

# Robert P. Olling: Curriculum Vita, February 2018

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## CURRENT POSITION

Dept. of Astronomy, University of Maryland,  
Visiting Assistant Research Scientist

02/17 – present

## EDUCATION

**Columbia University**, New York, Ph.D. in Astronomy 10/95  
**Dissertation Title:** “The Shape of Dark Matter Halos”  
**Dissertation Adviser:** Professor Jacqueline van Gorkom  
**Columbia University**, New York, M.Phil. in Astronomy 10/93  
**Groningen University**, the Netherlands, M.Sc. in Astronomy 7/86

## HONORS AND AWARDS

USRA’s ”Navy Programs Programmatic Excellence Award (2002)”

## Positions Held

**University of Maryland**, Research Associate 05/2006–02/2017  
**University of Maryland**, Visiting Research Associate and **USRA** 9/05–04/06  
**USRA**, Research Scientist 9/05–1/06  
**USRA/USNO**, Research Scientist 9/00–9/05  
**Rutgers University**, Postdoctoral Researcher (8/98-1/00) and Research Associate 1/00–7/00  
**Southampton University**, Postdoctoral Research Fellow 10/95–8/98

## SUMMARY

Numerous research interests & experience: Kepler-based discovery of low-level variability in AGN and supernovae and ground-based follow up. Leader of team that is proposing a AGN/SN survey for the second Kepler mission (K2). This project has the ability to provide the ultimate calibration of SN Ia. Previously: near-earth asteroid searches, transiting exoplanets, nearby stars, binary stars, structure and dynamics of the Milky Way, dynamics of spiral galaxies, galaxy-thickness determination, shapes of dark matter halos, extra-galactic distance scale and cosmology.

Many research grant proposals as PI: eight accepted, six with funds (602k\$). Several grant proposals as Co-I. Served on NSF and NASA grant proposal review panels and the “Review of EPOXI and Comet Data panel.”

Nine “White Papers:” one for Kepler two-gyro mode (2013), five for the ASTRO 2010 Decadal Survey (*one first author*, and three for the Extrasolar Planet Task Force (2007) *2 single author*).

Contributions to the “SIM Book” (SIM-Lite Asdtrometric Observatory, 2009)

Over one hundred papers and conference proceeding with 1,488 citations to 22 refereed publications, plus one accepted for publication in *Nature*. These papers have a high total normalized citation rate ( $=\sum_i \#citations_i / \#authors_i$ ) of 618

and a high total citation rate of 67.6 per paper. Google Scholar reports an h-index of 19 and an i10 index of 23. Of these papers, more than one-third are first authored. Contributed to nine (9) white papers of which 4 first author, of which 2 single author.

Refereed 30+ scientific papers and observing proposals.

Thirty-four invited colloquia, four invited talks, six public lectures, two radio interviews and several press releases.

Well positioned to take advantage of ESA's "Mission to the Milky Way" (Gaia, 22 month parallax release in April 2018).

Experience in space-mission design for high-cadence photometry and astrometry: cost analysis for MIDEX missions and trade offs between engineering and science requirements.

Teaching experience: taught 9 (2) courses for (non-science) undergraduate students.

Mentored seven (7) students in total. **3** high school students: summer projects; **2** graduate students: 2<sup>nd</sup> year project; one graduate student for masters thesis; **1** computer-science major research project (ASTR498) [this student used to be in my ASTR300 class]; **1** graduated student (astronomy minor; computer science major; recruited from my A300 class) on a project to help him gain practical experience in programming, data reduction and astrometry.

Several years experience in (crowded-field) photometry: 2MASS, GALEX, HST, Kepler, Deep Impact & STEREO.

20+ years Analysis & Software Experience for: medium-sized catalogs, optical & radio, imaging and spectroscopic data. Wrote over 700,000 lines of computer code (470,000 in IDL) for numerous specialized research projects including several data processing pipelines. Extensive experience in vectorization and parallelization of IDL code.

## **RESEARCH EXPERIENCE**

**University of Maryland**, Research Associate

05/2006–present

- White paper for extra-galactic research with Kepler in 2-gyro mode: AGN and SNe discovery/characterization (with Shaya & Mushotzky *et al.*; 2013)
- "New AGN, Supernovae & Supernova Impostors in the Kepler Field" Kepler Cycle 5 proposal (with Shaya & Mushotzky; 2013)
- "Millimagnitude Variability of Galaxies in the Kepler Field, Going for the Break:" follow up for low-variability AGN Kepler Cycle 4 program (with Shaya & Mushotzky; 2012)
- "Millimagnitude Variability of Galaxies in the Kepler Field," a search for low-variability AGN. Kepler Cycle 3 program (with Shaya & Mushotzky; 2011)
- "Search for Transiting Exoplanets Orbiting Bright Stars Using STEREO Data" Submitted/declined "Origins of Solar Systems" proposal (PI, Tsvetanov; 2012).
- "Deep Impact 3" Submitted/declined to "Planetary Mission Senior Review- 2012" proposal (PI, A'Hearn).
- "Wide Binaries and Escaped Binary Components in the Solar Neighborhood." Submitted/declined NSF proposal & 2011 ApJS paper.

- "Astrometry of Stars & Galaxies in the Kepler Field." Kepler Cycle 2 proposal.
- "The GALEX Extragalactic Star (GES) Catalog: a multi-wavelength investigation of extragalactic stars resolved by GALEX." Awarded GALEX Cycle 6 grant.
- FIVE White Papers for the ASTRO 2010 Decadal Survey, **ONE first author**:  
"An Era of Precision Astrophysics: Connecting Stars, Galaxies and the Universe"
- Contributor to the "SIM Book,"
  - Chapt. 1** Co-author
  - Chapt. 3** Co-author
  - Chapt. 10.1.1** Co-author
  - Chapt. 6** Author, "Luminosity-Independent Distances"
  - Chapt. 13.1** Co-author, "Searching for Solar System Giant Analogs"
  - Chapt. 13.2** Co-author, "Using Rotational Parallaxes to Estimate 1% Luminosity-Independent Distance to Nearby Galaxies"
- Member of the SIM/GAIA Synergy Group (-2011)
- Extra-galactic Astrometry: Member of the SIMDOG SIM Key Project (PI, Shaya; 2000-2011)
- Three White Papers for the "ExtraSolarPlanet Task Force" (2007)
  - **Olling R.P.**, "How to detect Solar-System Analogs amongst other stars"  
(Also: *SIM Science Studies Research Grant*)
  - **Olling R.P.**, "Astrometric distance determination of external galaxies to 1%"  
(Also: *SIM Science Studies Research Grant*)
  - Hajian, **Olling R.P.**, Behr & Cenko, "Hunting for Earth-Mass Exo-Planets with the Dispersed Fourier Transform Spectrometer"
- The importance of  $H_0$  for characterizing dark energy
- HI-based self-consistent mass models of the Milky Way

**University of Maryland**, Visiting Research Associate and **USRA** 9/05–04/06

- Studies of binarity among Hipparcos stars
- Dark Matter Halo Shapes from Flaring Gas Layers

**USRA**, Research Scientist 9/05–1/06

- Analyze 2MASS Red-Clump stars to determine  $R_0$  (**NASA/ADP grant**);
- Preliminary design for a MIDEX-class space mission to identify 10,000 transiting planets

**USRA/USNO**, Research Scientist 9/00–9/05

- Critical participant in dispersed Fourier Transform Spectrograph project (PI Hajian)
- Many aspects of proposed US astrometric missions
  - Draft of substantial part of the science case for the AMEX & OBSS missions
  - Minimize overlap with ESA's GAIA mission
  - Starformation and assembly history of the Milky Way: "near-field cosmology."
  - Content of OBSS catalogs as a function of magnitude and astrometric accuracy
  - Temporal characteristics of the FAME, AMEX and OBSS missions
  - Discovered OBSS' utility in discovering transits of extra-solar giant planets
  - OBSS' capability to discover a significant number of potentially hazardous asteroids
- Participated in USNO's TPF activities
- Astrometric signatures of binarity in the Hipparcos catalog.

**Rutgers University**, Postdoctoral Researcher (8/98-1/00) and Research Associate 1/00–7/00

- Large-scale software development: reduce and analyze HST-STIS spectroscopy
- Three Space Interferometry Mission grant proposals:
- Unraveling the inter-relations between luminous, dusty and dark matter in M31
- The time-evolution of the disk-halo conspiracy: rotation curves of high-redshift galaxies
- HI widths and kpc-scale structure in galactic dark matter distributions
- HI gas layer widths and the shape of dark matter halos
- Disk mass of NGC 2403 from stellar velocity dispersions and HI width measurements
- The radial density profiles of luminous and dark matter in spirals

**Southampton University**, Postdoctoral Research Fellow 10/95–8/98

- Determined the Galactic constants from Oort constant constraints [ $R_0 \sim 7.1$  kpc]
- Determined the shape (almost round) of the Milky Way's dark matter halo
- Use self-consistent mass models to predict  $\mu$ -lensing rates towards the Galactic bulge
- Determined the Oort constants from the Tycho/ACT catalogue

**Columbia University**, Dissertation Research 1/90–9/95

- Developed new methods to determine the thickness of the gas layer from the full HI spectral line cube.
- Developed self-consistent mass models to determine the shape of dark matter halos.
- Found that NGC 4244's dark halo is extremely flattened

**NRAO**, Socorro, Visiting Researcher Summers of 1991–1994

- Acquired, reduced and analyzed VLA HI spectral line data

**Netherlands Foundation for Research in Astronomy**, Summer Research Fellowship 1990

- Data reduction of HI spectral line cubes

**Space Research Organization of the Netherlands**, Scientific Consultant 9/86–12/89

- Designed and implemented software to extract spectra of faint and/or extended sources from the IRAS-LRS database
- Sorted LRS all-sky spectrometer data from time-based to POSS-based system

**Groningen University**, M.Sc. thesis 1984–1986

- Wrote software to analyze the IRAS point source catalogue
- Obtained long-slit and Echelle spectra of PN (candidates) at La Silla observatory (ESO)
- Determined IRAS-FIR fluxes for the "Polar Ring Catalogue"

## **OBSERVING EXPERIENCE**

**Optical Fourier Transform Spectroscopy:** USNO's 11 and 24" telescopes

**Radio**, VLA, HI spectral line synthesis imaging (PI, hundreds of hours on-site)

**Mid Infra-red**, IRAS low resolution spectrograph

**Near Infra-red imaging**, Calar Alto, 3.5m (CoI, 2 nights)

**Optical spectroscopy** ESO, 1m (long slit, 4 nights), ESO CAT (Echelle, 3 nights), WHT (long slit; PI 6 nights)

**Optical imaging** INT, 2m: BVR wide field imaging (PI, 3 nights)

## **FELLOWSHIPS**

**Columbia University**, Research Fellowship 6/91- 9/95

**Columbia University**, Teaching Fellowship 1/90- 5/91

**Netherlands Foundation for Research in Astronomy** Summer Research Fellowship 1990

**GRANT PROPOSALS (PI)**

**Selected**, eight, for a total of 602.4 k\$

UMd, 2013, “New AGN, Supernovae & Supernova Impostors in the Kepler Field” **Olling (PI)**, Shaya & Mushotzky; NASA/KEPLER-GO5. Selected, but not awarded due to cancellation of the Kepler GO5 program

UMd, 2012, “Millimagnitude Variability of Galaxies in the Kepler Field: Going for the Break,” **Olling (PI)**, Shaya & Mushotzky; NASA/KEPLER-GO4, ~78.4

UMd, 2011, “Millimagnitude Variability of Galaxies in the Kepler Field,” **Olling (PI)**, Shaya & Mushotzky; NASA/KEPLER-GO3, ~128k\$

UMd, 2010 ( 0 k\$). “Astrometry of Stars & Galaxies in the Kepler Field” **Olling (PI)** & Shaya; NASA/Kepler-GO2

UMd, 2009 (90 k\$). “The GALEX Extra-Galactic Star Catalog,” **Olling (PI)** & Shaya; NASA/GALEX-GI/Cy6

UMd, 2008 (75 k\$). “1% Luminosity-Independent Distances to Nearby Galaxies with the Rotational Parallax Technique,” **Olling (PI)** & Shaya; NASA/SIM Science Studies

UMd, 2008 (75 k\$). “Searching for Solar System Giant Analogs with SIM PlanetQuest,” **Olling (PI)** & Shaya; NASA/SIM Science Studies

USNO/USRA/UMd (156 k\$) 2004–2008, “Galactic Structure & Dynamics from 2MASS, Tycho-2 & UCAC-2” **Olling (PI)**, NASA/ADP

**GRANT PROPOSALS (CoI)**

**Selected**:

UMd, 2013, “Kepler AGN variability studies Cycle 5,” Kepler GO5, **Edelson (PI)** et al

USRA/USNO, 2003, The Origins Billion Star Survey (OBSS) mission. Johnston (PI), ..., **Olling (Co-I/science-team member)**. NASA/JPL’s Origins Roadmap Program

**STUDENTS MENTORED**

UMd, **2013** Mentoring two computer-science major/astronomy minor: IDL to C coding.

UMd, **2013** Mentoring computer-science major research project (ASTR498)

UMd, **2011** Mentored graduate student for masters thesis

UMd, **2010** Mentored graduate student for 2<sup>nd</sup> year project

UMd, **2009** Mentored high school student for summer research project

USNO/USRA, **2005** Mentored high school student for summer research project

USNO/USRA, **2001-2004** Mentored high school student for summer research projects.

**ACADEMIC SERVICE**

<b>MNRAS/ApJ/ApJL/AJ/A&amp;A/PASJ/PATT:</b>	
Refereed 25 papers & 5 observing proposals	'98-present
<b>Some NASA panel:</b>	2014
<b>Some NASA panel:</b>	2011
<b>Intel Science Talent Search:</b> Outside review of student's entry	February 2011
<b>UMD/PDS:</b> Reviewed EPOXI data for NASA's Planetary Data System	Oct. 2010
<b>NASA/ADP:</b> Was asked to review grant proposal	August 2009
<b>AAS:</b> Panel member that recommended speakers for the 2006 AAS Winter Meeting	Apr. 2006
<b>AAAS:</b> Review contributions to the AAAS Science Journalism Awards	September 2005
<b>NSF:</b> Was asked to serve on a panel that reviews and rank grant proposals to NSF	Feb. 2004
<b>AAAS:</b> Review contributions to the AAAS Science Journalism Awards	August 2003
<b>USNO:</b> Review papers for the internal Editorial Board	2002-2004
<b>USNO:</b> Organizing loosely-formatted (pizza-lunch) research talks	2002-2005
<b>NSF:</b> Served on a panel that reviews and ranks grant proposals to NSF	March 2002
<b>Rutgers University:</b> Organized local research seminars	Fall 1999
<b>Southampton University:</b> Organized colloquium series	Spring 1998
<b>Swiss National Science Foundation:</b> Reviewed grant proposal	1996
<b>Columbia University:</b> Grad. Student Advisory Council. Departmental student rep.	'91-'92
<b>University of Groningen:</b> Student representative to the Faculty Board	1984-85

**SUMMARY OF PUBLICATIONS, PRESENTATIONS & PUBLICITY**

- Twenty two refereed papers, of which **four single authored & 4 first author.**
- One papers accepted for publication in *Nature*.
- One White Paper for the 2013 Kepler "2-gyro mission" (2013: Olling et al: "Extragalactic Science with Kepler in two Gyro Mode, a White Paper.")
- Five White Papers for the 2010 Decadal Survey (1 first author)
  - 1 Olling et al: "An Era of Precision Astrophysics: Connecting Stars, Galaxies and the Universe," an Astro2010 Science White Paper
  - 2 Shaya et al: "Properties of Dark Matter Revealed by Astrometric Measurements of the Milky Way and Local Galaxies
  - 3 Shao et al: "Astrometric Detection of Earthlike Planets"
  - 4 Jonston et al: "Is There a Need for an Improved Celestial Reference Frame ?"
  - 5 Benedict et al: "Astrometry: Challenging our Understanding of Stellar Structure and Evolution"
- Three White Papers for the ExtraSolar Planet Task Force (2007; 2 single author)
  - 1 Olling "Finding Solar System Analogs With SIM and HIPPARCOS: A White Paper for the ExoPlanet Task Force"
  - 2 Olling: "LEAVITT: A MIDEX-class Mission for Finding & Characterizing 10,000 Transiting Planets in the Solar Neighborhood"

### 3 Hajian et al: "Hunting for Earth-Mass Exo-Planets with the Dispersed Fourier Transform Spectrometer"

- Five invited oral conference contributions
- One invited conference panelist
- **78** other papers, including: **11** OBSS Technical Memorandums; **14** FAME/AMEX Technical Memorandums; **53** conference presentations, including **10 conference talks**
- **Thirty-four invited Colloquia**
- Six public lectures
- Two press releases resulting in several newspaper articles
- Two radio interviews (BBC)

## PRESENTATIONS

### INVITED CONFERENCE TALKS

- "KISS: The Kepler International Supernova Search," 2nd Kepler Science Conference, 11/2013
- "Searching for Solar System Giant Analogs with SIM," JPL/NExSci 9/2008
- "1% Luminosity-Independent Distances to Nearby Galaxies with the Rotational Parallax Technique," JPL/NExSci 9/2008
- "Rotational Parallaxes," Michelson Science Center 5/2007
- "The Shape of Dark Matter Halos," Aspen 1/1999
- "The Flattened Dark Matter Halos of NGC4244 and the Milky Way," Heidelberg 9/1996

### CONFERENCE PRESENTATIONS

- |  |                        |
|--|------------------------|
| 1/14 223 <sup>th</sup> AAS meeting, USA:   | <b>Talk</b>            |
| - "Kepler Supernovae"  |                        |
| 1/14 223 <sup>th</sup> AAS meeting, USA:   | <b>Poster Paper</b>    |
| - "Newly Discovered AGN and their Multiyear Light Curves from Kepler4"               |                        |
| 1/11 217 <sup>th</sup> AAS meeting, USA:   | <b>1 Poster Paper</b>  |
| - "Very Wide Binaries"   |                        |
| 1/10 215 <sup>th</sup> AAS meeting, USA:   | <b>1 Poster Paper</b>  |
| - "SIM Science Studies: Long-Period Planets & Rotational Parallax"                   |                        |
| 1/10 215 <sup>th</sup> AAS meeting, USA: <i>Talk by Patterson</i>                    | <b>Co-author</b>       |
| - "SIM Measurements Near and Far"  |                        |
| 1/10 215 <sup>th</sup> AAS meeting, USA: <i>Talk by Howard</i>                       | <b>Co-author</b>       |
| - "SIM Science Studies to Enhance Planet-Finding and Characterizing Capabilities"    |                        |
| 9/09 "The Milky Way and the Local Group - Now and in the Gaia Era,"                  | <b>Talk</b>            |
| - "Precision Astrophysics: Connecting Stars, Galaxies & the Universe" (Heidelberg)   |                        |
| 6/09 214 <sup>th</sup> AAS meeting, USA:   | <b>1 Poster Paper</b>  |
| - "SIM Science Studies: Dynamics of Nearby Galaxies & Long-Period Planetary Systems" |                        |
| 1/09 213 <sup>th</sup> AAS meeting, USA:   | <b>2 Poster Papers</b> |
| - "Searching for Solar System Analogs with SIM"                                      |                        |
| - "Rotational Parallax: A SIM Science Study"   |                        |
| 5/08 STScI Symposium "A Decade of Dark Energy,"                                      | <b>1 Poster Paper</b>  |
| - "Astrometry, Precision Astrophysics, H0 & (some) Cosmology:"                       |                        |

- A Connection between Stars, Galaxies and the Universe”
- 1/08 211<sup>th</sup> AAS meeting, USA: **1 Poster Paper**  
 - “The distance to the Galactic Center from Red Clump Giants”
- 1/06 207<sup>th</sup> AAS meeting, USA: **2 Poster Papers**  
 - “The Milky Way: A Connection between Stars, Galaxies and the Universe”  
 - “The Dispersed Fourier Transform Spectrometer - Toward Earth-Mass Planet Detection”
- 1/05 206<sup>th</sup> AAS meeting, USA: **1 Poster Paper**  
 - “VLA Imaging of the SiO Maser Emission Toward AGB Stars:  
 SIM PlanetQuest Preparatory Science”
- 10/04 Flagstaff, USA, “Astrometry in the Age of Large Telescopes;” **1 Poster Paper**  
 - “Astrometric Binaries in the Age of the Next Generation of Large (Space) Telescopes”
- 5/04 Uni. of California, Berkeley, USA, “Wide Field Imaging From Space;” **1 Poster Paper**
- 1/04 203<sup>rd</sup> AAS meeting, USA: **1 Poster Paper**  
 - “Binarity and the Fine-Print in the Hipparcos Catalogs:  
 Revised Distance Scale?, More Binaries in the Solar Neighborhood”
- 10/03 Uni. of Maryland, USA, “The search for Other Worlds;” **1 Poster Paper**  
 - “The AMEX Astrometry Mission: An Effective ExtraSolar Planet Finder”
- 6/03 Boston University Surveys of the Milky Way: **1 Poster Paper**  
 - “Oort’s Constants Measured from Proper motions:  
 Solid Evidence for an Asymmetric Galactic Potential”
- 1/03 201<sup>th</sup> AAS meeting, USA: **3 Poster Papers**  
 - “Photometric Detection of Hot-Jupiters with a FAME-like Space Astrometry Mission”  
 - “Precision Astrophysics with a FAME-like Space Astrometry Mission”  
 - “Stellar Mass-to-Light Ratios and Rotation Curves of Spiral Galaxies”
- 1/02 199<sup>th</sup> AAS meeting, USA: **2 Poster Papers**  
 - “FAME Astrometry of Faint Objects and the Kinematics of the Galaxy”  
 - “Full-sky Astrometric Mapping Explorer (FAME) Rescope Activities”
- 7/01 “Challenges for Photometry and Spectrometry with GAIA;” **Talk**  
 - “FAME: Precision Astrometry, Photometry & Astrophysics”
- 2/01 WAS Winter meeting, USA **1 Poster Paper**
- 1/01 197<sup>th</sup> AAS meeting, USA **1 Poster Paper**  
 - “One Percent Distances to Local Group Galaxies via Rotational Parallaxes”
- 6/00 196<sup>th</sup> AAS meeting, USA **2 Poster Papers**  
 - “Dynamical modeling of M32 with stellar kinematics from STIS”  
 - “Kinematical Results for NGC2841, NGC4552, and M87”
- 1/00 195<sup>th</sup> AAS meeting, USA **3 Poster Papers**  
 - “Kinematical Black Hole Results for NGC2841, NGC4552, and M87”  
 - “STIS Observations of the Center of M32”  
 - “Oort’s Constants Measured from the Tycho/ACT Catalogue”
- 9/99 “Black Holes in Binaries and Galactic Nuclei,” ESO: **Talk**  
 - “Black Hole Results from STIS”
- 6/99 194<sup>th</sup> AAS meeting, USA **2 Poster Papers**  
 - “New Black Hole Results from STIS”



- "The Origin of the Black Hole in M87"
- 7/99 "Galaxy Dynamics," Paris, France **1 Poster Paper**
- "New Black Hole Results from STIS"
- 10/98 "Galactic Dynamics," Rutgers, USA **1 Poster Paper**
- "The Shape of the Milky Way's Dark Halo"
- 1/98 191<sup>th</sup> AAS Meeting, USA: **Talk**
- "The Case for a Leaner Milky Way"
- 7/97 "Galactic Halos," Santa Cruz, USA **2 Poster Papers**
- "The Shape of the Milky Way's Dark Halo"
- "Refining the Oort Constants: The Case for a Smaller Milky Way"
- 4/97 NAM, UK **1 Poster Paper**
- "The shape of the Milky Way's Dark Matter Halo"
- 7/96 "Dark & Visible Matter in Galaxies & Cosmological Implications," Sexto/Italy **Talk**
- 4/96 NAM, UK **1 Poster Paper**
- "The Highly Flattened Dark Matter Halo of NGC 4244"
- 1/96 187<sup>th</sup> AAS Meeting, USA **Thesis Talk**
- "The Highly Flattened Dark Halo of NGC 4244"
- 1/95 185<sup>th</sup> AAS Meeting, USA **1 Poster Paper**
- "Flaring gas layers : A tool to determine the shape of dark matter halos"
- 10/94 "Maryland Astrophysics Conference on Dark Matter," USA **1 Poster Paper**
- "The Shape of the Dark Matter Halo of NGC 4244"
- 6/93 182<sup>th</sup> AAS meeting, USA **1 Poster Paper**
- "The shape of the dark matter halo of NGC 4244"
- 6/92 "Teton Summer School on Astrophysics," USA **1 Poster Paper**
- "The Effects of Flaring in HI on the Observed Velocity Field of Spirals"
- 89 Netherlands Astronomy Meeting **1 Poster Paper**

**INVITED COLLOQUIA**

- 5/09** GWU, Fairfax, VA "Connecting Stars (their planets), Galaxies and the Universe in the Decade of Astrometry"
- 3/09** PALS, College Park, MA "Astrometric & Photometric Detection & Characterization of (massive) Extrasolar Giant Planets"
- 1/09** GSFC, Greenbelt, MA "Astrometric & Photometric Detection & Characterization of (massive) Extrasolar Giant Planets"
- 10/07** NRAO Charlottesville/UVa, VA "Astrometry, Precision Astrophysics,  $H_0$  & (some) Cosmology: Connecting Stars, Galaxies and the Universe"
- 10/05** Uni. of Maryland, College Park, MD "Astrometry of the Milky Way & Co"
- 3/01** Uni. of Maryland, College Park, MD "Size, Mass & Shape of the Milky Way"
- 9/01** Uni. of Massachusetts, Amherst, MA "Size, Mass & Shape of the Milky Way"
- 3/01** NRAO, Greenbank, WV "The Case for a Leaner Milky Way"
- 5/00** Am. Museum of Nat. History, NY "The Case for a Leaner Milky Way"
- 4/00** USNO, Washington "Size, Mass & Shape of the Milky Way"
- 1/00** Berkeley "Size, Mass & Shape of the Milky Way"

1/00	LLNL-IGPP			“Size, Mass & Shape of the Milky Way”
10/99	Rutgers University			“The Shape of Dark Matter Halos”
9/99	NRAO, Charlottesville			“Size, Mass & Shape of the Milky Way”
7/99	MPIA, Heidelberg, Germany			“Size, Mass & Shape of the Milky Way”
2/99	Yale University			“Size, Mass & Shape of the Milky Way”
4/98	Princeton University		4/98	Columbia University
4/98	STScI		2/98	Imperial College, UK
1/98	OAN, Alcalá, Spain		10/97	Rutgers University
10/97	Uni. of Brighton, UK			“The Shape of Dark Matter Halos”
10/97	Uni. of Groningen, NL			“The Shape of Dark Matter Halos” (SDMHs)
5/97	IAP, Paris, France	“SDMHs”	1/97	IAC, Tenerife, Spain “SDMHs”
10/96	Uni. of Hertfordshire, UK	“SDMHs”	6/96	Uni. of Durham, UK “SDMHs”
5/96	Uni. of Groningen, NL	“SDMHs”	5/96	Uni. of Liverpool, UK “SDMHs”
2/96	NMSU, Las Cruces	“SDMHs”	10/95	IAA, Granada, Spain “SDMHs”
9/95	Columbia University	“SDMHs”	1/95	NRAO, Socorro “SDMHs”

## EDUCATION AND PUBLIC OUTREACH ACTIVITIES

### PUBLIC LECTURES

The National Capital Astronomers Open House: College Park, USA	10/09
Open House: Metzgerot Observatory, UMd, College Park, USA	1/09
Amateur Astronomers Association, Princeton, USA	12/98
American Museum of Natural History, New York, USA	10/98
Hampshire Amateur Astronomical Society, Southampton, UK	6/98
Amateur Astronomical Society of the Isle of Wight, UK	6/98

### PUBLICITY & INTERVIEWS

“BBC World Service,” Radio Interview for “Discovery” (UK)	4/14/97
“BBC Solent,” Radio Interview (UK)	4/97
“El País” reported on: “3 Dimensional Structure of the Dark Matter” (Spain)	4/10/97
“Science Now” reported on: “The Milky Way’s Dark Shell” (USA)	4/9/97
“The Independent” reported on: “The Dark Side of the Milky Way” (UK)	4/9/97
“The Independent” Leading Article inspired by “...the enormously abstruse calculations disclosed yesterday in Southampton [by Olling & Merrifield] ...” (UK)	4/9/97
“Royal Astronomical Society,” Press Release (UK)	4/7/97

### PRESS RELEASES

USNO Press Release, 2005 AAS Winter Meeting: “Star Companions Rule” **Olling R.P.**  
 RAS Press Release, 1997: “Viewing the Milky Way through Dark Matter Glasses.”

[http://ad.usno.navy.mil/~olling/Publicity/nam97\\_MW.html](http://ad.usno.navy.mil/~olling/Publicity/nam97_MW.html)

**Olling R.P.**, Merrifield M.R.

### SCIENCE EDUCATION PROGRAMS

Outside referee for Intel’s Science Talent Search	2/2011
Project “ASTRO NOVA”	9/98-04/00
Woodrow Wilson Middle School, Edison, NJ. Bringing hands-on astronomy to the classroom ( <a href="http://www.raritanval.edu/planetarium/astro/astronova.htm">http://www.raritanval.edu/planetarium/astro/astronova.htm</a> ).	

## **PROGRAMMING & SYSTEM DEVELOPMENT EXPERIENCE**

I have over thirty years experience in developing software and several pipeline-like data reduction systems for various data sets. I have worked extensively on image data, hyper-spectral data (radio “cubes”), spectra, catalogs, model development and general astrophysics problems. I have extensive experience in using (reading & writing) the Flexible Image Format (FITS) as related to the projects above. All in all, I have written over 700,000 lines of code (about one-half in compiled languages, the rest in IDL).

A large part of the work I have done in my astronomical career involved the development of **new** software, both for my own research and as support for the astronomical community. The emphasis of my coding lies on the legibility, modularity, adaptability, portability and recycling of the routines. Typically, I use FITS as a standard data format for storing images and multi-dimensional data and ASCII tables for 1D results. In summary, I have extensive experience with designing (FORTRAN, C, PASCAL, IDL, SM) and using algorithms and image processing systems (AIPS, GIPSY, IDL).

While at Umd and before that USNO, I have worked extensively with catalogs and data bases, to collect most known information about a given set of sources such as GALEX sources in nearby galaxies, binary stars, or the Kepler Input Catalog (KIC). For example, the combination if the KIC, USNO, KIS, UBV, 2MASS, and WISE data allowed me to develop a robust method to identify galaxies and AGN in the Kepler field.

Since I have been at the University of Maryland, I worked on 1) GALEX data analysis (imaging & catalog), 2) HST/ACS/WFPCII, STEREO, GALEX & Kepler image analysis, star/galaxy counts, extra-galactic proper motions (M31 & Omega Centaurus), 3) extra-solar planets: LEAVITT survey for 10,000 transiting planets (EXOP-TF white paper), 4) finding long-period extra-solar planets (solar system analogs) with SIM & HIPPARCOS (EXOP-TF white paper), 5) Effects of improved  $H_0$  on equation of state of dark energy, 6) combined 2MASS JHK &  $B_T$  and  $V_T$  Tycho-2 photometric catalogs, 7) extracting the  $b = \pm 20$  deg strip from the 2MASS catalog and importing the results into IDL save-files, 8) find short-period binary systems in the HIPPARCOS & TYCHO-2 catalogs, 9) find new common-proper motion pairs in the HIPPARCOS & TYCHO-2 catalogs, 10) effects of non-steady state galactic dynamics on the “observables,” 11) to analyze the azimuthal dependence of the thickness of the Galactic HI layer, 12) et cetera.

I have spent a very large effort in writing my IDL code for obtaining as fast execution as possible. This means that I write my loops such as to optimally use IDL’s vector processing capabilities. Notwithstanding the fast execution of my IDL routines, they are not quite fast enough for the big research projects that I am working on. So, during the last year I have been working with two of my students work on software projects to facilitate the incorporation of compiled language (C) routines into my IDL software library.

While at Rutgers University (NJ), I completed a data analysis package ( $\gtrsim 27,000$  lines) for the HST long-slit spectrograph. This package is superior to the standard routines in that we designed

it specifically to handle both the under-sampling of the spatial PSF and the presence of numerous cosmic rays.

My dissertation work at Columbia University (NY) required a large amount ( $\gtrsim 60,000$  lines) of new software to: 1) analyze high-resolution HI spectral line data, and 2) to determine the 2D potentials for model galaxies, so that their properties can be compared with the observations.

While at Columbia University, I was, in effect, the assistant to the system manager. There, I learned the basic skills to run networks of UNIX systems. I was responsible for installing and maintaining several software packages (e.g., AIPS, GIPSY and SM). I wrote a “security script” which checks whether CPUs are “alive”. This program proved effective enough to satisfy the insurance company’s requirements for security against theft. I was also part of the committee which plans the future development of computational resources in the department. In many aspects I served as a front-end to relieve our part-time system manager from the many small problems the computer users frequently faced. At my current institution, I am again responsible for maintaining the IDL package. In my previous position at the University of Southampton, I continued being responsible for general astronomy software packages: AIPS, GIPSY, and SM.

## BIBLIOGRAPHY & PRESENTATIONS

Some of my publications can be obtained electronically at:

<http://www.astro.umd.edu/~olling/RecentPapers.html>, and and ADS:

According to ADS, my 18 refereed papers have 1,231 citations (68.4/paper as per 06/24/2014; 29/paper/author), and a normalized citation rate of 522 (from ADS). According to “Google Scholar,” my papers have 1,388 citations, with an h-index of 16 and an i10 index of 19.

### REFEREED PUBLICATIONS

- Shaya, E.J. & **Olling, R.P.**, “Very Wide Binaries and Other Comoving Stellar Companions: A Bayesian Analysis of the Hipparcos Catalogue” 2011, ApJS, 192, 2
- Unwin, S. C., ..., **Olling, R.P.**, and 34 co-authors, “Taking Measure of the Universe: Precision Astrometry with SIM PlanetQuest” 2008, PASP, 120, 38
- **Olling, R.P.**, “Accurate Extra-Galactic Distances and Dark Energy: Anchoring the Distance Scale with Rotational Parallaxes,” 2007, MNRAS, 378, 1385
- Hajian, A.R., Behr, B., Cenko, A., **Olling, R.P.**, and 14 co-authors, “Initial Results from the USNO Dispersed Fourier Transform Spectrograph,” 2007, ApJ, 661, 616
- Johnston, K. J., Dorland, B., Gaume, R., Hennessy, G., **Olling, R.**, and 29 co-authors, “The Origins Billions Star Survey: Galactic Explorer,” 2006, PASP, 118, 1428
- Makarov, V., **Olling, R.P.**, Teuben, P.J., “Stellar Associations at Large: I. The Epicycle Approximation and the Convergent Point Method,” 2004, MNRAS, 352, 1199
- **Olling, R.P.**, Dehnen, W., “The Oort Constants Measured from Proper Motions,” 2003, ApJ, 599, 275
- Salim, S., Gould, A., **Olling, R.P.**, “Astrometry Survey Missions Beyond the Magnitude Limit,” 2002, ApJ, 573, 631
- **Olling, R.P.**, Merrifield, M.R., “Luminous and Dark Matter in the Milky Way,” 2001, MNRAS, 326, 1
- Joseph, C., Merritt, D., **Olling, R.P.**, Valluri, M., Bender, R., and the STIS IDT, “The Nuclear Dynamics of M 32 I. Data and Stellar Kinematics,” 2001, ApJ, 550, 668
- **Olling, R.P.**, Merrifield, M.R., “Two Measures of the Shape of the Dark Halo of the Milky Way,” 2000, MNRAS, 311, 361
- **Olling, R.P.**, Merrifield, M.R., “Refining the Oort and Galactic Constants,” 1998a, MNRAS, 297, 943
- **Olling, R.P.**, “The Highly Flattened Dark Matter Halo of NGC 244,” 1996, AJ, 112, 481
- **Olling, R.P.**, “NGC 4244: A Low Mass Galaxy with a Falling Rotation Curve and a Flaring Gas Layer,” 1996, AJ, 112, 457
- **Olling, R.P.**, “On the Usage of Flaring Gas Layers to Determine the Shape of Dark Matter Halos,” 1995, AJ, 110, 591
- Whitmore, B.C., Lucas, R.A., McElroy, D.B., Steinman-Cameron, T., Sackett, P.D., & **Olling, R.P.**, “New Observations & Photographic Atlas of Polar-Ring Galaxies,” 1990, AJ, 100, 5
- García-Lario, P., Manchado, A., Pottasch, S.R., Suso, J., and **Olling, R.**, “Near Infrared Survey of IRAS Sources with Colours Like Planetary Nebulae. II,” 1990, A&AS, 82, 497
- Pottasch, S.R., Bignell, C., **Olling, R.**, and Zijlstra, A.A., “Planetary Nebulae near the Galactic Center,” 1988, A&A, 205,

### IN PREPARATION

- **Olling, R.P.**, Shaya, E.J., Mushotzky, R., 2013, to be submitted to Nature "The Discovery and Extensive Light Curves of 4 Supernovae with Kepler"
- **Olling, R.P.**, Shaya, E.J., Mushotzky, R., et.al. 2013, to be submitted to Nature, "Kepler Supernovae"
- **Olling, R.P.**, Shaya, E.J., Mushotzky, R., 2014, to be submitted, "New AGN Candidates Identified Through Kepler Variability"
- **Olling, R.P.**, Shaya, E.J., Mushotzky, 2014, to be submitted, "Long-Term Stable Kepler Photometry."

### OTHER PUBLICATIONS

- **Olling R.P.**, Shaya, E.J., Mushotzky, R., Rest, A., Tucker, B.E., Kasen, D. & Margheim, S.J. "Kepler Supernovae," 2014, AAS Abstracts, 223, #316.02
- Shaya, E.J., **Olling R.P.** & Mushotzky, R., "Newly Discovered AGN and their Multiyear Light Curves from Kepler," 2014, AAS Abstracts, 223, #421.07
- **Olling, R.P.**, Tucker, B., Shaya, E., Fillipenko, A., Garnavich, P., Kasen, D., Rest, A., Rhodes, J., Tonry, J., Mushostsky, R., Margheim, S.  
"Extragalactic Science with Kepler in two Gyro Mode, a White Paper."  
2013, A **White Paper** for NASA's "Call for White Papers: Soliciting Community Input for **Alternate Science Investigations for the Kepler Spacecraft.**"  
see: [http://keplerscience.arc.nasa.gov/docs/WhitePapers/Olling\\_WhitePaper.pdf](http://keplerscience.arc.nasa.gov/docs/WhitePapers/Olling_WhitePaper.pdf)
- **Olling R.P.** & Shaya, E.J. "Very Wide Binaries," 2011, AAS Abstracts, 217, #144.08
- **Olling R.P.** & Shaya, E.J. "SIM Science Studies: Long-Period Planets & Rotational Parallax" 2010, BAAS, 42, 570
- Patterson, R. J., Anglada, G., Kaplinghat, M., Kuchner, M. J., & **Olling, R.** 2010, BAAS, 42, 597
- Howard, A., Ford, E., Gaudi, B. S., **Olling, R.**, Subasavage, J., & Tanner, A. 2010, BAAS, 42, 596
- **Olling R.P.** & Shaya, E.J. "SIM Science Studies: Dynamics of Nearby Galaxies & Long-Period Planetary Systems" 2009, AAS, 21441107
- **Olling R.P.** and 16 co-authors, "An Era of Precision Astrophysics: Connecting Stars, Galaxies and the Universe,"  
2009, **Astro2010 Science White Paper**, #226 (2009arXiv0902.3197O)
- Shaya E., **Olling R.P.**, and 19 co-authors, "Properties of Dark Matter Revealed by Astrometric Measurements of the Milky Way and Local Galaxies,"  
2009, **Astro2010 Science White Paper**, #274 (2009astro2010S.274S)
- Shao, M., et al. ... **Olling R.P.**, ... and 13 co-authors  
"Astrometric Detection of Earthlike Planets,"  
2009, **Astro2010 Science White Paper**, #271 (2009astro2010S.271S)
- Johnston K.J., ... **Olling R.P.** & 10 co-authors, "Is There a Need for an Improved Celestial Reference Frame ?"  
2009, **Astro2010 Science White Paper**, #143 (2009astro2010S.143J)
- Benedict G.F., Henry T.J. & **Olling R.P.**  
"Astrometry - Challenging our Understanding of Stellar Structure and Evolution,"  
2009, **Astro2010 Science White Paper**, #17 (2009astro2010S..17B)
- **Olling R.P.** & Shaya, E.J., "Searching for Solar System Analogs with SIM,"  
2009, BAAS, 213, 455.04
- Shaya, E.J. & **Olling, R.P.**, "Rotational Parallax: A SIM Science Study,"  
2009, BAAS, 213, 455.13

- **Olling, R.P.**, “The distance to the Galactic Center from Red Clump Giants,” 2007, AAS, 211.1403O
- **Olling R.P.**, “Finding Solar System Analogs With SIM and HIPPARCOS,” **A White Paper for the Extrasolar Planet Task Force.**, 2007arXiv0704.3059O
- **Olling R.P.**, 2007, “LEAVITT: A MIDEX-class Mission for Finding & Characterizing 10,000 Transiting Planets in the Solar Neighborhood”, **A White Paper for the Extrasolar Planet Task Force (EXOETF)**, 2007arXiv0704.3072O
- Hajian,**Olling R.P.**, Behr & Cenko “Hunting for Earth-Mass Exo-Planets with the Dispersed Fourier Transform Spectrometer”, 2007, **A White Paper for the EXOETF.**
- Hajian *et al.* & **Olling R.P.**, “The Dispersed Fourier Transform Spectrometer - Toward Earth-Mass Planet Detection,” 2006, AAS, 68.13
- **Olling R.P.**, “The Milky Way: A Connection between Stars, Galaxies and the Universe,” 2006, AAS, 133.02
- **Olling R.P.**, “Astrometric Binaries in the Age of the Next Generation of Large (Space) Telescopes,” 2005, ASPC, 338, 272
- Boboltz, D. A., *et al.* & **Olling R.P.**, “VLA Imaging of the SiO Maser Emission Toward AGB Stars: SIM PlanetQuest Preparatory Science,” 2005, ASPC, 338, 46,
- Johnston K.J., *et al.* & **Olling R.P.**, “The Origins Billion Star Survey (OBSS): Galactic Explorer,” 2005, ASPC, 338, 46

My 25 unpublished *FAME/AMEX/OBSS* technical memoranda listed below can be found at: [http://www.astro.umd.edu/~olling/index\\_1.htm#My\\_Astrometry](http://www.astro.umd.edu/~olling/index_1.htm#My_Astrometry)

Here I only give the title of the memos single-authored by me:

+ **2005**

- “Some Possible Science with OBSS”
- “OBSS Observing Modes”
- “The Astrometric Potential of Photon Counting Devices”
- “GAPS: A Ground-Based, Galactic Astrophysics Photometric Survey”
- “Radial Velocity Requirements for OBSS/GAIA”

+ **2004**

- “Bright Science with OBSS”
- “Astrometric Detection of Cold Jupiters: OBSS versus GAIA”
- “Data Rate, S/N & Spectroscopy for the OBSS-A/B/C Concepts”
- “OBSS/A & NASA’s Origin’s Research Topics: A Detailed Comparison”
- “NEAR detection & Characterization by OBSS”
- “Science Requirements & Instrument Designs for OBSS-A/B”

+ **2003**

- “Connecting the Physics of Stars, Galaxies and the Universe: AMEX Astrometry & Photometry and NASA’s Research Themes”
- “Evaluating the USNO-Flagstaff DISPIs”
- “DISPIs and/or Filters for AMEX”

+ **2002**

- “Space Astrometry: Capabilities at the SMEX, MIDEX, and DISCOVERY Class Levels”

+ **2001/2000**

- “More on FAME’s Stray Light Events”
- “Some Centroiding and A/D-conversion Results”
- “Photometric Parallaxes”
- “Astrometric & Photometric Accuracy for the Descoped FAME”
- “Two Dimensional sinc<sup>2</sup> PSFs for FAME: Centroiding Precision along the Cross-Scan Diffraction Ridge”

- “Intermediate-Band Photometric Systems for FAME Talk at GAIA/Vilnius Meeting”
- “A Proposal For Additional Photometric Bands, II; 3D Classification without a u’ band”
- “A Proposal For Additional Photometric Bands, I”
- “On FAME’s Eclipses, Occultations and Stray-Light Events” (2000)
- “On FAME’s Star Transit Rate” (2000)

Other publications, continued.

- **Olling R.P.**, “Slicing & Dicing The Binary Rate: All Stars are Binaries! (of some sort),” 2004, AAS, 205, 10.701
- Johnston K.J., *et al.* & **Olling R.P.**, “The Origins Billion Star Survey (OBSS),” 2004, AAS, 205, 05.11
- Gaume, R.A., Johnston, K.J., *et al.* and **Olling R.P.**, “AMEX: The Astrometric Mapping Explorer,” 2003. BAAS, 203, 0312
- de Jong, R.S., Bell, E.F., Courteau, S., **Olling R.P.**, 2002, AAS, 201, #13.01, “Stellar Mass-to-Light Ratios and Rotation Curves of Spiral Galaxies”
- Gaume, R.A., **Olling R.P.**, 2002, AAS, 201, #41.06, “Photometric Detection of “Hot-Jupiters” with a FAME-like Space Astrometry Mission”
- **Olling R.P.**, Gaume, R.A., 2002, AAS, 201, #41.05, “Precision Astrophysics with a FAME-like Space Astrometry Mission”
- Salim, S., Gould, A., **Olling R.P.**, 2001, AAS, 199, #91.01, “FAME Astrometry of Faint Objects and the Kinematics of the Galaxy”
- Johnston, K., *et al.*, 2001, AAS, 199, #45.04 “Full-sky Astrometric Mapping Explorer (FAME) Rescope Activities”
- Joseph C. L., Merritt D., Valluri M., **Olling R.**, The STIS IDT team, in “Dynamics of Star Clusters and the Milky Way,” ASP Conf. Series, 2001, Vol. 228. p. 464, “STIS Kinematical Results on Galactic Nuclei”
- Valluri M., Joseph C. L., Merritt D., **Olling R.**, STIS GTO, 2000e, AAS, 196, #21.11. “Dynamical modeling of M32 with stellar kinematics from STIS”
- Joseph C. L., Merritt D., **Olling R.**, Valluri M., 2000d, AAS, 196, #21.10. “Kinematical Results for NGC2841, NGC4552, and M87”
- Valluri M., Joseph C. L., Merritt D., **Olling R.**, 2000c, AAS, 195, #118.05. “STIS Observations of the Center of M32”
- Joseph C. L., Merritt D., **Olling R.**, Valluri M., 2000b, AAS, 195, #118.06. “Kinematical Black Hole Results for NGC2841, NGC4552, and M87”
- **Olling R.P.**, Dehnen W., 2000a, AAS, 195, #7.09 “Oort’s Constants Measured from Proper Motions,”
- **Olling R.P.**, Joseph C. L., Merritt D., Valluri M., ESO Astrophysics Symposia, Springer-Verlag, 2001, p. 91 “Black Holes in Binaries and Galactic Nuclei” workshop, September 1999, ESO. “Black Hole Results from STIS”
- **Olling R.P.**, Valluri M., Joseph C. L., Merritt D., 1999d, AAS, 194, #48.04. “New Black Hole Results from STIS”
- Joseph C. L., Merritt D., **Olling R.P.**, Valluri M., 1999c, AAS, 194, #48.03. “The Origin of the Black Hole in M87”
- Merritt D., Joseph C. L., **Olling R.P.**, Valluri M., 1999b, to be published in the ASP Conference Series, 1999. P. 113. “Galaxy Dynamics: from the Early Universe to the Present,” July 1999, Paris. “New Black Hole Results from STIS”
- **Olling R.P.**, Merrifield M.R., 1999a, in “Galaxy Dynamics,” Rutgers University, August 1999 (ASP, Conf. Series, Vol. 182, p. 407) “Building a self-consistent model for the Milky Way”



- **Olling R.P.**, Merrifield M.R., 1998b, in “Workshop on Galactic Halos,” Santa Cruz, August 1997 (ASP Conference Series, Vol. 136, p. 216), [astro-ph/9711157 (abcd)]. “Refining the Oort Constants: the case for a smaller Milky Way”
- **Olling R.P.**, Merrifield M.R., 1998a, in “Workshop on Galactic Halos,” Santa Cruz, August 1997 (ASP Conference Series, Vol. 136, p.219), [astro-ph/9710224 (abcd)]. “The Shape of the Milky Way’s Dark Matter Halo”
- **Olling R.P.**, Merrifield M.R., 1997c, AAS, 191, #97.02. “The Case for a Leaner Milky Way”
- **Olling R.P.**, 1997, p. 44, in the proceedings of “Aspects of Dark Matter in Astro- and Particle Physics,” Heidelberg, September 1996 (World Scientific: Eds. H.V. Klapdor-Kleingrothaus, Y. Ramachers), [astro-ph/9612018 (abcd)]. “The Flattened Dark Matter Halos of NGC 4244 and the Milky Way”
- **Olling R.P.**, 1997, in ”Dark and Visible Matter in Galaxies and Cosmological Implications,” eds. M. Persic and P. Salucci, (ASP Conference Series, Vol. 117, p. 82), [astro-ph/9610249 (abcd)]. “The Highly Flattened Dark Matter Halo of NGC 4244”
- **Olling R.P.**, Merrifield M.R., 1996, NAM, “The Shape of the Milky Way’s Dark Matter Halo,” poster paper
- **Olling R.P.**, 1995, AAS, 187, #48.05. “The Highly Flattened Dark Halo of NGC 4244”
- **Olling R.P.**, 1995, Ph.D. Thesis, “The Shape of Dark Matter Halos,” Columbia University
- **Olling R.**, van Gorkom J.H., 1995, p. 121. in: “Dark Matter,” The 5<sup>th</sup> Annual Astrophysics Conference in Maryland. “The Shape of the Dark Matter Halo of NGC 4244”
- **Olling R.**, van Gorkom J.H., 1994, AAS, 185, #25.04. “Flaring Gas Layers : A Tool to Determine the Shape of Dark Matter Halos”
- **Olling R.**, van Gorkom J.H., 1993, AAS, 182, #06.18. “The Shape of the Dark Matter Halo of NGC 4244”
- **Olling R.**, van Gorkom J.H., 1992, p. 374 in “The Evolution of Galaxies and their Environment,” NASA conf. Pub. 3190, Eds. D. Hollenbach, H.Thronson, J.M. Shull. “The Effects of Flaring in HI on the Observed Velocity Field of Spirals”
- Pottasch S.R., Ratag M.A., **Olling R.**, 1990, in “From Miras to Planetary Nebulae: Which Path for Stellar Evolution?”; Proc. of International Colloquium, Montpellier, Gif-sur-Yvette, France, Editions Frontieres, p 381. “Newly Discovered Young Planetary Nebulae”
- **Olling R.P.** & Pottasch S.R., 1989 “IRAS Luminosity function of Planetary Nebulae,” Netherlands Astronomy Meeting, Poster paper
- Lynch D.K., *et al.* & **Olling R.P.**, 1989 in “Proc. of 22nd ESLAB Symposium on Infrared Spectroscopy in Astronomy.” “IRAS LRS Spectra of Extended Objects:The Crab Nebula”
- Lynch D.K., *et al.* & **Olling R.**, 1988, AAS, 20, #07.32., “IRAS LRS Spectra of Extended Sources”

## Past, Present & Future Research

Robert P. Olling, UMd

Currently I am working on the analysis and interpretation of Kepler long-cadence data of small, distant galaxies for which we obtained data through Kepler Guest Observer programs, GO2-GO4. Below I call this the UMd AGN/SN team or project<sup>1</sup>. This is a blind survey with a threefold goal: 1) to identify low-level AGN through their optical variability (Olling Shaya & Mushotzky 2014), 2) maybe detect tidally shredded stars (by a supermassive black hole or SMBH), and 3) to search for supernovae (Olling Shaya & Mushotzky 2013). The first and last goals were successful, but we didn't survey enough galaxies to see any encounters between a star and a black hole.

The most exciting result to date is our identification of *four supernovae* for which we have measured the rising part of the light curves with exquisite time resolution and sensitivity. I note that it is very rare to have SN lightcurves with data points with a few days after explosion. For example, Bianco et al (2011), using 87 SN lightcurves, obtained during the first three years of the supernova legacy survey found a grand total of 217 V-band data points taken in the first 10 days after explosion. Our Kepler lightcurves are sampled twice per hour thus yielding 480 samples per Kepler supernova during the first ten days after explosion.

Interestingly, and in support of other recent investigations (Hayden et al. 2010; Bianco *et al.* 2011), the lightcurves of our Ia supernovae show no significant secondary features. Such features might arise from the blast wave running into a companion star (Kasen 2010). Thus, the lightcurves of our Ia candidates indicate that the precursor to SNe Ia might be “double degenerate” systems, where the donor star is also a white dwarf since we do not see evidence for excess emission (Kasen 2010) beyond what is expected from a fireball (Olling Shaya & Mushotzky 2013; Olling *et al.* 2013b).

I am leading a team that submitted a White Paper to NASA laying out a possible extragalactic science project (Olling *et al.* 2013a) with Kepler in two-gyro mode or K2. Our team has chosen to call this the “Kepler extragalactic survey,” or KEGS. KEGS would monitor 10-20 thousand galaxies with Kepler, while also employing a significant ground-based observing program. Team members Garnavich and Tucker came up with the brilliant concept of pre-followup of galaxies in the Kepler field. They selected about one hundred galaxies that were continuously monitored with Kepler. However, Kepler downloads these data up to six months after the event, so that no SN data can be collected anymore. Garnavich & Tucker just added their 100 Kepler galaxies to their list of galaxies to be regularly searched for SNe. If one would go off, the ground-based segment would characterize them, and the Kepler data would follow six months later. Unfortunately, the Kepler SN rate is just too small, and they didn't detect any SNe. For Kepler GO5, our teams decided to join forces by adding the ~800 galaxies of the UMd AGN/SN project to Garnavich & Tucker's ground-based SN search. And then Kepler died. And then the call for white papers for the Kepler-two (K2) mission came out. Our KEGS proposal for K2 is basically the UMd AGN/SN Kepler GO5 proposals, scaled up to 10-20,000 galaxies to yield 50-250 supernovae, reinforced with the Garnavich & Tucker ideas.

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<sup>1</sup>Our GO5 proposal was awarded but canceled due to the failure of Kepler's gyro.

Critical to the utility of Ia supernovae for dark energy research is our ability to fully characterize these explosions. At this point, the calibration of SNe Ia is less than perfect due to: 1) uncertainty in the absolute photometric calibration, a degeneracy between color, extinction and absolute magnitude, and their relation to the shapes of the lightcurves. The best possible science outcome for a KEGS project would occur if we can also observe the Kepler targets as part of a project that provides well-calibrated photometry. PanSTARRS would be well suited for this task. Some members of our White Paper team are associated with PanSTARRS (Rest & Tonry), and we would like PanSTARRS join Kepler in the effort to observe and calibrate Kepler SNe, but, at this time, it is not clear that this will be feasible. Other projects in which members of our team are involved with are the KAIT (Fillipenko), ATLAS (Rest & Tonry) and SkyMapper (Tucker). These projects can do part of the ground-based segment. While at STScI I plan to continue leading the KEGS project. I would hope that the close collaboration between STScI and JHU could help cement an association between Kepler and PanSTARRS to obtain the required photometry for the KEGS project, to calibrate SN Ia and to help characterize dark energy, as an ultimate goal.

Another pillar of the KEGS survey relate to the presence of SMBHs in the center of galaxies. For our Kepler GO programs we (Olling, Shaya and Mushotzky) were on the lookout for tidally shredded stars by SMBH (Magorrian & Tremaine 1999; Gezari 2012), but didn't really expect to find one due to the low frequency of occurrence (1 per 10,000 galaxies per year). We anticipate that the duration of the KEGS project would be between 0.5 and 2 times 10,000 galaxy years, and so we might expect a few such events.

Our original Kepler GO program (Olling, Shaya & Mushotzky) focused on discovering low-level active galactic nuclei (AGN) through weak optical variability. This project has taken a bit of the back seat due to the discovery of supernovae in the Kepler data. However, we estimate that such low-level AGN are hosted by 5-30% of regular galaxies. The mmag photometric accuracy of Kepler allows us to 'dig out' faint AGN washed out by the brightness of its host. For a SMBH mass of  $4 \times 10^6 M_{\odot}$  (as in our Milky Way) the Eddington (maximum) luminosity is about  $L_{Edd} = 5.2 \times 10^{44}$  erg/sec. With the total luminosity of the Milky Way of about  $L_{MW} = 10^{44}$  erg/sec, the Eddington luminosity is substantially larger than the combined output of all the stars in the Galaxy. If the SMBH shines at only a fraction  $\epsilon$  of its  $L_{Edd}$ , its brightness varies by a factor of  $f$ , and that we can recover the variability at a level of  $\alpha$  times the total luminosity. We can reach an Eddington ratio of  $\epsilon = \alpha / (f - \alpha) L_{MW} / L_{Edd}$ . With Kepler's mmag capability,  $\alpha = S/N * 0.1\%$  level. Assuming  $S/N = 5$  and  $f = 0.25$ , we can reach Eddington ratios of  $\epsilon = 5 * 0.001 / (0.25 - 0.01) * 1 / 5.2 = 0.004$  for a BH/galaxy system like the Milky Way. The Eddington ratio that our Kepler survey can reach is 50-100x smaller than is possible for ground-based surveys (e.g., Wilhite et al 2008). This work is in progress.

All our Kepler work hinges on our ability to eliminate long-term instrumental? variations that are readily visible in the lightcurves of any Kepler target. I have developed a methodology to indeed remove most of these long term variations. In fact, I find that many apparent instrumental effects are strongly mitigated by using photometric apertures that are substantially larger than Kepler's standard. Also, long term trends in the Kepler data appear to be due to the varying pathlength of the line of sight to the Kepler field through the Zodiacal cloud as the S/C orbits the Sun. After

applying these corrections, our photometry is precise to about 0.5 mmag at 17th magnitude.

Finally, I am actively providing the Kepler project team with information on the KEGS proposal that can help them to secure a follow-up to the Kepler mission.

### 1. The Evolution of the Disk-Halo Coupling

The relationship between luminous and dark matter can be recovered from the *evolution* of galaxy rotation curves. Since the dark matter assembles more quickly than the luminous matter [e.g., (Naab & Ostriker 2006)], the stellar mass fraction of a galaxy decreases with increasing redshift. My dynamical model tracks the changing stellar mass, and the effects thereof on the observable rotation curve. A galaxy that is currently dominated by luminous matter may have been DM-dominated earlier in its life (Olling 2005). To quantify the evolution of the disk-halo coupling, one needs to obtain rotation curves of galaxies with redshift between  $\sim\frac{1}{2}$  and  $\sim 2$  [e.g., (Conselice *et al.* 2004); Cassata *et al.* 2005)]. Large telescopes and high spatial ( $0''.1-0''.2$ ) and spectral resolution ( $R \gtrsim 3,000$ ) are required to resolve the rising parts of the rotation curves. Instruments like OSIRIS at Keck; (Wright *et al.* 2007) and/or space-based telescopes such as JWST are needed to obtain the required data. I would be very interested to re-invigorate this old research idea employing JWST's intergal field unit.

### 2. Technical Experience

My technical and scientific experience is vast and reflects the large number of topics I have worked on during my career. I provide an enumeration in my CV. Here I provide a very short summary.

- Substantial experience in “image processing” of both the 1st generation STIS spectra as well as space-based CCD imaging data: STEREO, Kepler, HST and Deep Impact.
- Designed part of the science case for a re-tooled Deep Impact mission, DI3: Searching for near-Earth asteroids in horseshoe and tadpole orbits.
- Some experience in S/C design and operation: presented a science case for, scoped and costed a MIDEX astro-photometric mission (LEAVITT).
- I have very extensive programming experience, with over 700,000 lines of code of which more than 1/2 in IDL. Most my research project required specialized software: no canned routines.
- Specialized in galactic dynamics, astronomy and astrometry.
- Substantial experience in astrometry, and well positioned to take advantage of the upcoming Gaia catalog.
- Vast experience in catalog use and creating value-added information to catalogs: photometric transformations, cross-correlation and combination of catalog.
- Expert in analysis of HI spectral line data

## REFERENCES

- Olling, R.P.**, Shaya, E.J., Mushotzky, R., 2014, to be submitted, "New AGN Candidates Identified Through Kepler Variability"
- Olling, R.P.**, Shaya, E.J., Mushotzky, R., 2013, to be submitted to Nature "The Discovery and Extensive Light Curves of 4 Supernovae with Kepler"
- Olling, R.P.**, Shaya, E.J., Mushotzky, R., Rest, A., Tucker, B., Margheim, S., Kasen, D., Filippenko, A., Garnavich, P. 2013b, to be submitted to Nature, "Kepler Supernovae"
- Olling, R.**, Tucker, B., Shaya, E., Filippenko, A., Garnavich, P., Kasen, D., Rest, A., Rhodes, J., Tonry, J., Mushotzky, R., Margheim, S. 2013a, "Extragalactic Science with Kepler in Two Gyro Mode, a White Paper," see: [kepler-science.arc.nasa.gov/TwoWheelWhitePapers.shtml](http://kepler-science.arc.nasa.gov/TwoWheelWhitePapers.shtml)
- Shaya, E.J., & **Olling, R.** "Very Wide Binaries and Other Comoving Stellar Companions: A Bayesian Analysis of the Hipparcos Catalogue" 2011, ApJS, 192, 2
- Benedict, G. F., Henry, T. J., & **Olling, R.** "Astrometry - Challenging our Understanding of Stellar Structure and Evolution," 2009, The Astronomy and Astrophysics Decadal Survey, 2010, 17 <http://adsabs.harvard.edu/abs/2009arXiv0903.4154B>
- Johnston, K., ... **Olling, R.P.**, ... and 10 co-authors, "Is There a Need for an Improved Celestial Reference Frame ?" 2009, The Astronomy and Astrophysics Decadal Survey, 2010, 143 <http://adsabs.harvard.edu/abs/2009astro2010S.143J>
- Shaya, E., **Olling, R.P.**, ... and 20 co-authors, "Properties of Dark Matter Revealed by Astrometric Measurements of the Milky Way and Local Galaxies" 2009, The Astronomy and Astrophysics Decadal Survey, 2010, 274 <http://adsabs.harvard.edu/abs/2009arXiv0902.2835S>
- Shao, M., ... **Olling, R.P.**, ... and 13 co-authors, "Astrometric Detection of Earthlike Planets," 2009, The Astronomy and Astrophysics Decadal Survey, 2010, 271 <http://adsabs.harvard.edu/abs/2009arXiv0904.0965S>
- Olling, R.P.**, Allen, R. J., Anderson, J., Chaboyer, B. C., Freedman, W., Guhathakurta, P., Johnston, K.J., Kulkarni, S., Lepine, S., Makarov, V. V., Mamajek, E. E., Quillen, A. C., Sahu, K. S., Sarajedini, A., Shaya, E. J., Terndrup, D., Young, P. A. "An Era of Precision Astrophysics: Connecting Stars, Galaxies and the Universe," an Astro2010 Science White Paper, 2009 <http://adsabs.harvard.edu/abs/2009arXiv0902.3197O>
- Olling, R.P.**, "Connecting Stars, Galaxies and the Universe in the 1% Century," 2009, in the virtual proceedings of "The Milky Way and the Local Group - Now and in the Gaia Era" Heidelberg, Germany <http://www.ari.uni-heidelberg.de/meetings/milkyway2009/talks/rolling.pdf>
- Unwin, S. C., ..., **Olling, R.P.**, and 34 co-authors, 2008, PASP, 120, 38
- Olling, R.P.**, & Shaya, E.J., 2010, to be submitted to MNRAS
- Olling, R.P.**, 2007c, arXiv:0704.3059
- Olling, R.P.**, 2007b, arXiv:0704.3072
- Olling, R.P.**, 2007a, MNRAS, 378, 1385
- Hajian, A.R., Behr, B., Cenko, A., **Olling, R.P.**, and 14 co-authors, 2007, ApJ, 661, 616
- Johnston, K. J., ... , **Olling, R.**, and 32 co-authors 2006, PASP, 118, 1428
- Hajian, A.R., **Olling, R.**, *et al.*, 2005, BAAS, 207, 68, 13
- Olling R.P.**, 2005, AAS, 1382
- Olling, R.P.**, 2005, ASP Conf. Ser. 338, 272; and [astro-ph/0505471](http://astro-ph/0505471)
- Olling, R. P., & Dehnen, W. 2003, ApJ, 599, 275
- Gaume, R.A., Johnston, K.J., *et al.* and **Olling R.P.**, 2003. BAAS, 203, 0312
- Olling R.P.**, FAME Technical Memorandum 2003-02 "DISPIs and/or Filters for AMEX"
- Olling R.P.**, FAME Technical Memorandum 2003-01 "Connecting the Physics of Stars, Galaxies and the Universe: AMEX Astrometry & Photometry and NASA's Research Themes"
- Olling R.P.**, FAME Technical Memorandum 2001-15 "A Proposal For Additional Photometric Bands, III; Astrometric & Photometric Parallaxes Compared"
- Olling, R.P.**, Peterson, D.M., 2000, [astro-ph/0005484](http://astro-ph/0005484)
- Joseph, C., Merritt, D., **Olling, R.**, Valluri, M., Bender, R. and the STIS/IDT, 2001, ApJ, 550, 668
- Olling, R.P.**, Joseph, C. L., *et al.*, ESO Astrophysics Symposia, Springer-Verlag, 2001, p.91
- Olling, R.P.**, Merrifield, M.R., '98, MNRAS, 297, 943
- Olling, R.P.**, 1996b, AJ, 112, 481-490
- Olling, R.P.**, 1996a, AJ, 112, 457-480
- Olling, R.P.**, 1995a, AJ, 110, 591-612
- Bianco, F.B., *et al.* 2011, ApJ, 741, 20
- Cassata, P., *et al.* 2005, MNRAS, 357, 903
- Conselice, C. J., *et al.* 2004, ApJ, 600, L139
- Gezari, S., EPJ Web of Conferences, 39, 2012 ([www.epj-conferences.org/articles/epjconf/pdf/2012/21/epjconf.tda012](http://www.epj-conferences.org/articles/epjconf/pdf/2012/21/epjconf.tda012))
- Hayden, B., *et al.* 2010, ApJ, 722, 1691
- Kasen, D., 2010, ApJ, 708, 1025
- Magorrian J. & Tremaine S. 1999, MNRAS, 309, 447
- Naab, T. & Ostriker, J. P. 2006, MNRAS, 366, 899
- Wilhite B.C. *et al.* 2008, MNRAS, 383, 1232
- Wright, S. A., *et al.* 2007, ApJ, 658, 78

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