

## Dr. Bryan E. Penprase

Dean of Faculty, Soka University of America

Research Professor of Astronomy, Pomona College

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## Education

University of Chicago, Astronomy and Astrophysics, **Ph.D.** 1992

Stanford University, Applied Physics, **M.S.** 1985

Stanford University, Physics, **B.S.** 1985

## Recent Appointments

July 2017-present: **Dean of Faculty, Undergraduate Program, Soka University of America.** Duties include directing the Undergraduate Academic Program at Soka University. With the Soka faculty, working to hire and develop faculty, advancing the innovative Soka University of America curriculum, managing Learning Clusters, and other duties to support the growth and excellence of the undergraduate program.

July 2015-2017: **Director, Yale-NUS College Center for Teaching and Learning and Professor of Science.** Duties include founding and leading a new faculty development center, and establishing programs for assessing teaching, teaching awards, campus honors, and tenure and promotion teaching portfolios, in consultation with the Dean of Faculty. Additional duties include coordinating the core curriculum Foundations of Science course, and organizing global liberal arts conferences in consultation with the Yale-NUS President.

July 2014-July 2015: **Visiting Professor of Science, Yale-NUS College.** Duties included planning the campus opening at Yale-NUS College, developing new initiatives in global liberal arts, expanding study abroad and research opportunities for students, developing a global observatory network, and teaching the Foundations of Science course.

**July 2012-July 2013: American Council on Education (ACE) Fellow, Yale University,** Peter Salovey, mentor. While an ACE fellow, duties included studying and writing white papers about online learning, STEM education, bridge programs for enhancing diversity, and helping launch the new Yale-NUS College in Singapore.

**June 2007-July 2012: Visiting Associate, California Institute of Technology.** Research projects include quasar absorption line spectroscopy, and gamma ray burst research using the Keck telescope, Palomar Observatory, and Hubble Space Telescope.

**July 1994-present: Frank P. Brackett Professor of Astronomy, Pomona College.** In addition to managing an observatory, planetarium and remote telescope facility, I developed new curriculum, procured funding for the renovation and upgrading of our observatory and planetarium, and taught a wide range of courses across physics and astronomy. Administrative duties included chairing the department of Physics and Astronomy (2007-2011), serving as Division Chair for the Science Division (2013), Chairing the Future Learning Technologies Committee (2013-2014), serving on the Executive Committee (2013), and Chairing the Teaching and Learning Committee (2006-2007).

## **Administrative Experience**

Previously I was the inaugural Director of the Yale-NUS College Teaching and Learning Center in Singapore, and I am also working on strategic initiatives for global liberal arts with the Yale-NUS College President and Dean. My work includes managing resources and programming for faculty development, exploring the possible use of online education at Yale-NUS, as well as planning and organizing a series of major international conferences on Global Liberal Arts hosted by Yale-NUS and Yale University. The group working at our Center includes an Associate Director, a postdoctoral researcher in Mathematics Education, an administrative assistant, and additional staff from the Educational Resources and Technology Group at Yale-NUS.

During 2014 and 2015, I co-organized an initiative on the "The Future of Liberal Arts in India" which brought together founding leaders of emerging new institutions in India, academic leaders from the U.S., and other experts in liberal

arts to conferences in Bangalore in Jan. 2014, and New Delhi in March of 2015. During 2014, I the founding co-director for the Liberal Arts Consortium for Online Learning (LACOL), which includes Pomona College, Swarthmore, Williams, Amherst, Carleton, Haverford, Vassar and Claremont McKenna Colleges.

During academic year 2012-13, I was an American Council on Education (ACE) fellow at Yale University, under the mentorship of Yale's President, Peter Salovey. During that academic year, I was a co-author of the Yale-NUS curriculum report, and helped design several of the interdisciplinary common curriculum classes at Yale-NUS. While at Yale, I also wrote white papers on online learning, math teaching at IVY+ universities, Teaching and Learning Centers, and served on a Yale University committee that designed the Freshman Scholars at Yale (FSY) program, which gives first-generation and under-represented minority students a six week immersion at Yale's campus in New Haven.

As Chair of the Physics and Astronomy department from 2007-11, I was responsible for an extensive set of laboratories, shops, and off-site facilities (including a mountain-top observatory), and was the direct report for four staff members, as well as a group of eight faculty. During that period our department doubled its number of majors, and received approval for a new building for the Physics, Math and Astronomy Departments, and led initial discussions for the design of the building. While at Pomona, I led a restructuring of the physics curriculum in our department, with new formats for the senior and freshman courses, new initiatives to discuss and enhance diversity in the department.

## **Service and Leadership**

As Dean of Faculty, I direct the Undergraduate Academic program at Soka University of America. With the Soka faculty I am working to advance the innovative Soka University of America curriculum, managing Learning Clusters, and supporting the growth and excellence of the undergraduate program.

At Yale-NUS College I chaired the Teaching, Learning and Advising Center, advised the President on Liberal Arts initiatives and undergraduate education conferences, and directed the Centre for Teaching and Learning. At Pomona College, I was appointed chair of the Future Learning Technologies Committee in 2013-14, was Chair of the Pomona Science Division, and a member of the campus

Executive Committee. I served as Chair of the Physics and Astronomy Department for four years (2007-2011), was Chair of the Teaching and Learning Committee (2006-2007), and Director of the Brackett Observatory since 1993. Additional committee service at Pomona College included serving as a member of the Outdoor Education Committee, British Fellowship Committee, Curriculum Committee, Faculty Position Planning Committee, Grievance Committee, Public Events Committee, and Science Library Planning sub-committee.

I have been a member of the Project Kaleidoscope (PKAL) F21 network since 1995, and helped found the Southern California PKAL Network. I was a member of the inaugural class of the PKAL Leadership Institute, and served four times as a mentor to help junior faculty plan their careers as STEM educators.

## **International Higher Education and Global Liberal Arts**

As a member of the new Yale-NUS College in Singapore, I was involved in several international strategic projects linking institutions around the world to refine their models of liberal arts and sciences, and to enable teaching and research among global partners. My role as Director of Teaching and Learning Centre has enabled me to work with other Singaporean Teaching and Learning Center directors to help create a Singaporean faculty development network, which will soon include members from other countries in the region. In addition to planning three major conferences on liberal arts and innovative undergraduate education I have been involved in site visits to major universities in China, Taiwan and Hong Kong, as well as to liberal arts institutions throughout Asia.

## **Research Grants**

I have been a PI or Co-I for numerous grants totaling over \$10-million, coming from funding sources that include NSF, JPL, the Space Telescope Science Institute, and NASA, as well as private foundations. Below is a listing of just the major grants in recent years.

**8/14 NSF PIRE.** *"GROWTH - The Global Relay of Observatories for Watching Things Happen,"* M. Kasliwal, PI, (Caltech), with co-I's T. Prince (Caltech), Lin Yan (Caltech); with B. Penprase (Pomona), R. Quimby (SDSU), P. Wozniak (LANL); S. Vogel (U. Maryland), and D. Kaplan (U. Wilwaukee).

**\$4,500,000.** My role is to lead a global educational initiative that will offer students international research opportunities, and a global observational astronomy course. International partners include Tokyo Institute of Technology, National Central University in Taiwan, IUCAA, India; Weizmann Institute, Israel; Stockholm University, Sweden; and Humboldt University in Germany.

**8/14 NSF Division of Astronomical Sciences, MSIP.** *“The Zwicky Transient Facility,”* S. Kulkarni, PI, (Caltech) with Co-PI’s T. Prince, B. Penprase, R. Dekany, and G. Helou, **\$8,980,000.** This grant will develop a new cutting-edge camera and control system for the Palomar Observatory, linking it with a global network of telescopes, and supercomputers at LANL for processing the data. A sub-award to Pomona College will enable establishing an Undergraduate Astronomy Institute, to train future instrument designers and observational astronomers.

**12/13 Fletcher Jones Foundation:** “Digital Immersive Theatre,” Ebert, M., Penprase, B., Choi, P., and Tanenbaum, D., **\$1,000,000.** This grant will enable creating an interdisciplinary digital immersive theatre for creating visualizations in astronomy, physics, chemistry, biology, and the arts and humanities.

**3/10 NSF MRI,** P. Choi (Pomona), PI; (co-I with R. Erik Spjut (HMC), Scott A. Severson (SSU), “CCAO-Cam: A Remote-Access, Dual-Band (Optical/NIR) Adaptive Optics System for the Table Mountain 1-meter telescope,” **\$637,000.** Funding to enable Pomona to develop a new adaptive optics system for our 1-meter telescope with undergraduates.

**1/01 Fletcher Jones Foundation:** “Astronomical Computing Initiative at Pomona College”, Penprase (PI), **\$567,000.** Enabled development of web-based curriculum in astrophysics simulations, upgrade of planetarium and observatory facilities, and implementing of new technologies in astronomy education such as an n-body “supercomputer” for simulations.

## Honors and Awards

National University of Singapore, Teaching Academy Member, 2016-2019.

American Council on Education (ACE) Fellow, Yale University – 2012-2013  
(Peter Salovey, primary mentor).

Hubble Space Telescope Time Allocation Committee, 2011-2013.

Keck NASA Time Allocation Committee, 2010-2013.

Director, PKAL Southern California Regional Network 2008-2011.

Chair of Higher Education Working Group, California Space Grant Consortium,  
2008-2011

Visiting Professor, Raman Research Institute, Bangalore, India, 2008.

Mentor, Project Kaleidoscope F21 Network for Science Education Reform, 2007-  
2011

Visiting Fellow, Downing College, Cambridge University, UK, 2005.

Harvard SAO Visiting Scientist Fellowship, summer 2004.

ASEE/JPL faculty fellow, 1997 and 1998.

American Astronomical Society, full member since 1992.

NASA California Space Grant Affiliate representative – 1994-2011

Rebecca Carrington Award for Distinguished Scholarship and Service, Stanford  
University Physics Department – 1985.

Westinghouse Science Talent Search – National Finalist, 6<sup>th</sup> place finish – 1979.

## Teaching and Education

I have developed a number of innovative and interdisciplinary courses that allow students to experience active learning and discovery through their own inquiry-based projects. At Yale-NUS College, I am facilitating a team-taught interdisciplinary science course involving disciplinary case studies and immersive fieldwork in the environment surrounding Singapore. During 2015-2016, this course has been modified to include two 5-week case studies, and a culminating interdisciplinary Grand Challenge project where students work together in teams

of four to answer a question challenging society. I have also developed several upper-level undergraduate courses that integrate current research into the classroom, such as the upper-level astrophysics seminars taught in collaboration with the Carnegie Observatory staff in Pasadena. One innovative new course being developed within the NSF PIRE collaboration is a parallel course known as a DOCC (Distributed Open Collaborative Course) where astronomers from Caltech, Pomona, Haverford, and Williams colleges will teach an observational astronomy course in parallel, sharing observational data, and collaborating on instructional materials. At Pomona, my Archaeoastronomy and World Cosmology course enabled students to explore the cultural roots of astronomy in a wide cross-section of world civilizations. This latter course was the impetus for the book "Power of Stars" which has been used as a text for archaeoastronomy courses at other institutions, such as Yale University.

A partial list of courses I have developed and taught at Pomona includes Introduction to Astronomy and Lab (Astro 1), Archaeoastronomy and World Cosmology (Astro 6), Earth's Cosmic History (Astro 9), Advanced Introduction to Astronomy (Astro 51), Introduction to Environmental Science (Env Studies 51), Advanced Observational Astronomy (Astro 101), Extragalactic Astronomy and Cosmology (Astro 121), High Energy Astrophysics (Astro 122), Interstellar Medium and Star Formation (Astro 123). Physics courses taught at Pomona include Electricity and Magnetism (Physics 135), Advanced Introductory Physics – E&M (Physics 72), Physics Senior Seminar (Physics 191), and numerous introductory Physics Lab sections. These curriculum development efforts were funded by numerous internal grants from Pomona College, such as Mellon and Hahn technology awards, and were supplemented by substantial external funding from the NSF and Fletcher Jones foundation.

## **Research Interests**

I have conducted research across a broad spectrum of modern astrophysics, with published work on photometric studies of near-earth asteroids, interstellar absorption studies of the local galaxy, and high resolution spectroscopy of quasars and gamma-ray bursts at the edge of the universe. I have conducted my research at Caltech as a Visiting Associate, and also have been a visiting fellow at Downing College, Cambridge, as well as a visiting scholar at the Harvard Smithsonian Astrophysical Observatory, Jet Propulsion Laboratory, and the Raman Research

Institute in Bangalore, India. My research has made use of the Las Campanas Observatory, the Keck Telescope and Hubble Space telescope, among other facilities. My main research effort focuses on the nature of damped Lyman alpha absorbers, the history of cosmic element formation as revealed in quasar absorption lines, and the nature of gamma ray bursts. In these studies, I employ high-resolution optical spectroscopy to detect absorption lines from atoms and molecules billions of light years away, and then use astrophysical models for these absorbers to constrain the temperatures, densities, and compositions of these remote clouds of gas, as a way to reveal the cosmic history of element formation in the universe.

## Selected Publications

### **Books and Book Chapters:**

**Penprase, B.E.**, “*The New Age of STEM Teaching and Learning: How Active Learning, Online Technologies and Research Have Transformed STEM Education,*” under contract with Stylus Publishing; to appear in early 2018.

**Penprase, B.E.**, "Curricular Innovation: The Case of the National University of Singapore," in *Envisioning the New Flagship University*, John Aubrey Douglas and John N. Hawkins, editors, Berkeley Public Policy Press, Berkeley, 2017.

**Penprase, B.E.**, "The Founding of Yale-NUS College in Singapore," in *Envisioning the New Flagship University*, John Aubrey Douglas and John N. Hawkins, editors, Berkeley Public Policy Press, Berkeley, 2017.

**Penprase, B.E.**, "New liberal arts and science institutions in India and Singapore – the role of STEM education," contributed article to be published in *The Liberal Arts and Science Education Dialogue across Continents: Experiences and Perspectives from the USA, Europe, and Asia*, Palgrave Macmillan.

**Penprase, B.E.**, "Calendars and Timekeeping Around the World" an entry in the *Encyclopaedia of the History of Science, Technology, and Medicine in Non-Western Cultures*, H. Selin, editor, Springer Verlag, NY.

**Penprase, B.E.**, “*The Power of Stars – How Celestial Observations Have Shaped Civilization,*” published by Springer Verlag (trade title; released October 2010; second edition approved and in progress). Book web site at: <http://www.astronomy.pomona.edu/powerofstars/>; Second edition is under contract, to be delivered by July 2016.



During the ACE fellowship year I was a co-author of the Yale-NUS College curriculum report entitled, "*Yale-NUS College - A New Community of Learning*" available at the link below:

<http://www.yale-nus.edu.sg/wp-content/uploads/2013/09/Yale-NUS-College-Curriculum-Report.pdf>.

**Publications in Refereed Journals:**

*The listing below includes a complete set of publications, primarily in high-resolution spectroscopy of quasars and gamma-ray bursts, near earth asteroid research, and interstellar medium astrophysics. (undergraduate student authors indicated with an asterisk)*

Swiggum, J.K., Kaplan, D. L., McLaughlin, M.A., Lorimer, D.R., Bogdanov, S., Ray, P.S., Lynch, R.L, Gentile, P., Rosen, R., Heatherly, S.A., Barlow, B.N., Hegedus, R.J., Vasquez Soto, A., Clancy, P., Kondratiev, V.I., Stoval, K., Israte, A., **Penprase, B.**, and Bellm, E.C., 2017, A Multi-Wavelength Study of Nearby Millisecond Pulsar PSF J1400-1431: Improved Astrometry and an Optical Detection of its Cool White Dwarf Companion, *Astrophysical Journal*, in press.

Marsh, F.M.\*, Simon, A.A., **Penprase, B.E.**, Mettig, H., and Hahn, G. 2016, "The Relationship of Feature Drift Rate to Zonal Wind Velocity in the Northern Equatorial Belt of Jupiter I: Synoptic Scale Features," submitted to *Icarus*.

Trilling, D.E., Mommert, M., Mueller, M., Spahr, T.B., Hora, J.L., Harris, A.W., Thomas, C.A., Benner, L., Bhattacharya, B., Bottke, W.F., Delbo, M., Emery, J.P., Fazio, G., Mainzer, A., **Penprase, B.**, and Smith, H.A. 2015, "ExploreNEOs VI: Second data release and preliminary size distribution of near Earth objects," submitted to *Astronomical Journal*.

Phillips, M.M., Simon, Joshua D., Madore, Barry F.; **Penprase, B. E.**, (several co-authors omitted for space), 2013, "On the Source of the Dust Extinction in Type Ia Supernovae and the Discovery of Anomalously Strong Na I Absorption," *Astrophysical Journal*, **779**, 38

Sternberg, A., Gal-Yam, A., Simon, J. D., Leonard, D. C., Quimby, R. M., Phillips, M. M., Morrell, N., Thompson, I. B., Ivans, I., Marshall, J. L., Filippenko, A. V., Marcy, G. W., Bloom, J. S., Patat, F., Foley, R. J., Yong, D., **Penprase, B. E.**, Beeler, D. J.\*, Allende Prieto, C., Stringfellow, G. S., 2011, "Circumstellar Material in Type Ia Supernovae via Sodium Absorption Features," *Science*, **333**, 856.

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- S. Guieu , L. M. Rebull , J. R. Stauffer , F. J. Vrba , A. Noriega-Crespo , T. Spuck, T. Roelofsen Moody , B. Sepulveda , C. Weehler , A. Maranto , D. M. Cole , N. Flagey , R. Laher , **B. Penprase** , S. Ramirez , S. Stolovy, 2010, "Spitzer Observations of IC 2118 ," *Ap. J.*, **720**, 46.
- Trilling, D.E., Mueller, M., Hora, J.L., Harris, A.W., Bhattacharya, B., Bottke, W.F., Chesley, S., Delbo, M., Emery, J.P., Fazio, G., Mainzer, A., **Penprase, B.**, Smith, H.A., Spahr, T.B., Stansberry, J.A., and Thomas, C.A., 2010, "ExploreNEOs. I. Description and First Results from the Warm Spitzer Near-Earth Object Survey", *A.J.*, **140**, 770.
- Tanvir, N. R.; Fox, D. B.; Levan, A. J.; Berger, E.; ..., **Penprase, B. E.**, 2009, "A  $\gamma$ -ray burst at a redshift of  $z \sim 8.2$ ", 2009, *Nature*, **461**, Issue **7268**, pp. 1254-1257 (2009). (some co-authors removed for space)
- Gal-Yam, A., Nakar, E., Ofek, E.O., Cenko, S.B., Kulkarni, S.R., Soderberg, A.M., Harrison, F., Fox, D.B., Price, P.A., **Penprase, B.E.**, Frail, D.A., Atteia, J.L., Berger, E., Gladders, M., Mulchaey, J., 2008, "New Imaging and Spectroscopy of the Locations of Several Short-Hard Gamma-Ray Bursts", *Astrophysical Journal*, **686**,408.
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**Penprase, B.E.** and Marsh, F.M.\*, "A Study of Cyclones and Anti-Cyclones in Jupiter's North Tropical Zone, 2003-2013," Poster at the 2014 DPS meeting, Tucson, AZ.

Liu, C.T., **Penprase, B.E.**, and 18 co-authors, 2014, "Maximizing LSST's Scientific Return: Ensuring Participation from Smaller Institutions," white paper for astronomical community.

Hedlund, A.\*, Madore, B.F., **Penprase, B.E.**, and Choi, P., "High-Mass Star Formation in NGC6822: The Ultraviolet as a Tool for Identification," 2014 AAS meeting presentation.

Sternberg, A., **Penprase, B.E.**, et al., 2011, "Evidence for Circumstellar Material in Type Ia supernovae via NaI D Absorption Features," 2011 AAS meeting presentation.

Guieu, S., **Penprase, B.E.**, et al, 2010, "Spitzer Observations of Young Stars in IC2118, the Witch Head Nebula," 2010 AAS meeting presentation.

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## Media Appearances and Major Public Talks

**Benjamin Dean Lecture** - California Academy of Sciences, December 9, 2013. Sold-out talk discussing “The Power of Stars” with new visualizations created with the CAS staff in their digital planetarium theatre.

**“The Universe - Ancient Mysteries Solved”** History Channel 2 (2014) - Appeared in two episodes - one on Stonehenge and one on the Egyptian Pyramids.

**Griffith Observatory FOTO talk** - Feb. 28, 2011. Lecture based on the “The Power of Stars” included over 200 people and was sold out.

**“Known Universe - Ancient Observers”** - National Geographic Channel (2010); several clips were included on the broadcast international version - can be viewed at <http://natgeotv.com/ca/known-universe/videos>

**Huntington Library Scholarly Books Lecture Series**, June 20, 2011 - “Power of Stars” book talk with full house and over 200 attendees.