



E. G. Patrick Bos

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Personalia

Name	Evert Gerardus <i>Patrick</i> Bos
Date of Birth	February 27, 1986
Place of Birth	Emmer Compascuum (municipality Emmen)
Nationality	Dutch
Marital Status	Married

Summary

I am a trained *astrophysicist*: I know **physics**, theoretical and numerical **mathematics**, **computer science**, **programming** and **data science/analysis/visualization**, among other things. I currently study the large scale structures of the universe and cosmology in general (more on that below).

My current day to day tasks include developing and applying methods for data reduction and analytics, statistical (mostly Bayesian) inference and visualization. I have also taught several courses in mathematics, computer science and physics and have been awarded (by the students and education council) the **highest grade** for my most recent course. For years now, I have also been actively involved in policy making, in matters of education and general organization, most recently as board member of our university's graduate school of science.

I have a wide range of (scientific) interests, including technology (in general), genetics and biotechnology, bioinformatics, finance and economy, politics, linguistics, philosophy, and, obviously, physics and astronomy.

Education

PhD	Rijksuniversiteit Groningen	Astronomy	September 1, 2010 - now
MSc <i>cum laude</i>	Rijksuniversiteit Groningen	Astronomy	2008 - July 9, 2010
BA	Rijksuniversiteit Groningen	Philosophy of Astronomy	2006 - April 9, 2009
BSc	Rijksuniversiteit Groningen	Astronomy	2004 - June 17, 2008
VWO <i>cum laude</i>	Esdal College, Emmen	Nature, Health and Technology	1998 - 2004

Research Experience

MAIN PHD RESEARCH PROJECT

Title: "*Clusters and the Cosmic web*"

Since: September, 2010

Description: With my promotors Rien van de Weijgaert and Jelle Kaastra (SRON Utrecht) I conduct an investigation into galaxy clusters, the cosmic web and their mutual dependencies. It is an observational study into the interplay of gravitational (tidal) forces from massive clusters with the surrounding environment of galaxy groups and filaments/sheets that make up the cosmic web.

SECONDARY PHD RESEARCH PROJECT

Title: "*Topology and morphology of the cosmic web and its dependence on Dark Energy*"

Since: 2010

Description: Our group under supervision of Rien van de Weijgaert is exploring a brand new field of cosmological probes from mathematical topology theory. In particular, we study alpha shape Betti



numbers and the genus that we can derive from the density field of a cosmological simulation or a galaxy position catalog. These provide us with novel opportunities for probing the cosmological parameters of our universe.

MASTER RESEARCH PROJECT ASTRONOMY

Title: “*VOIDS AS PROBES OF THE NATURE OF DARK ENERGY*” Grade: 9.0 Duration: 1 year

Description: Supervisor Rien van de Weijgaert and I are investigating (void) statistics with which models of dark energy can be discriminated in real data. To test these statistics we use medium sized cosmological N-body simulations, where different models of dynamical dark energy (quintessence) have been used on the same initial conditions. Used statistics include Void Probability Functions and shape parameters of voids, determined using Erwin Platen’s Watershed Void Finder.

BACHELOR THESIS PHILOSOPHY OF ASTRONOMY

Title: “*DEFINING PLANETS*” Grade: 9.0 Duration: 2 months

Description: Under supervision of Jan Albert van Laar, I have made a thorough analysis (using points of view from philosophy of science and theory of argumentation) of the debate around the Dwarf Planet definition at the IAU General Assembly of 2006. Care must ever be taken when defining categories of physical objects which in essence we know little about, because important oversights might occur when similar objects are excluded from study.

BACHELOR RESEARCH PROJECT ASTRONOMY

Title: “*DWARF GALAXIES IN THE VIRGO-ACS SURVEY*” Grade: 7.5 Duration: 4 months

Description: In this project, supervised by Reynier Peletier and Edwin Valentijn, we used high-resolution HST (ACS) data of the Virgo Cluster to find a sample of very faint dwarf galaxies. We verified this sample by comparing to data from the SDSS and similar data from the literature. Using this sample we studied dwarf galaxy properties as a function of environment to find out more about galaxy evolution in clusters.

Publications

See the arXiv for an up-to-date list of my publications: http://arxiv.org/a/bos_e_1

Teaching experience

TEACHING ASSISTANT ASTROPHYSICAL HYDRODYNAMICS, UNIVERSITY OF GRONINGEN RATED A+ BY STUDENTS AND EDUCATION COUNCIL

From April until July of 2011, I prepared and gave tutorials on Astrophysical Hydrodynamics. I also gave a lecture on Numerical Hydrodynamics and prepared some exam questions.

In 2012 (January until March) I took care of a full week of lectures on the topic of (gravity and sound) waves, in addition to the lectures and tutorials I gave in 2011. In 2013 I taught the course again.

PHYSICS TEACHER, UNIVERSITY CENTRE FOR LEARNING & TEACHING, GRONINGEN

In April and May of 2009 I taught high school physics to senior high school students that needed extra last minute training for their final exams.

TEACHING ASSISTANT PROGRAMMING/NUMERICAL METHODS, UNIVERSITY OF GRONINGEN

From September until November in 2007, 2008 and 2009 I introduced second year bachelor students Astronomy to Unix, Python and general use of computational methods in astronomy.

Awards

I was team member and webmaster of the *winning team* of the Academische Jaarprijs 2007/2008 (a yearly Dutch national prize for science outreach projects). Our winning project, titled “*Discover the invisible universe*”, was about (infrared) astronomy, and (not coincidentally) coincided with the launch of the Herschel space telescope and the International Year of Astronomy, 2009. We developed and taught lessons for high-school children on (infrared) astronomy, organized an infrared photography contest and eventually bought a mobile inflatable planetarium that is still in operation at elementary schools.

Other academic experience

SCHOOLS AND COURSES



- Presentation skills course by Ludens Seminars & Private Coaching, 1-2 February, 2011.
- NOVA Fall School on the Diffuse ISM, October 4-8, 2010.
- Astro-Computing Summer School on Galaxy Simulations, July 26 - August 13, UC-HIPACC.

CONFERENCES AND WORKSHOPS

Conference	Date & Location	Talk/poster
<i>Tracing the Cosmic Web</i> Lorentz Center workshop	Februari 17-21, 2014 Leiden, NL	-
<i>Computational Astrostatistics</i> Lorentz Center workshop	January 27-31, 2014 Leiden, NL	Reconstructing the local universe (talk)
<i>Quantum Universe III</i>	March 27, 28, 2013 Groningen, NL	-
<i>The Structure of the Cosmic Web</i>	October 15-19, 2012 Potsdam, DE	Less is more: How cosmic voids can shed light on dark energy (talk)
<i>13th Marcel Grossman Meeting</i> on Recent Developments in Theoretical and Experimental General Relativity, Gravitation, and Relativistic Field Theory	July 1-7, 2012 Stockholm, Sweden	Less is more: How cosmic voids can shed light on dark energy (talk)
<i>Quantum Universe II</i>	4, 5 April, 2011 Groningen, NL	-
<i>Cosmic Flows: Myth, Reality, and Prospects</i> Cosmological workshop	18-21 December, 2011 Haifa, Israel	Less is more: How cosmic voids can shed light on dark energy (talk)
<i>Groups and Clusters of Galaxies: Confronting Theory with Observations</i> Lorentz Center workshop	July 25-29, 2011 Leiden, NL	-
<i>Cosmic Web Morphology and Topology</i> Cosmological workshop	12-17 July, 2011 Warsaw, Poland	Less is more: How cosmic voids can shed light on dark energy (talk)
<i>Quantum Universe I</i> Symposium on (astro-)particle physics and astronomy	20, 21 April, 2011 Groningen, NL	Less is more: How cosmic voids can shed light on dark energy (invited talk)
<i>Theoretienoverleg</i> Periodic University of Groningen workshop on theoretical (astro-)physics	September 9, 2010 November 16, 2010 March 3, 2011	Less is more: How cosmic voids can shed light on dark energy (invited talk)



Conference	Date & Location	Talk/poster
Dutch Astronomers' Conference (5x)	2008 (Dalfsen) 2009 (Kerkrade) 2010 (Nijmegen) 2011 (Texel) 2012 (Ameland)	-
<i>Subdivide and Tile</i> Lorentz Center workshop	November 16-20, 2009 Leiden, NL	-
<i>Fysica 2009</i> Physics conference of the Dutch Physical Society	24 April, 2009 Groningen, NL	-
<i>Vliegende Hollanders 2008</i> Science & Technology Summit	November 11, 2008 Amsterdam, NL	<i>technical support for talk by Gijs Verdoes Kleijn and general promotion of our outreach activities (Discovery Truck)</i>
<i>From exoplanets to galaxy clusters: Science with Astro-WISE</i> Lorentz Center workshop	March 31 - April 3, 2008 Leiden, NL	Dwarf galaxies in the ACS Virgo Cluster Survey (contributed talk)
<i>9th National Astroparticle Physics Symposium</i>	October 12, 2007 Groningen, NL	-
<i>Universal Origins, Uncovering astronomical Roots</i> FMF symposium	October 4, 2006 Groningen, NL	-

OBSERVING EXPERIENCE

Date	Telescope & Instrument	Description
May - June 2012	Suzaku (space), X-ray Imaging Spectrometer	Three X-ray observations of the hot gas content of three clusters/groups of galaxies. Total observing time of 75 kiloseconds.
December 2006	Isaac Newton Telescope (La Palma), Wide Field Camera	Optical observation of a strong gravitational lens with a multiply imaged object.

OUTREACH AND MANAGERIAL/ORGANISATIONAL

- Member of the Board of the Groningen Graduate School of Science (January - September 2013).
- Member of the social committee for the Dutch Astronomers' Conference 2012 (January - May).
- Member of the Advisory Board of the Groningen Graduate School of Science (July 2011 - June 2012).
- Member of the PhD council of the Groningen Graduate School of Science (July 2011 - December 2013).
- Founding member of the Kapteyn Alumni Society (2011).
- Co-organiser of the Kapteyn Institute outing 2011 (Franeker).
- Coordinator of the Kapteyn Institute end-of-year festivities (the "Kastanjeborrel").
- Board member (secretary) of the Bèta Student Federation (2009 - 2010).



- Volunteer for public nights at the Blaauw Observatory of the University of Groningen and other outreach events organized by the Kapteyn Astronomical Institute (2007 - 2013).
- Member of the education committees of Astronomy (March 2007 - 2010) and Philosophy (2007-2008).
- Member and webmaster of the *national* education committee Astronomy (July 2008 - 2010).
- Member of several student councils (NSOS, FEBO/FOCO, SOF).

WEBSITES

I have managed three astronomy related websites; our institute website (2007-2010), an astronomical outreach website (2009) and a website for the national research school for astronomy, NOVA (2010).

Skills

Computing	Python, C, C++, Fortran, Java, Javascript, XML, HTML, PHP, LaTeX, SQL, ImageMagick, Matlab
Astronomical tools	Gadget, SPEX, XSPEC, IRAF, DS9, Aladin, Topcat, IFRIT, Skycat, Astro-WISE, SExtractor
Language	Dutch (native speaker), English (fluent), German (basic), French (basic), Frysian (basic)

Memberships

Nederlandse Astronomenclub (2008 - now), Nederlandse Natuurkundige Vereniging (2009 - now).



University Grades (Masters Astronomy & Physics courses)

Note that in the Netherlands, grades from 9/10 to 10/10 are given only in highly exceptional cases.

Course	Grade	Course	Grade
Large Scale Structure	9.5	Stellar Structure and Evolution	9.0
High Energy Astrophysics	8.8	Dynamics of Galaxies	9.0
Active Galaxies	8.5	Formation and Evolution of Galaxies	9.0
Classical Mechanics & Electromagnetism	8.0	Relativistic Quantum Mechanics	9.0
General Relativity	8.5	Symmetry in Physics	9.5
Quantum Field Theory	8.0	Cosmology	8.0
Virtual Observations	8.0	IAC Extrasolar Planets & Astrobiology	7.5

References

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prof. dr. Bernard Jones Kapteyn Astronomical Institute, University of Groningen, Landleven 12, 9700 AV, Groningen bernard@astrag.demon.co.uk +31503634086	dr. Jan Albert van Laar Faculty of Philosophy, University of Groningen, Oude Boteringestraat 52, 9712 GL, Groningen j.a.van.laar@rug.nl +31503636163
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