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差出人　maeda@serc.kyushu-u.ac.jp

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Attachment(s):
(1) "IAUNL78final-october2013", 1.6 MB pdf, 35 pages.

: Re:
: IAU Commission 46 Newsletter 78
:

Dear ISWI Participant:

Please find it attached to this email.
Below is the editorial inside of Newsletter 78.

: EDITORIAL
: Welcome to IAU Commission 46 Newsletter 78, the second to be
: published under the new editor, Larry Marschall (Gettysburg College).
: This newsletter contains a lengthy message from Commission 46
: President Prof. Jean-Pierre De Greve regarding the proposed
: reorganization of the Commission. It also contains a report on
: educational activities by OAD Director Kevin Govender, which
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: feature an article by Prof. Chris Impey on a hot topic in
: higher education today: MOOCs (Massive Open Online Courses).
: As we ease into this new editorship, comments and contributions
: are both needed and welcome. Thanks to everyone who has made
: a contribution to this edition of the Newsletter. Please note
: the text in this Editorial highlighted in RED.
: END OF EDITORIAL.

Most humbly yours,
. George Maeda
. The Editor
. ISWI Newsletter

COMMISSION 46
ASTRONOMY EDUCATION AND DEVELOPMENT
Education et Développement de l'Astronomie

Newsletter 78 – October 2013

Commission 46 seeks to further the development and improvement of astronomical education at all levels throughout the world.

Contributions to this newsletter are gratefully received at any time.

PLEASE WOULD NATIONAL LIAISONS
DISTRIBUTE THIS NEWSLETTER
IN THEIR COUNTRIES

This newsletter is available at the following website
http://www.iaucomm46.org/newsletters/
and also at
http:/www.gettysburg.edu/~marschal/clea/IAU/

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EDITORIAL

Welcome to IAU Commission 46 Newsletter 78, the second to be published under the new editor, Larry Marschall (Gettysburg College). This newsletter contains a lengthy message from Commission 46 President Prof. Jean-Pierre De Greve regarding the proposed reorganization of the Commission. It also contains a report on educational activities by OAD Director Kevin Govender, which we hope will be a regular feature of the newsletter. And we feature an article by Prof. Chris Impey on a hot topic in higher education today: MOOCs (Massive Open Online Courses).

As we ease into this new editorship, comments and contributions are both needed and welcome. Thanks to everyone who has made a contribution to this edition of the Newsletter. Please note the text in this Editorial highlighted in RED.

For the March 2014 issue the copy date is **Friday 28 February 2014**. If you can include photos or illustrations with any material, please do so. Feel free to encourage others to submit material – anything with an astronomy education or development aspect will be considered.

IAU C46 NEWSLETTER – GUIDANCE FOR CONTRIBUTORS

The editor is happy to accept articles on any aspect of astronomy education or development, including obituaries and other articles on people. 500-2000 words are the approximate upper and lower limits. Shorter contributions, up to a few hundred words, such as meeting announcements, meeting reports, and other news items, are also welcome.

> Send contributions to me by email, at marschal@gettysburg.edu. You can either send a Microsoft Word attachment (preferred) or include the text in the body of the email. **Illustrations must be sent as separate, individual files**, preferably as JPEGs or TIFFs no larger than about 3 Mbytes each. **DO NOT SEND ANYTHING AS A PDF.**
>
> Do not send a preliminary draft unless it is clearly marked as such, but feel free to contact me with preliminary ideas for contributions.

I try to edit as lightly as possible, and I certainly don't care whether US English or British spelling conventions are used, so you may notice an inconsistency in style insofar as such conventions can vary from author to author with no loss of comprehensibility. I also leave local turns of phrase untouched unless the meaning is obscure. Clarity, conciseness, and being interesting or informative are what is needed. Only in rare cases is heavier editing necessary.

Notes on Resources and Methods for Education

I welcome short notes pointing readers to resources useful for education. Such notes can just point to a website, or can include a paragraph describing the nature and application of the resources available. You will find several examples of these notes in this edition. I also welcome longer articles detailing methods and techniques, as well as studies regarding the impact and effectiveness of such techniques for astronomical learning. Chris Impey's article on massive open online courses in this issue is a good example.

Book reviews

I welcome book reviews, a feature introduced by Barrie Jones, and which I hope to continue. Reviews should be of books centered on astronomy education or development. If there's such a book that you think is worth reviewing, please send your review to me.

The C46 websites

The "official" C46 website is at http://www.iaucomm46.org. The IAU Office of Astronomy for Development (OAD) is at http://www.astro4dev.org/

Back issues of the C46 Newsletter

During my predecessor, Barrie Jones' tenure as editor of this newsletter, October 1998 to August 2012, the Newsletters have appeared in March and October in every year. The October 2012 issue was delayed due to the reorganization of the IAU commission structure as well as the transition to a new editor, but with this issue, we have now returned to the old publication schedule. So this issue, number 78, published in October 2013, will be followed by issue 79, to be published in March 2014.

Back issues are available at http://www.iaucomm46.org. Newsletter 49, October 1998, has been scanned from hard copy, so the quality of reproduction is only modest. This is also he case for earlier ones, edited by John Percy. These extend back to February 1992, but there are gaps.

Larry Marschall
For further information on the editor, see my personal web page:
http://public.gettysburg.edu/~marschal/clea/lam.html
(for contact details see Program Group Chairs and Vice Chairs)

MESSAGE FROM THE PRESIDENT

C46-Div.C: From program groups to working groups

Introduction:

Commission C46 is in a peculiar position among other IAU Commissions, with regard to the new IAU governance structure. For historical reasons (the specific active and funded nature of the activities) C46 had PGs (Program Groups) instead of WGs. (Working Groups). It now finds itself in the odd situation that it has nothing in the new IAU structure. Establishing new Working Groups along the IAU criteria requires consultation of Commission members. As C46 has to start from scratch, this might take some time. Therefore, I propose to have a transitory decision taken by the Division in using some of the Program Groups as Working Groups, dropping those PGs that are under the umbrella of the OAD, and adding two new Working Groups in line with the new mission of C46. This allows members of C46 to work in a clear structure. The nature of the Working Groups can then be determined more precise in the coming months, with the members and through the activities.

Proposal:

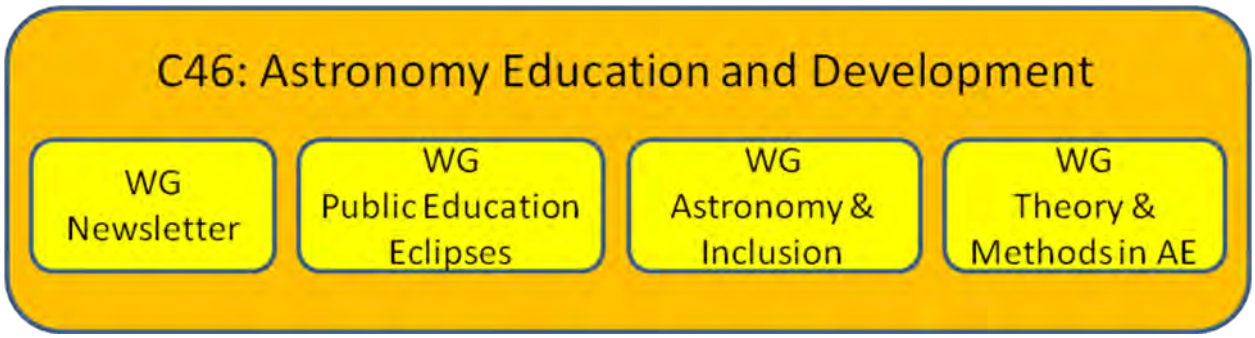
The decision of the Division would be the following:

- Keeping for the time being some existing Program Groups (eventually with a modified title) but **transforming** them into Working Groups.
- Adding for the moment two new Working Groups as they reflect the new mission of C46.

In 2013-2014, C46 will therefore have the following Working Groups:

a. WG 'Astronomy Education and Development Newsletter and National Representatives': The Newsletter is an important regular communication channel within C46 and requires a small group to supervise its content. The WG is a merger of 2 PGs as the National Liaisons are used as contact points but do not have interactions as a group, and hence a separate PG/WG does not make much sense.
b. Public Education at the Times of Eclipses (Old PG with a shortened title, outreach was done in Australia for the annular eclipse, and will be done in Africa for the total eclipse in November.)
c. Astronomy and Inclusion (new WG, proposed by Beatriz Garcia, together with Amelia Ortiz)
d. Network for Astronomy School Education (the NASE programme. Its situation may need to be cleared later. For the moment it has a dual nature, as a WG and as a program that receives funding on a competitive project basis. The proposal is to keep NASE as a WG for the time being.
e. Theory and Methods in Astronomy Education (New WG proposed by De Greve and Garcia, and led by Paulo Bretones)

Trimming down: The PGs are no longer continued under C46, because they fall under OAD responsibility (or have disappeared) are ISYA, TAD, WWDA.



Division C, Commission 46 : Proposal to transform two Program Groups into one Working Group (WG) 'Astronomy Education and Development Newsletter and National Representatives'

Name of Working Group: Astronomy Education and Development Newsletter and National Representatives
Name of parent Commission(s) or Division(s): C46, Div C
In case of inter-Commission or inter-Division WG, name of primary Commission
or primary Division (one name only):
Creation year (1): 2013 (the underlying Program Groups exist since very long)
Chair: Larry Marschall (Editor)
List of Members (Editorial Board): Beatriz Garcia, Jean-Pierre De Greve, John Baruch (UK), Ian Glass (S Africa), and Barrie Jones (advisor)
Web site: http://www.iaucomm46.org/newsletters/
Mission/Goals (short-term/long-term/permanent ?)(2): long term; to serve as information carrier for astronomy education and development research, for the members of C46 and the wider astronomical community.
Deliverables, including time frame: 2 Electronic Newsletters per year (March, October)
Interest for the community and/or society: Information on educational and outreach investigations.
Do you want to become a "functional group" ? (3): No
If "yes", please provide a short justification:

Division C, Commission 46: new Working Group: Astronomy and Inclusion

Name of Working Group: Astronomy and Inclusion (AI)

Name of parent Commission(s) or Division(s): C46, Div C

Creation year (1): 2013

Chair: Beatriz García – ITeDA Mendoza, UTN Regional Mendoza
Vice-chair: Amela Ortiz-Gil, Observatorio Astronómico - Universidad de Valencia

List of Members:

IAU-Members:

Rosa Ros, chair of NASE

Dominique Proust, Paris-Meudon observatory.
Kimberly Kowal Arcand, Media Production Coordinator, Chandra X-ray Center/Smithsonian Astrophysical Observatory.

IAU.Non members.

Vivian Hoette, Director of Education & Outreach, University of Chicago, Yerkes Observatory.
Mike Simmons, Astronomers Without Borders.
Thilina Heenatigala. Communications Manager Astronomers Without Borders (AWB)
Peggy Walker, Astronomers Without Borders, Coordinator - National Coordinator Network National Coordinator - U.S.A. Co - Chair - Disabilities Working Group
Silvia Martínez Núñez, Instituto de Física Aplicada a las Ciencias y las Tecnologías Universidad de Alicante , Spain.
Lina Canas, NUCLIO – Interactive Astronomy Nucleus /GTTP, Portugal.
Frank Busutil, Founder of Project Bright Sky, Astronomers Without Borders

Web site: in construction.

Mission

Create strategies, tools, resources to provide people with special educational needs or people with visual, hearing and / or motor disabilities, a learning and participative space, accessible, interesting and educational, without neglecting the basics of scientific dissemination, ensuring interaction in a playful context.

Goals

a) The creation of an interdisciplinary working group that astronomers convene educators and disability specialists to develop new teaching and learning strategies,

b) Generate resources and tools of high-impact hierarchy in these minority populations which are usually away from astronomy

c) Create a resource base of didactical approaches, models and tools for all the audiences.

Duration: long term

Deliverables (time frame: 3 years)

- Website which include all materials of the WG (in preparation)
- Website with local activities (in preparation)

Interest for the community and/or society:

There are several records related to the topic:

You can do Astronomy, by Noreen Grice, http://www.youcandoastronomy.com/

Touch the Universe, by Amelia Ortiz http://astrokit.uv.es/

The tactile 3D Moon,
http://observatori.uv.es/index.php?option=com_content&view=article&id=1467%3Adiscapacitados&catid=60%3Aactividades-divulgativas&Itemid=98&lang=en&limitstart=7

Astronomy and inclusion, , by Beatriz García
Planetarium for inclusion, https://www.dropbox.com/sh/4z8xodsygwx3e8l/sil9HdtAMs
Gravity, https://www.dropbox.com/sh/vf75wc906ipi8ba/2dW1LvkE_3
Mars tactile, https://www.dropbox.com/sh/id8yijxjac3g9r4/8Piz2zPmTE
Planets in scale for blind, https://www.dropbox.com/sh/2yp3lfh6c0md8pb/t6ID1IoaFv

Recently the OAD funded one special T2- project on this topic, *An astronomical kit for the visually impaired*, conducted by Amelia Ortiz.

In the Next European Planetary Science Congress 2013, University College London, 08 – 13 September 2013, at the OEP – Outreach, Education and Policy, an especial session was proposed: the OEP4 - PLANETARY SCIENCE FOR INCLUSION, and Lina Canas is the chair of it.

Do you want to become a "functional group" ? (3): yes
If "yes", please provide a short justification:

The synergy of the Commission 46 is defined in this line of work and could link the people working in isolation in many cases, and can be a factor to develop and promote this fundamental activity for inclusion. As one of the objectives is create special tools, we consider that would be adequate a periodic review of the activities

(1) *if known*
(2) (2) *short-term = during this triennium (until 2015); long-term = up to ~ 2018; permanent: see last question.*
(3) (3) *"Functional groups" are a new structure (subject to triennial reviews), introduced as part of implementing the IAU restructuring (for background information, please consult IB109, Feb. 2012). They will be dedicated to permanent IAU activities producing deliverables of general interest on a regular basis (e.g., fundamental constants, specific educational activities, etc.).*

Division C, Commission 46: Proposal for a new Working Group (WG) 'Theory and Methods in Astronomy Education'

Name of Working Group: Theory and Methods in Astronomy Education
Name of parent Commission(s) or Division(s): C46, Div C
In case of inter-Commission or inter-Division WG, name of primary Commission or primary Division (one name only):
Creation year (1): 2013
Chair: Paulo S. Bretones
List of Members: not yet started, members of C46 and astronomers with a keen interest in development of theories and methods in astronomy education
Web site: No, but a LinkedIn expert group has been created (http://www.linkedin.com/groups/TMAE-Expert-Group-5129421?trk=groups_most_popular-h-dsc&goback=.gmp_5129421)
Mission/Goals (short-term/long-term/permanent ?)(2): long term; mission and goals are described below.
Deliverables, including time frame: ideas on questions and issues that require research, one scientific meeting per year, reports in the C46 Newsletter.
Interest for the community and/or society: research on astronomy education, especially on methodology and theory is rather rare, whereas fundamental and methodological research on the issue is needed to get astronomy well integrated in all levels of education. Some of the outcomes of this WG should also be useful for projects within HoA, UNAWE, NASE and other astronomy networks.
Do you want to become a "functional group" ? (3): No
If "yes", please provide a short justification:

---

(1) *if known*
(2) *short-term = during this triennium (until 2015); long-term = up to ~ 2018; permanent: see last question.*
(3) *"Functional groups" are a new structure (subject to triennial reviews), introduced as part of implementing the IAU restructuring (for background information, please consult IB109, Feb. 2012). They will be dedicated to permanent IAU activities producing deliverables of general interest on a regular basis (e.g., fundamental constants, specific educational activities, etc.).*

Mission:

To exchange ideas on and promote the development of Research into Theory and Methods in Astronomy Education.

Rationale:

The implementation of the IAU Strategic Plan with the start of the Office of Astronomy for Development (OAD) strongly affected the structure and working of Commission 46 (C46). Previously, C46 was the assembly of 5 different outreach and educational development programmes, each with its specific budget. These activities have moved to the OAD or have been abolished to make room for new activities. The changes required a new mission for C46. That mission is to further the development and improvement of scientific research into education and specifically astronomical education at all levels throughout the world, through stimulating, gathering and exchanging scientific research in the field. This research should address epistemological questions, as well as innovative teaching and learning processes

appropriate to the needs of astronomy education. The commission will further encourage and develop efforts to disseminate this information at all levels. Such activities will complement those of the OAD and allow for various synergies to develop.

Next, there is the observation of a world-wide need for interest of the young in studying science and technology, struggling with a decreasing interest of the young in undertaking such studies.

Moreover, with the start of a series of small projects (and hopefully more to come in the future, when resources increase) by the OAD, the need arises to support several of these projects with adequate research into educational tools, models, quality and impact evaluation. Some of the projects may even serve as the subject for educational field research.

Last but not least, there is the need to innovate and adapt teacher training, curricula, pedagogical methods to the fast changing knowledge base, the societal changes and the corresponding changes in attitude of the young. Modern astronomy education can play an important role in it, if it is based on underlying research in how to bring contemporary astronomy in an innovative competence building framework.

Hence, the OC of C46 proposes as first major implementation of its new mission the introduction of a new Working Group, focussing precisely on the active exchange of ideas on research into Theory and Methods in Astronomy Education.

Goals:

1. To develop a promotional strategy for enhancing astronomical educational research.
2. To identify the research needed for the design of strategies to teach modern astronomy.
3. To identify and indicate the most interesting and needed areas for such research.
4. To identify structures that can serve for research of education in contemporary astronomy (such as NASE and UNAWE).
5. To prepare the framework for a symposium or special session at the next GA, or a symposium just after it (if we want to have results of initiated research).

Hence, the discussion within the WG is about a theoretical transdisciplinary approximation to "how to teach contemporary astronomy" at different levels.

Working method:

A discussion forum is being developed on LinkedIn to explore ways to bring astronomy into education and the necessary research that needs to be undertaken. To become a member, contact jpdgreve@vub.ac.be

Governance:

A Steering Committee with a chairperson governs the activity of the WG and ensures that various threads (topics) remain focused within the discussion. It also takes care of concluding threads, formulating resulting proposals, and opening new lines of discussion. Eventual proposals and conclusions are forwarded to the President of C46 for further treatment. The Steering Committee and its Chairperson is appointed by the OC of C46 for an extendable period of 3 year, after a call for candidates among C46 members.

Membership of the WG:

All C46 members can sign up into the LinkedIn discussions, and thus become member. Educational experts outside astronomy can also be invited by C46 members to participate, because as astronomers, the educational research techniques, especially into didactics, are not part of our professional training.

Possible start up discussion threads (to be decided, or reformulated, by the Steering Group):

(i) Open learning and what it can do for astronomy education,
(ii) Optimum educational curricula at various levels (see also (iv)),
(iii) Effectiveness of archives vs small telescopes and planetaria for stimulating development,
(iv) Recommendations (and action plans) to ministers of education based on research and analyses done in (ii),
(v) What does Astronomy Education (AE) mean today?
(vi) What's the status of AE Research? Research on State of the Art of Current AER Research Findings.

Jean-Pierre De Greve
Brussels
jpdgreve@vub.ac.be

UPDATE ON THE IAU OFFICE OF ASTRONOMY FOR DEVELOPMENT (OAD) FROM KEVIN GOVENDER, DIRECTOR OF OAD

1. **Background and Overview:**

The IAU Office of Astronomy for Development (OAD) was established in March 2011 in order to drive the implementation of the IAU Strategic Plan adopted at the 2009 General Assembly. The OAD is hosted at the South African Astronomical Observatory (SAAO) in Cape Town, South Africa. Updates are regularly published in IAU Information Bulletins. This is a special update targeted at IAU Commission 46 members. The OAD also releases quarterly newsletters which are available on the OAD website or via the OAD mailing list (see www.astro4dev.org). Any queries on the OAD and its activities can be directed to info@astro4dev.org – comments, suggestions, ideas and input are always most welcome.

2. **OAD Call for Proposals 2012:**

In August 2012 the OAD released its first open Call for Proposals for projects related to its three Task Forces: TF1 (universities and research); TF2 (children and schools); or TF3 (public outreach). Members of the Task Forces are appointed by the IAU's Extended Development Oversight Committee (EDOC) and include key individuals from Commission 46 to ensure synergies – names of members available on the OAD website. The response to the Call was very good with 191 proposals received (42 proposals for TF1; 96 for TF2; and 53 for TF3). Of these 18 projects were selected for funding and these are listed below (full details on OAD website):

TF1 (Universities and Research):

Title	**Country**
(Re-)integration of DPRK astronomers in the international research community	DPRK, China
National Workshop on Astronomy & Astrophysics (NWAA2013), Kathmandu, Nepal	Nepal
Starlight in the university lab	Nigeria, Zambia
Astronomy lectures for university students and teachers in Accra, Ghana	Ghana
MENA Regional Summer School: "Astronomy with Small Telescopes"	Lebanon
Strengthening Astronomy Research at University in Rwanda (Phase 1)	Rwanda
Guatemalan School of Astrophysics	Guatemala

TF2 (Children and Schools):

Title	**Country**
An astronomical kit for the visually impaired	Spain, several
Mathare Ambassadors of Astronomy	Kenya
Galileo Teacher Training Program (GTTP)	Nepal
NASE Africa	Several
Astronomical measurements in Ancient Greece	Greece

TF3 (Public Outreach):

Title	**Country**
Astronomy for Extremely ill or Traumatically Injured Children and Their Families	US, model for others

Astronomía Periférica (Peripheral Astronomy)	Colombia
Chinese Ancient Poetry Astrophotography	China
Coordinating Astronomy for Public Outreach in Viet Nam: Bringing Astronomy to Remote Areas	Vietnam
Limpopo Astronomy Public Outreach (LAPO)	South Africa
Dark Skies Outreach to Sub-Saharan Africa	Several in Africa

The recommendations by the TFs were approved by the IAU's Extended Development Oversight Committee (EDOC) at the end of 2012 (for implementation in 2013). Since then the OAD has developed grant agreements and completed grant payments for all 18 projects. The funding for these projects are provided by the IAU (for 2013 projects there was an allocation of €90,000) with the OAD tasked with finding additional funds for projects on the "wish list". It is worth noting that the total amount requested was €1,835,820 – which was brought down to €968,940 after evaluations. Funded projects are monitored by the OAD and individual project reports/updates are available on the OAD website. By the end of September 2013 four projects had reached completion, with most others nearing completion.

3. **OAD Call for Proposals 2013:**

The next Call for Proposals, for projects to be implemented in 2014, was released on 1st July 2013 with a new online submission system and a deadline of 31st August 2013. The new online system performed well with minimal issues identified. In early September proposals were sent to the Task Forces for evaluation. Recommendations from the Task Forces will reach the OAD by 31 October 2013, and then sent to the EDOC for final approval. Successful applicants will be notified during December 2013. In total the OAD received 230 proposals (54 proposals for TF1; 113 for TF2; and 63 for TF3). Translations were provided in Portuguese, Spanish, Arabic, Russian, Chinese and French. The total amount requested was € 2,237,844. This represents a general increase in demand by about 20% from the previous year. Projects recommended but not funded will go onto a wish list for which the OAD will continue to look for support.

4. **Regional Nodes and Language Expertise Centres**

These are offices like the OAD but with a minimum of one full time staff member and focusing on a particular geographical or cultural/language region. Two nodes currently in place are in China for the East Asian geographical region and the Chinese language globally, and in Thailand for the South East Asian geographical region. The OAD's continued efforts to establish regional nodes and language expertise centres across the world saw five more full proposals being developed (Ethiopia for East Africa, Nigeria for West Africa, Armenia for Eastern Europe/Middle East, Zambia for Southern Africa and Colombia for the Andean Region). The first three proposals were evaluated by the IAU EDOC in April 2013 *(reminder: the EDOC consists of the OAD Steering Committee, the IAU President, IAU General Secretary and President of the IAU's Division C)*. The EDOC approved the establishment of a regional node in Ethiopia which will focus on the East African region – at the time of writing this a draft agreement is awaiting approval from the relevant Ethiopian authorities. Input is requested from Commission 46 membership for anyone who is from or has experience/contacts in these or other regions. Existing nodes are progressing well: the South East Asian node in Thailand has appointed a full time coordinator (Prof. Wayne Orchiston); the East Asian node in China has been coordinating various activities in the region including translation of resources into Chinese. Both nodes should have websites operational in the near future listing their activities.

5. **OAD Collaborations:** Several opportunities ranging from funding for travel to scholarships to sponsorship for workshops are available through OAD collaborations such as those with ICTP (various), RAS (visiting experts), NWO (visiting experts), UCLan (distance learning scholarships) and IUCAA (research and outreach training). More information on these can be found on the

OAD website. The OAD continues to invite institutions to become partners on areas of common interest. Advice from Commission 46 membership will be most welcome.

6. Pilot Project Highlights

In exploring new ways of using astronomy and astronomy technology for development the OAD hosted a "Raspberry Pi Hack Session" at its offices where technology-related staff at SAAO were invited to work on educational applications of the Rasberry Pi (this is a small computer, slightly larger than a credit card, which runs Linux and can be used on an average television set). The modest cost of the RPi (~€40) opens up opportunities to providing access to computers in remote/under-resourced areas. The outcome of the workshop was the development of a useable setup for a teacher or student to access educational content via this device, as well as the establishment of a wiki page which could be used to continue developing educational materials, especially astronomy education tools, for this device. The OAD also participated in an educational film-making project in an advisory role. The film, entitled "My room at the Centre of the Universe" sees collaboration between artists, astronomers and archaeologists and revolves around a young boy in a rural village who is exploring these respective fields of study. This film has already gained international attention and will be released by the end of 2013 along with an educational resource that can be used by school teachers

In July 2013 the OAD organized a workshop at the University of Zululand as a side event to the South African Institute of Physics Conference. The workshop was meant as a follow up to the Astronomy Teaching and Research Orientation Workshop (ASTROW) held at the OAD in October 2012. The purpose was to introduce basic astronomy instrumentation and data analysis techniques to Physics lecturers and students in order to enhance the teaching of Physics at universities. The event has led to several follow up actions including a proposal by the university to purchase its own telescope and a proposal for funding to expand the project to 4 other universities around South Africa.

The OAD also hosted a Python Programming workshop in September 2013. The workshop targeted non-astronomy university students. The objective was to explore the potential application of tools used within astronomy to fields outside of astronomy. Amongst the 15 attendees the fields of Chemistry, Computer Science, Physics and Statistics were represented. The feedback from the 3-day workshop was extremely positive. Materials will be made available online so that similar workshops can be conducted elsewhere.

The OAD welcomes innovative ideas from Commission 46 members for pilot projects that can be tested from the OAD itself. These are independent of the annual Call for Proposals.

7. Events Highlights

Special visitors to the OAD included Tim de Zeeuw (Director General of the European Southern Observatory) and Robert Jan Smits (EU Director-General for Research and Innovation). This was part of their visit to South Africa and the opportunity was used to inform them about the activities of the OAD and explore potential collaborations. Other visitors to the OAD included (i) Henry Throop from the Planetary Science Institute; (ii) Stefan Dreizler and his 12 students from the Institut fuer Astrophysik, Georg-August-Universitaet Goettingen; (iii) Courtney Matson and the USAID team from Washington DC; (iv) Michelle Willmers and delegates of the Open Science for Development conference (v) Edward Jurua and Simon Anguma from Mbarara University in Uganda (vi) Derek Fish from the Unizul Science Centre.

8. International meetings/highlights

(i) Visit to European Parliament in Brussels in March 2013 by the OAD Director to attend an event titled "EU Global Challenges, Global Collaboration." At this event the OAD, through

George Miley, hosted a parallel session and conducted several side meetings with various Members of the European Parliament (MEPs). A very productive (and unpredicted) outcome was that there were two "parliamentary questions" that arose as a result of our meetings. These are questions asked by MEPs to the European Commission and can sometimes influence respective policies or funding decisions. (ii) Visit to Germany (ESO Headquarters) by the OAD Project Officer, to attend a workshop with various IAU stakeholders to discuss the possibility of a common web platform that could serve all IAU projects. The outcome was a proposal to revamp the IAU website and incorporate the Office for Astronomy Outreach into the new website. (iii) Visit to Europe by the OAD Director for two meetings: one to attend and present at a conference in the Netherlands in honour of George Miley; and the other to attend a workshop in Brussels on the Africa-European Radio Astronomy Platform (AERAP). This workshop in Brussels was part of an ongoing high level effort to build partnerships in astronomy between Europe and Africa (iv) Visit to the US for several reasons including "dotastronomy" conference in Boston; presentations at Harvard-Smithsonian Centre for Astrophysics, the National Radio Astronomy Observatory and the US State Department; meetings with several key stakeholders including the American Astronomical Society, the Space Telescope Science Institute, NASA, Associated Universities Incorporated, Association of Universities for Research in Astronomy, USAID, National Science Foundation, American Institute of Physics, National Society of Black Physicists, National Academies of Science, and Smithsonian Air and Space Museum. The purpose of the US visit was to introduce the OAD to the key stakeholders, explore possible collaborations and determine the best way to engage with the US science and development community.

9. Publicity

In January 2013 the Director of the OAD was invited to give a TEDx talk at a local event (TEDx AIMS) and the topic chosen was "Astronomy for Humankind." The talk was very well received and although it was more about the bigger picture of astronomy impacting on society, it did highlight the OAD and the IAU's strategic plan. Such events are a significant opportunity to promote the OAD activities. The talk remains available online with a link on the OAD website. The OAD was also invited to an event called "Talking Heads" which brings together various people in leadership roles to engage with the public in conversation about their areas of specialisation. This is a highly publicised event organised by the Africa Centre in Cape Town and provided a high level platform for the OAD to promote its work. Another opportunity to publicise the OAD came in the form of an interview with Peter Cox from Voice of America. The outcome of that interview has been unexpectedly far reaching including an article on Voice of America and recently a translation of that interview into Amharic for Ethiopian audiences. Video messages on the OAD have been sent to projects that requested them. Several interviews were also conducted with Meera Senthilingam, a journalist who was preparing a pitch for the BBC regarding astronomy for development.

10. OAD Staffing

Around the middle of February 2013 the third and final staff member, OAD Project Officer Dr Jean-Christophe Mauduit, started work in Cape Town to join the existing Director and Administration Officer. The Project Officer position had been open for a very long time and his appointment brings the OAD to a point where it is now fully staffed (according to its business plan). Dr Mauduit holds a PhD in Astrophysics from the Paris Observatory and participated in ESA & NASA satellite missions as a postdoctoral researcher at the Observatoire de la Côte d'Azur and the California Institute of Technology. He has been involved in many international education and outreach programs (Hands on Universe, UNAWE, Caltech & Spitzer outreach) as well as various science development projects around the world.

Highlights from OAD interns (all short term and part time): (i) Laure Catala is working on an evaluation of the impact of astronomy for development, and has led the workshop held at the South African Institute of Physics conference, using astronomy instruments to enhance Physics

teaching; (ii) Eli Kasai (who left us in August) has implemented the use of educational videos in Sutherland and initiated Task Force 2's AstroPack (consolidating educational materials from around the world). He also initiated efforts towards the local production of UNAWE's Universe in a Box resource package; (iii) Rajin Ramphul developed the Python programming workshop which was presented to senior students from a variety of science disciplines in order to explore how this programming tool, which is used so well in astronomy, could help tackle problems in other disciplines; (iv) Maya Barlev (who left us in April) worked on astronomy presentations that can be freely distributed to teachers and astronomy outreach staff globally. More information regarding OAD interns and their projects can be found on the OAD website.

11. **Message to OAD Volunteers**

The OAD would like to express its gratitude to the many volunteers who have registered on the OAD website and who have provided input and assistance over the course of the OAD's existence. A challenge that we have had at the OAD has been to fund the travel and expenses for volunteers who wish to engage in activities in other parts of the world. The Call for Proposals and the OAD's various partnerships are seen as opportunities for volunteers to register their ideas so that the OAD can find ways to make them happen. The OAD has also set up a "request" system on its website for people around the world to request volunteers, where requesters will provide the costs where necessary. Volunteers are contacted based upon these requests and the respective volunteer's registered skills and interests. Commission 46 members are invited to send us their interests via the OAD website so that we can keep you posted regarding opportunities around the world.

12. **Future Outlook**

With the evaluation of this year's proposals well under way, the OAD is in the process of developing a funding framework which will be used for an intensive fund-raising campaign in the short to medium term, both to fund "wish list" projects arising from the Call for Proposals, as well as large global projects initiated by the Task Forces and long term OAD operational requirements. The OAD will also be working to finalise agreements for more regional nodes and language expertise centres before the next IAU General Assembly. The OAD is also working closely with the Institute for Monitoring and Evaluation at the University of Cape Town in order to develop a framework that can be applied to most if not all OAD funded projects.

13. **More information/Contact**

For more information or to provide suggestions and input, please visit the OAD website (www.astro4dev.org) or contact any of the OAD team:
(i) Kevin Govender (kg@astro4dev.org);
(ii) Jean-Christophe Mauduit (jcm@astro4dev.org); or
(iii) Nuhaah Solomon (ns@astro4dev.org).

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A MASSIVE OPEN ONLINE ASTRONOMY CLASS

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Higher Education Online

Higher education in the United States is in a state of flux and stress. A variegated system of two and four year institutions is still seen as a gateway to a better future and financial security, but the cost of a college education has increased by a factor of two (inflation-adjusted) over 30 years, and outstanding student loans of nearly a trillion dollars exceed credit card and automobile loan debt. STEM (or Science, Technology, Engineering, and Mathematics) education faces its own particular set of challenges. The science literacy of the average citizen is modest, leaving them poorly prepared to understand or judge technical societal issues like energy production, climate change, and genetic engineering. Meanwhile, there is growing demand for graduates with technical skills and majors but the supply of trained graduates is inadequate. Completion rates for STEM majors are 40%, much lower than in non-technical subjects. President Obama has set a challenging goal of training 100,000 STEM teachers and producing a million more STEM graduates.

The rapidly increasing capability of the Internet and the availability of online content are rapidly eroding the "sense of place" in a college education. Online learning is not new but it has started to become a major component of the educational landscape. The number of students taking one or more online class grew from 2 million to 7 million from 2002 to 2011 and over the same period the percentage of total college enrollment grew from 10% to 32%. Reticence over the quality of online instruction is steadily diminishing. In one 2012 survey, 77% of academic leaders at 2800 U.S. colleges considered purely online education to be the same as or superior to face-to-face education. Set against this growth is the fact that research-based, learner-centered teaching methods have not been adopted widely in the science classroom. The challenge of implementing good pedagogy without face-to-face contact or personalized interaction is one that is unsolved.

Massive Open Online Classes

Meanwhile, the sector attracting the most media attention is MOOCs, or massive open online classes. The traditional MOOC is free, open to everyone, and does not result in university credit, so it is more appropriately considered outreach than formal education. Universities are putting up video lectures online and the number of iTunes U downloads has grown in four years from zero to 60 million (Figure 1). Coursera is now the largest company delivering online courses, and their course enrolment has grown at a meteoric rate, from 1 million in September, 2012 to 9 million in April, 2013. By lowering the bar for access to instructional materials and accomplished teachers, private companies like Coursera, edX, and Udacity are helping to democratize higher education. For example, 75% of iTunes U downloads and 70% of Coursera users are located outside the United States. Coursera has pioneered the delivery of online courses for transferrable college credit. This opens up a new

and very powerful "marketplace" in higher education, where students can combine elements of a degree using local, face-to-face classes and the best of the online offerings. Online education is not new, but widespread availability of high bandwidth and wireless Internet is making it accessible to large new audiences. MOOCs are typically aimed at adult "recreational" learners, but a majority of the undergraduate population is now composed of students older than 22, often people with family and jobs. They will increasingly demand flexible delivery of the courses they are taking.

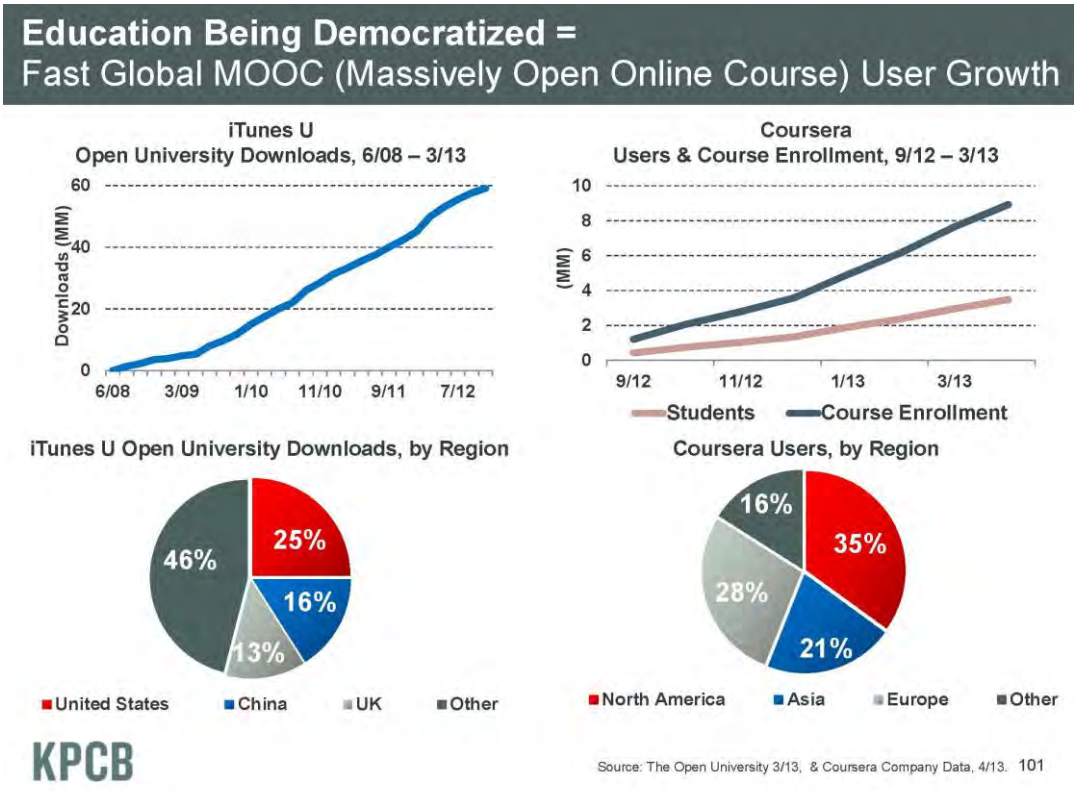

Figure 1. Freely available educational materials like video lectures on iTunes U and YouTube (not shown here but growing equally rapidly) are democratizing education. Within the private sector, Coursera has the largest, most rapidly growing enrollments (Meeker and Wu, Internet Trends, D11 Conference, May 2013).

The spread of online education receives varying reactions from university educators and from administrators. Administrators are fearful of the threat to the current, unsustainable cost model for higher education but they also hope it may be way to spread their "brand" to new markets, while educators are excited by the potential of the Internet as a learning medium but are suspicious that the quality of learning will be poorer when it is online. This ambivalence is encapsulated by a quote from Nathan Heller in *The New Yorker* from May 20 of this year: "Education is a curiously alchemic process. Its vicissitudes are hard to isolate. Why do some students retain what they learned in a course for years, while others lose it through the other ear over their summer breaks? Is the fact that Bill Gates and Mark Zuckerberg dropped out of Harvard to revolutionize the tech industry a sign that their Harvard educations worked, or that they failed? The answer matters, because the mechanism by which

conveyed knowledge blooms into an education is the standard by which MOOCs will either enrich teaching in this country or deplete it."

An Astronomy MOOC

The author has been teaching an astronomy MOOC since March this year. The course is "Astronomy—State of the Art" (http://www.udemy.com/astronomy-state-of-the-art/) and it's offered with no charge by Udemy, which has a somewhat different demographic and business model than Coursera, edX, and Udacity. Most Udemy courses are for technical subjects and professional development, and courses are asynchronous in the sense that a student can sign up for the course at any time and follow the material at their own pace. The core content is a set of video lectures covering astronomy from the Solar System to cosmology with emphasis on the cutting edge topics that put astronomy in the news daily: large telescopes, adaptive optics, exoplanets, collapsed late stages of stars, supermassive black holes, dark energy, and dark matter. There's a reading for each major section of the course, and 2-3 podcasts of interviews with leading researchers at Steward Observatory. Because the course is not offered for grades or university credit, there's no evaluation of learning or testing on the content. The Udemy site provides a mechanism for answering student questions and there has been one live Q&A session offered every 2 weeks since March. About 40% of those enrolled are from outside the United States, and there are twice as many men as women taking the course.

As of early October, 2013, just over 5500 people were enrolled for the class, with about 150 joining each week. The average rating for the class among 200 people who submitted an evaluation online is 4.95 out of 5 stars. The course is ranked on both measures in the top five of the nearly 200 Liberal Arts courses offered by Udemy. This experiment with Udemy yielded valuable experience in video editing, conducting live sessions, boosting participation and interest using social media (particularly Facebook and Twitter), tracking metrics of engagement, and diagnosing and setting appropriate learner expectations. The classic MOOC sets the bar low for learners since there is no cost and no grades, with the corollary that the level of engagement can also be low. "Astronomy—State of the Art" has a large amount of content, amounting to 14 hours of video, 500 pages of readings, and 15 hours of podcasts. A third of the people who enroll never access the materials, a statistic which is common in MOOCs. Of those accessing the materials, 5% complete all of it, 12% complete half of it, and 20% complete a quarter of it. Most people access the content sequentially so a much higher fraction views the first module of the class than the last modules (Figure 2). Despite the low completion rate, the high aggregate engagement can make a MOOC an effective vehicle for outreach.

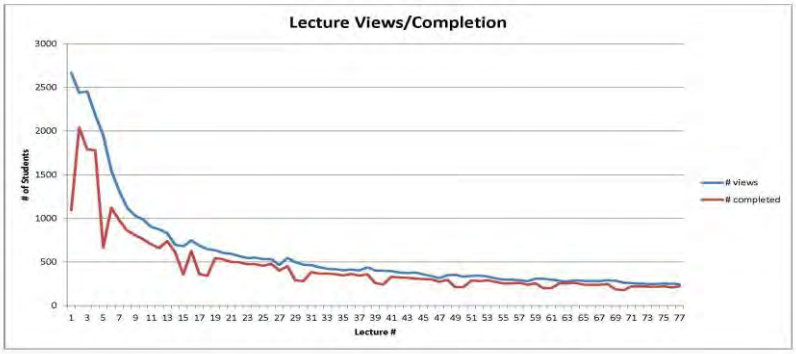

Figure 2. The number of "Astronomy—State of the Art" students viewing the lectures of the Udemy class, where a "lecture" is a video lecture or a reading or a podcast. Most of the students who view a video lecture complete it, but the overall completion rate for the class is low, and a larger fraction of those enrolled only watch the first few video lectures.

Next Generation Online Science Class

After this experiment with a MOOC for Udemy winds down at the end of the year, the author plans a second experiment next year with Coursera, where the infrastructure is better for doing online evaluation and texting. Although the MOOC will continue to be open to anyone who is interested, several additional audiences with the professional or personal motivation for deeper engagement in the MOOC will be recruited. High school astronomy teachers will be recruited from a national pool of about 1500 to enhance their content knowledge and for professional development credit. Also, there are about 800 instructors at community colleges and two-year colleges who teach astronomy. Most of them do not have a degree in astronomy; they will value the content rigor and research currency of the MOOC. The most engaged members of these cohorts will be recruited as citizen scientists for projects used in the course, and as learning assistants in subsequent offerings of the MOOC. There is very little control over the motivations of students who participate in a MOOC as a free-choice learning experience, just as museums have little control over the motivations of their customers. But it is possible to control the degree to which participants' expectations for the MOOC are met. Thus, one goal of this project is to better understand the motivations of MOOC participants, to shape their expectations for how the MOOC will serve their education needs.

The classic MOOC, which primarily has an outreach function, will be co-convened with "The Physical Universe," a Natural Sciences course taught at the University of Arizona that satisfies a General Education requirement for non-science majors. Using the same core online content that has been created for the MOOC (with additional modules on the physics of radiation, atomic structure, energy, and gravity that are not necessary for the informal learners), the local course will employ a "flipped" model where the students can access lectures and podcasts online but are in a face-to-face classroom two times a week for labs and hands-on activities, lecture tutorials, group discussions, and other research-validated tools for enhancing learning. A flipped/hybrid model gives students flexibility, uses the online medium

for the content where interaction with an instructor isn't required, and optimizes the scarce resource represented by time in a large classroom. The eventual goal is to recruit undergraduates from anywhere in the U.S. and award them transferrable credit for completing the class. The main audience will be students who need a science class as a graduation requirement or who are piecing together a degree with a mixture of online classes and face-to-face classes from their local institution.

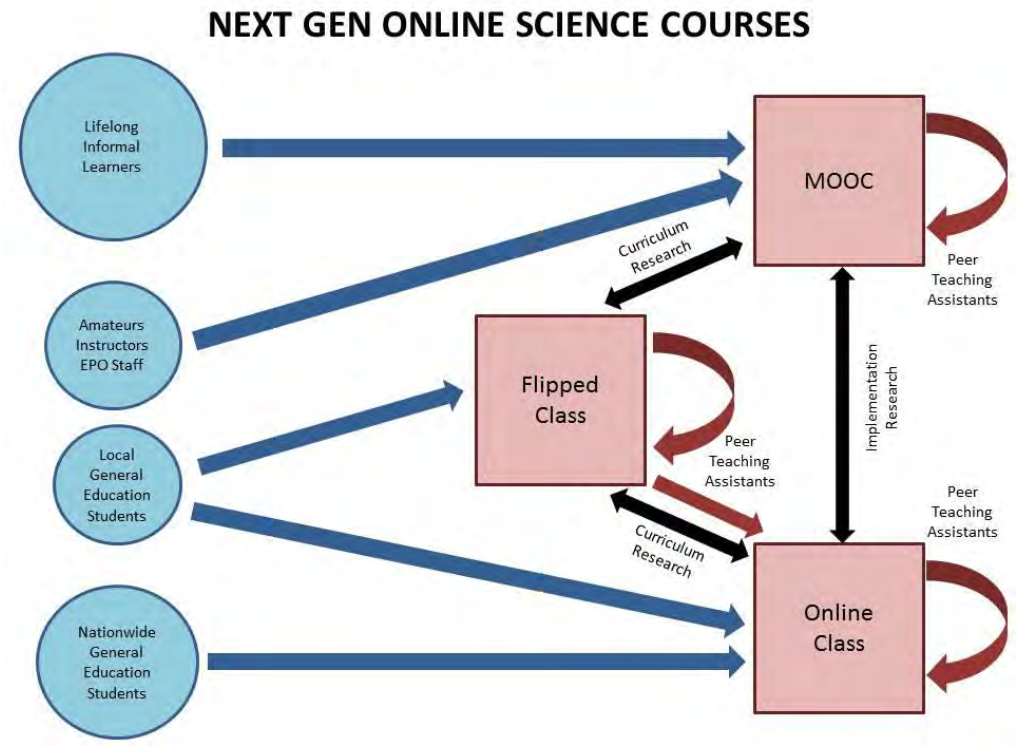

Figure 3. A schematic view of the combination of informal and formal learning that is possible when online content is used to serve both audiences. The MOOC is a purely online experience, offered free, and not for college credit. Meanwhile, college students at the University of Arizona and elsewhere view online lectures and use face-to-face time for active engagement, with learning facilitated by peer assistants from within the class.

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REPORT ON ACTIVITIES: THE 35TH ISYA 2013, IN BANDUNG, INDONESIA

The 35th International School for Young Astronomers (ISYA 2013) took place from 25 August until 14 September 2013 in Bandung, West Java, Indonesia, commemorating the 50th anniversary of Indonesia National Institute of Aeronautics and Space (LAPAN). ISYA 2013 was organized by a joint committee of Space Science Center of LAPAN and the International Astronomical Union (IAU), together with Astronomy Division, Faculty of Mathematics and Natural Sciences, Institut Teknologi Bandung (ITB), and thanks to the support of the Norwegian Academy of Sciences and Letters (NASL).

The 2013 class plus lecturers and staff

The organizers of the 35th ISYA were: Ms. Clara Yarini, Director Space Science Center of LAPAN, Prof. Hakim L. Malasan, ITB, Prof. Jean-Pierre De Greve, ISYA.

Students in class

Solar observations

The School was conducted in the Assessment building of the JeregeLembaga Administrasi Negara Jatinangor just outside Jatinangor, some 40 km from Bandung. Rooms with hotel service were provided for lecturers and students. A large conference room was used as classroom, fully equipped. A separate computer at the back of the room was provided to allow a central collection of all the photos.

Out of 106 candidates, 40 were selected for participation (20 Indonesian students and 20 coming from regional countries). Three of them withdraw, and three additional candidates were selected. One of the selected students declined at the last moment. The final number of participants is 39. In total there were students from Indonesia, Cambodia, Philippines, Taiwan (R.O.C.), China, Nepal, Malaysia, Vietnam, Thailand, India, Sri Lanka. The gender distribution was 41% female, 59% male.

The scientific topics covered by ISYA are: space weather, space science, cosmology, galactic astronomy, origin and evolution of galaxies, space observation and instrumentations (radio and optic), involving both lectures and observational work in teams. The goal was to give students ideas of modern research projects and to show them which technical expertise is needed to plan, propose for, obtain, reduce and analyse modern astronomical data. Four observing evenings were foreseen, as well as a whole day at the solar observatory, to perform, reduce, and analyse observations of the sun.

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BOOK REVIEWS

FRED HOYLE: A LIFE IN SCIENCE

Simon Mitton, (Cambridge, UK: Cambridge University Press, 2011). 369 + xi. PB $36.99. ISBN 978-0-521-18947-7.

Simon Mitton, for many years the science director at Cambridge University Press, where he managed the astronomy list, and a Ph.D. astronomer himself, has written an engrossing biography of Fred Hoyle (1915-2001). As Mitton tells us, “For about a quarter of a century, from 1948 to 1972, Fred Hoyle was one of the most famous astronomers in the world,” who not only made major contributions in the fields of stellar evolution, nucleosynthesis, astrobiology, and cosmology, but also transformed post-World War II England into an international astronomical powerhouse. The coiner of the term “Big Bang,” he remained through his life one of the most vocal dissenters from the now widely accepted explanation of what happened at the very beginning of the universe. In addition to his enormously creative mind, Hoyle is remembered for his outsized and occasionally confrontational personality, which led him, after a 39-year association with the University of Cambridge, to resign his position at the institution that he personally built and oversaw there, the Institute of Theoretical Astronomy (IoTA).

Mitton, who rubbed shoulders with many of the scientists whose work he describes, packs a great deal of drama into his biography, and I would recommend the book to anyone interested in the history of science. What I think makes this book of particular interest to members of Commission 46 on the Teaching of Astronomy, however, is the theme of

education that runs through it. Mitton's subtitle for his biography of Hoyle is *A Life in Science,* but as I read it occurred to me that an equally suitable subtitle would be *A Life in Education.* From the outset, the book opens a window into how one of the great figures in the field in the last century was educated by himself, his parents, his teachers, his mentors, and his colleagues, and how he himself educated not only undergraduates and graduate students but also the general public. The biography also illuminates how academic institutions and entire professional fields can make sometimes undesired news, as a result of the conflict between strong personalities.

Hoyle's boyhood education in Yorkshire did not begin auspiciously. His parents, strapped for cash, sent him to a one-room schoolhouse, which failed to meet his needs. Although Hoyle spent more time as a truant than in the schoolroom, in later life he would attribute "an early interest in mechanics and hydraulics to the observations he made during his periods of truancy," which included time spent watching barges on the Leeds-Liverpool Canal, the longest in Britain. Once his parents became aware of the truancy, they placed him in another school, where his teacher drummed into him the importance of securing a scholarship. Noting his interest in stars, which was kindled during his walk home from that school in the dark, his parents gave 10-year-old Fred a telescope for Christmas. At home he found and made use of a chemistry textbook, a Bunsen burner, and some chemicals his father had accumulated, perhaps as aids to his profession as a wool merchant. Not without difficulty, Fred did secure a scholarship to the Bingley Grammar School, where his talents were recognized and nurtured both by the headmaster, who had studied mathematics at Cambridge, and the chemistry teacher. At age 12 he was reading Arthur Eddington's *Stars and Atoms*, borrowed from the public library, and university-level chemistry textbooks. Thanks to the efforts of the headmaster, he was accepted as a scholarship student in natural sciences at Emmanuel College, Cambridge, where the master "strongly encouraged applications from grammar schools and boys with big potential but little money." Even at 18, Hoyle was thoughtful enough about his academic future to realize that he would do better to switch his subject to mathematics, not only because "he was convinced that it was the gateway to all of the physical sciences," but also because it was the route James Clerk Maxwell, J. J. Thomson, and others he admired had taken to their distinguished careers in physics. Hoyle did so well in his undergraduate studies, graduating as the top theoretical physicist of his year, that he was funded both by a university prize and a scholarship from Yorkshire to continue as a research student at Cambridge.

At Cambridge he was lucky in his mentors, who included Rudolph Peierls, Maurice Pryce, and Paul Dirac. Although his relationship with Peierls ended badly, Hoyle learned from him how to give a compelling public presentation. From Dirac he learned "the importance of mathematical fluency," and how "to adopt a rigorous approach to problems, using mathematics as his tool." Although Pryce advised him not to bother getting a doctorate but to concentrate instead on publishing papers and getting a research fellowship, Pryce also opened many doors for Hoyle. With the outbreak of World War II, Pryce recommended Hoyle for war work on radar. Hoyle's contributions soon led to his appointment as leader of his own theory group. With the inclusion of Hermann Bondi and Tommy Gold as key members of that group, one of Hoyle's many fruitful scientific collaborations coalesced around him. When the three of them went to see the 1945 horror film *Dead of Night,* which has a circular plot, Gold made a remark that inspired the trio's steady-state theory of cosmology: perhaps "the universe might be just like the *Dead of Night,* where you can come in at any time. Perhaps the universe had no beginning and will have no end." Hoyle's wartime radar work also took him to a conference in the United States. The institutions and

astronomical facilities he visited there would ultimately influence his design for the Institute of Theoretical Astronomy that he created and led from 1967 to 1972. Among the many people Hoyle met on this first trip to the US was Walter Baade, whose discovery that there were two distinct stellar populations would lead Hoyle and collaborators to make major contributions to the study of stellar and galactic evolution. Baade also taught him the importance of having "good-quality observations…to underpin theory."

Following the war Hoyle returned to a fellowship at St John's College, Cambridge, where he had a heavy load of undergraduate teaching. "The word quickly spread that Hoyle's lecturing style was excellent and he regularly packed the room." He also trained "a string of outstanding graduate students." As his fame as a lecturer spread, Hoyle was invited in the late 1940s, a time of postwar austerity in England, to give radio talks on the BBC. Since he was paid handsomely for these talks, Hoyle agreed to give them. One consequence of his doing so, however, was that he didn't always show up when expected for his undergraduate supervisions or conferences with his research students. Among the charming stories Mitton tells is how Bondi met his future wife, Christine Stockman, when both were trying to find Hoyle. Mitton's summary in chapter 9 of Hoyle's interactions with his students shows that the "inspirational teacher" could also be elusive and maddening. Another drain on Hoyle's time, also related to his "exceptional talent for lucid explanation" of difficult matter, were the popular magazine articles and books he wrote, which also brought him a considerable amount of money. He was a success both as the author of popular science books, notably *The Nature of the Universe* (1950) and *Frontiers of Astronomy* (1955), and of science fiction, notably *The Black Cloud* (1957). When Hoyle became Plumian Professor at Cambridge in 1958, his undergraduate teaching was over, but he continued his public outreach, not only with popular science lectures but also with science fiction books and television series.

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As Mitton's book makes amply clear from the very outset, however, the inspirational portrait of Hoyle, rising from impecunious roots to a prestigious scientific career, is only half the story. As I read on, the Greek term *hamartia* came to mind more than once. This term, sometimes translated as "tragic flaw," is often applied to the heroes of Greek tragedy, whose errors in judgment lead them to disastrous outcomes. From his father's experiences as a soldier in World War I and from other unfortunate family experiences, young Fred developed "an utter contempt for those in authority" and "a view that the authorities were both stupid and powerful." Convinced that the university authorities were engaged in a conspiracy against him, Hoyle intemperately resigned from Cambridge in 1972, at the age of 57, ten years before the compulsory retirement age. The financial consequences were serious, costing him not only his Cambridge professorial salary but also diminishing "his future pension pot," leading him to cobble together part-time appointments in America and to be on the lookout for remunerative publishing and lecturing opportunities. A few years after his dramatic resignation, he dug himself into another professional hole that threatened literally to bankrupt him. As Mitton describes in a chapter called *Clash of Titans,* for years, both locally in Cambridge and on the world astronomical stage, a rift grew between Fred Hoyle and radio astronomer Martin Ryle. Once extragalactic radio sources were verified in 1952, Ryle sought the opportunity to undermine Hoyle's steady state model of the universe, and nine years later Hoyle was publicly embarrassed at a press conference at which Ryle announced his most recent results. The humiliating event received so much publicity that even Hoyle's children were "ragged at their schools for weeks," leading Ryle, to his credit, to call Hoyle at home to apologize. In 1974, Ryle shared the Nobel Prize for Physics with Antony Hewish, the former for the development of radio interferometers, the latter "for his decisive role in the discovery of pulsars." At a press conference in 1975, Hoyle made an off-the-cuff response to an

unanticipated question about whether Hewish's research student Jocelyn Bell, who actually identified the pulsars, should have been included in the prize. Hoyle not only asserted that as the actual discoverer Bell should have been included but also implied that Hewish stole her results. When Hewish publicly called Hoyle's remark "an astonishing fabrication," Hoyle realized that he might be sued for libel, which, with England's libel laws, would bankrupt him. According to Mitton, Ryle was also involved in the threat to Hoyle's finances. "In a personal act of kindness, Ryle settled for a written undertaking from Hoyle not to criticize the radio astronomy group members ever again," but "made it quite clear he would resort to the courts if Hoyle dared to break the gagging order." Although Hoyle came out of this episode without being wiped out financially, his criticism of the Nobel committee's choice of laureates in 1974 perhaps led to his exclusion from the 1983 Nobel Prize for Physics, which was shared by his longtime collaborator and close friend William Fowler and Subrahmanyan Chandrasekhar. Because Hoyle was overlooked, Fowler's pleasure in his share, for his contributions to the field of nucleosynthesis, was diminished. As he wrote to the Nobel Foundation in an autobiographical note, "The grand concept of nucleosynthesis was first definitely established by Hoyle in 1946."

There is so much to be learned from the life story of Fred Hoyle beyond his contributions to astrophysics and cosmology that it seems worthy of a feature film, similar to the one based on Sylvia Nash's *A Beautiful Mind,* about Nobel laureate in economics John Nash. The story even includes a dramatic and near-fatal accident in the mountainous terrain in Yorkshire, where Hoyle, a mountain climber like other famous physicists (including Bohr and Heisenberg), disappeared one afternoon in 1997, possibly the victim of a mugging. As I await such a film, I remain grateful to Mitton for giving his readers the gift of this book.

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STAR MAPS: HISTORY, ARTISTRY, AND CARTOGRAPHY

Nick Kanas, 2nd ed. (New York: Springer, 2012). 528 + xxxv. PB $44.95. ISBN 978-1-4614-0916-8. eBook $35.99. ISBN 978-1-4614-0917-5.

By chance, the day I sat down to write this review, a quotation from Nick Kanas, the author of this beautiful and informative book, appeared in an article in *USA Today* entitled "Mission to Mars looks like a sleepy journey": "'Mars 500 [what the ESA calls "the first full-length, high-fidelity simulation of a human mission to Mars"] went only so far in answering the real questions about Mars travel,' says astronaut health expert Nick Kanas of the University of California-San Francisco, 'since real danger and microgravity were absent in this simulation and since only one crew was studied.'" At the same time, my husband, Jay Pasachoff, at the American Astronomical Society's meeting in Long Beach, California, learned from Springer editor Harry Blom that Kanas is the owner of the magnificent collection of star maps that he lovingly and learnedly shares with his readers in this, the second edition of his book. The very fact that the book has gone into a second edition following two printings of the first edition, which came out only a handful of years ago, in 2007, demonstrates how popular it has been despite its focus on such a specialized topic. Kanas has done a remarkable service by relating the tradition of sky mapping from antiquity to the present to the evolution of ideas concerning humanity's place in the cosmos.

As in the first edition, the book covers the history of celestial cartography in 10 chapters. Chapter 1 compares and contrasts constellation maps and cosmological maps. Although the main focus of the book is the European sky mapping tradition, chapter 2, "non-European cosmology and constellation development," shows how China, Mesopotamia, Egypt, and India had an influence on or were influenced by European celestial cartography. The aim of Chapter 3, which reviews the development of European cosmology from the ancient Greeks through Newton, is to facilitate comprehension of cosmological maps, while the aim of the complementary chapter 4, which reviews the development of constellations in Europe, is to facilitate comprehension of constellation maps. The remaining six chapters focus on specific periods and cartographers.

As I looked over the new material in the second edition, several additions caught my eye. As author of the entry on Hypatia in Thomas Hockey's *Biographical Encyclopedia of Astronomers,* I am pleased to see her mentioned in a section in chapter 3 describing the "impact of the fall of Rome" on European astronomy of the early medieval period. Despite the efforts of leaders of the early Christian church to focus exclusively on scriptural descriptions of the heavens, "some pockets of Greek mathematical astronomy survived into the 5th Century. For example, in Alexandria the Neoplatonist philosopher Hypatia (ca. 355-415) was an influential teacher of mathematics and astronomy. She wrote several important commentaries, including one with her philosopher father, Theon, on Ptolemy's *Almagest.*" In his first edition, Kanas credited Gerard Mercator as the first to include Antinous and Coma Berenices as constellations on his celestial globe of 1551, but here Kanas gives pride of place to Caspar Vopel, a mathematics teacher at the Cologne Gymnasium, whose 1536 celestial globe included the two constellations. Ptolemy had included neither of these as separate constellations, though he designated Antinous as a sub-division of Aquila. Among the interesting additions to chapter 8, devoted to "special topics of relevance to celestial maps and prints," I was particularly intrigued by the brief discussion of playing cards with a celestial cartographic theme, which appear to be quite rare; in addition to figure 8.44, which shows an Ace card with an armillary sphere, the 1785 pack of cards from which it came also includes another Ace with a diagram of the Copernican model of the universe. [Make sure to look not only at the black-and-white figures within the context of each chapter but also at the gorgeous "color plate gallery" that constitute chapter 11, which contains computer-enhanced full-page color reproductions of "important figures that have appeared earlier in this book," including figure 8.44.]

Chapter 9, "Mapping the stars in early America," contains new material on colonial America. We learn, for example, that at Harvard College, founded in 1636, Copernican ideas were added to the curriculum in 1659. The first major telescope in America was brought there in 1663 by Colonial physician John Winthrop Jr., who "made many observations of the sky, including the planets," which he "communicated…to colleagues in the newly formed Royal Society." Thomas Brattle's observations of the Great Comet of 1680, which he sent to John Flamsteed, then the Astronomer Royal, and to Isaac Newton, were made with Winthrop's 3.5-foot refractor, which Winthrop bequeathed to Harvard in 1672. (Kanas is wrong, however, to call Newton "Sir" in this context, since he did not have this title until he was knighted in 1705.) Having been very involved in observations of the two Transits of Venus of the 21st century, I was interested to read that "The pinnacle of colonial astronomy was the 1769 transit of Venus, which fortuitously happened to be best viewed from North America and where the observations of several colonists contributed to a value of the Sun's distance approximating today's value." Knowing that teachers of astronomy are always on the lookout for materials

covering the contributions of women in the field, I am grateful to Kanas for including in this second edition a brief section on Hannah Mary Bouvier (1811-1870) that now concludes chapter 9. Bouvier's *Familiar Astronomy, or an Introduction to the Study of the Heavens,* published in 1857 by her husband's publishing company, included in its 499 pages "information on astronomical instruments and globes." Among the endorsers of Bouvier's book was George Airy, then the Astronomer Royal.

Chapter 10, "The transition to non-pictorial star maps," includes a new final section on computerized star maps. It includes useful information on apps that can be used with iPhones, iPads, and their Android equivalents to "display the sky in dynamic detail and in some cases allow the observer to drive a go-to telescope using the apps," as well as other astronomy-related apps, "including one that simulates collisions between galaxies and another that displays the size of a crater an asteroid might make if it hit the Earth." While noting that hi-tech star maps have only limited "value as collectibles," Kanas offers as consolation the fact that "for someone with a PD [personal device] and a few dollars for the app, the sky is no longer the limit."

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MISCELLANEOUS EDUCATIONAL RESOURCES

A USEFUL WEB SOURCE OF VIDEOS ON ASTRONOMICAL CONCEPTS

Anja C. Andersen (Dark Cosmology Centre, Niels Bohr Institute, University of Copenhagen) notes the following resource that may be of interest to astronomy educators. "**Studynova** is a project by Canadian Mitch Campbell. There, students can find hundreds of videos on the subjects of mathematics and physics. http://studynova.com/videos/ There are three topics in particular that are of interest to astronomy students. First, under 'physics', is a set of 48 videos on astrophysics. These are relevant for high school and introductory university students, and are an overview of common astrophysics topics (including stellar properties, HR diagrams, calculating distances, cosmology, etc). Second, also under 'physics', is a set of 23 videos called 'Astrophysics extra'. These feature additional material for high school and introductory university students, such as calculating the mass of a black hole, rotation curves and lensing as evidence for dark matter. There are also videos on exoplanet detection techniques (Doppler method in more detail - estimating orbital radius, mass, surface temperature). Last is a set of 28 videos under 'Astrobiology'. This is an introduction to astrobiology, and is at a more basic level (no mathematics). These feature topics such as the history of life on Earth, habitable zone, abiogenesis, panspermia, Urey Miller experiment, searching in our own solar system, exoplanets, SETI, aliens and UFOs."

A SUITE OF SIMULATION PROGRAMS FOR TEACHING COSMOLOGY

An article in the American Journal of Physics, June 2013 (V81, pp 414-420) describes a useful set of programs that illustrate techniques of analysis in modern cosmology, allowing students to "discover" the acceleration of the universe. The authors are Jacob Moldenhauer, Larry Engelhardt, Keenan M. Stone, and Ezekiel Shuler from the Department of Physics and

Astronomy, Francis Marion University, Florence, South Carolina, 29506 USA. Here is the abstract of the article: "We present a collection of new, open-source computational tools for numerically modeling recent large-scale observational data sets using modem cosmology theory. These tools allow both students and researchers to constrain the parameter values in competitive cosmological models, thereby discovering both the accelerated expansion of the universe and its composition (e.g., dark matter and dark energy). These programs have several features to help the non-cosmologist build an understanding of cosmological models and their relation to observational data, including a built-in collection of several real observational data sets. The current list of built-in observations includes several recent supernovae Type-Ia surveys, baryon acoustic oscillations, the cosmic microwave background radiation, gamma-ray bursts, and measurements of the Hubble parameter. In this article, we discuss specific results for testing cosmological models using these observational data."

The software described in the article, called CosmoEJS, is freely available online from ComPADRE at http://www.compadre.org/osp/items/detail.cfm?ID=12406 .

OBITUARIES

DONAT WENTZEL, 1934 -2013

Donat Gotthard Wentzel died of a rapidly developing cancer on February 20, 2013 at the home of his daughter Tania in Glenwood, Maryland, USA. Don did research on cosmic magnetism and electrical currents flowing in interstellar space and in the solar atmosphere, kinetic plasma physics and radiation theory. At the end of his career, however, he was best known for his educational activities and considered them to be among his most important and enduring contributions.

Don was born in 1934 in Zurich, Switzerland, where his father, Gregor Wentzel, was a professor of physics at the University. In the late 40s the family moved to Chicago before Don entered college. He quickly learned English and picked up what was needed to finish college and earn a PhD at the University of Chicago. His thesis was on "Hydromagnetic Equilibria;" Subrahmanyan Chandrasekhar was his adviser. After he finished his PhD in 1960, he worked for 6 years at the University of Michigan, becoming an associate professor in 1964. Finally, he and his family moved to Maryland, where Don was a professor in the Astronomy Department at the University of Maryland until his retirement.

Don's seminal work on cosmic-ray propagation made him known in the astronomical community. Later he became involved in kinetic problems of solar flare radio emissions and applied percolation theory to the development of solar active regions. Typical for his approach was the theoretical derivation of plasma phenomena from first principles. There was always the question in his mind about how he would explain this to his students. Combining his experience in science and teaching, he published a book on "The Restless Sun," written for undergraduates. It was named Book of the Year by the Astronomical Society of the Pacific in 1989.

Today, a countless number of former students remember Don fondly. He patiently supported young people in their first steps entering science. Apart from his work with students and graduates in astronomy, he helped to develop an astronomy course for college students who would not be majoring in a science. This course at one time attracted over 3000 students per year at the University of Maryland. As part of this course, he developed student activities and lab courses based on astronomical photographs and other data. He stimulated similar courses nationally and internationally. This work took a large part of his time, therefore often only the summer months were left for research. Spending a half-year sabbatical in India opened his eyes to teaching astronomy in less privileged countries.

He became involved with the Commission on Teaching Astronomy of the International Astronomical Union in the early 1970s and was Vice-president from 1973 until 1979. As its president, 1979 - 1982, he developed new ways for teaching astronomy as a medium for science education in scientifically developing countries. He remained an active member of the commission in many ways. So he was the Chairman of the Committee for the Visiting Lecturers Program 1982—1994, the editor of the Newsletter of Commission 46, 1976—1985 (published at University of Maryland). As secretary (i.e. chair of scientific organizing committee) for International Schools for Young Astronomers, 1991-1997, he set clear academic goals and instituted timely fiscal management. He served also as a teacher at the International Schools for Young Astronomers in Indonesia (1973 and 1983), Indonesia (1983), Malaysia (1990), Romania (1999), China (1992), India (1994), Egypt (1994), Iran (1997). About four years after the event, he conducted reviews of the 11 International Schools for Young Astronomers.

He initiated the IAU the program "Teaching for Astronomy Development." Serving as its chairman, he identified suitable advisors and negotiated individual programs with astronomers of Vietnam, Central America (six countries), Morocco, and Philippines. He negotiated and advised annual programs and budgets; provided equipment, books, journals, software, planetarium shows; facilitated travel of astronomers or students to or from these countries. Tirelessly, he guided the planning of workshops of university teachers and the writing of a new bilingual text in Vietnam. For Central America he chaired the planning of annual regional meetings, of two observational courses, and, in particular, of the introduction of astronomy to Nicaragua; for the Philippines, he organized visiting observer and lecturer courses. To encourage others for the same goal, Don was the Chairperson and organizer for the IAU-COSPAR-UN "Special Workshop on Education"1999 during the UNISPACE III conference in Vienna.

Don Wentzel's goal was a sustainable development in education, and in many countries his work had an impact that is still growing today. In recognition of his extensive efforts in astronomy education, the American Astronomical Society honored Don with its 2003 George Van Biesbroeck Prize of the American Astronomical Society for his "long-term extraordinary or unselfish service to astronomy".

Don Wentzel was a joyful and peaceful person helping everybody he met along the way. He was also a connoisseur of good wine. In his honor, his family asks that you buy a good bottle of wine, share it with somebody you love, and toast to your memories. Prost, Don!

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Don Wentzel and Hans Haubold discuss the teaching material prepared by Don for the annual UN/ESA/NASA/JAXA workshops on Basic space science at the IAU General Assembly, Kyoto, Japan, 1997

MASATOSHI KITAMURA, 1926 -2012

Prof. Kitamura was honored with a United Nations letter of appreciation at the occasion of the UN/ESA/NASA/JAXA workshop hosted by the Government of Japan, Tokyo at the NAOJ in 2007.

Professor Dr. Masatoshi Kitamura passed away on 13 July 2012. Since 1989 he was affiliated with the Office for Outer Space Affairs of the United Nations and a founding father of what was later named the United Nations Basic Space Science Initiative (UNBSSI). Professor Kitamura was an internationally distinguished astronomer who focused his research on variable stars and in this capacity was a member of Division V Variable Stars and its Commission 42 Close Binary Stars of the International Astronomical Union (IAU). Early in his professional career he felt inclined to make his professional achievements available in the education of young astronomers, particularly at the widest international level for the benefit of development of astronomy in developing nations.

Since 1982 Masatoshi Kitamura was among the members of a small group of well-known astronomers from Japan, who, on behalf of the Government of Japan, provided developing nations with high-grade equipment under the framework of the Official Development Assistance (ODA) cooperation program in order to promote education and research in such countries. The equipment donated included university-level reflecting telescopes as well as modern planetaria used for educational purposes. Starting from the first contact with respective individuals and Governments, Professor Kitamura worked through each and every step of search, administration, negotiation, implementation, and eventual operation of such telescopes and planetaria supposed to be donated to nations. Even the final publication of research results or the development of educational programs was meticulously accompanied by Masatoshi Kitamura's advice and support, professionally and personally.

In 1989 Prof. Kitamura's efforts achieved such a high level that cooperation with the United Nations was desirable in order to involve in a more formal and direct manner Governments and scientific communities by taking advantage of already established mechanisms of support for the world community of nations at large. This was the time that Japan started informing the members of the United Nations (UN) General Assembly's (GA) Committee on the Peaceful Uses of Outer Space (COPUOS) about its donation program for astronomical telescopes and planetaria. Professor Kitamura's efforts eventually lead to the donation of seven (7) astronomical telescope facilities and 20 planetaria to developing nations as recorded in the UN GA document A/AC.105/902 which also contains the details of the deliberations of a UN/ESA/NASA/JAXA Workshop on the International Heliophysical Year

2007 (IHY2007) and Basic Space Science, hosted by the National Astronomical Observatory of Japan (NAOJ) in 2007 (photos attached). The hosting of this Workshop by Japan was already informally discussed at a similar workshop of the UNBSSI at the occasion of the inauguration of the astronomical telescope facility at the Arthur C. Clarke Center in Sri Lanka in 1996.

Professor Kitamura was a leading member of the International Scientific Organizing Committees of all annual United Nations Workshops on Basic Space Science (UNBSSI) in the period of time 1991-2011 and made his presentations on astronomical topics to the programs of the Workshops while also negotiating the support for existing and proposed telescope facilities and planetaria. Many astronomers from such developing nations were invited to visit and to work at public observatories in Japan and, conversely, many Japanese astronomers went abroad to further astronomy education. Professor Kitamura visited many countries to explore the conditions for establishing new telescope facilities and planetaria, all this coordinated with and in support of the United Nations.

The spirit of Masatoshi Kitamura's knowledge and enthusiasm for widest international cooperation for the benefit of education and research in astronomy accompanied with a fine personal kindness in human relationship will continue being felt in future activities of the UNBSSI.

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USEFUL WEBSITES FOR INFORMATION ON ASTRONOMY EDUCATION AND OUTREACH MEETINGS

The following websites contain information on future (and recent) meetings and conferences on, or very relevant to, astronomy education and development. In compiling this short list I am well aware of a strong European bias. **Please send me URLs by email for relevant websites in other areas of the world.**

WORLDWIDE
IAU Office of Astronomy for Development (OAD) http://www.astro4dev.org/

UK
The Association for Astronomy Education http://www.aae.org.uk
The British Association of Planetaria http://www.planetaria.org.uk/
The National Schools Observatory http://www.schoolsobservatory.org.uk

Europe
The European Association for Astronomy Education http://www.eaae-astro.org
The European Astronomical Society http://eas.unige.ch/
The European Southern Observatory http://www.eso.org/outreach/eduoff

USA
(among several other good sites)

The Astronomical Society of the Pacific http://www.astrosociety.org

OTHER EDUCATIONAL RESOURCE WEBSITES

Project CLEA—Research Simulations in Astrophysics
http://public.gettysburg.edu/~marschal/clea/CLEAhome.html
The Nebraska Astronomy Applet Project -----Online Labs for Introductory Level Astronomy
http://astro.unl.edu/naap/

INFORMATION THAT WILL BE FOUND ON THE IAU C46 WEBSITE

Among the information that will be contained on the IAU C46 website http://www.iaucomm46.org/ is the following

- Overviews (of C46, in English, French, and Spanish)
- Guidelines (including Programme Groups)
- Resolutions
- Newsletters (including OAO newsletters and triennial reports from National Liaisons)
- Organizing committee
- National contacts (liaisons)
- Links
- News

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