

Amara Lynn Graps

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Born: March 28, 1961, Honolulu, Hawaii, U.S.A.

Citizenship (dual): Latvia (Grapa), U.S.A. (Graps)

Child: Vija Alexandra Graps (Grapa), born 2 January 2009.

Education

Ph.D. Physics University of Heidelberg (Germany), July 2001. Thesis title: *Io Revealed in the Jovian Dust Streams*. (rated: Magna Cum Laude)

M.S. Physics San Jose State University, California (USA), August 1991. Thesis title: *Investigating the Motions and Energies of Ions Confined in a Uniform Magnetic Field*.

B.S. Physics University of California, Irvine (USA), June 1984.

Employment/Experience

My life's work since 1982 demonstrates a principle of career driving one's education, rather than the other way around. On the small scale, my PhD and postdoc scientific work is in cosmic dust charging and dynamics. On the large scale, working for twelve different NASA research teams for 18 years as a computational physicist in the first half of my career grew my space network and granted me access to academia, where I was publishing papers before I earned my PhD (2001) on two continents.

Starting in 2014, my reach for my own high-impact space projects began. In 2014 was my try for creating planetary small bodies department at the University of Latvia. That effort triggered unethical behavior, which resulted in Latvian government-appointment personnel changes. The years 2015-2016 were the co-founding and closing of the Latvian subsidiary of the asteroid mining company: Deep Space Industries, which taught me my first space resource utilisation business lessons. That 2016-year also began my work on the intersections between asteroid miners and asteroid scientists ('ASIME'). Continuing my space resource utilisation interests, in 2016-2018, I supported my partners at the Irish company Terrestrial Celestial Materials' (TCM) to fund a 6M€, 3D metal printer in microgravity project in Luxembourg, where we wrote 5 yr, 10 yr ISRU business plans. Since 'Baltics in Space' (BiS) had become my established (2017) non-profit, I used BiS to support my development and successful implementation of the local organizing for the 1000-Abstract, 40 country-participant conference: European Planetary Science Congress 2017 Riga, where I led the local organization of a 4-country, nearly 200 person, and 145 K€ effort. Thus the integration of Baltic space entities was born. Large impact project development continued: in 2018-19; I developed a Baltic 2M€, 4-country, 10-partners, climate-change-with-a cubesat, citizen science project: "ELLF" in an H2020 proposal, submitted April 2019. We just learned the negative result, so our ELLF consortium will try again for funding in 2020.

In my ESA and NASA missions support work, I have assisted mission planning and analyzed data from the New Horizons space mission, Rosetta spacecraft (most recently: as a GIADA instrument data archive reviewer), Ulysses spacecraft, GORID/Express spacecraft, Cassini spacecraft, Galileo spacecraft, SOHO spacecraft, NASA's Kuiper Airborne Observatory, NASA's ER-2 aircraft, the Voyager 2 spacecraft, the Pioneer Venus Orbiter spacecraft, the Infrared Astronomical Satellite (IRAS), the Space Shuttle's SpaceLab 2, and ground-based telescopes in Hawaii, California, and Arizona. Additionally, The data includes calibration star cluster fields, dust from Saturn's and Jupiter's magnetosphere and Earth's geostationary orbit, the Sun, Comet Shoemaker-Levy 9, Comet Halley, Supernova 1987a, Venus, Mars, Io, Mercury, the Moon, Saturn's and Uranus' rings, asteroids, Earth's atmosphere, protostars, molecular clouds, galaxies, novas, main-sequence stars, and the exhaust-cloud around the Space Shuttle. I'm on the Science team of ESA's new Comet Interceptor mission in study phase.

I am an active advocate for asteroid mining, Eastern European planetary scientists, girls in STEM, and Baltic Space workers.

• **March 2017-Present** *Executive Director and Founder*. Social Enterprise: [Baltics in Space](#) to carry my

July 2019

Baltics space-capacity building projects. First success of BiS: Developed and implemented the local organization for the European Planetary Science Congress 2017 Riga for the Europlanet-RI2020 Consortium: a 145 Keur project, 15 parts, nearly 200 Baltic space workers involved. Baltics in Space currently has six projects in development for meeting local, Baltic, European and International needs.

- **April 2016-Present** *Independent Consultant*. Proposal writing support to Baltic entities. Expert H2020 SME Space Industry reviewer. Implementing Climate Change Study Case for Finnish Meteorological Institute on H2020-funded EOPEN for Community-accessible Earth Observation data. Building an Asteroid mining community, linking science and industry: 'ASIME'. Observer of Hague International Space Resources Governance Working Group. Developed the science of the ASIME 2018 for the Luxembourg Ministry of the Economy, to address the asteroid composition questions. Developed and implemented the Asteroid Science In-space Mine Engineering (ASIME) 2016 conference for the Luxembourg Ministry of the Economy to bring the asteroid scientists and the asteroid mining companies together and address key issues.
- **May 2015-January 2017** *Chief Scientist-Europe, Deep Space Industries Europe, S.à.r.l. (Luxembourg), then DSI Latvia, SIA*. Building European teams & mission scenarios for the support of asteroid mining. DSI-L subsidiary transitioned to company: Heliocentric Technologies Latvia in 2/2017.
- **July 2014-April 2015** *Science Team, Deep Space Industries, (USA)*. Building project teams and proposals in Europe for the support of asteroid mining.
- **April 2014-Present** *Lead Scientist: University of Latvia, Institute of Astronomy* Multiple approaches to bring planetary science to the University of Latvia and to support Latvia as a new member state in the European Space Agency. Founding member of the Latvian Space Bureau. Funded Europlanet-RI Work Package for astronomy education with a Raspberry Pi microcontroller. Funded by the Fotonika-LV grant through April 2015. One unsuccessful attempt to build a new planetary small bodies research department. Guiding a PhD student on Ceres OH detection with the VIRAC 32-m radio telescope. Support of space debris observations at the Riga Satellite Laser Ranging Station and at VIRAC. Support of Baldone Observatory digitization of 20,000 plates (1968-2001) for asteroid and comet recovery. Set up COST action: "ORIGIN" for astrobiology support for Latvian students and researchers.
- **August 2013-March 2014** *Research Scientist: University of Latvia, Institute of Astronomy*. In recruitment for European Commission funded research. Two Marie Curie proposals submitted (Submitted, but they were not reviewed by the European Commission).
- **April 2012-Present** *Senior Scientist: Planetary Science Institute, (April-May: Boulder, Colorado, >June 2012: Riga, Latvia)* Circum/interplanetary dust charging and dynamics. Five NASA grant proposals submitted. One Honda Foundation STEM proposal submitted. Two Co-I NASA proposals accepted: TREX, a NASA SSERVI node and an SSW Io plasma torus (Jupiter dust) study.
- **November 2007-March 2012** *Researcher: Southwest Research Institute (SwRI), Boulder, Colorado*. Mission work for the Ralph camera on board the New Horizons Pluto mission and continuing my circum / interplanetary dust charging and dynamics and the origin of water on the terrestrial planets. Ten grant proposals submitted; seventh proposal was funded.
- **2006-2007** *Associate Research Scientist: Planetary Science Institute, Tucson, AZ*. Started the path of self-funded research by submitting three grant proposals. Third (2007) proposal was funded; transferred that project to SwRI.
- **January 2003-October 2007** *Scientific Researcher: Istituto di Fisica dello Spazio Interplanetario, INAF Rome*. Mission support for both existing and in-the-process-of-being- built infrared spectrometers on space missions: Dawn (VIR), Cassini (VIMS), and Rosetta (VIRTIS). Europlanet Small Bodies and Dust N2 Working Group Coordinator. Editor with H. Krueger of book we produced in LaTeX of 55 articles: Proceedings of the Dust in Planetary Systems (Workshop, Sept 26-30, 2005, Kauai, Hawaii), SP-643 January 2007.
- **2004-2005** *Adjunct Assistant Professor of Astronomy, American University of Rome, Rome, Italy*. Astronomy instructor for the liberal arts university students.
- **April 1998-December 2002** *Graduate student/Post-doc: Max-Planck-Institut für Kernphysik and University of Heidelberg*. Examined circum/interplanetary dust charging and dynamics, including

Io as the origin of the Jovian dust streams, using in-situ dust data from the Galileo and Cassini spacecraft dust instruments.

- **1995-1998** *Scientific Programming: Solar Oscillations Investigations Project, Stanford University, California.* Image processing and helioseismic oscillation software, and solar education materials for the MDI SOHO instrument.
- **1995-1996** *Scientific Programming Consultant: Research Systems, Boulder, Colorado.* Wrote wavelet software for the IDL programming language.

1995

- *Scientific Applications Consultant: Advent Systems, Mountain View, California.* Wavelet programming and radar data reduction
- *HTML Programming Consultant: MacSciTech Users Association.* World Wide Web site work.

1994

- *Technical Writer: Greenleaf Medical, Palo Alto, California.* Wrote a user manual for a Macintosh medical data acquisition system.
- *Research Scientist: Bay Area Environmental Research Institute, San Francisco, and NASA-Ames Research Center, Moffett Field, California.* Wavelet algorithms and applications.
- *Numerical Analysis Consultant: Alliance Laboratories, Redwood City, California.* Updated and rewrote thermocouple numerical analysis programs.

1993

- *Consultant: NASA-Ames Research Center, Moffett Field, California.* Wrote bimonthly Digital Explorations newsletter for Atmospheric and Space Sciences divisions.
- *Consultant: Apple Computer, Cupertino, California.* Wrote User and Programmer manuals for the Scientist's Workbench application.
- *Consultant: Franklin and Marshall College, Pennsylvania.* Created list of infrared-excess star candidates for Infrared Space Observatory observations.
- **1986-1994** *Software Specialist II: Sterling Software, NASA-Ames Research Center.* Infrared data analysis and interpretation for astronomical and atmospheric data from KAO, SpaceLab 2, ER-2, ground-based telescopes, laboratory prototype instruments, and simulated tropospheric data, database development for three ER-2 atmospheric missions, dynamics of chaotic orbital evolution of solar system objects, UV ring occultation data analysis from Voyager 2, detecting circumstellar dust around main sequence stars, beta-testing of Macintosh scientific commercial software, writing/ editing technical manuals, systems operations for eight Macintoshes, Unix systems administration for two Silicon Graphics workstations. Modified and applied LaTeX scripts to follow Kluwer Academic Publisher's requirements to produce book: *Interstellar Dust* by Allamandola and Tielens (eds.), Kluwer, 1989. Forty-four chapters, figures, color plates, preface, table-of-contents, subject index, object index, index of molecules.
- **1984-1986** *Professional Research Assistant: LASP, University of CO, Boulder, Colorado.* Ultraviolet data analysis for planetary ring data from the Voyager 2; and ultraviolet data analysis for Venus atmospheric and Comet Halley data from the Pioneer Venus.
- **1982-1984** *Technical Assistant: Jet Propulsion Laboratory, Pasadena, California.* Ultraviolet data analysis for planetary ring data from the Voyager 2 Photopolarimeter Project.
- **1981-1986** *Research Assistant: Jet Propulsion Laboratory, Pasadena, California.* Technical assistance for systematic photographic search for asteroids with Palomar Observatory's Schmidt telescopes. **Codiscoverer of Near Earth asteroid 1982 XB.**

Publications 12 leading author/23 co-author publications & 70 presentations since 1982.

Dust in the Solar System (including Earth debris)

- Krüger, H.; Bindschadler, D.; Dermott, S. F.; **Graps, A. L.**; Grün, E.; Gustafson, B. A.; Hamilton, D. P.; Hanner, M. S.; Horányi, M.; Kissel, J.; Linkert, D.; Linkert, G.; Mann, I.; McDonnell, J. A. M.; Moissl, R.; Morfill, G. E.; Polansky, C.; Roy, M.; Schwehm, G.; Srama, R., (2010). "Galileo dust data from the Jovian system: 2000 to 2003", *Planetary and Space Science*, Volume 58, Issue 7-8, p. 965-993. 06/2010 DOI: 10.1016/j.pss.2010.03.003
- **Graps, A.L.**, Jones, G.H., Juhasz, A., Horanyi, M., Havnes, O. (2008), "The Charging of Planetary Rings", in *Planetary Atmospheric Electricity*, ed.: Aplin K., Harrison R.G., Leblanc F., Treumann R., Yair Y., Space Sciences Series of ISSI, Springer.
- Krüger, H.; Dikarev, V.; Anweiler, B.; Dermott, S. F.; **Graps, A. L.**; Grün, E.; Gustafson, B. A.; Hamilton, D. P.; Hanner, M. S.; Horányi, M.; Kissel, J.; Linkert, D.; Linkert, G.; Mann, I.; McDonnell, J. A. M.; Morfill, G. E.; Polansky, C.; Schwehm, G.; Srama, R. (2010). "Three years of Ulysses dust data: 2005 to 2007", *Planetary and Space Science*, Volume 58, Issue 7-8, p. 951-964. 06/2010, DOI: 10.1016/j.pss.2009.11.002.
- **Graps, A.L.** (2006), "Characterization of Jovian Plasma-Embedded Dust Particles", *Planetary and Space Sciences*, Volume 54, Issue 9-10, *Physics of Dusty Rings* (special ISSI publication) Pages 911-918.
- **A. L. Graps**, Green, S.F., McBride, N.M., McDonnell, J.A.M., Bunte, K., Svedhem, H., and Drolshagen, G. (2006). "GEO Debris and Interplanetary Dust: Fluxes and Charging Behavior", in *Dust in Planetary Systems*, Krüger, H. and Graps, A. eds., ESA Publications, SP-643 (February 2007).
- Krüger, H., **Graps, A. L.** (editors). *Proceedings of the Dust in Planetary Systems* (Workshop, Sept 26-30, 2005, Kauai, Hawaii), SP-643 January 2007. This volume of 55 articles is available at NASA ADS.
- Krüger, Harald, **Graps, Amara L.**, Flandes, Alberto, Forsythe, Robert J., Hamilton, Douglas P., Horanyi Mihaly, Grün, Eberhard (2006). "Ulysses jovian latitude scan of electromagnetically interacting dust streams", *Planetary and Space Sciences*, Volume 54, Issues 9-10, Pages 919-931.
- Krüger, Harald; D. Bindschadler; S.F. Dermott; **A. L. Graps**; E. Grün; B.A. Gustafson; D.P. Hamilton; M.S. Hanner, M. Horányi; J. Kissel; B.A. Lindblad; D. Linkert; G. Linkert; I. Mann; J.A.M. McDonnell; R. Moissl; G.E. Morfill; C. Polansky; G. Schwehm; R. Srama; H.A. Zook (2006). "Five years of Ulysses dust data: 2000-2004" (, *Planetary and Space Sciences*, Volume 54, Issues 9-10, Pages 932-956.
- Krüger, Harald; N. Altobelli; B. Anweiler; S.F. Dermott; V. Dikarev; **A. L. Graps**; E. Grün; B.A. Gustafson; D.P. Hamilton; M.S. Hanner, M. Horányi; J. Kissel; M. Landgraf; B.A. Lindblad; D. Linkert; G. Linkert; I. Mann; J.A.M. McDonnell; R. Moissl; G.E. Morfill; C. Polansky; G. Schwehm; R. Srama; H.A. Zook (2006). "Galileo dust data from the jovian system: 1997-1999", *Planetary and Space Sciences*, Volume 54, Issues 9-10, Pages 879-910.
- **Graps, Amara L.**; Cerroni, Priscilla; Guest Editors (2005), "The Saturn Universe: A Cassini Workshop October 5-8, 2004", *Earth, Moon and Planets* 96 Nos. 3-4, June 2005.
- Krüger, Harald; **Graps, Amara L.**; Forsythe, Robert J.; Eberhard (2005). "Electromagnetically Interacting Dust Streams During Ulysses' Second Jupiter Encounter", *New Vistas in Dusty Plasma: Fourth International Conference on the Physics of Dusty Plasmas*, AIP Conference Proceedings, Volume 799, pp. 157-160.
- Harald Krüger, Mihaly Horanyi, Alexander V. Krivov and **Amara L. Graps** (2004). "Jovian Dust: Streams, Clouds and Rings", in: *Jupiter: The Planet, Satellites & Magnetosphere*, eds. F. Bagenal, W. McKinnon, T. Dowling, Cambridge University Press.
- E. Grün, Dikarev, V., Krüger, H.; Kempf, S.; Moragas-Klostermeyer, G., Srama, R.; Frisch, P. C.; **Graps, A. L.**, Landgraf, M. (2004). "Dust in interplanetary space and in the local galactic environment", in *Astrophysics of Dust*, editors: Witt, Adolf N., Clayton, Geoffrey C., Draine,

Bruce T., ASP Conference Series 309.

- S.F. Green, **A.L. Graps** (2004). “Gorid Data Analysis”, in Summary Report for ESA Contract 6272/02/ NL/EC : Processing, Analysis and Interpretation of Dust Data from Impact Detectors.
- Harald Krüger, Paul Geissler, Mihaly Horanyi, **Amara L. Graps**, Sascha Kempf, Ralf Srama, Georg Moragas-Klostermeyer, Richard Moissl, Torrence V. Johnson, Eberhard Gruen (2003). “Jovian Dust Streams: A monitor of Io's volcanic plume activity”, *Geophysical Research Letters*. 30(21):2101, 2003 Nov 7.
- **Graps, A. L.**, Grün, E., Svedhem, H., Krüger, H., Horanyi, M., Heck, A., Lammers, S. (2000). “Io as a Source of the Jovian Dust Streams”, *Nature* 405, 48-50 (May 4, 2000).
- **Graps, A. L.** and Grün, E. (2000). “Dust in the Earth's Magnetosphere: Properties, Charging, and Dynamics”, in Summary Report for ESA Contract 13145/98/NL/WK : Update of Statistical Meteoroid/Debris Models for GEO, 2000.
- **Graps, A.L.** and Grün, E., (2000). “Charging Processes for Dust Particles in Saturn's Magnetosphere”, *Dust in the Solar System and Other Planetary Systems*, Proceedings of the IAU colloquium 181 and COSPAR Colloquium 11, University of Kent, April 2000.
- E. Grün, H. Krüger, **A. L. Graps**, D. P. Hamilton, A. Heck, G. Linkert, H. A. Zook, S. Dermott, H. Fechtig, B. A. Gustafson, M. S. Hanner, M. Horanyi J. Kissel, B.A. Lindblad, D. Linkert, I. Mann, J. A. M. McDonnell, G. E. Morfill, C. Polanskey, G. Schwehm, R. Srama (1998). “Galileo Observes Electromagnetically Coupled Dust in the Jovian Magnetosphere”, *Journal of Geophysical Research* 103, No. E9, Pages 20, 011-20, 022, August 30, 1998.
- E. Grün, H. Krüger, S. Dermott, H. Fechtig, **A. L. Graps**, B. A. Gustafson, D. P. Hamilton, M. S. Hanner, A. Heck, M. Horanyi, J. Kissel, B. A. Lindblad, D. Linkert, G. Linkert, I. Mann, J. A. M. McDonnell, G. E. Morfill, C. Polanskey, G. Schwehm, R. Srama, H. A. Zook (1997). “Dust Measurements in the Jovian Magnetosphere”, *Geophysical Research Letters* 24, No. 17, 2171-2174.
- J.P. Simpson, F.C. Witteborn, **A. Graps**, G.G. Fazio, D.G. Koch (1993). “Particle Sightings by the Infrared Telescope on SpaceLab 2”, *J of Spacecraft and Rockets* 30, 216-221.
- **Amara Graps** and Antal Juhasz (2001). “Dusty Phenomena in the Solar System”, *Sky & Telescope*, January 2001, pp 56-63.

I presented my dust in the solar system projects at:

Asteroids, Comets, and Meteors 2014, Helsinki, Finland / 2013 Division of Planetary Sciences, Denver, Colorado / 2013 Dusty Visions Stuttgart, Germany / 2011 Division of Planetary Sciences, Nantes, France / 2010 Dusty Visions Goettingen, Germany / 2010 American Geophysical Union, San Francisco, California / 2007 Southwest Research Institute Colloquium, Boulder, Colorado / 2007 International Space Science Institute ‘Planetary Lightning Workshop (Bern, Switzerland) / 2005 Dust in Planetary Systems, Lihue, Hawaii / 2005 International Space Science Institute ‘Dusty Rings Workshop (Bern, Switzerland) / 2005 Division of Planetary Sciences, Cambridge, England / 2005 Consiglio Nazionale delle Ricerche Colloquium, Rome, Italy / 2005 VI Convegno di Scienze Planetarie, Aosta, Italy / 2004 COSPAR, Paris, France / 2004 Osservatorio Astronomico di Capodimonte Colloquium, Naples, Italy / 2003 Université de Fribourg Suisse Colloquium, Fribourg, Switzerland / 2003 Consiglio Nazionale delle Ricerche Colloquium, Rome, Italy / 2003 V Convegno di Scienze Planetarie, Gallipoli, Italy / 2003 Galileo-Ulysses-Cassini-StarDust 2003 Dust Workshop Noordwijk, Netherlands / 2003 Astrophysics of Dust, Estes Park, Colorado / 2003 EGS-AGU-EUG Joint Assembly, Nice, France / 2002 Galileo-Ulysses-Cassini-StarDust 2002 Dust Workshop, Potsdam, Germany / 2002 Asteroids, Comets, and Meteors 2002, Berlin, Germany / 2002 EuroJove Conference (Jupiter after Galileo and Cassini, Lisboa, Portugal / 2002 European Geophysical Society, Nice, France / 2001 Division of Planetary Sciences, New Orleans, Louisiana / 2001 ESC Seismic Phenomena Associated With Volcanic Activity, Tenerife, Canary Islands, Spain / 2001 Meteoroids, Kiruna, Sweden / 2001 Galileo-Ulysses-Cassini-StarDust 2001 Dust Workshop, Heidelberg, Germany / 2001 Jupiter Symposium, Boulder, Colorado / 2001 NASA-Ames Spaces Sciences Colloquium, Mountain View, California / 2001 Max-Plank-

Institut für Kernphysik Colloquium, Heidelberg, Germany / 2000 Division of Planetary Sciences, Pasadena, CA / 2000 European Geophysical Society, Nice, France / 2000 IAU Symposium 181: Dust in the Solar System and Beyond, Canterbury, England / 1999 TU-München, Fachgebiet Raumfahrttechnik, Garching bei München, Germany / 1999 Division of Planetary Sciences, Padua, Italy / 1999 Galileo-Ulysses-Cassini-Stardust Dust Workshop, Münster, Germany / 1999 Asteroids, Comets, and Meteors 1999, Ithaca, New York / 1999 European Geophysical Society, Den Haag, The Netherlands / 1998 Division of Planetary Sciences, Madison, WI / 1998 Meteoroids, Tatranska Lomnica, Slovakia / 1998 Galileo-Ulysses-Cassini Dust Workshop, College Park, MD.

Origin of Water on Earth

- Lunine, Jonathan I.; O'Brien, David P.; Raymond, Sean N.; Morbidelli, Alessandro; Quinn, Thomas; **Graps, Amara L.** (2011). "Dynamical Models of Terrestrial Planet Formation", *Advanced Science Letters*, Volume 4, Number 2, pp. 325-338

I presented my origin of water on earth projects at:

2009 Southwest Research Institute Colloquium, Boulder, Colorado / 2007 Goldschmidt, Cologne, Germany / 2007 European Geophysical Union, Vienna, Austria

Wavelets Introduction

- **Graps, A.L.**; "An Introduction to Wavelets", *IEEE Computational Sciences and Engineering*, Summer 1995, pp 50-61. This paper was downloaded at my old site amara.com (Wayback machine: <https://goo.gl/4jLKdg>) by approximately 200,000 people since its publication in 1995 and has been referenced in papers, theses and books including: The Illustrated Wavelet Transform Handbook by Paul S. Addison (Institute of Physics Publishing, 2002), The World According to Wavelets by Barbara Hubbard (2000, AK Peters), and Discovering Wavelets by Edward Aboufadel and Steven Schlicker (1999, Wiley), and in hundreds of web sites.

I presented my introduction to wavelets topic at:

2008 Southwest Research Institute Colloquium, Boulder, Colorado / 2003 ESC: Seismic Signals Related to Volcanic Unrest, Pantelleria, Italy / 2002 Etamax, Braunschweig, Germany / 1999 TU-München, Fachgebiet Raumfahrttechnik, Garching bei München, Germany / 1998 Cornell Astronomy Seminar, Ithaca, NY / 1997 One-day Workshop: for SmallTalk inventors: Alan Kay, Dan Ingalls plus Ted Kaehler and the rest of their Squeak Group (Disney), Palo Alto, CA / 1996 Stanford Helioseismology Seminar, Stanford, CA / 1995 Scientific & Engineering Applications on the Macintosh, San Francisco, CA.

Ultraviolet Observations (Saturn's/Uranus' Rings) from Voyager 2, (Interplanetary Lyman-alpha) from Pioneer, (asteroid Lutetia) from Rosetta

- Stern, S. A.; Parker, J. Wm.; Feldman, P. D.; Weaver, H. A.; Steffl, A.; A'Hearn, M. F.; Feaga, L.; Birath, E.; **Graps, A.**; Bertaux, J.-L.; Slater, D. C.; Cunningham, N.; Versteeg, M.; Scherrer, J. R. (2011). "Ultraviolet Discoveries at Asteroid (21) Lutetia by the Rosetta Alice Ultraviolet Spectrograph", *The Astronomical Journal*, Volume 141, Issue 6, article id. 199 (2011). DOI: 10.1088/0004-6256/141/6/199 published in print:06/2011.
- **Graps, A. L.**, M. R. Showalter, J. J. Lissauer, D. M. Kary (1995), "Optical Depth Profiles and Streamlines of the Uranian Epsilon Ring", *The Astronomical Journal* 109, 2262-2273.
- J.M. Ajello, A.I. Stewart, G.E. Thomas, and **A. Graps** (1987). "Solar Cycle Study of Interplanetary Lyman-Alpha Variations", *Astrophysical Journal* 317, 964-986.
- Arthur L. Lane, Charles W. Hord, Robert A. West, Larry W. Esposito, Karen E. Simmons, Robert M. Nelson, Brad D. Wallis, Bonnie J. Buratti, Linda J. Horn, **Amara L. Graps** (1986). "Photometry from Voyager 2: Initial Results from the Uranian Atmosphere, Satellites, and

Rings”, *Science* 233, 65-70.

- **A. L. Graps** and A. L. Lane (1986). “Voyager 2 Photopolarimeter Experiment: Evidence for Tenuous Outer Ring Material at Saturn”, *Icarus* 67, 205-210.
- **A. L. Graps**, A. L. Lane, L. J. Horn, and K.E. Simmons (1984). “Evidence for Material between Saturn's A and F Rings from the Voyager 2 Photopolarimeter”, *Icarus* 60, 409-415.
- Arthur L. Lane, **Amara L. Graps**, and Karen E. Simmons (1982). “The C-Ring of Saturn: A High Resolution View of Some of its Structure”, in *Planetary Rings*, ed by A. Brahic, Cepadues-Edition Toulouse.

Infrared Observations (Molecular Clouds, the Moon)

- Sprague, A. L. , F. C. Witteborn, R. W. Kozlowski, D. P. Cruikshank, J. J. Bartholemew, and **A.L. Graps** (1993). “The Moon: Mid-Infrared (7.5-11.4 microns) Spectroscopy of Selected Regions”, *Icarus* 100, 73-84.
- F. C. Witteborn, S. A. Sandford, J. D. Bregman, L. J. Allamandola, M. Cohen, D. H. Wooden, and **A.L. Graps** (1989). “New Emission Features in the 11-13 micron Region and Their Relationship to Polycyclic Aromatic Hydrocarbons”, *Astrophysical Journal* 341, 270-277.

Funded Projects

- Book: Building Good Collaborative Practices: A Handbook for Eastern and Central Europe. Funded by the European Commission Latvia Representation office. Summer/Fall, 2019.
- *Provided main Triple Helix concept in 2017-8 VIRAC ERA-Chair 2.5 MEur winning LV proposal. *Provided small-planetary bodies research concept in 2018 LU-VIRAC 350 KEur winning LV proposal.
- Scientific Organizing Lead to implement the *Asteroid Science Intersections with In-Space Mine-Engineering (ASIME) 2018*. April 16-17. Belval, University of Luxembourg where we addressed one of the science knowledge gaps: asteroid composition. (<https://asime.uni.lu>). Nearly 70 attendees, industry participants: 26%, student participants: 10%, female speakers: 20%, female keynote speakers: 39%. The participants represented 14 countries including the USA, China, Japan, and S. Korea. White paper outcome: <https://arxiv.org/abs/1904.11831>
- Co-I., as Planetary Science Institute, NASA (Solar System Workings) - *The Ins and Outs of the Io Plasma Torus: understanding the relationship between material motion and energy flow using correlative study between two decades of optical and radio observations* (2017-2019).
- Co-I., as Planetary Science Institute, *NASA Solar System Exploration Research Virtual Institute 2016 (SSERVI16) “TREX: Toolbox for Research and Exploration”* (2017-2020).
- Co-I., as University of Latvia, *ESTLAT-2020. Training the next generation entrepreneurs with hands-on methods in space STEM (SpaceTEM)* (2017-2019).
- Initiator, Developer, Implementer of the *Asteroid Science Intersections with In-Space Mine-Engineering (ASIME) 2016*. September 21-22. Luxembourg City, Luxembourg. (<http://fmispace.fmi.fi/index.php?id=asime16>) 85-participants including engineers, technology transfer specialists, venture capital companies, and four Luxembourg sponsors. 80-page White Paper outcome with Science Knowledge Gaps: “Answers to Questions from the Asteroid Miners” (<https://arxiv.org/abs/1612.00709>) Funder: Luxembourg Ministry of the Economy.
- Three Baltic Bonus grants (funds were mostly absorbed by the University of Latvia administration) for my three high-scoring, but unaccepted, European Commission Horizon 2020 projects: *ENS-Net*, *C-DUST*, and *CATNAP*. February 2016.
- Co-I: Horizon 2020 INFRAIA-1-2014-2015 (Advanced Research Networks) *“EUROPLANET 2020”* (my contribution: *“Planetary Climate Detectives”*). Started funding in September 2015. (33 partners, 2014-2018: total 9.945 MEUR, my work package: 28KEur)
- Co-I/Advisor: Latvian Research Programme: *“Preparation of the instruments of Near Earth Object observation for ensuring safe cosmic space”* (2014-2016)

- Co-Investigator. (P.I.: Jeffrey Morgenthaler) NASA Outer Planets Research. “*The Ins and Outs of the Io Plasma Torus: A Comparison of Two Decades of Io Plasma Torus and Io Volcanic Data*” (2013-2015, 387,421 USD)
- Principal Investigator. NASA Outer Planets Research. “*Can Ring Dust Impacts Alter the Surfaces of the Mid-sized Saturnian Moons?*” (2010-2013, 178,299 USD, no-cost extension: 2014-5)
- Principal Investigator. NASA Cassini Data Analysis Program. “*The Development of the Saturnian Dust Streams*” (2007-8, 113,265 USD)
- Member of European Centre of Science and Technology (COST): An Astrobiology project TD1308: *ORIGINS*, contribution to the icy satellites and planetary formation topics (2014-2018, 142 kEUR total for 90 members).
- Member of the FP7 project REGPOT-2011-1 Nr. 285912 FOTONIKA-LV "Unlocking and Boosting Research Potential for Photonics in Latvia – Towards Effective Integration in the European Research Area" (2011-2014, 400 kEUR).

Funded by Donations

- Participant at the UNOOSA / Holy See Seminar ‘Exploration and Development of Space Opportunities and Issues in the Context of the Sustainable Development Goals’ 27 – 28 March 2018, Castel Gandolfo. Funded by futurist David Orban.
- Chair of the Local Organizing Committee (LOC) of the European Planetary Science Congress 2017 Riga, the world’s second largest planetary science conference. With a given allocation of time (1.5 years) and no initial local or European funds, Graps built a Baltic-wide program to represent eight Baltic institutes in the conference (exhibits, booklet), engage the Baltic scientists in the scientific program, employ 6 students in the ground-floor, fund 25 early-career Baltic students to display their Summer 2017 internship space projects, invite and support 5 Baltic and European government Ministers talks, support a Solar System for Kids Exhibit which has so far (Summer 2019) reached 15,000 Latvian (600 visited during the conference week), supported the Latvian social event and art-science exhibits and communicated publicly (600 Latvian and International press mentions) about the event and the value of space for the Baltic region. The cost of the LOC was approximately 145 K€, with 190 Baltic people paid directly or in-kind at a cost of 113 K€.

Unfunded

- Deputy-PI (concept and proposal writer): for Horizon 2020 SwafS-14-2018-2019: Supporting the development of territorial Responsible Research and Innovation. “Estonia-Latvia- Lithuania- Finland “*ELLF*” *Climate Change Cubesat (C^s) STEM*”. (April 2, 2019). 10-partners, 4-countries, with nanosatellite, 35 deliverables, 2M€.
- Manager “Space” @ Terrestrial Celestial Materials: for 2016-7 Luxinnovation MetalWorks project (Luxembourg Ministry of the Economy: green light June 3, 2017). Prototype phase 3M€, Production phase: 3M€. Insufficient Luxembourg funding for prototype phase.
- P.I., as DSI Latvia, built a 15-member team and submitted for the first time to European Space Agency, PECS call: AO/1-8437/15/NL/NDe – “An Asteroid Database from the Baldone Observatory Plates”. November 2015.
- Co-I: for Horizon 2020 COMPET-05-2015 – “*C-DUST: Cometary environment: light scattering and interaction with dust and plasma*”. (April 8, 2015). (high score: 11.5)
- Co-I: for Horizon 2020 COMPET-05-2015 – “*CATNAP: Cartography and Analysis Tools, Numerical modeling, Atmospheric models for Planetary science*”. (April 8, 2015). (high score: 12.5)
- 2014 P.I. "An Asteroid and Comet Database from the Baldone Observatory", NASA Planetary Data Analysis and Archiving Program 2014 (PDART-2014).
- 2014 P.I.: Horizon 2020 Widespread 1-2014: ERA-Chair. “*BOUNCE: Turn Loose the Excellence of the University of Latvia’s Planetary Small Bodies*”. (2.5 MEUR). An unauthorized copy of this work into a competing proposal had repercussions through LU, the Latvian Ministry of Science and Education and European Commission DG Research (Brussels). I wrote a White paper to the Latvian Ministry of Education and Science to summarize lessons

- 2014 Co-I: Horizon 2020 PROTEC-2014 *"The European NEO Science Network (ENS-Net)"* (my contribution: An Asteroid Regolith Database). (high score: 12.5)
- P.I. 2011, 2012, 2013+ NASA Planetary Geology and Geophysics Program. *"Electrostatic Dust Alterations of Asteroid Surfaces"*

Awards / Special Mention

- June 2018: **Winner of 2018 Europlanet Public Engagement Prize** for years of public engagement.
- Asteroid 'Graps': (9027) Graps = 1988 VP5 = 1981 UT11 = 1995 WJ6
<https://goo.gl/k362xd>
- Co-discoverer of asteroid 1982 XB
http://www.minorplanetcenter.net/iau/ECS/MPCArchive/1983/MPC_19830922.pdf

Personal Skills and Competences

Mother tongue(s)	English																																						
Other language(s)																																							
Self-assessment																																							
	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th colspan="2">Understanding</th> <th colspan="2">Speaking</th> <th colspan="2">Writing</th> </tr> <tr> <th colspan="2">Listening</th> <th colspan="2">Reading</th> <th colspan="2">Spoken interaction</th> <th colspan="2">Spoken production</th> </tr> </thead> <tbody> <tr> <td>DE</td> <td>A2</td> <td></td> <td>A2</td> <td></td> <td>A2</td> <td></td> <td>A2</td> </tr> <tr> <td>IT</td> <td>A2</td> <td></td> <td>A2</td> <td></td> <td>A2</td> <td></td> <td>A2</td> </tr> <tr> <td>LV</td> <td>A2</td> <td></td> <td>A2</td> <td></td> <td>A2</td> <td></td> <td>A2</td> </tr> </tbody> </table>	Understanding		Speaking		Writing		Listening		Reading		Spoken interaction		Spoken production		DE	A2		A2		A2		A2	IT	A2		A2		A2		A2	LV	A2		A2		A2		A2
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Language																																							
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Organisational skills and competences	Scientific team projects. 34 years experience as team member, 10 years experience as team leader and project coordinator.																																						
Technical skills and competences	<p>Astronomical/Atmospheric space mission support, data reduction and interpretation. 30 years experience.</p> <p>Technical writing. 20 years experience.</p> <p>Grant proposal writing: 13 years experience: USA and European funding agencies. Other technical strengths include: Running event sponsorship programs and crowd-funding campaigns, Non-profit company management, Pricing event assets, Communication with policy-makers and company executives, Raspberry Pi microcontrollers, Dust physics, Computational physics, numerical analysis, infrared and ultraviolet data acquisition and analysis, popular science writing, technical writing, statistics, database design, computer graphics.</p>																																						
Computer skills and competences	<p>Skilled in most standard word processors and spreadsheets.</p> <p>Programming. 16 years experience. Some Unix system admin.</p> <p>Computer Languages and Operating Systems:</p> <p>Python, IDL, Matlab, Perl, HTML, Drupal, TeX, LaTeX, IRAF, Pascal, Fortran, Basic; PiTop, Linux, DEC: VMS; APPLE: Macintosh; IBM: DOS; Unix: Mac OSX, Silicon Graphics, Sun.</p>																																						