Anomaly'", O. Lahav, T. Yamada, C. A. Scharf, R. Kraan-Korteweg, *Monthly Notices of the Royal Astronomical Society*, 262, 711, 1993.
46. "Spherical harmonic analysis of IRAS galaxies - Implications for the Great Attractor and cold dark matter", C. A. Scharf, Y. Hoffman, O. Lahav, D. Lynden-Bell, *Monthly Notices of the Royal Astronomical Society*, 256, 229, 1992.

OTHER SIGNIFICANT PUBLICATIONS

- "Extrasolar Planets and Astrobiology", C. A. Scharf, undergraduate to graduate level textbook, published August 2008, University Science Books ISBN: 978-1-891389-55-9.
- "Moons of Exoplanets: Habitats for Life ?", C. A. Scharf, review chapter in "Exoplanets: Detection, formation, properties, habitability", J. W. Mason (Ed.), Praxis/Springer-Verlag, 2008, ISBN: 978-3-540-74007-0.
- "How to build planets", C. A. Scharf, 2006, *Science*, 314, 255.

PROFESSIONAL PRESENTATIONS (RECENT)

- "Epic Astrobiology", 2014, Fermilab Colloquium.
- "Exoplanetary Science", 2014, Case Western Reserve University colloquium.
- "Outstanding questions for exoplanetary science", 2013, Max Planck Institutes joint colloquium.
- "Outstanding questions for exoplanetary science", 2012, U. Mass Amherst invited colloquium.
- "The New Astrobiology", 2009, Johns Hopkins/STScI colloquium.
- "The New Astrobiology", 2009, invited Princeton lunch seminar.
- "The New Astrobiology", 2009, invited colloquium, Physics Dept. Columbia University.
- "The 2 and 3-body problems and exoplanets", 2008, invited talk American Museum of Natural History, New York.
- "Protons to Planets", 2008, invited colloquium, St Mary's College, Maryland.
- "Protons to Planets", 2008, American Physical Society (APS/DAMOP) invited review.
- "Extended habitability", 2007, U. Penn invited Colloquium.
- "Icy and Temperate Moons", 2006, SPIE Astrobiology Instrumentation.
- "Tidally heated habitable zones", 2006, UCL Astrobiology Conference.
- "Planets, moons, and microbes", 2005, invited MIT Astrophysics Colloquia.
- "The biomass of the galaxy", 2002, invited AMNH public lecture.

SELECTED CONFERENCE PROCEEDINGS & MISCELLANEOUS IN PAST 10 YEARS

1. "New Worlds: Evaluating terrestrial planets as astrophysical objects", C. A. Scharf, D. Spiegel, M. Chandler, L. Sohl, A. DelGenio, M. Way, N. Kiang, White Paper to the 2010 Astronomy & Astrophysics Decadal Survey, 2009.

2. "Towards a Classification System for Assessing Extrasolar Planet Habitability", L. Sohl, M. Chandler, C. A. Scharf, A. DelGenio, M. Allison, K. Menou, American Geophysical Union, Fall Meeting 2005, abstract #SA52A-08
3. "Detecting the warm-hot intergalactic medium", J. W. den Herder, et al. C. A. Scharf, UV and Gamma-Ray Space Telescope Systems. Edited by Hasinger, Günther; Turner, Martin J. L. Proceedings of the SPIE, Volume 5488, pp. 922-932, 2004.
4. "X-ray Emission from a Proto-cluster at $z = 3.8$ ", C. A. Scharf et al. Clusters of Galaxies: Probes of Cosmological Structure and Galaxy Evolution, from the Carnegie Observatories Centennial Symposia. Carnegie Observatories Astrophysics Series. Edited by J.S. Mulchaey, A. Dressler, and A. Oemler, 2004.
5. "Hunting for the WHIM with Chandra", C. A. Scharf, Two Years of Science with Chandra, Abstracts from the Symposium held in Washington, DC, 5-7 September, 2001.

POPULAR SCIENCE: PRESENTATION AND PROMOTION

Books

'Extrasolar Planets and Astrobiology', Upper-level undergraduate/graduate textbook published by University Science Books in 2008, Winner of 2011 Chambliss Prize and Medal from The American Astronomical Society.

'Gravity's Engines: How Bubble-Blowing Black Holes Rule Galaxies, Stars, and Life in the Universe', popular account of modern black hole astrophysics, published by Farrar, Straus & Giroux/Scientific American, 2012. Translation rights acquired for: Japan, Italy, Brazil, Poland, Russia, Turkey.

'The Copernicus Complex: Our Cosmic Significance in a Universe of Planets and Probabilities', published by Farrar, Straus & Giroux/Scientific American, Fall 2014.

Popular Science Articles

'The Shadow Biosphere', guest post at Discover magazine, 2010.

'Life, Unbounded' blog covering planets, exoplanets, and astrobiology at Scientific American, over 150 pieces published with total annual unique pageviews of over 350,000. Sample titles: *'Something's Cooking on Mars'*, *'The Monk of a Million Telescopes'*, *'This is What we Don't Know About the Universe'*, *'Exomoons Can Spoof Exoplanet Biosignatures'*, *'The Photons of Your Life'*, *'Pitch Black: The (almost) dark truth about hot Jupiters'*, *'The molecules that made the universe'*, *'Intelligent Life in the Universe and Steve Jobs'*, *'Life in Liquid Carbon Dioxide'*, *'Billion Year Old Seawater'*, *'An Abundance of Exoplanets Changes our Universe'*. Since 2011.

'Instant Expert: Astrobiology', New Scientist magazine special multi-page insert, 2011

'Plucked From the Vacuum', book review for Nature, 2012

Review of *'The Copernican Revolution'*, by Thomas Kuhn for Nature Summer Reading, 2012.

'Black Holes Come Into The Light', guest post for Huffington Post, 2012

'What Can Astronomers Teach Biologists?' Opinion for Zocalo Public Square, 2012

'Cosmic Citizenship', opinion for Columbia Spectator Magazine, 2012

'The Benevolence of Black Holes', Scientific American article, 2012.

'Come on, Earth – Let's Shine a New Light on Black Holes', op-ed for WIRED-UK, 2013

'Goodbye Copernicus, Hello Universe', for Nautilus magazine of science, philosophy, and culture, 2013.

'Are We Alone?', for Aeon Magazine, 2013

'A Universe Full of Planets', Op-Ed for New York Times International, 2013.

'An Exploding Star, a Grain of Sand, and an Origin Story', for The New Yorker, online Elements section, 2013.

'Are Planets Forming Without Stars?', for The New Yorker, online Elements section, 2013.

'Cloudy, With a Chance of Meteors', for The New Yorker, online Elements section, 2013.

'Our Cosmic Context', for Project Syndicate, published separately in Africa: LIBERIA: «The New Dawn» MALAWI: «The Daily Times» MOROCCO: «Medias24.com» Asia: CHINA: «The Shanghai Daily» KOREA, SOUTH: «The Korea Times» NEPAL: «Kathmandu Post» NEW ZEALAND: «The Timaru Herald » PHILIPPINES: «The Daily Inquirer» SINGAPORE: «Today» TAIWAN: «Taipei Times» Eastern Europe: MACEDONIA: «Utrinski Vesnik» MOLDOVA: «Logos Press» POLAND: «Project Syndicate Polska» Near East: JORDAN: «Jordan Times» KUWAIT: «Al Jarida» QATAR: «Al Jazeera Arabic» QATAR: «Gulf Times» UNITED ARAB EMIRATES: «Khaleej Times», 2014

'How The Cold War Created Astrobiology', for Nautilus magazine of science, philosophy, and culture, 2014.

'Dark Oceans, Deep Life', for Sky & Telescope magazine, 2014.

'Can You Ever Really Know An Extraterrestrial?', for Nautilus magazine of science, philosophy, and culture, 2014.

Recent Television/Film/Radio Appearances

'Aliens Found in Ohio? The WOW Signal', NPR with Robert Krulwich, 2010

'Weird or What? With William Shatner', Discovery Channel, 2011.

'Black Holes: A Force for Good?', BBC Forum radio show, broadcast to over 100 million listeners on the BBC World Service, 2012.

In conversation: NPR/Minnesota Public Radio, 2012.

'Evacuate Earth', National Geographic Television, 2012.

Interviews on: BBC Radio Bristol, BBC Radio 5 Live, 2012.

'Science Weekly Podcast', The Guardian newspaper, London, 2012.

'Swallowed by a Black Hole', BBC Horizon/Discovery Channel, 2013.

'The Origins of the Universe', interview on Minnesota Public Radio, The Daily Circuit, 2013.

'Star Trek: Secrets of the Universe', History Channel/JJ Abrams, 2013.

'How to Survive the End of the World', multiple episodes, National Geographic Television, 2014.

'After Words: The Copernicus Complex', CSPAN BOOK-TV, 2014

Recent Popular Science Talks/Events

Gravity's Engines, Google Author talks, 2012.

Frontiers of Astronomy, public lecture, Hayden Planetarium, The American Museum of Natural History, 2012.

Bristol Festival of Ideas, 2012.

Royal Institution, London, 2012.

Town Hall Seattle, Seattle, 2012.

Secret Science Club, Brooklyn, 2012.

Westchester Amateur Astronomers Association, 2012.

New York Academy of Sciences, 2012.

Decatur Book Festival, Atlanta, 2013.

Westport Astronomical Society, 2013.

In conversation with Lee Billings at The Strand Bookstore, NYC, 2014.

The Copernicus Complex, The Cleveland Museum of Natural History, 2014.

'Science on a Sphere, World Science Festival NY', 2014.

The Copernicus Complex, Frontiers Lecture, American Museum of Natural History, 2014.

Other Media/Interviews

Consultant and narrator for *'Journey to the Exoplanets'*, #1 iPad App, Scientific American/FSG, 2012.

'The Q&A: Engines of Creation', interview published in The Economist, 2012.

Popular Science magazine, interview 2012.

Focus magazine, interview/podcast 2012.

'Black Hole as a Creator?', interview at Trending Sideways, 2012.

Think Atheist, radio/podcast interview, 2012.

'Define Life', Sift podcast, 2012.

Podacademy, interview with Adam Smith, 2012.

'Ingenious', video interview with Nautilus magazine, 2013.

'Masters of the universe', interview with Marcus Chown, New Humanist magazine, 2013.