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

Newsletter 77 – March 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.

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CONTENTS

EDITORIAL

Welcome to IAU Commission 46 Newsletter 77, the first to be published under the new editor, Larry Marschall (Gettysburg College). 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 October 2013 issue the copy date is **Friday 14 September 20 2013**. 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 English is used. 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.

Book reviews

I welcome book reviews, a feature introduced by Barrie Jones, and which I hope to continue. Reviews must 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 intend to return to the old publication schedule. So this issue, number 77, published in March 2013, will be followed by issue 78, to be published in October 2013.

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

A word from the new president of C46, Jean-Pierre De Greve.

Dear Colleagues,

You're all aware of the new situation of Commission 46. The introduction of the Office for Astronomy Development (OAD), with its supporting Task Forces, has created a new situation. C46's previous portfolio with many outreach and development activities was greatly reduced, as activities moved to the OAD, in accordance with the Decadal Plan 2010-2020. The OAD has become responsible for the capacity building, especially in developing countries. Commission 46 should concentrate on education.

But what does that mean in a situation where all educational activities (apart from NASE activities) are organized through the OAD? Moreover, the development of those activities is supported by strong, extensive Task Forces, one for each layer: the public, schools and children, and higher education and research. Given this, shouldn't we consider abolishing C46?

As already mentioned in the discussion paper that was in my absence discussed at the C46 business meeting at the GA in Beijing, I consider the drastic change as an opportunity to define new tasks for C46, without abandoning the heart of C46's reason for being: make sure that astronomy education remains an important issue within the structure of the International Astronomical Union. To this end, I suggested in that paper to concentrate on the development and improvement of scientific research into education and specifically astronomical education at all levels throughout the world, not through activities as we did in the past, but 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. Parallel to this, Paul Bretones also worded ideas for astronomy education research within the framework of C46.

In the coming months, I will discuss with all C46 members concrete ideas on the working of C46, and on its relations with the OAD, with other commissions and with its supervising division C. These discussions should result in ideas that will give C46 a fruitful life in the new structure of the IAU, a life that contributes significantly to an enhanced deployment of astronomy education.

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MESSAGE FROM THE DIVISION C REPRESENTATIVE

On the New Division Structure for the International Astronomical Union.

Mary Kay Hemenway, University of Texas at Austin

At the conclusion of the Beijing IAU meeting on 31 August, the membership voted on a new structure for the Union. According to the incoming president, Norio Kaifu, "the new Division structure gives the IAU more flexibility to cope with the rapid evolution of astronomy." The out-going president of the IAU, Bob Williams, recently said, "I think a key change for the IAU is that we are moving from an organization that historically has been largely internally focused on the professional development of astronomy to one that is more outward looking and committed to using astronomy as a tool for development in emerging nations. As part of this we are becoming a more operational organization and increasing our programs in education and outreach. Much of this has been follow up from the International Year of Astronomy 2009."

Of interest to Commission 46, is the new Division C: Education, Outreach and Heritage. I've been appointed as the President of Division C for 2012-2015, with Hakim Malasan of Indonesia as Vice-President. The commissions and their working groups that will come under this umbrella include Commission 41: History of Astronomy; Commission 46: Astronomy Education and Development; Commission 50: Protection of Existing & Potential Observatory Sites; and Commission 55: Communicating Astronomy with the Public.

The Executive Committee and new Division officers will work together to produce initial plans for a revised structure for Commissions, Working Groups and other bodies by May 2013. It is hoped that all the new Divisions, not just Division C, will find ways to work towards the successful implementation of the Union's Strategic Plan that was approved at the 2009 IAU General Assembly. The activities of Division C will be closely coordinated with those of the newly established IAU Office of Astronomy for Development (OAD). The Division structure should allow sharing of ideas across these commissions and working groups, and perhaps even result in joint projects. More information on Division C is available at http://www.iau.org/science/scientific_bodies/divisions/C/ . Every IAU member received an e-mail asking them to enroll in one or more divisions (if you did not receive a message, please go to http://www.iau.org/science/news/169/). You may enroll in divisions independent of the Commissions to which you belong. The next step for Division C will be to elect members of the Division Steering Committee within the next month through a ballot that will be distributed by the IAU to members of Division C.

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The text of the resolution is:

RESOLUTION B4
on the restructuring of the IAU Divisions
Proposed by the IAU Executive Committee
The XXVIII General Assembly of the International Astronomical Union, noting
(a) that both the IAU and astronomy as a whole have evolved considerably since the current Divisions were introduced in 1994 and formally adopted in 1997, and that it is therefore appropriate to consider re-optimising the Divisional Structure,
(b) the report and recommendations of the Task Group established by the Executive Committee to examine the case for restructuring the Divisions, and the Executive Committee response to these recommendations,
(c) that the Commissions, Working Groups and other bodies under the Divisions may also require reform,
(d) that the implementation of the Strategic Plan through the Office of Astronomy for Development (OAD) and other associated programmes requires the Executive Committee to establish appropriate oversight and governance provisions for all Astronomy for Development activities, including the Office of Astronomy for Development, ensuring a strong link between these activities, the Divisions, and the Executive Committee.

approves the proposal of the Executive Committee to restructure the Divisions as follows:

Division A Space and Time Reference Systems
Division B Facilities, Technologies, & Data Science
Division C Education, Outreach, & Heritage
Division D High Energies & Fundamental Physics
Division E Sun & Heliosphere
Division F Planetary Systems & Bioastronomy
Division G Stars & Stellar Physics
Division H Interstellar Matter & Local Universe
Division J Galaxies & Cosmology
and requests the new Divisions, guided by the Executive Committee, to work together to produce initial plans for a revised structure for Commissions, Working Groups and other bodies to be

approved, in accordance with the Statutes and Bye-Laws of the Union, by the Executive Committee at its meeting in May 2013

BOOK REVIEWS

THE SENSORIUM OF GOD Stuart Clark, (Edinburgh: Polygon Books, 2012). 280 pp. HB ISBN 978-1-84697-187-7, £12.99. PBK £7.99 and eBook, ISBN 978-1846972157.

In the autumn 2011 edition of this newsletter I reviewed with pleasure Book One of Stuart Clark's *The Sky's Dark Labyrinth Trilogy* of historical novels, of which *The Sensorium of God* is the second instalment. While Book One, also called *The Sky's Dark Labyrinth,* focused on Galileo and Kepler, with guest appearances by Tycho Brahe and others, Book Two focuses on Edmond Halley, Isaac Newton, and Robert Hooke, with guest appearances by Johannes Hevelius, Christiaan Huygens, Gottfried Leibniz, and John Flamsteed, among others. While I knew more than a bit before beginning the novel about, for example, Halley's having to convince Newton to publish the work that became the world-altering *Philosophiæ Naturalis Principia Mathematica*—Latin for "Mathematical Principles of Natural Philosophy," often referred to as simply the *Principia*; about the pirated first appearance of Flamsteed's star atlas, followed by the second authorized one; and about some of the bitter priority battles of the time, I had no idea that there was so much intrigue in the story of how the laws of the universe came to be understood, with more than a smattering of heresy, espionage, and sexual hanky-panky all thrown into the mix.

As well as a thoroughly enjoyable read, this book can be considered a great aid to teachers who seek to humanize the context for laws that can seem very dry when appearing in textbooks only in dry prose or as straightforward equations, say, such as $F = ma$. Chapter 23, for example, shows that this law, now taught in middle school, was not always known, and that someone struggled to figure it out. Halley tells an assemblage of unengaged fellows of the Royal Society that in Newton's "most remarkable treatise, advancing a number of propositions taken from observations of the world and backed by experiment," the author has demonstrated "through observation and experiment" that "heavenly motions are the exclusive results of a force, here called gravity," that the planets "are held to their paths by the gravity emanating from the Sun," and that the same force of gravity enables each planet to "hold its moons." It is fascinating to realize that only Halley at the time, at least on the strength of Clark's retelling, believed in the importance of Newton's *Principia,* while most of the leaders of the Royal Society were unable to "get past the first page." Similarly, today children from a young age—perhaps from toddlerhood, when they get to play with their first Fisher-Price Rock-a-Stack—learn about the colors of the spectrum, but in Chapter 25 Clark brings to life the fact that before Newton's *Opticks* appeared, it was a commonly held belief that "colours are created in the light by the medium it travelled through."

In my review of the first novel in Clark's trilogy, I was stumped by the title of the book, which is also the title of the trilogy. Stuart Clark, however, now kindly provides on his website an explanation of the titles for his readers: http://www.stuartclark.com/cosmo-blog/474-naming-the-skys-dark-labyrinth-trilogy. While doing his background reading for the trilogy, Clark decided to take as inspiration for his titles particularly "catchy, intriguing phrases" from the writings of scientists who play some role in each book. Galileo used the words "dark labyrinth" in his 1623 *Il Saggiatore,* where he argues that without the aid of mathematics, the language of the universe, we are left floundering around in a dark labyrinth. In his *Opticks* Newton talks about God's "sensorium," and the phrase is discussed amply in the course of the novel, particularly in the penultimate chapter, where the Princess Caroline is trying to determine if Newton is a heretic based on his use of that word. The title for the third volume, Clark tells us, comes from the 1931 paper by that name by the Belgian cosmologist Georges Lemaître, often called "The Father of the Big Bang." As for what to call the three-book series as a whole, Clark tells us that while watching the second film in George Lucas's *Star Wars* trilogy, *The Empire Strikes Back,* it occurred to him to follow that model for his own trilogy.

Clark doesn't, however, explain the titles of the three parts into which the 40-chapter *Sensorium of God* is divided: the 124-page Part I, "Action" (chapters 1 through 22); the 72-page Part II, "Distance" (chapters 23 through 33); and the 73-page Part III, "Force" (chapters 34 through 44). My quick search on the Internet led me to
http://wiki.answers.com/Q/Newton's_force_of_action_at_a_distance#ixzz273H38rz1
There I learned that the problem called "action at a distance"—regarding the ability of gravity, electricity, and magnetism to act over a distance "to produce forces without direct contact between the affected objects"— was "a matter of considerable philosophical debate in Newton's time." One of the most memorable scenes in the book for me occurs in Chapter 14, set in Garraway's, one of the real coffeehouses of the time, where the philosophical problem is communicated through concrete words and actions. Hooke then demonstrates to a group congregated around him how gravity works in a clever way by asking a member of the audience whether Hooke could cause him to move without either of them changing positions. When the man says it would be impossible for Hooke to do so, "so long as I stay out of your reach," Hooke then initiates a chain reaction by shoving the man sitting next to him, who in turn bumps into his neighbor, and so on, until "the momentum had reached the [audience member], who rocked sideways." Hooke then explains that "Mechanics…[is] the key to understanding how forces transmit themselves." He explains that the force of gravity travels through "the ether"—a belief that would hold sway until the Michelson-Morley experiment of 1887, about which readers of the third volume of the trilogy are likely to read.

Chapter 14 demonstrates how much more adept at scientific exposition Clark has become since writing *The Sky's Dark Labyrinth,* in my review of which I complained about examples of clunkily intrusive scientific explanations, such as when Kepler pedantically explains his work to the women in his life. I am glad to report that since completing Book One, Clark seems to have gained much firmer control of another aspect of that book that troubled me, namely, descriptions of the sex lives of our scientific heroes. In fact, sex provides a much steadier *basso continuo* to Book II, focusing on Halley's roving eye before his marriage and his "lusting in his heart" (*pace* Jimmy Carter) while remaining constant to his wife after marriage; as well as on Hooke's incestuous feelings for his niece Grace, who serves as his housekeeper; and on Newton's homosexual tendencies, if not on their implementation. My only objection to Clark's otherwise excellent handling of this subtheme is his decision to relegate his explanation of its rootedness in historical fact to his Acknowledgements (American readers: Please note Clark's use of British spelling), at the very end of the book. I would have been saved a lot of time checking things out online if I had read his comments on this matter first. While doing my own research, however, I came across some things worth sharing with readers of this review. Did you know that Hooke kept a diary in which he used the astrological symbol for the zodiacal constellation Pisces as his private code to designate a sexual encounter? Or that when Halley became Savilian Professor of Astronomy at Oxford, an assistant librarian at the Bodleian, where Halley's portrait hung next to Hevelius's, let it be known that "some persons say that Halley made him a Cuckold, by lying with his wife when he was at Gdansk, the said Hevelius having a very pretty Woman as his wife"?

Another reason I would have liked to read the contents of the Acknowledgements as a Foreword is its explanation for the role of the one fictional character in the book, the royal functionary Winslow, who, while serving different monarchs of different religions over the more than 30-year span of the novel, remains a thorn in the side of Halley and becomes a threat to the lives of both Halley and Newton by the end. While I had figured out on my own that Winslow was not a historical character, I do not object to Clark's use of him as a means to an end—to describe issues developed in an exchange of letters—as I did to Clark's use of a fictional cardinal in Book One.

Only one problem that bothered me in Book One of the trilogy (and in Clark's nonfictional *The Sun Kings,* which I had earlier reviewed in another venue), continues to bother me here. What Clark still isn't good at is keeping the reader up to date with the chronology, so, for example, he gives only two dates for the first section—1679 and 1683—but some events occur later than that, e.g., Halley's visit to Cambridge (August 1684) and the death of King Charles II and accession to the throne of the Duke of York as King James II (February 1685), and there's no reason Clark couldn't

insert the actual dates unobtrusively. Similarly, Part III is dated 1703, but a few chapters into it we are in 1705, the year of Newton's investiture into the knighthood, without Clark giving us the date. A few pages later we are in 1710, the year the Royal Society moved from Gresham College to Crane House, though, again, Clark doesn't keep the pages of the calendar turning for us. Similarly, the pirated edition of Flamsteed, the subject of Chapter 41, came out in 1712, and Clark could have given us the date. And since Halley's book predicting the return of the comet in 1758 was published in 1705, it shouldn't be discussed later in the book than the appearance of the pirated star catalogue.

What Clark succeeded in doing well in Book One is putting scientific development in the context of social and political issues of the day, and in Book Two he demonstrates real mastery in this area. He skilfully inserts background material on diverse transitional events and social institutions of the period, including, in the first category, the Great Fire of London, the Great Plague, and the so-called Popish Plot, and, in the second category, the coffeehouses and theatres of London. As author of a dissertation on an aspect of early English drama, I was particularly intrigued by Chapter 13, which recreates the historical episode in which Hooke attends a performance of Thomas Shadwell's *The Virtuoso,* whose title character, Sir Nicholas Gimcrack, is mocked for carrying out experiments that are based on Hooke's own work described either in his *Micrographia* or in *The philophical transactions of the Royal Society.*

Another thing I learned while reading this novel relates to my family's deep connection to total solar eclipses. I hadn't known that Halley was the first to use the name Saros for the eclipse cycle. In chapter 38, when Newton is annoyed that Flamsteed's lunar observations, which he has been demanding to enable him to finish his work on gravity, will not serve the purpose after all, Halley offers to conduct "a complete set of lunar observations over a Saros" at his almost-ready observatory in Oxford. Perhaps it's a mere quibble, but Clark says a Saros is a 19-year period, while those steeped in eclipse vocabulary know it's only 18 years 11-1/3 days. In the epilogue, Clark tells us that Halley "lived long enough to record the position of the Moon for an entire nineteen-year Saros cycle" once he became Astronomer Royal after Flamsteed's death in 1719.

I admire Clark's proficiency in this central novel of the trilogy in connecting his story both back and forward. Vincenzo Viviani, "Galileo's last student," appears in person in Chapter 10, telling Halley, who is in Rome on business, that in Italy his mentor "is still considered a traitor," and wondering whether there is "anyone in "England who could be the next Galileo." In Chapter 24 Halley remembers that encounter but not specifically what Viviani had told him then about why Galileo wrote his final book, the *Discorsi,* "in such mathematical tones." Newton enlightens Halley: Galileo had gotten into trouble in the first place because *Dialogues* "was written as an accessible discussion" that everyone could understand, To protect himself, Newton explains, Galileo then wrote his final masterpiece "in only maths, measurements and experiments. The cardinals couldn't understand a word of it." Not only Galileo's but also Kepler's and Tycho's work are referred to in *The Sensorium of God.* Newton explains from time to time the connection between his discussion of gravity in *Principia* to Kepler's laws. Tycho's quarter-century effort to put together his observations is referred to in Chapter 35, when John Flamsteed defends the length of time it is taking him to put together his royal star chart by referring not only to Tycho's long labor but also to the 27 years it took Kepler to put together the *Rudolphine Tables*.

The Sensorium of God concludes with a dramatic set-up for the third volume of the trilogy. While defending himself from accusations brought by the Crown about his possible heresy, Newton explains how he has proven God's existence through a flaw in his theory of gravity: according to that theory, since every object in the Universe attracts every other object through gravity, "the Universe should have collapsed long before now, everything pulled into everything else…Yet the Universe remains stable around us. This, then, is observational evidence of God's sustaining love." As this, the penultimate, chapter concludes, Halley asks Newton, "So, what you said about God's will supporting the Universe—have we really found the boundary of our science, or do you think someone will come after us and explain it with rational means?" Newton responds, "Only time will tell." The final, very brief, chapter of the book is reserved for Fatio, the young Swiss mathematician who becomes deeply

involved with Newton for a while. I wondered why Clark had left the final word to Fatio, but discovered why by reading the book's Epilogue, which immediately follows, where Clark tells us that Fatio's theory of gravity continued to interest scientists into the 19th century, though "no one could make the mathematics of Fatio's idea work." Nagging questions about gravity grew more intense after better telescopes showed that Mercury "did not follow the route prescribed by Newton's laws," and the matter that concerned Newton about why the Universe didn't collapse in on itself "because of its combined gravity" also continued to intrigue. Among those whose imaginations were stimulated by the nature of gravity was "young German-born physicist Albert Einstein," whose theory of relativity would supersede Newton's theory of gravitation and whose story follows in Book Three. I hope to have the opportunity to review that book in a future edition of this newsletter.

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THE ASTRONOMER JULES JANSSEN: A GLOBETROTTER OF CELESTIAL PHYSICS, Françoise Launay, trans. Storm Dunlop (New York: Springer, 2012). 220 + xv. HB $199. ISBN 978-1-4614-0696-9. Ebook, $99. ISBN 978-1-4614-0697-6.

In the interest of full disclosure, I begin this review by mentioning that the preface to the English edition of this biography of French astronomer Jules Janssen is by past president of IAU Commission 46 Jay M. Pasachoff, who is also my husband; that the preface to the original, French edition is by past secretary-general of the IAU (1964-1967) Jean-Claude Pecker, who is our friend in addition to my husband's colleague; and that the author of the book directed us to the exhibit mentioned in the next paragraph. Pecker asserts that Launay is an "attentive and erudite" biographer, and that her book is destined to "become a source of reference." I am happy to say that, having read the book in its fine English translation by Storm Dunlop, I concur completely.

I should also mention that before reading the book all I knew of Janssen (1824-1907) was "Janssen's revolver," two versions which I have actually laid eyes on: one in Paris, in the same university building where, as a biographer of Marie Curie, I had gone to visit the site of her early collaborations with her husband, Pierre; and one in the Sydney Observatory in Australia. I knew that Janssen's revolver (illustrations of which are to be found in Launay's Chapter 7, "Janssen and the Cinema: The Transit of Venus of 1874 and the Revolver Photographique") was not a gun but rather a high-speed photographic device, a forerunner of movies. Reading Pecker's preface, however, immediately whetted my appetite to know more about this self-motivated polymath, an expert in, among other things, geophysics, physiology, and spectroscopy, whose reaching out to the director of the Paris Observatory seems not to have resulted in the desired collaboration, but whose connections to a wealthy lawyer whose sons Janssen tutored led him indirectly to some years of world travel.

The scientific accomplishments of those travels included measuring the Earth's magnetic field and determining the magnetic equator in Peru. Among the charming things Pecker has to tell us about Janssen is that he knew how to find the individuals who could help him in his various quests—"He built up, if I may put it this way, a really useful address book"—and that he was "a sort of 'self-made man,'" an inventor whose "first invention was, in effect, Janssen himself." Among the fruits of the many scientific expeditions that Janssen made, Pecker notes the "technical advance" made by Janssen's invention of the photographic revolver during his 1874 trip to Japan to observe the Transit of Venus, "to record the precise

instants of the moments of contact during the course of the transits," and the major advances he made to solar physics through his unflagging travels around the globe to observe the sun during total solar eclipses.

Perhaps the most romantic of these expeditions was in 1870, while Paris was under siege by Prussian forces, when Janssen left Paris by balloon, enabling him to deliver a political message to a government minister in Tours, before continuing on to Algeria for his scientific observations! In addition to his scientific accomplishments, Janssen was also, apparently, a visionary institution-builder. Janssen (whose parents, we later learn from Launay, had wanted him to have a career as an artist) drew up the plans of what became the Meudon Observatory, which with the largest refractor in Europe, as well as a reflector and a spectroscopy lab, became and remains "one of the pinnacles of astronomy in the world today." Janssen also set up the observatory on Mont Blanc.

My new curiosity about Janssen was further piqued by reading the preface by Jay Pasachoff. An eclipse expert himself, Pasachoff notes the importance of the simultaneous discovery by Janssen through spectroscopic studies of the 1868 total solar eclipse in India "that the solar prominences can be observed even outside of eclipse by looking a the red spectral line of hydrogen now known as H-alpha" and by Norman Lockyer outside of eclipse, in England. Janssen, like Pierre Curie, was the rare French scientist to have been trained outside of the "scientific and academic environment of the French 'grand schools' that provided the elite."

Pasachoff, who at the 2012 IAU in Beijing gave a paper to the Commission on the History of Astronomy on "Expeditions to Death and Disaster," where he could have but did not mention the King of Siam, notes here that the king's death from malaria followed his contracting malaria after being bitten by a mosquito at Janssen's eclipse site for his 1875 eclipse expedition to Siam. Pasachoff gives a clear description of the Janssen revolver and of the scientific goal that inspired Janssen to invent it. In order make timing measurements accurate enough, despite the pesky "black-drop effect," to determine the distance between Earth and Sun, the major astronomical problem of the time, Janssen developed "an annular daguerreotype with an intricate system of rotating wheels that allowed 48 exposures to be taken at 1.5-s intervals." Pasachoff calls the "Janssen," as it is known in England, a "forerunner of multiple imaging, beginning the path that led through Muybridge's study of locomotion to the movie cameras of Thomas Alva Edison and the Lumière brothers." (In addition to her Chapter 7 on the "revolver photographique," Launay devotes Chapter 9 to "Janssen, the Photographic Technician.)

In the last two pages of prefatory material Launay makes some interesting comments about herself and her interest Janssen. An engineer by training, she had been approached "some 15 years ago," by a historian of ophthalmology "who wanted to write an article on Jules Janssen's links with his specialty." So our polymath is also revered by eye doctors! Launay's technical responsibilities in her job at the Meudon Observatory extended to the spectrograph, where, she realized, Janssen carried out spectroscopic studies. The book that this contact inspired her to write was a treat to read, and proved to me that, in Launay, Janssen has indeed found his ideal biographer.

Launay sets the stage by asking challenging questions in her Foreword: Given that Janssen's name was inscribed along with the likes of Louis Pasteur's on the pediment of the Science and Industry wing of the Grand Palais, and that during his lifetime his name appeared

as “a benefactor of humanity” on chocolate bar wrappers, why is he “so poorly known nowadays?” And how did the grandson of a cobbler, without the standard education of the French elites, become so admired by “the highest scientific and political authorities” of his day to merit the creation of the Meudon Observatory, where his statue stands?

I believe that Launay’s answer to the second question is a version of Pecker’s reference to Janssen’s impressive address book; in one of the early chapters, we learn that “Janssen had no laboratory. But never mind: he had contacts!” As to the first question, I conclude that while Launay does not really provide an answer, her intention is for her biography and its readers to reverse the fact that Janssen is so little known. The final section of the book, “Passing into the Land of Memory,” concludes with Launay’s thanking her readers “for making sure that [Janssen’s name] remains there as long as human memory persists.” I heartily recommend this book to teachers of astronomy from around the world and urge them to spread the word of the achievements of the man whom Pecker calls not only “the founder of astrophysics in France” but also “among the world’s leaders in astrophysics.”

Perhaps unusual for a biography of a scientist, Launay’s is also likely to find an audience among students who are interested in women’s studies, because of Launay’s attentiveness to the issues faced by Janssen’s wife, Henriette. One telling passage in a letter from Janssen to Henriette will serve as an example of one such issue. Janssen tells her to stop complaining about the length of his observing trip: “I have started to acquire glory and position for you, you have all you need, you have an interesting child to raise, you can do good, etc., and still you complain!....I beg you, once for all, show more courage and await my return with cheerfulness, work and spirit.” I was happy to read that Henriette accompanied Janssen on what turned out to be for him a scientifically unproductive expedition to India for the eclipse of 1871 but provided Henriette with her own moment in the sun, so to speak. Her studies there on the customs of the Toda tribe of the Nilgiris region of Tamil Nadu resulted in a published article.

I was amused to read that two years later, at a government-sponsored dinner in Vienna, Janssen gave a speech about “scientific wives,” where he expressed “gratitude to my dear companion, to the one who has followed me, helped me, and even advised me in my travels for science,” and had the audience drink to the health of Henriette, before asking his audience to acquiesce in the name Planet Henrietta for the asteroid (#225) that his host, Johann Palisa of the Vienna Observatory, had recently discovered. In a letter to his wife, Janssen announces that “the name of my life’s dear companion is now thus inscribed in astronomical ephemerides, and will live longer than those of many princesses.” One can only hope that this gesture made up for much of Henriette’s earlier sufferings.

In any case, Launay’s biography is the richer for achieving her goal of bringing the spotlight onto a neglected hero in the history of science without making her book a hagiography. Launay is also to be complimented, in this connection, for dedicating the book to the other woman in Janssen’s life, his daughter, Antoinette, who saw to the publication of two volumes of her father’s scientific papers; donated to the Library at the Institut de France over 1000 letters to her father from over 160 correspondents, along with her father’s notebooks, resources that have proven for Launay “an extraordinary mine of information”; and left to the Conservatoire national des arts et métiers three instruments designed by her father: a spectroscope (1862), an aeronautical compass (1870), and a photographic revolver (1874).

A final note: I have already mentioned my pleasure in discovering a connection between Curie, the subject of my first biography, and Janssen. In Chapter 10 of Launay's biography I was also pleased to discover that on his trip to Washington in 1883 Janssen met "his famous friend Alexander Graham Bell," the subject of my second biography, whose hospitality to Janssen made "his stay in that beautiful city, extremely pleasant and extremely fruitful," and that the two subsequently dined and went to the ballet together in New York. In additional to enlightening me about the man who has long been a hero of my husband's, I am grateful to Launay for bringing this association to my attention.

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NEWS FROM NASE

In 2012 the Network for Astronomy School Education (NASE) organized 10 courses in 10 different countries. This continues a project that, since its beginning, has conducted 26 NASE courses reaching more than 1000 teachers, who, in turn, have involved 500,000 students in their home countries. (See the chart below). NASE has created 14 national groups with about 100 volunteers who carry on NASE activities throughout the year. These national groups have created performances, bubble planetariums, monographic courses, seminars, exhibitions and even scale-model solar systems walks in small cities. More details can be found on the NASE web page: http://sac.csic.es/astrosecundaria/index-en.html.

NASE countries	Courses	Participants Teachers	Students involved
Argentina	**6**	**234**	**119600**
Bolivia	**1**	**24**	**4800**
Colombia	**3**	**112**	**62000**
Ecuador	**2**	**54**	**55600**
Ghana	**1**	**24**	**4800**
Guatemala	**1**	**27**	**5400**
Honduras	**2**	**126**	**35400**
Nicaragua	**3**	**133**	**71000**
Panamá	**1**	**48**	**19200**
Paraguay	**2**	**67**	**23000**
Peru	**3**	**135**	**106200**
Uruguay	**1**	**47**	**9400**

NOVEL SEMANTIC SOFTWARE FOR ASTRONOMICAL CONCEPTS

Beatriz Garcia notes an interesting new item of software from M. Heydari-Malayeri, N. Moreau F. Le Petit of the University of Paris. Here is a description of the software from a brief paper they have provided: " We have created a new semantic tool called AstroConcepts, providing definitions of astronomical concepts present on Web pages. This tool is a Google Chrome plug-in that interrogates the *Etymological Dictionary of Astronomy and Astrophysics*, developed at Paris

Observatory. Thanks to this tool, if one selects an astronomical concept on a web page, a pop-up window will display the definition of the available English or French terms. Another expected use of this facility could be its implementation in Virtual Observatory services." Dr. Garcia has downloaded and installed this dictionary and reports that "for a first approximation to the concepts, it works fine". Further information on this plug-in can be found at http://astroconcepts.obspm.fr/ .

GALILEOSCOPES: GET 'EM WHILE YOU STILL CAN!

Richard Tresch Fienberg, American Astronomical Society, USA (rick.fienberg@aas.org) and Douglas N. Arion, Carthage College, USA (darion@carthage.edu)

Since partway through the International Year of Astronomy (IYA) in 2009, some 200,000 Galileoscopes have been distributed to educators, outreach specialists, and astronomy enthusiasts in 106 countries worldwide. Teaching materials developed for use with the Galileoscope, including an educator's guide on how lenses and refracting telescopes work and an observer's guide on suitable astronomical targets for the Galileoscope, are freely available online and have been translated into many languages. Numerous science-education efforts around the world incorporate the Galileoscope into their curriculum, including the U.S. National Optical Astronomy Observatory's Teaching with Telescopes program and the international Galileo Teacher Training Program (GTTP).

What if the Galileoscope were no longer available? It's a real possibility. Manufacturing and distribution are managed by the authors of this article, who have poured thousands of hours into the project (and put a significant amount of personal money at risk) over the last five years. We never intended the company we formed, Galileoscope, LLC, to be a lifetime commitment — we have demanding day jobs, after all! As of January 2013 our inventory had dwindled to less than 2,000 Galileoscopes. We managed to scrape enough money together to produce about 7,000 more to fill orders for at least a few more months. But to guarantee the long-term availability of the Galileoscope, we need to find someone else, perhaps a telescope or science-kit manufacturer, willing and able to take over the project and to fund another full production run of tens of thousands of kits. We have met with several companies and other organizations but have yet to find any takers. Simply put, the project is now living on borrowed time.

The Story So Far

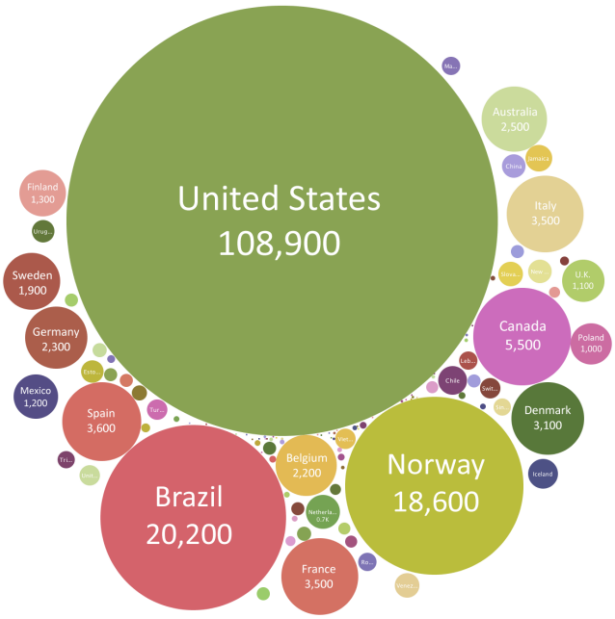
In the unlikely event you're unfamiliar with it, the Galileoscope is a high-quality, low-cost telescope kit developed by a team of astronomers, optical engineers, and science educators for the IYA 2009. It is a 50-mm (2-inch) diameter, 25- to 50-power achromatic refractor designed to be put together by students. Assembly takes only minutes and requires no tools, tape, or glue.

In contrast to other inexpensive telescope kits, the Galileoscope can be used effectively both in educational settings (e.g., schools, museums, and science centers) to investigate how lenses make images and outside under the stars as a tool for cosmic exploration. Even from brightly lit cities, with the Galileoscope anyone can see the celestial wonders that Galileo first glimpsed 400 years ago and that still delight stargazers today: lunar craters and mountains,

four moons circling Jupiter, the phases of Venus, Saturn's rings, the Pleiades star cluster, sunspots (with a safe solar filter covering the aperture, of course), and more.

Of the approximately 200,000 Galileoscopes distributed so far, about one-third were sold via 30,000 small orders from individuals, and about two-thirds were sold via 500 large orders from institutions. More than 20,000 kits were donated to schools, some in the U.S. and some in less developed countries, chiefly in Africa and the Middle East.

Throughout the IYA kits were sold direct to individual and institutional customers via our website, priced in bulk at U.S. $12.50 (later $15.00) plus shipping, and individually at U.S. $15 (later $20) plus shipping. The prices are higher today, as noted below, because of



increased costs and the requirement from retailers that they get a markup (i.e., profit margin). Total sales to date have exceeded U.S. $4.5 million.

Our team worked hard to develop, produce, and distribute Galileoscopes so that people everywhere can experience the thrill of observing the cosmos through a telescope that they will be proud to own and that offers superior optics and mechanics, as well as demonstrable educational value, at the lowest possible cost.

Four years after the IYA, sales of individual kits are made through a growing network of retailers who typically charge from U.S. $45 to $60 per kit plus shipping. We continue to sell Galileoscopes in bulk direct to education-and-outreach professionals via our website, http://galileoscope.org, starting at quantities of 6 kits (1 case), for U.S. $25 each plus shipping; this facilitates the continued use of the kits in formal and informal educational venues, where budgets are often tight. But, as noted earlier, our inventory is finite and shrinking.

Telescopes4Teachers

We recently entered into a partnership with the Astrosphere New Media Association, a U.S. 501(c)(3) nonprofit organization dedicated to improving science literacy and education (http://www.astrosphere.org). Astrosphere has created Telescopes4Teachers (http://telescopes4teachers.org), a program through which supporters in the U.S. can make tax-deductible donations of Galileoscopes to teachers and schools of their choosing and supporters anywhere can make donations to support the distribution of Galileoscopes worldwide. This is in response to requests from teachers for donated telescopes, and to requests from customers for a way to donate telescopes to schools.

U.S. teachers: To receive free Galileoscopes for your classroom, you'll need to find a donor or donors willing to contribute U.S. $50 (1 kit) or $200 (1 case of 6 kits) and to specify your school as the recipient. We do not maintain a list of educators seeking donations.

For those outside the U.S.: You can contribute any amount (not tax-deductible) toward the purchase of Galileoscopes to be shipped to underserved schools through-out the world. In partnership with GTTP and the CosmoQuest citizen-science project, Astrosphere will identify teachers in financially struggling regions and provide them not only a case of Galileoscopes for their class, but also the training they need to teach astronomy effectively.

Next Steps

We plan to continue filling orders from our remaining inventory for as long as it lasts and to continue our search for someone to take the project off our hands and keep the Galileoscope in production indefinitely. If you have any specific suggestions, please contact us!

A NEW DARK SKY RESERVE FOR THE CENTRAL SOUTH ISLAND OF NEW ZEALAND

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The story began in 1981. In that year I helped to draft a new lighting ordinance for the Mackenzie District Council to be included in the District Plan. The ordinance was designed to prevent light pollution by controls on outdoor lighting (including the types of light fixtures, ensuring they only shine below the horizontal and not upwards and restricting the damaging blue emissions from some types of lamp). The new ordinance was enacted through the Town & Country Planning Act 1977, and later came under the Resource Management Act, 1991.

The objective of the ordinance was stated to be: 'Maintenance of the ability to undertake effective research at the Mt John University Observatory and of the ability to view the quality of the night sky'. It is fair to say then that 90 per cent of the motivation was to protect the skies above Mt John University Observatory, and 10 per cent was so the layperson could easily continue to stargaze.

The Mackenzie lighting ordinance was probably the first lighting ordinance in the southern hemisphere and one of the first in the world (after Tucson's ordinance, 1972) for protecting night skies. It applied over a large area of the Mackenzie Basin, including all of lakes Tekapo and Pukaki, and encompasses an area some 60 km east-west and 100 km north-south.

So, we have had a lighting ordinance for over 30 years. Now, in addition, we have an internationally recognized Dark Sky Reserve. What is this and why do we need it?

The answer

The answer is that a dark-sky reserve is about marketing and branding, about astro-tourism and public education and even inspiration. In short, a reserve helps promote the *romance* of astronomy, and allows people to connect spiritually with the universe.

These aims are very different from those of the lighting ordinance, which is strictly a legal document to protect the night sky, mainly for astronomical research, with public stargazing as a secondary aim, and the development of astro-tourism is not mentioned at all.

The IDA application

We established a Dark Sky Reserve Working Party in 2009, with Margaret Austin, a former Labour cabinet minister, as chair. Our original aim was to seek World Heritage status for the Mackenzie Basin, but it soon became clear that numerous problems needed to be overcome in an international arena before the World Heritage Committee might recognize the concept of starlight reserves.

So from mid-2011, we focussed on a Dark Sky Reserve application to the International Dark-Sky Association (IDA), based in Tucson, Arizona. Most of the IDA application (a book of 181 pages) was written in the summer of Dec 2011 and Jan 2012 – a marathon effort by over half a dozen people! The main authors were Margaret Austin, John Hearnshaw, Steve Butler, Alison Loveridge, Alan Gilmore, Ivy Au, Monique Milne, Lizzie Cook and Julie Abbari. The last four of these people have been UC summer students and we are grateful for support to allow them to work on this project, writing and collecting data. Brilliant photos by Fraser Gunn were used.

The IDA application can be viewed on-line at www.saps.canterbury.ac.nz/starlight/ and it discusses geography, topography, population, ecology, climate, fauna, flora, settlement history of the region, the Lighting Ordinance, Maori astronomy, Mt John Observatory, astro-tourism, land ownership, conservation, local governance and gives a complete catalogue of all external street lighting in the proposed Reserve. It included ten letters of support from prominent New Zealanders, including three former prime ministers and the Mayor of Mackenzie District. The rest is history!

In summary the proposal was to create a reserve over an area of 4367 km^2, which includes all of the Mackenzie Lighting ordinance zone, which was extended to include Twizel (population 1080), plus all of Aoraki/Mt Cook National Park, where DOC lighting controls already apply.

We applied to create the largest International Dark Sky Reserve in the world! But one containing a total resident population of only about 1670 inhabitants (Tekapo 290, Mt Cook 300), or a mere 0.4 persons per km^2.

The Aoraki Mackenzie International Dark Sky Reserve

The new reserve was announced by IDA in April 2012, but we embargoed the media announcement to 10 June, so as to coincide with the opening of our Starlight Conference held in Tekapo this year. It is just the third International Dark Sky reserve (IDSR) in the world (after Mt Mégantic, in Quebec and Exmoor in the UK). It is also the first IDSR in the southern hemisphere, the first IDSR to be declared by IDA at Gold Tier level (the NamibRand Nature Reserve in Namibia, announced in May 2012 is the second). And it is the world's largest IDSR at 4367 km^2

So how did I come to promote a Dark-Sky Reserve for the Mackenzie District and Aoraki/Mt Cook? Well, even astronomy professors can appreciate the romance of the heavens, while teaching and researching complex concepts of astrophysics! In particular I love Mt John Observatory and I love Tekapo – scenically a beautiful part of New Zealand. Astro-tourism started at Mt John in 2004 with the establishment of the astro-tourism company Earth & Sky Ltd, with exclusive tourism access to Mt John. Astro-tourism is rapidly becoming a world-wide phenomenon, growing at an exponential rate in many countries. We are proud to be at the forefront of this new world-wide movement.

Mt John has a very dark and unpolluted sky

For our IDA application, we undertook a survey of night sky brightness at new moon using Unihedron Sky Quality Meters, from June 2011 to Jan 2012. The measurements were done by Fraser Gunn at Mt John, at Tekapo village, and also at Twizel and Mt Cook. We were able to demonstrate that the whole area has exceptionally dark skies (averaging visual magnitude 21.7 per sq. arc second, which is about as dark as anywhere in the world!). We were therefore in the fortunate position of protecting already dark skies for future generations.

The fact is that most urban dwellers in the world today never have the chance to see a beautiful dark sky with thousands of stars visible, which is possible in our new Dark Sky Reserve. For international visitors to Tekapo, they are spell-bound by the majesty of the heavens, and witness something that is almost impossible in any populated region of the northern hemisphere.

Main strengths of our case (as we saw it)

In making our case to the IDA, we were aware of the many strengths of our case we could promote. There was wide community support: the fact of three decades of the Mackenzie Lighting Ordinance, the presence of a significant astronomical research observatory in the reserve area (Mt John), the presence of several flourishing astro-tourism companies in the region, especially Earth and Sky, the easy access to Mt John by tourists, and the extraordinary beauty of the natural landscape (lakes, mountains, rivers, glaciers), not to mention an energetic team in our Working Party and excellent support along the way from Local Government and the University.

Mission of Mt John Observatory

For Mt John we could point to almost half a century of research activity using excellent instruments on small telescopes, but still doing cutting edge research. Moreover, Mt John has

a unique geographical location which can and has been exploited for the research we do (both longitude and latitude). It is the southernmost optical observatory (apart from telescopes now being installed in Antarctica), and our longitude is unique and very useful for multi-site campaigns. We also note that Mt John graduate students have produced about 40 MSc theses in astronomy and over two dozen PhD theses, a considerable record of research and training activity.

With the establishment of the 1.8-m telescope in collaboration with Nagoya University in 2004, and the Earth and Sky Astrocafe on Mt John soon thereafter, the ambience on Mt John has changed considerably in recent years. It is now not just a research observatory but also one engaged actively in public outreach and education.

Why we need an observatory on NZ soil at Mt John

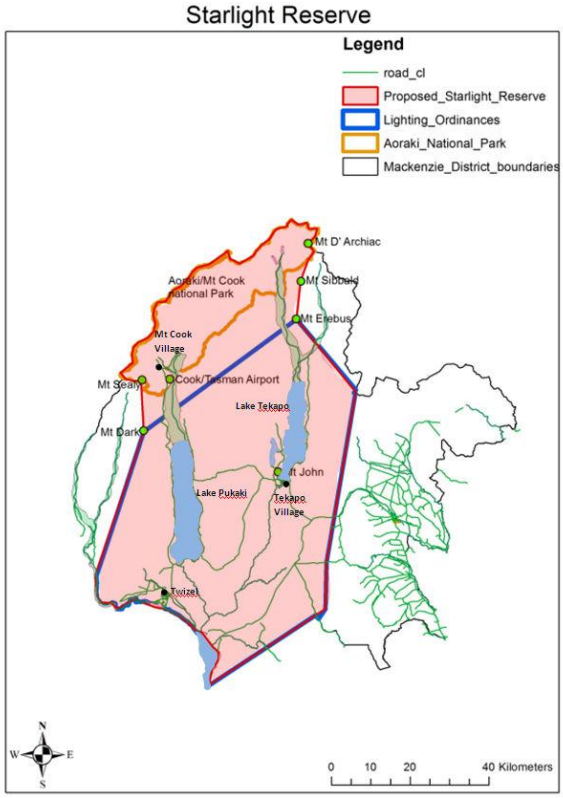
We can now say why we need an observatory in New Zealand. It is not just to provide hands-on training of graduate students, and to have a fast response to ephemeral events in the sky which we are researching, and to take advantage of our unique geographical location. It is also to provide public outreach in astronomy to New Zealanders and to the world, and to inspire people and capture the romance of the heavens. This is why an observatory surrounded by a Dark Sky Reserve will take on an extra dimension beyond research, embracing public education.

So in summary, our International Dark-Sky Reserve is about a **P**assion for astronomy, the **R**omance of the heavens, the **I**nspiration of astro-tourists, the **Z**eal of night-sky guides and the **E**ducation of the public – that's the PRIZE from a Dark Sky Reserve!

Mt John and the Starlight Declaration

In 2007, UNESCO's Starlight Initiative, part of the world-wide dark sky reserve movement, issued the Starlight Declaration (see www.starlight2007.net), which treated the right to see the stars as a fundamental right of mankind. It read in its introduction: "An unpolluted night sky that allows the enjoyment and contemplation of the firmament should be considered an inalienable right equivalent to all other socio-cultural and environmental rights. Hence the progressive degradation of the night sky must be regarded as a fundamental loss."

It was this declaration which underpins and inspired the creation of the new International Dark Sky Reserve at Aoraki/Mt Cook and the Mackenzie Basin. Now we look forward to developing the activities of stargazing and outreach in the new reserve, and promoting it in the media as a resource for all New Zealanders and for international visitors to the central South Island.



The Aoraki Mackenzie International Dark Sky Reserve comprises the area in pink (with a red border), and most of the Mackenzie Basin where the lighting ordinance applies (blue border) plus all of the Aoraki/MtCook National Park (orange border).

This image of the Church of the Good Shepherd at Tekapo near Mt John has become a symbol for our new International Dark Sky Reserve. Photo Fraser Gunn, Lake Tekapo (www.frasergunn.co.nz).

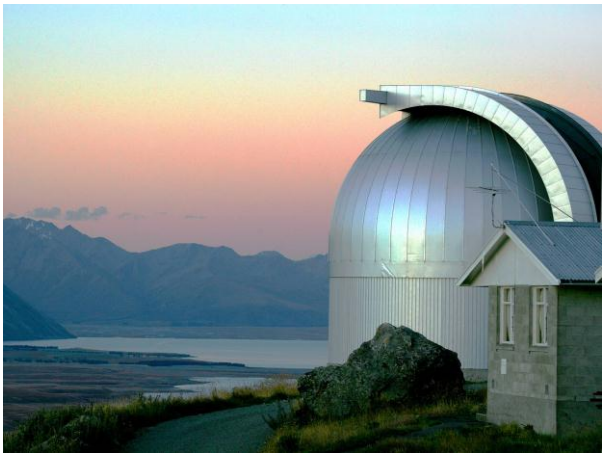
The clear blue waters of Lake Tekapo near Mt John are in the centre of the new International Dark Sky Reserve Photo Fraser Gunn, Lake Tekapo (www.frasergunn.co.nz)

The MOA 1.8-metre telescope at Mt John, a joint New Zealand-Japan project to find distant extrasolar planets, is the largest telescope in New Zealand. Photo Fraser Gunn, Lake Tekapo (www.frasergunn.co.nz).

The Earth and Sky Astrocafe at the summit of Mt John now attracts hundreds of visitors to the observatory every week.

Comet McNaught was a spectacular sight in the southern sky in January 2007. Photo Fraser Gunn, Lake Tekapo (www.frasergunn.co.nz)

An Earth and Sky astro-tour allows visitors to experience the night sky in groups guided by experienced astronomy guides. Photo Fraser Gunn, Lake Tekapo (www.frasergunn.co.nz).



The MOA 1.8-metre telescope dome at Mt John, with Lake Tekapo and the Two Thumb Range in the background. Photo Fraser Gunn, Lake Tekapo (www.frasergunn.co.nz).

The McLellan 1.0-metre telescope building and observers' accommodation at Mt John, looking south over the Mackenzie Basin. Photo Fraser Gunn, Lake Tekapo (www.frasergunn.co.nz)

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 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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