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Looking Up for 150 Years: possible projects for RASC anniversaries 2015 & 2018

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For the History Committee

INTRODUCTION

The Royal Astronomical Society of Canada has long prided itself on its commitment to bringing the heavens to Earth, providing encouragement, knowledge, and the means for fellow citizens to look up. From the era of magic lantern slides, Verne's *The Fur Country*, and constellation study with opera glasses, to the time of a universe of hard-copy journals alone, the dominance of ATM telescopes at star parties, and dreams of observable intelligent life in the solar system, to the age of Alouette 1, NFB's *Universe*, and planetaria, to the present communications revolution of wifi Go-To mounts, astronomy apps, and social media, the RASC has aspired to be a portal to the sky.

This year marks the 125th anniversary of the incorporation of the RASC, then known as "The Astronomical and Physical Society of Toronto" (`http://www.rasc.ca/sites/default/files/tapst-1890.pdf`; P.R. Broughton, *Looking Up: A History of the Royal Astronomical Society of Canada* [Toronto & Oxford: Dundurn, 1994], p. 4). Incorporation was a significant achievement in the life of the revived and renewed Society. It conferred a firmer and more mature legal identity, and the self confidence it gave can be seen in the establishment of our first official publication, the direct lineal ancestor of the present *Journal* (`http://www.rasc.ca/earlysociety`). Equally, if not more significant, is 1868 December 1, which Society members have long looked upon as the founding meeting of the Society (`http://www.rasc.ca/sites/default/files/TASMinutes1868-69.pdf`; `http://www.rasc.ca/content/meeting-1868-dec-1`). Foundation stories are to a certain extent acts of self-fashioning. To judge by our publications, our present foundation narrative did not appear in print till thirty-three years after the event, as documented by one of the founders himself (`http://www.rasc.ca/sites/default/files/ttas-1901.pdf`, pp. 83-84)! It took the RASC some time to realize it had a history. The narrative handed down to us can serve to further the aspirations of the present RASC. Celebrating our history in 2015 and 2018 offers strong opportunities to shape the continuing story of the RASC to ensure a more effective Society for the future. Of the two anniversaries, the 150th anniversary in 2018 of the 1868 founding of the Society offers more scope for innovative and ambitious projects than does the 125th anniversary 2015 of our incorporation. The characteristics of the projects described below reflect that difference.

This document provides suggestions for projects the Society *could* undertake in 2015, and 2018. It is meant to initiate meaningful discussion. The projects frequently involve complementary sections of the Society, call on various resources, and could potentially enhance many of our core activities—EPO, research, observation, imaging, and cooperation with our institutional partners. Some projects will make no demands on our financial resources, while others will require material investment, but all will call for volunteer effort. None of these proposals are written in stone. They are all malleable according to the will of the Society, the guidance of the Board of Directors, and the enthusiasm and drive of individual members. There are doubtless other worthwhile initiatives which could be considered in addition to those mentioned here, and members are encouraged to mould their own insights and interests into projects at the personal, centre, multi-centre, or national level. It is our shared responsibility to bring the past alive in the present to animate our future. If we lack the imagination, daring, and competence to build on what we've been given, we only have ourselves to blame for making astronomy dull, and failing to live up to our promise "to be Canada's premiere organization of amateur and professional astronomers, promoting Astronomy to all".

*Note: this document is an expanded version of an earlier version presented to the History Committee. The projects they approved of are indicated by an *. Projects 9 to 12 are presented here for the first time. The order of presentation does not indicate any ranking of preference, ease of accomplishment, or resource use. Acknowledgements can be found on page 10 below.*

Possible Projects for RASC Anniversaries

A) Projects for 2015 could include:

1)* **obtaining Royal patronage for the RASC**. *Discussion*: Other societies which have been honoured with the title "Royal" have long had royal patrons. The office is honorary (except in exceptional cases), and is usually held by vice-regal office holders in the former colonies. The Royal Canadian Institute's (RCI; http://royalcanadianinstitute.ca/about-rci/council/) Honorary Patron is the Governor General (GG). A society can apply either to the GG, or a provincial Lieutenant Governor to be granted Royal patronage. Given the national character of the RASC, it would probably be most fitting to seek the patronage of the GG. If patronage is granted it runs only for the term of the incumbent. *Personnel*: this project would be lead by the ED and the Chair of the History Committee, with consultation with the BOD & History Committee as required. The National President has informally approved the initiative. The BOD may wish to consult further. *Budgetary impact*: implementation is not expected to have any impact on the budget;

2)* **issuing a publication highlighting some aspect of our heritage**. *Discussion*: The easiest way to accomplish this would be to produce a second expanded edition of the illustrated catalogue of the astronomical art in our archives (2008), which went out of print within months of publication (it was funded by a private donor). Materials are in hand for the revision. *Personnel*: this project would be lead by the Society's Archivist, and could involve the History Committee and the Publications Committee—the bulk of the work would fall to the former. The work would ideally not be issued as grey literature. This project is a relatively painless way to increase our published offerings, diversify our anniversary projects, and fulfil a demand in the astrosketching community for a reprint. *Budgetary impact*: if released as a pdf book for free distribution there would be no impact on the budget; if the pdf is placed behind a pay wall it could generate some revenue. It is recommended that the expense and complication of DRM encryption and proprietary ebook format be dispensed with. The prime emphasis should be on providing a resource to the wider astronomical community, in accord with our mandate, mission, and values statement;

3)* **initiating a joint project with the CASCA Heritage Committee to further the awareness of Canada's astronomical history and heritage and its preservation. This would be aimed primarily at the astronomical community, professional and amateur.** *Discussion*: there is a need to locate, inventory, and make accessible the media of past observations for data mining, and to discover, preserve, and conserve the significant historical hardware of amateur and professional activity. This could be both a campaign to raise awareness of the materials and what they represent, and an opportunity to provide conservation resources to guide people in identifying what they have, to inform them of best practices of conservation, and when to seek professional assistance. The science case for this project has been made in http://www.rasc.ca/sites/default/files/RAR_Preserving_the_Past.pdf, also available at
http://www.baalunarsection.org.uk/tmnrv1n1jul2011.pdf, 23-26.
This project could make use of multiple media, electronic and hardcopy, such as pamphlets and posters (on the lines of Roy Bishop's GLP brochure;
http://www.rasc.ca/sites/default/files/GLP_Brochure.pdf), facebook, and youtube. *Personnel*: the project would be lead by the Chairs of the RASC History Committee and the CASCA Heritage Committee, with the cooperation of their respective committees, perhaps with the RASC IT Committee in a consultative role. A relationship with the successor to the IAU Division B Commission 5 WG—TG on Preservation & Digitization of Photographic Plates, and Division B Commission 5 Documentation & Astronomical Data, could be formed after the IAU XXIX General Assembly. This would be in accord with the current Strategic Plan 2014-2016, "Strategic Goal #4 -

Advance Canadian astronomy research through specific projects and partnerships between CASCA, CSA, and RASC" (http://www.rasc.ca/system/files/private/RASCSP_2014_16_0.pdf, pp.7, 11; 5). *Budgetary impact*: the project could be started in 2015 without funds, and considerable progress made through the creation of electronic resources, but monies would eventually have to be found if hard-copy versions of the resources were deemed necessary to meet the project's goals. This could also be a fitting project for 2018;

B) Projects for 2018 could include:

1)* **an update of *Astronomy in Canada: Yesterday, Today, and Tomorrow***. *Discussion*: This publication (http://www.rasc.ca/astronomy-in-canada) was a centennial project to mark Canadian Confederation (1867-1967) jointly with the centenary of the RASC (1868-1968). It was a landmark retrospective survey of the state of Canadian astronomy in 1968—the RASC contributors were all professional astronomers because CASCA did not then exist (although a mere three years later it would). The half century since 1968 has seen an efflorescence in the application of new technologies, the rise of several key intuitions and facilities, and Canadian participation in leading international collaborations. The 2018 survey would present the history of Canadian astronomy since 1968, the current state of the discipline, and its possible future. It would deal with both professional *and* amateur astronomy. *Personnel*: the project would be lead by the Chairs of the RASC History Committee and the CASCA Heritage Committee, with the possible cooperation of the RASC's Publications Committee. The goal should be a formal publication, and possibly related presentations at both the 2018 GA and CASCA 2018. There is enough ability among members of both committees to produce work of value, supplemented with contributions from other scholars (one or two contributors from outside Canada could assess the Canadian achievement from an extra-national vantage point). This would be in accord with the current Strategic Plan 2014-2016, "Strategic Goal #4 - Advance Canadian astronomy research through specific projects and partnerships between CASCA, CSA, and RASC" (http://www.rasc.ca/system/files/private/RASCSP_2014_16_0.pdf, pp.7, 11; 5). *Budgetary impact*: funding for the publication would be required if it were to be issued by the RASC, or by the RASC in partnership with a scientific publisher as a hard-copy book. It could also be issued by a scientific publisher alone (*e.g.*, Springer). The production costs of an electronic publication would be considerably less than for a hard-copy or dual mode hard-copy and electronic versions;

2) the current state of the 3rd project for 2015 or some aspect of it could be presented or developed for 2018, perhaps highlighting select results. This may or may not involve RASC funds;

3)* **an EPO project melding modern science and astronomical heritage**. *Discussion*: those conducting star parties on the grounds of historical observatories, or better yet offering views through vintage equipment are often struck by how fascinated the public is by old astronomical equipment *and* the latest astronomical results. A program to combine those two fascinations into EPO opportunities using Canadian material could be innovative, the ultimate goal being to help people help themselves to acquire or refine scientific modes of thought transferable across disciplines. Examples of cases on which to build education packs are: i) ***impact events - hits and near misses***. The starting point could be C.A. Chant's dossier and analysis of the 1913 Great Meteor Procession (http://adsabs.harvard.edu/abs/1913JRASC...7..145C), and the end point could be Peter Brown, Dave Clark, and colleagues' work on the Chelyabinsk impactor (http://communications.uwo.ca/media/russianasteroid/). Issues to explore include methods of data collection, data evaluation, interpretation of phenomena, how to judge between competing scientific accounts, how to become comfortable with the non-finality and dynamicism of

scientific knowledge, understanding the difference between science-based and "other" risk assessments, resource allocation, effects of the recognition of current technological limits; ii) ***origins of life***. The starting point could be Society member Gustav Hahn's *Die Meteorite (Chondrite) und ihre Organismen* (*Chondritic Meteorites and Their Life Forms*, Laupp'sche Verlagsbuchhandlung, Tübingen, 1880)—a work which caused a stir in the age of Darwin and Wallace for its advocacy of panspermia, then Gordon Walker's and Bruce Campbell's technical innovations in the race to discover the first confirmed exoplanet (`http://arxiv.org/abs/0812.3169`), and end with Sara Seager's and colleagues exoplanet investigations (`http://seagerexoplanets.mit.edu/ProfSeagerEbook.pdf`). Issues to explore include finding the origins of searches into "origins", interpretation of phenomena, how techniques are adopted and improved, the difficulties of data collection at the limits of system detection, evaluating the advantages and disadvantages of rival techniques, the social and scientific construction of credit for discoveries, the effects and ramifications of long-term non-detection (e.g., SETI), and the societal and scientific impact of detection scenarios. *Personnel*: History Committee and EPO Committee, possibly with the cooperation of their CASCA counterparts. *Budgetary impact*: effective web-based resources *can* be developed and delivered at minimal cost. Relying on existing data bases and technology could help keep costs down. It may be possible to partner with astronomical EPO institutes with non-trivial resources;

4)* **a modern observational project with historical depth, to challenge observers (or imagers) to see in new ways**. *Discussion*: at its simplest this could involve finding a well-documented observing campaign, project, or opportunity from the RASC's past that provides a contrast with the present in the media used, the conventions of depiction and record, styles of observing, goals, and theoretical and cosmological underpinnings. This project would provide the materials to enable present observers to try to see with the eyes of the past, including historic images, descriptions of technique, and guides to contrasting modes of observing. The project goals would be: i) to provide challenging and creative alternatives to how observers and imagers normally go about seeing or processing images; ii) to show what observers and imagers see can be dependent on the contingencies of what is known and what has been seen prior to putting eye to eyepiece, or electronic sensor to OTA; iii) to provide a sense of perspective, for as past observations may seem alien to us, so astronomers of the future may find our contemporary images, ways of seeing, and techniques equally strange; and iv), to suggest new ways of seeing or processing images to enrich present practice. Examples of cases on which to build observational challenges are: i) ***Mars at opposition***. 2018 July 27 marks one of the closest perihelic oppositions this century, with Mars at a relatively large diameter of 24.2" (it was 25.11" in 2003). Viewed from Toronto, Mars will only rise ca. 15^0 in altitude, but that is not very much less than the altitude of Mars during the favourable opposition of 1892, the earliest for which RASC visual records survive for comparison (`http://www.rasc.ca/search/node/1800s%20mars`). It appears that the RASC observers were influenced by the British naturalistic style (exemplified by N.E. Green), eschewing the influence of the Schiaparellian canalists—this was the period immediately before Percival Lowell's unscientific approach impinged so heavily on many amateurs. By the time of the 1918 campaign, canalists and non-canalists could be found among the RASC observers (`http://www.rasc.ca/category/archivetags/1918`). This pattern continued in the Society until the reality of Mariner 4's photographs abruptly altered perceptions of Martian topography (`http://www.rasc.ca/category/archivetags/sazielinski`; `http://www.rasc.ca/mars-1960-61`). By reading theoretical accounts of Mars of the time, and looking at earlier observational drawings, and then observing the same features, can one don the eyes of our predecessors to see what they saw, and understand what they saw better? How will this knowledge and the added flexibility in seeing aid us in being better observers today?; ii) ***painting the Moon***. Our satellite was the subject of the earliest observational sketches by female Canadian observers in our Archives. A study group of selenographers formed around Dr. Wadsworth's observatory in Simcoe in the late 19th century (`http://www.rasc.ca/wadsworth-telescope`). In 1897 Cora Beemer, E.M.

Brook, and Helen Stennett sketched the Moon, and their observations survive in ink-wash drawings (http://www.rasc.ca/bay-rainbows; http://www.rasc.ca/mare-crisium; http://www.rasc.ca/bay-rainbows-2; http://www.rasc.ca/clavius-2; http://www.rasc.ca/clavius). Their Moon was a product of volcanism, not impact, and much amateur effort was directed to achieving ever more detailed cartographic coverage, and making observational drawings as accurate as possible to serve as chronologically anchored references in the search for discernible change on the lunar surface. Our knowledge of the forces shaping the Moon are different, what we look for is different, and the media for our finished sketches is rarely ink-wash. Are there features in the Victorian observers' Moon which we perceive differently now? Why? Can ink-wash be used at the eyepiece? Does that medium impose any limitations on what is recorded, or does it confer any advantages over the commonly used media of today?
Personnel: History Committee and Observing Committee. *Budgetary impact*: if web based (*e.g.*, http://www.rasc.ca/sirius-b-observing-challenge), the cost would be null;

5) **RASC anniversary stamp and/or coin**. *Discussion*: the attempt to interest the Royal Canadian Mint in issuing a commemorative coin celebrating the RASC's anniversaries is unlikely to go anywhere due to the mercenary nature of that body. For other reasons the approach to Canada Post will probably not result in a philatelic issue celebrating the RASC. All is not lost on this front, however. The present National President is in favour of the RASC itself producing something commemorative for members (and others?) to mark the event. Perhaps a well produced poster celebrating the RASC's heritage, and/or a certificate for members in good standing in 2018 (it could incorporate imagery from our past like the certificate given to Jim Hesser at the 2013 GA), or even something useful—hardware or software—for the craft of astronomy could be given to members (*e.g.*, a RASC-branded version of the dark-adaptation lights Rob Dick experimented with http://adsabs.harvard.edu/abs/2013JRASC.107...20D; RASC-branded micro-fibre cloths; RASC-branded high-capacity data sticks; a sky-quality app for smart phones, *etc.*). *Personnel*: the ED, the Membership & Development Committee, the IT Committee, and the History Committee could be involved. *Budgetary impact*: This would involve a budget allocation;

6)* **RASC grant or award to stimulate pro-am research**. *Discussion*: a long-standing Society weakness is the lack of initiative, vigorous support, and progressive development of real science opportunities for pro-am research. This is all the more embarrassing given that "research" is written into our mission statement (http://www.rasc.ca/society), and the current Strategic Plan 2014-2016 (http://www.rasc.ca/system/files/private/RASCSP_2014_16_0.pdf) clearly states "Strategic Goal #4 - Advance Canadian astronomy research through specific projects and partnerships between CASCA, CSA, and RASC" (pp.7, 11; 5). The establishment of an ongoing grant/award program could be one component in turning around our reputation in this regard. A Society with a mandate for EPO, which is *also* a Society encouraging active participation in scientific research through offering opportunities and training for its members, *is* a Society which will do better EPO. It is crucial to look outside ourselves (*e.g.*, USA, Europe, Japan) for instructive examples to emulate (*e.g.*, some would hold that the AAVSO conducts research *and* EPO significantly more competently than we do, as does the ASP; http://www.aavso.org/; https://www.astrosociety.org/. Larger budgets, more numerous personnel, and differences in history and emphasis between the AAVSO, the ASP, and the RASC should not blind us to the lessons to be learned). *Personnel*: an innovative program could benefit from consultation with the current chair of CASCA's EPO Committee, our Honorary President, and our immediate past Honorary President. A project lead or co-leads would be necessary, but *in potentia* all Committees, Centres, and members could contribute to the program's formation. A clear and transparent process would have to be established for the awarding of grants, along with a properly constituted panel for ranking applicants and selecting successful projects. *Budgetary impact*: as with our other awards, this would involve a budget allocation;

7)* **exhibition to celebrate the RASC's heritage**. *Discussion*: an exhibit constructed around artifacts from the RASC Archives (http://www.rasc.ca/archives), supplemented with associated objects from other collections (*e.g.*, https://utsic.escalator.utoronto.ca/home/blog/category/collections/astronomy/) to celebrate and illuminate our history. For success such an endeavour should have a coherent theme capable of accruing artifacts, and capable of igniting interest within the RASC, and possibly beyond. As for the mode of venue, a travelling exhibit could reach attendees who could not travel to see a single-venue show, but successive multiple venues creates logistical complications (which can assume Hitchcockian colouring and proportions, and display exponential rates of growth). A way around that fcould be found via a virtual exhibition, either a stand-alone virtual exhibition, or the preferable option of a web-based version of a show which is *actually* mounted with real artifacts, in real time(!), at a real venue (the way shows happened in the pristine world at the dawn of the RASC). There are several possible venues which could host an exhibition in 2018. If, in three years time, the National Office should find itself in more generous quarters, display space may in fact be available in the very midst of our administrative centre. Another possibility would be to work with the Toronto Centre to mount the exhibit at the DDO administration building. An exhibit of artifacts illustrating various aspects of the scientific (and social life) of the DDO will be mounted in June of this year (2015) as part of a symposium marking the 80th anniversary of the DDO's dedication (a joint project of the Dunlap Institute for Astronomy & Astrophysics and the RASC Toronto Centre, with support from the RASC Archives). If this proves successful, then Toronto Centre, the founding "Centre" (as it were) of the Society, may be interested in collaborating on an exhibit for 2018. A RASC exhibition could be structured chronologically (1868 to the present), or thematically (i. people; ii. EPO responses to eclipses, comets, the space age, and delivering the heavens to Canadians; iii. RASC research; iv. future RASC), or it could be limited to a single theme. Regarding the latter, "The RASC and World War I" has been suggested (Broughton & Muir), which "could include members who served (like Arthur Currie, and Bert Topham) as well as those who served and later became members (e.g., Allie Douglas, Joseph Pearce)" (Broughton, *private communication* 2015 February 9). This theme would mesh with the Government of Canada's World War Commemorations (http://canada150.gc.ca/eng/1389030950562/1389031264299). Such an exhibit ought to explore what happens to "normal" science, its supporters, practitioners, and institutions under abnormal war-time pressures, the losses (programs disrupted or abandoned, Canadians seeing European facilities damaged, astronomers injured or worse), and gains (increased investment in practical astronomy with military applications, rapid development of new technologies which may have post-war astronomical applications, availability of surplus equipment after hostilities, full but sometimes dangerous employment for astronomers), the effect on the republic of letters (*e.g.*, how did RASC IAU members react to the exclusion of astronomers of the former Central Powers?), and the long-standing and sometimes uneasy relationship of astronomy and military technology (*e.g.*, M. Harwitt, *In Search of the True Universe* [Cambridge: CUP, 2013], ch. 7). Support from the Canadian War Museum might be possible (http://www.warmuseum.ca/home/). If the coverage is extended to WWII we could more fully cover the issue of gender in astronomy, for one "gain" in that latter period was increased opportunities for female astronomers at institutions like the DAO and the DDO. Themes other than the RASC at time of war are also possible. *Personnel*: PIs could be Peter Broughton, Clark Muir, and the RASC Archivist, with support from the History Committee, and the Dunlap Institute for Astronomy & Astrophysics through Lee Robbins, and the Toronto Centre (if they should agree to the DDO venue). *Budgetary impact*: funds would be necessary for properly mounting the exhibit. A catalogue could also be contemplated (which would have the advantage of adding to our publications, and possibly revenue stream);

8)* **RASC anniversary imaging competition**. *Discussion*: an opportunity to showcase the work of RASC astrophotographers *and* astrosketchers nationally. There could be regional run-off competitions for spots in the national competition, or it can be run without that intermediary stage. A more interesting twist would be to encourage imagers and astrosketchers to collaborate across the country in small or large

teams to make new astronomical art by combining their images in striking ways—others could even get involved with this creative endeavour, taking images from the online gallery and making new art based on the combinations, becoming in effect visual DJs. The goal should be a juried show, which can be a physical show as well as a permanent virtual exhibit based on the physical show. The show venue could be the GA, or Astrocats if the organizers would be willing to work with the RASC, or a Canadian planetarium or science centre, or multiple venues (the security and insurance issues with the display and transport of historic artifacts as in 7 above do not apply here). Other venues could also be explored, particularly venues to reach sectors of the populace our EPO regularly misses, such as commercial gallery spaces or art cafes (*e.g.*, cube gallery in Ottawa; `http://www.cubegallery.ca/`; `http://www.cubegallery.ca/exhibitions/2014_07_02_vanishing_stars`). We could even venture further beyond the commonplace astroimaging competition and show, by sponsoring cooperative art installations, or performance pieces imaginatively working with historical and modern astronomical imagery, concepts, or incidents. The difficulties would lie in finding receptive collaborators from the appropriate communities, and engaging their interest. Among the benefits would be the breaking down of artificial barriers between science and other human activities, and reaching significant parts of the fabric of Canadian society we habitually fail to reach. The RASC hasn't interacted much with the cultural sector since IYA2009 (and most—or all—of those interactions were blandly unchallenging). *Personnel*: experienced, recognized judges ought to make up the jury. The BOD could appoint a working group (not the jury) to do the design and organizing. *Budgetary impact*: funds will be necessary for significant prizes (although we might be able to secure manufacturer or vendor donations, but it had best not be vendors' unsalable junk!). Well-designed certificates might also be awarded;

9) **a RASC remote telescope and/or cubesat.** *Discussion*: sometimes big-ticket, scientifically exciting gear can energize an organizaton, *provided there are solid science and EPO cases for them, and well-thought out development and implementation plans*. A RASC remote 1-metre class telescope, with time allocation for members for research, EPO, and astrophotography could be an attractive enhancement of membership (note: this should be more than just a vehicle for pretty pictures; J. Cheng, *Principles of Telescope Design*, ASSL 360 [New York: Springer, 2009]; L. Sage, "Scientific Impact of Small Telescopes", in *The Future of Small Telescopes in the New Millennium*, ed. T.D. Oswalt, ASSL 287 [New York: Springer, 2003], pp. 49-53). It could also offer a way for the society to contribute to international networked projects. Time could also be offered for RASC educational programs delivered to the formal educational sector, as well as to highly motivated individual students of whatever age/grade. A RASC cubesat is a way for the Society to become a space-faring entity (W.A. Shiroma *et al.*, "CubeSats: a Bright Future for Nanosatellites", *Central European Journal of Engineering* 1, 1 [2011, March], 9-15; N.. Brosch *et al*., "Small Observatories for the UV", in *Astrophysics and Space Science* 354, 1 [2014 November], 205-209; `http://cubesatcookbook.com/`; `http://www.cubesat.org/`). Exciting with bragging rights? Yes. A solid science case, good experiment design, and excellent engineering are *desiderata* for success—remembering at all times that success with satellites is *never* guaranteed. If it works it could be spectacular, if it doesn't it could be very expensive with nothing to show but a spectacular hole in the budget. Nothing ventured, nothing gained. To reduce the risk (or rather share it), the RASC could partner with others with experience in the cubesat world. The EPO element could lie both in having students contribute to the hardware construction and design (perhaps of less crucial elements), or, more usefully (or safely), in the conduct of the experiments or post-operational use of the data. A scaled-back version of this could be science through high-altitude balloons into near space (*e.g.*, `https://www.facebook.com/pages/Earth-to-Sky-Calculus/174490502634920`). *Personnel*: for a cubesat project, the BOD would have to appoint a mission team of those with competence in diverse areas, and one or several PIs. A team would also be necessary for the RASC remote telescope project. *Budgetary impact*: both projects are at least several orders of magnitude more expensive than any other project listed here. A RASC remote 1-metre class telescope could cost anywhere from $150,000-$675,000, depending on optical design and other variables.

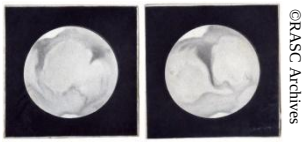
An instrument half that aperture could reduce costs by 60 percent. A cubesat, including launch, could run at ≈$200,000. These are very *BIG* ticket items. The remote telescope is an inherently less risky venture than the satellite. If the Society decides to explore either (or both) projects for 2018, it could try a "slow launch" program for 2018 (as it were), announcing and initiating the projects, but framing them as long-term endeavours;

10) **innovative EPO**. *Discussion*: many of us do the same sort of EPO that our RASC ancestors' ancestors did in 1890—groups of amateurs showing the wonders of the night sky to the public in urban or semi-urban settings. This may not be surprising, given the greying of amateur astronomy (R.T. Feinberg & J.K. Beatty, "Using the Night Sky to Cultivate Public Interest in Astronomy", in *Communicating Astronomy with the Public 2005*, ed. I. Robson & L.L. Chistensen [Munich: ESA/Hubble, 2005], pp. 84-91—note, this is a problem of first-world *amateur* astronomy, and does not afflict the ranks of professional astronomers). This sort of outreach does have an impact, although measuring it by raw numbers is hardly a useful or meaningful indication of impact. If 1,000 members of the public show up to a traditional EPO event organized around a lunar eclipse, and the scientific information given out is inaccurate, lacks depth and connection to its cultural matrix, is presented with superb dullness, and does not include opportunities for active engagement, what sort of "education" has been served through "public outreach" to those 1,000 victims of amateur astronomy gone wrong? In *Discover the Universe* we finally have a joint program with CASCA to address some of these issues (http://www.cascaeducation.ca/newsite/?page_id=30; http://www.discovertheuniverse.ca/pages/a-decouverte-univers-1.htm). What we don't have is an active process to find, develop, test, and deliver *innovation* in our EPO. Few of us even bother to look over the fence to see what other astronomical organizations are doing, much less non-astronomical organizations, here and abroad. We should take a good hard look at what we are doing, and whom we are not reaching. There is an astronomical EPO literature (*e.g.*, http://www.capjournal.org/; http://www.portico.org/Portico/#!journalLOVIView/cs=ISSN_15391515?ct=E-Journal%20Content: http://jraeo.com/; L.L. Christensen, *The Hands-On Guide for Science Communications: A Step-by-Step Approach to Public Outreach* [New York: Springer, 2007])—how many of us are familiar with it? And what are we doing to reach underserved communities? Delivering EPO to people who look like us is easy; and if it's all we do it's not anywhere good enough. For 2018 we could: i) provide a web-based and *actively* curated resource of EPO sites, electronic and print publications, conferences, software, with a news component to report on what is being done around the world which might be emulated here, and in more depth a periodic presentation of something new (not necessarily from the world of astronomy) which could be tried in astronomical EPO; ii) ask an effective presenter with a track record to look at what we do, and help us improve what needs improving. They could even be hired to do a workshop at every centre; iii) develop *some* significantly innovative outreach initiative for 2018. *Personnel*: the current Honorary President and the immediate past Honorary President should be involved in an such initiatives, as should the current Chair of the CASCA EPO Committee, at least as a consultant. The RASC EPO and Membership & Development Committees might seem the natural groups to lead this work. *Budgetary impact*: item i would be neutral, ii would require funds, and depending on its nature, so would item iii;

11) **the astronomical landscape of Canada**. *Discussion*: a resource giving access to the sites across Canada of astronomical history and heritage. This could include active professional institutions, significant amateur observatories, sites of observing campaigns, former observatory sites, sundials, buildings with astronomical decorative or design elements, museums with significant astronomical content, planetaria, science centres, Canadian Earth impact sites, places where discoveries happened, where significant astronomers lived, and space-science sites. The UK Society for the History of Astronomy (https://societyforthehistoryofastronomy.wordpress.com/) has

undertaken a county survey of sites of astronomical interest in the UK (https://shasurvey.wordpress.com/). We could initiative something similar, but to make it more useful the information could also be made accessible through an interactive map (GIS). The resource would be of interest to anyone curious about the astronomy that was done in their neighbourhood, and could be useful for those interested in astronomical tourism. ***Personnel***: the History, IT, and Membership & Development Committees could cooperate on this project. Chuck O'Dale in his superb IMPACT CRATER/STRUCTURE EXPLORATIONS site has already done the heavy lifting on the geological content of such a resource (http://ottawa-rasc.ca/wiki/index.php?title=Odale-Articles—Chuck's site would incidentally make a top-notch and attractive book for the Publications Committee to consider). ***Budgetary impact***: this could be done with no expenditure of funds, or money could be spent on site development and software. Either approach could work.

12) **a professional radio, film, or other media documentary on the RASC, or some aspect of Canadian astronomy with RASC content**. ***Discussion***: the key here would be to find a story with both scientific and human interest. NFB's *Shadow Chasers* (2000) comes close (https://www.nfb.ca/film/shadow_chasers), certainly more than the disappointingly shallow film version of Timothy Ferris' *Seeing in the Dark* (2008; http://www.pbs.org/seeinginthedark/). If the medium is radio CBC's *Ideas* might be worth approaching (http://www.cbc.ca/radio/ideas/contact/pitch). The problem is that at first glance we do not offer compelling material for documentarians who have not already forged some connection with astronomy. Possible story lines could be: i) *not of this Earth*—why do people take up amateur astronomy, how is it different from other pursuits, and why look up in the first place? (the last question can be a more profound than it sounds); ii) *LPA—the battle to save our skies*; iii) *painting the skies*—presents the results and motivations of astrophotographers (could—perhaps should—also ask why so many seek perfection in their astroimaging, but don't turn their skills to doing real science); iv. *science from the skies*—could tell the story of significant Canadian amateurs (and RASC members) who have contributed to science, such as the theoretician J. Miller Barr, the meteoriticist Ed Majden, and variable star observers Chris Spratt, Dave Lane, and Walter MacDonald; v. *saved for another day*—could tell the story of successful amateur repurposing of redundant professional facilities. It would be very effective to see the stories of the DDO, the *Great Melbourne Telescope* project (http://greatmelbournetelescope.org.au/), and the *Association T60* (http://www.astrosurf.com/t60/) told together. There are doubtless other stories which could be the basis for effective narratives. ***Personnel***: depending on the topic chosen, the Membership & Development, IT, History, and EPO Committees could collaborate. Members who have worked professionally in the media could make useful contributions. Several members have been featured in documentaries. ***Budgetary impact***: film documentaries would require financing, although the skills and experience of RASC members could reduce costs. Documentary makers usually exploit multiple funding sources (public and private) to finance productions (*e.g.*, Canada Media Fund http://www.cmf-fmc.ca/). The production unit responsible for CBC's *Ideas* would cover all costs for any documentary they agreed to do.



Andrew Elvins, Mars 1892, 3" O.G. achromat(?) (see project 4, at pp. 5-6 *supra*)

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