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EDUCATION

- 1997-2000 **Ph.D. Astronomy**, Queen Mary, University of London
Thesis Title: The Determination of Orbits from Spacecraft Imaging
PhD awarded 30th December 2000
Supervisor: Professor Carl D. Murray
- 1996-1997 **M.Sc. Astrophysics**, Queen Mary, University of London
- 1995-1996 **Postgraduate Certificate in Mathematics, Astronomy and Computing**,
Queen Mary, University of London
- 1992-1993 **Postgraduate Certificate in Education (Physics)**, Kings College London
- 1986-1989 **B.Sc. (Hons) Physics**, Imperial College London

EXPERIENCE

- 2018- **Research Scientist, SETI Institute**
- 2009-2018 **Research Associate, Cornell Center for Astrophysics and Planetary Science,
Cornell University.**

Cassini Rings Discipline Legacy Lead 2017-2018 – co-ordinating the Cassini mission closeout effort for ring science. Task is “to collect, organize or create and prioritize a set of significant Discipline products to be delivered to the Planetary Data System (PDS) for use with Cassini Science Data and Non-Science Data such that future planetary scientists can more easily begin their independent research”

Lead for the Cassini POST group 2014-2017. The POST group pre-integrated the periapse periods during the Proximal Orbit phase of the mission, the final twenty two orbits prior to insertion of the spacecraft into Saturn’s atmosphere. This involved

detailed negotiations leading to the firm allocation of the 2-24 hours around Saturn periapse, the highest resolution time of the mission, to individual observations. Membership of the POST group was instrument PIs/Team Leaders, Project Scientist, Deputy Project Scientist, Interdisciplinary Scientists and a few operations people.

Science Lead for the Cassini Cross Discipline Target Working Team 2009-2017. Running the group that was responsible for allocating time to science observations when Cassini was roughly more than a day or two away from Saturn periapse or a Titan/satellite encounter.

Cassini Imaging Team (ISS) associate member, 2001- present, associated with ISS Team member Prof. Joseph A. Burns

2003-2009 **Postdoctoral Research Assistant, Astronomy Unit, Queen Mary, University of London.**

Work was primarily mission operations for the NASA-ESA Cassini-Huygens spacecraft.

Participated in the discussions which lead to the selection of the spacecraft trajectory for the proposed Cassini Extended-Extended Mission (XXM) 2010-2017.

Integration Block Lead for 185 of the 387 days in the Cassini Extended Mission (XM) during the S44-S53 period (Sep 2008 to Oct 2009). Creating and presenting “strawman” timelines and running the subsequent negotiations to arrive at mutually satisfactory integrated timelines that become part of the Cassini Science Operating Plan (SOP) – personally responsible for integration of 47.8% of the Cassini Extended Mission. Attendance at all telecons for the Cassini RINGS Target Working Team (TWT), MAG TWT, RINGS TWT apoapse splinter group, Rings discipline Working Group (RWG) and occasionally the SATURN TWT. Imaging Team representative to the MAG TWT (responsibility delegated by C. Murray). One of the Integration Block Leads for the RINGS and MAG TWTs as well as leading the RINGS TWT apoapse splinter group.

Locating opportunities and creating observation requests for Cassini Extended Mission and their submission into the Cassini observation database (CIMS). Mainly F ring and satellite orbit determination observations but also mutual events, rock flybys, equinox shadow and satellite searches. Astrometric data reduction of the satellite orbit determination and other images and providing this data to the Cassini Project for use in ephemeris updates.

Wrote the Caviar software package (in IDL) for analysis and astrometry of Cassini ISS images.

Attended all Cassini Project Science Group Meetings (PSG), three a year, between Oct 2003 and July 2009.

Cassini Imaging Team (ISS) associate member, 2001- present, working for ISS Team member Prof. Carl D. Murray.

2001-2003 **Postdoctoral Researcher, Southwest Research Institute, Boulder, CO.**

Work was primarily mission operations for the NASA-ESA Cassini-Huygens spacecraft.

One of the Integration Block Leads for the Cassini Prime Mission Apoapse TWT. Attendance at and participation in all the RINGS, MAG, SATURN and Apoapse TWT telecons. Imaging team representative to Apoapse TWT. Participated in the discussions and negotiations leading to the integration of the 4-year Cassini Prime Mission, responsible for producing the initial template used for integration of sections of Cassini's approach phase (2004 Jan to Jun).

Locating opportunities and creating observation requests for Cassini Prime Mission and their submission into the Cassini observation database. Mainly ring observations and satellite orbit determination observations but also mutual events and satellite searches.

For some of this time I was Operations Technical Lead (OTL) for the ISS Team.

Cassini Imaging Team associate member from 2001 working for ISS Team Leader Dr. Carolyn C. Porco.

COMPUTING

Experience with IDL and FORTRAN programming languages – writing image analysis and astrometry packages, numerical orbital integration, and Cassini observation opportunity identification code. System administrator for network with machines running both LINUX and OSX.

PUBLICATIONS

Cooper, N.J., V. Lainey, L.E. Meunier, C.D. Murray, Q.F. Zhang, K. Baillie, M.W. Evans, W. Thuilot, A. Vienne. 2018. The Caviar software package for the astrometric reduction of Cassini ISS images: description and examples. *A&A* **610**, A2.

El Moutamid, M., P.D. Nicholson, R.G. French, , M.S. Tiscareno, C.D. Murray, M.W. Evans, C. McGhee-French, M.M. Hedmann, J.A. Burns. 2016. How Janus' orbital swap affects the edge of Saturn's A ring? *Icarus* **279**, 125-140.

Cooper, N.J., S. Renner, C.D. Murray, M.W. Evans. 2015. Saturn's Inner Satellites: Orbits, Masses, and the Chaotic Motion of Atlas from New Cassini Imaging Observations. *AJ* **149**, 27-45.

Cooper, N.J., C.D. Murray, V. Lainey, R. Tejeddine, M.W. Evans, G.A. Williams. 2014. Cassini mutual event astrometry of the mid-sized Saturnian satellites 2005-2012. *A&A* **572**, 572-579.

Tiscareno M.S., C.J. Mitchell, C.D. Murray, D. Di Nino, M.M. Hedmann, J. Schmidt, J.A. Burns, J.N. Cuzzi, C.C. Porco, K. Beurle, M.W. Evans. 2013. Observations of Ejecta Clouds Produced by Impacts onto Saturn's Rings. *Science* **340**, 460-464.

Hedmann M.M., J.A. Burns, M.W. Evans, M.S. Tiscareno, C.C. Porco. 2011. Saturn's Curiously Corrugated C ring. *Science* **332**, 708-711.

Beurle, K., C.D. Murray, M.M. Hedmann, M.W. Evans, N.J. Cooper, C.B. Agnor. 2010. Direct evidence for Gravitational Instability and Moonlet Formation in Saturn's Rings. *ApJL* **718**, L176-L180.

Tiscareno M.S., J.A. Burns, M. Sremcevic, K. Beurle, M.M. Hedmann, N.J. Cooper, A.J. Milano, M.W. Evans, C.C. Porco, J.N. Spitale, J.W. Weiss. 2010. Physical Characteristics and Non-Keplerian Orbital Motion of "Propeller" Moons Embedded in Saturn's Rings. *ApJL* **718**, L92-L96.

Hedmann, M.M, N.J. Cooper, C.D. Murray, K. Beurle, M.W. Evans, M.S. Tiscareno, J.A. Burns. 2010. Aegaeon (Saturn LIII), a G-ring Object. *Icarus* **207**, 433-447.

Hedmann M.M., C.D. Murray, N.J. Cooper, M.S. Tiscareno, K. Beurle, M.W. Evans, J.A. Burns. 2009. Three tenuous rings/arcs for three tiny moons. *Icarus* **199**, 378-386.

Murray, C.D., K. Beurle, N.J. Cooper, M.W. Evans, M.M. Hedmann, S. Charnoz. 2008. The determination of the structure of Saturn's F ring by nearby moonlets. *Nature* **453**, 739-744.

Cooper, N.J., C.D. Murray, M.W. Evans, K. Beurle, R.A. Jacobson, C.C. Porco. 2008. Astrometry and dynamics of Anthe (S/2007 S 4), a new satellite of Saturn. *Icarus* **195**, 765-777.

Jacobson, R.A., J.N. Spitale, C.C. Porco, K. Beurle, N.J. Cooper, M.W. Evans, C.D. Murray. 2008. Revised orbits of Saturn's small inner satellites. *AJ* **135**, 261-263.

Murray, C.D., N.J. Cooper, M.W. Evans, K. Beurle. 2005. S/2004 S 5: A new co-orbital companion for Dione. *Icarus* **179**, 222-234.

Murray, C.D., C. Chavez, K. Beurle, N.J. Cooper, M.W. Evans, J.A. Burns, C.C. Porco. 2005. How Prometheus creates structure in Saturn's F ring. *Nature* **437**, 1326-1329.

Porco, C.C., E. Baker, J. Barbara, K. Beurle, A. Brahic, J.A. Burns, S. Charnoz, N.J. Cooper, D.D. Dawson, A.D. Del Genio, T. Denk, L. Dones, U. Dyudina, M.W. Evans, S. Fussner, B. Giese, K. Grazier, P. Helfenstein, A.P. Ingersoll, R.A. Jacobson, T.V. Johnson, A. McEwen, C.D. Murray, G. Neukum, W.M. Owen, J. Perry, T. Roatsch, J.N. Spitale, S. Squyres, P. Thomas, M.S. Tiscareno, E.P. Turtle, A.R. Vasavada, J. Veverka, R. Wagner, R.A. West. 2005. Imaging of Titan from the Cassini spacecraft. *Nature* **434**, 159-168.

Porco, C.C., E. Baker, J. Barbara, K. Beurle, A. Brahic, J.A. Burns, S. Charnoz, N.J. Cooper, D.D. Dawson, A.D. Del Genio, T. Denk, L. Dones, U. Dyudina, M.W. Evans, S. Fussner, B. Giese, K. Grazier, P. Helfenstein, A.P. Ingersoll, R.A. Jacobson, T.V. Johnson, A. McEwen, C.D. Murray, G. Neukum, W.M. Owen, J. Perry, T. Roatsch, J.N. Spitale, S. Squyres, P. Thomas, M.S. Tiscareno, E.P.

Turtle, A.R. Vasavada, J. Veverka, R. Wagner, R.A. West. 2005. Cassini imaging science: Initial results on Saturn's rings and small satellites. *Science* **307**, 1226-1236.

Porco, C.C., E. Baker, J. Barbara, K. Beurle, A. Brahic, J.A. Burns, S. Charnoz, N.J. Cooper, D.D. Dawson, A.D. Del Genio, T. Denk, L. Dones, U. Dyudina, M.W. Evans, S. Fussner, B. Giese, K. Grazier, P. Helfenstein, A.P. Ingersoll, R.A. Jacobson, T.V. Johnson, A. McEwen, C.D. Murray, G. Neukum, W.M. Owen, J. Perry, T. Roatsch, J.N. Spitale, S. Squyres, P. Thomas, M.S. Tiscareno, E.P. Turtle, A.R. Vasavada, J. Veverka, R. Wagner, R.A. West. 2005. Cassini imaging science: Initial results on Phoebe and Iapetus. *Science* **307**, 1237-1242.

Porco, C.C., E. Baker, J. Barbara, K. Beurle, A. Brahic, J.A. Burns, S. Charnoz, N.J. Cooper, D.D. Dawson, A.D. Del Genio, T. Denk, L. Dones, U. Dyudina, M.W. Evans, S. Fussner, B. Giese, K. Grazier, P. Helfenstein, A.P. Ingersoll, R.A. Jacobson, T.V. Johnson, A. McEwen, C.D. Murray, G. Neukum, W.M. Owen, J. Perry, T. Roatsch, J.N. Spitale, S. Squyres, P. Thomas, M.S. Tiscareno, E.P. Turtle, A.R. Vasavada, J. Veverka, R. Wagner, R.A. West. 2005. Cassini imaging science: Initial results on Saturn's atmosphere. *Science* **307**, 1243-1247.

Porco, C.C., R.A. West, A. McEwen, A.D. Del Genio, A.P. Ingersoll, P. Thomas, S. Squyres, L. Dones, C.D. Murray, T.V. Johnson, J.A. Burns, A. Brahic, G. Neukum, J. Veverka, J.M. Barbara, T. Denk, M.W. Evans, J.J. Ferrier, P. Geissler, P. Helfenstein, T. Roatsch, H. Throop, M.S. Tiscareno, A.R. Vasavada. 2003. Cassini imaging of Jupiter's atmosphere, satellites, and rings. *Science* **299**, 1541-1547.

PROFESSIONAL MEMBERSHIPS

International Astronomical Union
American Geophysical Union
American Astronomical Society