A Half-Century of Astronomy Outreach: Reflections, and Lessons Learned

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In The Beginning ...
Downsview Collegiate, Class of 1958

- A shy, underage, nerdy, immigrant kid from “the sticks” blossoms,
- Thanks to an excellent public high school, and effective, inspiring teachers, and extra-curricular activities
- Teachers and mentors make a difference!

Downsview CI Yearbook, 1958
Undergraduate and Graduate Days

BSc (1962), MA (1963), PhD (1968) U of T

- I was educated in a department with a strong commitment to teaching and outreach as well as research
- Left: my role models
- Students get the message: if departments actively value teaching and outreach, they are more likely to give it high priority

Sidney van den Bergh, Helen Hogg, Don MacRae, Ruth Northcott, Don Fernie, Jack Heard
A Detour into Teaching
Teachers College (1963-4), Teaching (1964-5)

Like many graduates in the 1960's, I went to teachers' college, and taught high school – for one year.

My connections to school science have continued.

Teacher training does help – including at the post-secondary level!

Schools need/deserve our support.
Getting Started in EPO

As a grad student, I ran public and school programs at the Dunlap Observatory, a major centre for astronomy EPO as well as for research and grad student training.

This built on my interest and experience in teaching.

Give grad students encouragement and opportunity (and training), and they will run with it!
Building a New Campus
University of Toronto Mississauga aka Erindale College

- As a founding faculty member in 1967, I got to help build a campus, to develop outreach programs (with partners), and to develop interesting links with faculty and students in other departments.

- Interdisciplinary connections broaden and enrich astronomy teaching and scholarship.
Role Models

• My first “bosses”: UTM Principal J. Tuzo Wilson (right) – eminent geophysicist and communicator; Dean Peter Robinson (left) – chemist and educator

• Principals, deans, and department chairs can set a strong example by actively encouraging and supporting teaching and outreach

University of Toronto Mississauga; Tuzo Wilson (right); Peter Robinson (left); unidentified graduand (centre). Photo by Steve Jaunzems
Impacting the School System
(Doing this since 1971 ... or before)

- Astronomy is part of the school curriculum (grade 1, 6, and 9 in Ontario).

- I work with the Ministry of Education to craft curriculum, with publishers to ensure that textbooks are accurate and engaging, and with the science teachers association to educate teachers.

- Make and use these contacts! It's the highest-impact form of astronomy education!

Ontario school science curriculum;
Textbook (which I reviewed)
STAO: teacher PD
Science Teachers Association of Ontario
Member since 1971, most active 1985-91, honorary president 1988-91

- “Promoting excellence in science education through leadership and service”
- I've attended and presented at virtually every STAO conference; developed grade 6 and 9 resources as IYA projects with STAO
- Effective partner for any project involving school science: science teachers associations (easier), and school boards (harder)

Two dozen astronomy sessions at STAO conference in IYA 2009!
STAO (continued)

Don Galbraith: a role model for 40 years

Don Galbraith
President - 1989-90

Don is Chair of the Secondary Department, Faculty of Education, University of Toronto. He has been actively involved in STAO as a former editor of Crucible and his work on STAO conferences over many years. Don has many interests including that of photography.

John Percy
Honorary President

John is now Dean of Science at Erindale Campus, University of Toronto. He has been a member of STAO for nearly 20 years and is active as an associate editor of Crucible. John has been Vice President of the American Association of Variable Star Observers and President of the Royal Astronomical Society of Canada.
Royal Astronomical Society of Canada
Member since 1961; active 1965-2008; president 1978-80

- The RASC, with 4,000 members in 29 centres and elsewhere, does outstanding work in astronomy outreach
- They received a 2003 *Michael Smith Award*; with the FAAQ, they were an excellent IYA partner
- Encourage, support, and partner with your local RASC Centre or other astronomy club!
Royal Canadian Institute
Instructor: summer science program: 1963, active 1983-91, president 1985-86

- Canada's oldest scientific association (1849)
- Free public Sunday lectures, videoed and archived; programs and scholarships for youth
- There's still a place for the public lecture – scientists face-to-face with people -- especially if videoed, archived, and promoted. Astronomers can “plug in” to programs like this

Sir Sandford Fleming: co-founder of the Royal Canadian Institute etc.
Astronomical Society of the Pacific

- A major source of good astronomy education resources, including free, on-line, well-tested activities.
- They have conferences, publications, and resources for every level, including the public.
- Don't re-invent the wheel! Use what's good, and available!

Joint ASP-AAS project: filled a gap for those who should teach evolution.
American Astronomical Society
Education board: 1983-6, 199-2002; Shapley Lecturer: 1977-2005

- Education Board: with ASP, founded *Astronomy Education Review*.
- Shapley Lecturers: visit smaller institutions without astronomy programs;
- CASCA-Westar Lectures are patterned after these; I inaugurated the CWL in 2002 (North Bay ON)
- Promote and support the CWL! And read AER!

Refereed and non-refereed articles on all aspects of astronomy education
International Astronomical Union

- The IAU: “to promote and safeguard astronomy ... and develop it through international cooperation”.
- Commission 46 (Education and Development)
- Graduate students and other young (and older) astronomers should be made aware of the nature and importance of international astronomy, including education and development

IAU conferences bring together “kindred spirits” to advance the field
American Association of Variable Star Observers
Active 1982-present; president 1989-91

- Founded 1911; centennial 2011; has grown and diversified enormously since its founding
- The most significant organization through which amateurs can contribute to astronomical research
- Skilled amateurs can contribute to research! Encourage and support their work.

Official history by Thomas Williams and Michael Saladyga (Cambridge)
AAVSO and Undergraduate Research
A prime thrust of my research since 1985

- My undergraduate and high school students use AAVSO archival data to complete publishable projects, with them as co-authors

- Win-win-win! Science gets done; students benefit by doing real science with real data; AAVSO observers see how their work benefits science and education

Co-editor Joe Wilson was an undergrad research student! (ASP CS 220 (2000))
U of T Mentorship Program
Co-founder 1987; mentor/participant since then

- Enables outstanding senior high school students to work on research (or education) projects at the university; mine do variable star research
- 200 participants in 2012
- Talented/gifted students' capabilities rival those of undergraduates! Engage them in both research and outreach!

Bernadette, Elena, and Jou, and their UTMP project at the annual UTMP Research Fair
Hands-On Astrophysics
Janet Mattei and JRP PI's, 1992-98

- $304,000 from NSF
- Students develop and integrate science and math skills through variable star observation and analysis
- HOA has evolved into Variable Star Astronomy, a major segment of the prep for the US Physics Olympiad – high impact!
- Canada needs more government and foundation support for STEM education and outreach projects!

Video (now DVD) – one of many components of HOA.
McLaughlin Planetarium

- From 1968 to 1995, it was a world-class planetarium, but was closed in response to the uncertainty of Ontario's “common sense revolution”

- Part of the Royal Ontario Museum, primarily an art and archaeology museum, not a science centre

- The scientific community should connect actively and support with facilities like this!
Ontario Science Centre
Vice-chair, Board of Trustees, 1992-98

- One of the world's foremost science centres, and one of Canada's most popular cultural attractions
- A leader in astronomy education: exhibits, programs, workshops for teachers and students; host to the RASC Toronto Centre
- It's important for the scientific community to support science centres, and partner where possible
David Dunlap Observatory

- Opened in 1935 as part of U of T, with the world's second-largest telescope
- Especially active in the 1970's; after that, research, student training, and outreach declined
- Sold to a developer in 2007; proceeds endowed the Dunlap Institute; presently under heritage consideration; active public education program run by the RASC Toronto Centre, which I and colleagues support
Science & Technology Awareness Network
Co-founder/steering committee: 2003-2006

- A national organization to enhance the profile and influence of the STEM EPO sector
- Over 380 member institutions; CASCA was a founding member
- Annual conference, networking, collaboration, website resources
- CASCA should support STAN, and remain represented!

Bonnie Schmidt: co-founder, former President; driving force
Science Rendezvous
Co-founder: 2008

- A one-day festival of science, begun in Toronto (based on an event in Berlin), and now national; physicist Dwayne Miller was the driving force
- Best activities are hands-on, engaging, talk with a scientist
- Lectures don't work
- Canada needs a “science culture”!

Science Rendezvous 2012 in Toronto; Photograph by Sharmin Choudhury
International Year of Astronomy 2009

- 148-country celebration of Galileo's development and first use of the telescope
- In Canada: over 3,600 events reaching 2M people
- Success: leadership (Jim Hesser), partnership (CASCA, FAAQ, RASC), volunteership
Astronomy and the Arts
Tafelmusik Baroque Orchestra

- “The Galileo Project” is a superb multimedia combination of music, images, narration, and choreography – an outstanding fusion of arts and science
- It has toured in Canada, US, Mexico, Asia, Australia, and NZ; DVD is now available
- Combine astronomy with your extra-curricular interests to reach new audiences!

Tafelmusik Baroque Orchestra
www.tafelmusik.org
Toronto Public Library

- TPL: the world's busiest public library system
- During IYA and beyond, TPL branches hosted dozens of my presentations for all ages
- Libraries provide a venue, facilities, publicity, and audience – just provide astronomers
- Partner with your local public libraries!
Astronomical Heritage

Campus astronomical heritage walks: 2009, 10, 11

- IYA project: partnership with Heritage Toronto: guided walking tours of astronomical heritage sites around the U of T campus – very popular!

- Preservation of U of T's astronomical instruments, by grad-student-led UTSIC

- People are interested in history and heritage! If we don't preserve our astronomical heritage, no one else will!

Stewart Observatory (1855)
University of Toronto
Beyond IYA: Reaching Underserved Audiences

- This was the goal of a PromoScience-supported BIYA project
- Reach students from rural, remote, Aboriginal, inner-city communities
- Build on excellent IYA progress with Aboriginal groups (Cheryl Bartlett and colleagues, Jim Hesser)
- Not easy! Must partner, respectfully and patiently, with target communities
Reaching Inner-City Kids

- For astronomical events, it's easy to reach “the usual suspects” -- greying white males. But what about inner-city kids?

- We had some success through community boys-and-girls clubs, Visions of Science, libraries, and a multicultural astronomy festival 16 October 2010

- **Strategy:** patient, respectful, imaginative partnership

One World, One Sky: A festival of multicultural astronomy
Later Life Learners!
First course: 1963; three courses in 2011-12

- Receptive, enjoyable, interactive, significant, growing audience
- Audiences are typically 100, but up to 250
- Can offer courses or one-off lectures
- Contact and partner with local LLL groups (e.g. Probus)

Glendon College, York University, Toronto
Centre for STEM Education
Ontario Institute for Studies in Education, U of T

- I'm core faculty (but got in by the side door)
- OISE: education research, graduate and teacher education
- EPO activities should be subjected to evaluation and, if possible, research
- It's hard to connect education researchers with STEM departments – but we must try
U of T President's Teaching Academy
Founding member: 2007

- Teaching award winners form an academy to address fundamental issues in higher education, build a “culture” of teaching

- e.g. annual teaching and learning conference

- Address the issue that, especially in research universities, faculty have little or no initial or continuing education in best teaching practices
Astronomy EPO at DAA/DI/CITA
Toronto's powerful astronomy triumvirate

- Growing slowly but surely
- Building on research excellence
- EPO is part of DI mandate
- Guided by a DAA/DI/CITA committee of faculty, staff, PDFs, and students
- Aim for high impact and leverage, efficiency and effectiveness, through partnership and coordination

One-day, highly-interdisciplinary, student-driven symposium
STEM EPO at U of T

- Lots going on, but poorly coordinated and supported (we don't have a Faculty of Science)
- A round-table meeting, a decade ago, resulted in *Science Rendezvous*
- Recently: Ray Jayawardhana appointed Special Advisor to the President on Science Engagement
- **Get organized; coordinate; get the administration onside!**

Ray Jayawardhana, Professor, Canada Research Chair, Award-winning science author.
EPO in CASCA

- Tremendous growth in the last decade, thanks in large part to these four individuals' leadership
- cascaeducation.ca; CASCA-Westar Lectureship; ECass; CASCA meetings
- ... and partnership with RASC and FAAQ
- Make EPO an ongoing, growing, and improving part of CASCA's mandate and culture

Julie Bolduc-Duval, Dennis Crabtree
Jim Hesser, Heather Theijsmeijer
Acknowledgements

- My institutions (UTM, Astronomy & Astrophysics, OISE-SMT) and colleagues – faculty, staff, students – for encouragement, support and partnership.
- The partner organizations in which I have been privileged to serve – including CASCA – and the individuals I have worked with (and arm-twisted).
- Especially the students who have worked with me on research and outreach projects.
- Funding agencies, including NSERC (Discovery and PromoScience), NSF, ASP, and the University of Toronto.
- The mentors and role models who have inspired me.

http://www.astro.utoronto.ca/~percy/EPOindex.htm