Contents of this booklet

Overall schedule of C41/ICHA meetings at Prague

C41/ICHA Science Meetings

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C41/ICHA Business Meeting

Tue Aug 22, session 3 (14:00-15:30) in the Chamber Room

Working Group Meetings

Transits of Venus WG
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Astronomical Chronology WG
Tue Aug 22, session 4 (16:00-17:30) in Meeting Room 1.1

Archives WG
Wed Aug 23, sessions 1 & 2 (09:00-10:30 & 11:00-12:30) in Club E

Historical Instruments WG
Wed Aug 23, sessions 3 & 4 (14:00-15:35 & 16:10-17:30) in Club B

Inter-divisional WG on Historical Radio Astronomy
Thu 17, sessions 1–3 (09:00-10:30, 11:00-12:30 & 14:00-15:30) in the Chamber Room
Wed 23, sessions 3 & 4 (14:00-15:30 & 16:00-17:30) in the Chamber Room

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NB: Room allocations may have been changed since the time of printing; please check!

C41/ICHA Sessions and Presentations at a Glance

Commission 41/ICHA Main Meetings, Tue Aug 22 (Chamber Room)

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09:25–09:45 Jean Kovalevsky: HIPPARCOS in historic perspective
09:45–10:00 Steven Dick: The Venus transit of 2004
10:00–10:15 Tomoko Fujiwara & Masanori Hirai: Magnitude variation of 19 Piscium in historical records
10.15–10:30 Colin Montgomery & Wayne Orchiston: The emergence of "dark matter" as a critical element in astrophysics

Science Meeting 2: Ancient historical astronomy, archaeoastronomy and ethnoastronomy
11:00–11:15 Clive Ruggles: Fundamental problems of modern archaeoastronomy
11:15–11:30 John Steele: Ancient and modern use of Babylonian astronomical records
11:30–11:45 Thebe Medupe et al.: A project to study the scientific content of Timbuktu Manuscripts
11:45–12:00 Kim Malville, Hugh Thomson & Gary Ziegler: Recent discoveries at Llactapata, Peru
12:00–12:15 Ray Norris: Australian aboriginal astronomy
12:15–12:30 Anna Sidorenko-Dulom: The UNESCO thematic initiative "Astronomy and World Heritage"

Poster papers
#1 Wayne Orchiston et al.: History of Astronomy developments at James Cook University, Australia
#2: Ari Belenkiy & Eduardo Vila Echagüe: Newton's analysis of Hipparchus' equinox observations
#3: Izold Pustõlnik: Ernst Öpik's scientific legacy and its impact on modern astrophysics
#4: G. Pinigin et al.: Nikolaev Astronomical Observatory—astro-historical monument of the northern Black Seashore
#5: Mike Zawaski & Kim Malville: Archaeoastronomical fieldwork in Peru

14:00-15:30 C41/ICHA BUSINESS MEETING

Transits of Venus Working Group, Thu Aug 17 (Club E)

ToV Meeting 1: Transit of Venus history
09:00-09:15 Christine Allen & Jesús Galindo Trejo: Maya observations of 13th century transits of Venus?
09:15-09:30 David DeVorkin: Anticipating the 1882 transit of Venus
09:30-09:45 Chris Sterken & Hilmar Duerbeck: Houzeau and the Belgian transit of Venus expeditions
09:45-10:00 Suzanne Débarbat & Françoise Launay: The 1874 transit of Venus observed in Nagasaki by the French, and its remnants
10:00-10:15 W. P. Koorts: Transit of Venus observations and relics in South Africa
10:15-10:30 Wayne Orchiston Alex Buchanan & Tony Sprent: Further investigation of the 1874 transit of Venus relics at The Grange, Tasmania

Poster paper
#1 Rajesh Kochhar: Transits of Venus in the service of the state and astronomy: the Indian example

ToV Meeting 2: Transit 2004 and the future
11:00-11:15 Jay Pasachoff & Glenn Schneider: 2004 transit of Venus from TRACE, sea-level, and the mountaintop Swedish Solar Telescope
11:15-11:30 Glenn Schneider & Jay Pasachoff: Kepler-mission analog study using ACRIMSAT
11:30-11:45 L.A. Marschall et al.: Transits of Venus and Mercury: A new computer-based exercise from Project CLEA
11:45-12:00 Richard Strom: Transit of Venus in context: where has it all brought us?
12:00-12:15 D.L. Blank, G.L. White, B. Jayawardene & A.H. Hons: Exoplanet Transits: History and Future Prospects

12:15-12:30 WORKING GROUP BUSINESS MEETING (Chair: Steven Dick)

Inter-divisional WG on Historical Radio Astronomy, Thu Aug 17 (Chamber Room)

09:00-09:30 WORKING GROUP BUSINESS MEETING (Chair: Wayne Orchiston)

HRA Meeting 1: The history of European radio astronomy
09:30-10:00 Hugo van Woerden: The Dwingeloo 25-meter dish celebrates its Golden Jubilee
10:00-10:30 R.D. Dagkesamanskiy: Fifty years of the Pushino Radio Astronomy Observatory

11:00-11:30 Geoff Burbidge: Attempts by theorists to work with Martin Ryle in the Cavendish, 1954-1956
11:30-12:00 Richard Strom: A.H. de Voogt, radio amateur, engineer and astronomy pioneer
12:00-12:30 Yuri Parijskij: The Pulkovo (BRP 1956) giant radio telescope

14:00-14:30 PRESENTATION OF THE 2006 GROTE REBER MEDAL
14:30-15:00 Richard Wielebinski: Fifty years of the Stockert 25-m radio telescope and what came after
15:00-15.30 Rod Davies: The search for the elusive Zeeman Effect

Poster paper
#1 T. Tlamicha et al.: The Würzburg Reise radars as a basis for solar radio astronomy at Ondrejov Observatory

Astronomical Chronology Working Group, Tue Aug 22 (Meeting Room 1.1)

16:00-16:15 Alexander Gurshtein: Introductory comments
16:15-17:30 General discussion

Archives Working Group, Wed Aug 23 (Club E)

09:00-09:20 WORKING GROUP BUSINESS MEETING (Chair: Brenda Corbin)

Archives Meeting 1: Archives in astronomical institutions
09:20-09:50 Ileana Chinnici, Agnese Mandrino & Fabrizio Bònoli: Historical archives in Italian astronomical observatories: the "Specola 2000" project
09:50-10:10 Laurence Bobis & Suzanne Débarbat: Paris Observatory archives: enrichment over five years
10:10-10:30 Antoinette Beiser et al.: Archives programs at smaller institutions— successes on limited budgets

Archives Meeting 2: Archives and specific astronomical topics
11:00-11:30 Adam Perkins: A case of archival theft: the retrieval of the Greenwich Observatory Neptune papers
11:30-11:50 Tomoko Fujiwara & Masanori Hirai: Origin and history of Japanese star charts *"Sekido Nanboku Kosei Zu"*
11:50-12:10 Ihsan Hafez & Richard Stephenson: Abdul-Rahman al-Sufi and his "Book of the Fixed Stars"
12:10-12:30 Mitsuru Soma & Kiyotaka Tanikawa: Japanese astronomical and meteorological archives

Poster papers
#1 Tsuko Nakamura: The Japanese Astronomical Archives Project: final outcome
#2 Elvira Botez: Camille Flammarion and Romania
#3 Nagatoshi Nogami: A meteorite list from Chinese ancient records

Historical Instruments Working Group, Wed Aug 23 (Club B)

14:00-14:15 WORKING GROUP BUSINESS MEETING (Chair: Nha Il-Seong)

Oral papers: The world-wide search for historically significant astronomical instruments
14:15-14:35 James Evans: A miniature ivory sundial and equinox indicator from Greek Egypt
14:35-14:55 Rajesh Kochhar: Nineteenth-century astronomical instruments in India
14:55-15:15 Suzanne Débarbat: The instruments of the METRE
15:15-15:35 Tsuko Nakamura: A portable Dutch astronomical quadrant imported into Japan in 1792

16:10-16:30 Luisa Pigatto & Valeria Zanini: Eighteenth-century quadrants at the 'Specula Astronomica' in Padova
16:30-16:50 Nick Lomb: The most important instrument: the Sydney Observatory transit circle
16:50-17:10 John Pearson, Kim Malville & Wayne Orchiston: Astronomical instruments associated with Lick Observatory solar eclipse expeditions
17:10-17:30 Bill Wells & Wayne Orchiston: Nautical astronomy in the Pacific: the astronomical instruments used during Cook's third voyage stop-over at Nootka Sound

Poster papers
#1 Valeria Zanini: The Hofmann direct-vision spectroscope at the Padova Astronomical Observatory
#2 Nha Il-Seong & Nha Sarah: Time-keeping instruments from East Asian countries: a classification scheme and an inventory of significant relics
#3 Jenny Andropoulos, Wayne Orchiston & Graeme White: The Great Melbourne Telescope and observational astronomy
#4 Farhad Rahimi, Jamshid Ghanbari & Ali Adjabshirzadeh: The history of some of the astronomical instruments in the Astan-e Ghods Museum at Mashhad, Iran
#5 Lajos Balazs, Magda Vargha & Endre Zsoldos: Homage to Rado von Kovesligethy, a hero of early astrophysics

Inter-divisional WG on Historical Radio Astronomy, Wed Aug 23 (Chamber Room)

HRA Meeting 2: Radio astronomy 50 years ago—from field stations to 'big science'
14:00-14:30 Ken Kellermann & E.N. Bouton: The Beginnings of the U.S. National Radio Astronomy Observatory
14:30-14:50 Andrew Quinn et al.: The 218-ft Jodrell Bank Transit Telescope and its contribution to radio astronomy
14:50-15:10 V. Radhakrishnan: A true radio astronomy pioneer: Cornell H. Mayer (1921-2005)
15:10-15:30 Govind Swarup: Solar radio astronomy at Fort Davis, Stanford and Kalyan, 1956-1966

16:00-16:30 Wayne Orchiston & Harry Wendt: The contribution of the ex-Georges Heights experimental radar antenna to Australian radio astronomy
16:30-16:50 Martin George & Wayne Orchiston: The development of low frequency radio astronomy in Tasmania
16:50-17:10 Paul Boynton: Discovery of the CMBR: looking back 40 years
17:10-17:30 Bruce Partridge: The cosmic microwave background and radio astronomy

Poster papers
#1 Harry Wendt & Wayne Orchiston: The contribution of the Potts Hill field station to international radio astronomy
#2 Edward Waluska & Marshall Cohen: Owens Valley radio observatory, QSOs and Palomar
#3 Peter Stark, Richard Wielebinski & Wayne Orchiston: Early Australian pulsar astronomy

The C41/ICHA Science Meetings: Presentations and Abstracts

The Commission's main Scientific Sessions in Prague feature presentations of wide interest. The first of the two sessions focuses on the history of modern astronomy, while the second session turns to ancient historical astronomy, archaeoastronomy and ethnoastronomy.

SM 1: History of modern astronomy

Tue Aug 22, 09:00–10:30 in the Chamber Room

09:00–09:25

Milestones in the history of astronomy in Czech lands

Petr Hadrava, Astronomical Institute, Academy of Sciences of the Czech Republic (had@sunstel.asu.cas.cz)

The Czech lands were the setting for key developments in astronomy several times during the course of history. The most studied and best known period is the beginning of the seventeenth century, when Johannes Kepler worked in Prague. However, there are also other epochs, from prehistoric times through to the present day, that deserve the attention of historians of astronomy. In particular, the teaching of astronomy at Prague University in medieval times influenced several other universities in Central Europe. Another interesting problem is how astronomical knowledge was reflected within society at large. In this contribution, a brief account of key historical events will be accompanied by a review of recent results and current research questions.

09:25–09:45

HIPPARCOS in historic perspective

Jean Kovalevsky, Observatoire de la Côte d'Azur, France

The presentation will start by a sketch of the situation of astrometry around 1960, after five centuries of progress since Ulugh Beg. With the advent of the space age, the idea to make astrometric measurements from satellites arose in the minds of several astronomers. But it is Pierre Lacroute who was the first, in 1966, to propose an actual instrument for space astrometry. CNES, the French space agency, made a feasibility study, while P. Lacroute matured the design and presented a new one to ESRO in 1973. A symposium organized by ESRO in Frascati showed a vast interest in the astronomical community and ESRO/ESA started a mission definition study during which many new features were proposed, in particular by E. Hoeg while L. Lindegren designed the data reduction procedure. Further evolution of the project will be described up to the approval of Hipparcos by ESA, the constitution of INCA and two data reduction consortia, the inclusion of TYCHO as proposed by E. Hoeg, and the launch on the 8th of August 1989.

09:45–10:00

The Venus transit of 2004

Steven J. Dick, NASA Chief Historian, USA
(steven.j.dick@nasa.gov)

The 2004 transit of Venus, the first occurrence of this phenomenon since 1882, provided an occasion to discuss the history of the phenomenon, to use it for a variety of education and public outreach purposes, and above all to observe a rare astronomical event. The most important event since the last General Assembly was the occurrence of the transit itself on June 8, 2004. Gordon Bromage and D. W. Kurtz organized IAU Colloquium 196 centered around this event. The meeting was held at the University of Central Lancashire, Preston, UK, near the site where Jeremiah Horrocks first observed a transit of Venus in 1639. On the day of the rare event almost the entire transit was observed from the tiny Lancashire village of Much Hoole, where Horrocks lived, and several other locations. This meeting and other related events will be described in a special transit of Venus session at the Prague General Assembly. That session will range historically from possible Mayan observations of the transit in the 13th century to those of the 19th century and the 2004 observations made from the ground as well as with NASA's TRACE and ACRIMSAT satellites. Although the transit of Venus is no longer important for determination of the astronomical unit, planetary transits take on renewed importance with NASA's plans to use the transit method to detect extrasolar planets with the Kepler satellite, scheduled to launch in 2008. Since the last General Assembly the Commission 41 Transit of Venus Working Group has published Progress Reports # 3 and # 4 in the *Journal of Astronomical History and Heritage*, volume 7 (June, 2004), pp. 50-52, and volume 8 (June, 2005), pp. 70-71. Reports # 1 and # 2 were published in the same journal, vol. 5 (December, 2002), pp. 185-188 and vol. 6 (June, 2003), p. 64. Readers are referred to these publications for details of the activities of the Working Group, including lists of historical markers erected to commemorate sites where transit of Venus observations were made.

10:00–10:15

Magnitude variation of 19 Piscium in historical records

Tomoko Fujiwara, Kyushu University, Japan and Masanori Hirai, Fukuoka University of Education, Japan
(tomochan@gemini.rc.kyushu-u.ac.jp)

19 Psc (TX Psc) is well known as a typical carbon star found on the asymptotic giant branch (AGB). The type of variability is Lb (slow irregular pulsating variables of late spectral types) and the magnitude varies between 4.79 and 5.20in V. (Kholopov et al. 1988). Currently, photometric and spectroscopic studies have been much conducted and observations of spectra were obtained for the wavelength range from ultraviolet to radio. These works are mainly discussed the determination of evolutional stage on the AGB phase based on arrangement of chemical abundance and line profiles reflecting atmospherical structure of the star. Although such study of momentary phase confronting with theory of stellar evolution is emphasized, it is rare to clarify the long-term variability longer than 100 years which corresponds to evolutional time-scale. In order to know the evolutional process, we search magnitude data or appearance of 19 Psc recorded in historical star catalogues or charts, which are mainly published after the seventeenth century. In this paper, we show photometric variation based on historical records of 19 Psc and discuss the evolutional track.

10:15–10:30
The emergence of "dark matter" as a critical element in astrophysics
Colin Montgomery and Wayne Orchiston, James Cook University, Australia (colin.montgomery@jcu.edu.au; wayne.orchiston@jcu.edu.au)

In modern astrophysics, 'dark matter' is seen as a key element in attempts to explain the missing mass in the Universe'. Fritz Zwicky is usually given credit for coining the term in his famous paper of 1933, but in fact this concept has a long history that extends back to the eighteenth century and the illuminating writings of John Michell. During the nineteenth century, Adams, Bessel and Le Verrier all published papers that bear on this concept, while towards the end of the century E.E. Barnard produced his *Atlas of the Dark Patches in the Sky*, and recorded small, very dark, round spots within some of the 'dark patches'. In the early nineteenth century, H.D. Curtis and Elliott Smith both wrote about the existence of 'dark matter' prior to the appearance of Zwicky's seminal paper.

In this paper we will review the relevant writings of Michell, Adams, Bessel and Le Verrier, and how the concept of 'dark matter' gradually emerged to play a key explanatory role in late nineteenth and early twentieth century astronomy.

SM 2: Ancient historical astronomy, archaeoastronomy and ethnoastronomy
Tue Aug 22, 11:00–12:30 in the Chamber Room

11:00–11:15
Fundamental problems of modern archaeoastronomy
Clive Ruggles, University of Leicester, United Kingdom (rug@le.ac.uk)

After thirty years of explicit existence, archaeoastronomy has become broadly accepted within the archaeological mainstream. This stems from a general recognition that the sky formed a prominent part of the total environment—the "world"—perceived by all pre-industrial human societies. Over the last two decades, in particular, archaeologists have become increasingly interested in how human action was shaped by systems of belief and cognition, rather than purely "rational" (in our terms) responses to changing environmental factors, thus making it relevant to enquire how people in prehistory conceptualized what they saw in the sky. Meanwhile, archaeoastronomers have become increasingly aware of the social context of the material relationships they are studying. No longer is it acceptable to examine the technical aspects of astronomical alignments and relationships at ancient sites and landscapes without also considering the less tangible (and for a "hard" scientist, often much more challenging) questions of why and how sky knowledge was manipulated and used for social and political ends.

Yet the reconciliation between archaeologists and astronomers remains surprisingly superficial. There still exist serious conflicts of approach, stemming from fundamental differences in theoretical perspectives and methodological procedures. This paper will illustrate some of these problems using examples from some spectacular recent projects in the Americas, Europe, and Oceania.

11:15–11:30
Ancient and modern use of Babylonian astronomical records
John Steele, University of Durham, United Kingdom (j.m.steele@durham.ac.uk)

Babylonian astronomical observations form the most extensive and detailed body of astronomical observations preserved from the ancient world. Their quantity and quality was well known in antiquity, although the story told by Porphyry of Babylonian records of eclipses for 31000 years being sent to Aristotle after Alexander's conquest of Babylon is pure fiction. However, we know from Ptolemy that at least some Babylonian eclipse observations dating from the eighth to the fourth century BC were known by Hipparchus's time. Today, Babylonian observations provide the main source of data upon which studies of the variable rate of rotation of the Earth in the first millennium BC are made. In this paper I will review why and how Babylonian observations have been used by later astronomers and historians from Hipparchus and Ptolemy down to the present day, and discuss future prospects for the use of Babylonian astronomical data.

11:30–11:45
A project to study the scientific content of Timbuktu Manuscripts
Thebe Medupe, Brian Warner, Shamil Jeppie, Salikou Sanogo, Mohamed Maiga, Ahmed Maiga, Laya Tembely, Mamadi Dembele, Bernard Sodio, Rudzani Nemutudi, and Sharron Hawkes, South African Astronomical Observatory, Cape Town, South Africa (thebe@saao.ac.za)

From the 14th century to the 16th century, the city of Timbuktu was a major centre of commerce and learning in West Africa. Manuscripts dating from that era have been found in Timbuktu and in other towns in the region. A project to search for scientific content in some of these manuscripts has identified 37 examples at the Ahmed Baba centre in Timbuktu that deal with the subject of astronomy. Detailed studies of these manuscripts are now under way. Preliminary indications are that recordings exist of astronomical phenomena such as a meteor shower in 1583. In this paper we give an outline of the project and the feasibility studies, and describe the latest results.

11:45–12:00
Recent discoveries at Llactapata, Peru
J. McKim Malville, University of Colorado, USA; Hugh Thomson, Bristol, United Kingdom; and Gary Ziegler, Colorado College, USA (kimmalville@hotmail.com)

Located in part by Hiram Bingham in 1912, Llactapata lies only 5 km southwest of Machu Picchu. Bingham's ambiguous descriptions and its location in a dense cloud forest hindered its rediscovery until 2003. Llactapata's major structure, which is oriented toward the rising positions of the Pleiades and the sun at June solstice, has a design similar to that of the Coricancha of Cuzco. The area was a more substantial center of population and ceremony than Bingham had realized. Its five sectors contain more than 100 buildings, ranging from the elegant design of the sun temple to structures that may have been part of a system of visually interconnected shrines (*huacas*). Most of

the buildings provide dramatic views downward to Machu Picchu. Machu Picchu appears to be "Place of Huacas", similar to the Coricancha, which also has a concentration of huacas at the starting points of symbolic lines (*ceques*). An exemplary huaca next to the Urubamba River is visually connected along an approximately east-west line to the Intiwatana stone of Machu Picchu and the Overlook Temple of Llactapata. Other possible huacas appear to establish an extensive sacred landscape surrounding Machu Picchu, enclosed by the sacred peaks of Salcantay, Veronica, and Pumasillo.

12:00–12:15
Australian aboriginal astronomy
Ray Norris, CSIRO, Australia (ray.norris@csiro.au)

Many Aboriginal Australian rock art, ceremonies, and creation stories are centred on astronomical bodies and astronomical events. The heliacal rising of particular constellations is important in some aboriginal cultures, whilst the appearance of the Moon or planets is significant in others. This talk presents the first results of a long-term project to explore the astronomy of the Australian aboriginal cultures, and will present evidence that some stone arrangements show significant astronomical alignments.

12:15–12:30
The UNESCO thematic initiative "Astronomy and World Heritage"
Anna Sidorenko-Dulom, UNESCO, Paris
(a.sidorenko@unesco.org)

The Convention concerning the protection of cultural and natural World Heritage of 1972 provides a unique opportunity to preserve exceptional properties world-wide and to raise awareness about scientific concepts linked to these properties.

The mission of UNESCO regarding World Heritage consists of assisting the States Parties to this Convention to safeguard sites inscribed on the World Heritage List, to support activities led by States Parties in the preservation of World Heritage, and to encourage international cooperation in heritage conservation.

Considering that properties related to science are among the most under-represented on the World Heritage List and recognizing the absence of an integrated thematic approach for sites which have a symbolic or direct connection to astronomy, the UNESCO World Heritage Centre, in close consultation with States Parties, has elaborated the Thematic Initiative "Astronomy and World Heritage".

The main aim of this Initiative is to establish a link between science and culture on the basis of research aiming at the recognition of the cultural and scientific values of properties connected with astronomy. The identification, safeguarding and promotion of these properties are the three areas of actions for the implementation of this programme.

Including the interpretation of the sky as a theme in World Heritage is a logical step towards taking into consideration the relationship between humankind and its environment. This step is necessary for the recognition and safeguarding of cultural properties, cultural or natural landscapes that transcribe the relationships between humankind and the sky.

The comprehension of the development of astronomical knowledge through its material expressions therefore depends strongly upon research combining academic disciplines within both sciences and humanities. Understanding the role of these properties connected with astronomy, as well as promoting them through public awareness-raising campaigns, are crucial and vital steps in our common efforts to safeguard them for future generations.

The 29th session of the World Heritage Committee requested the World Heritage Centre to further explore the thematic initiative "Astronomy and World Heritage" as a means to promote, in particular, nominations which recognize and celebrate achievements in science.

Following this recommendation, the World Heritage Centre, in coordination with scientific institutions which were officially designated as responsible for the implementation of this initiative at the national level, started the elaboration of a project proposal for the nomination of serial and transnational properties entitled "World Ancient Observatories".

The World Heritage Centre wishes to assist the State Parties in the implementation of this project as a part of activities aims to the possible proclamation, by the United Nations General Assembly, of the Year of Astronomy in 2009 which was supported by the UNESCO General Conference at its 33rd session.

Poster papers

Poster #1
History of Astronomy developments at James Cook University, Australia
Wayne Orchiston, Kim Malville, Richard Stephenson and Brian Warner, James Cook University, Australia
(wayne.orchiston@jcu.edu.au)

The Centre for Astronomy at James Cook University in tropical northern Queensland was founded in 2002 in order to offer part-time off-campus internet-based post-graduate training in astronomy, and doctoral and masters degrees were soon established. In 2005 the decision was made to complement the astrophysics programs by offering history of astronomy at both the masters and doctoral levels.

In July 2005 the first author was invited to join the staff and oversee these developments, and he has since been joined by the other authors who have been offered adjunct Chairs in history of astronomy. Currently nine students (from Australia, Lebanon and the USA) are involved in history of astronomy doctoral studies through JCU. There has also been an important development at the masters level: from 2006, history of astronomy will feature in the Master of Astronomy degree, and all students will have the choice of majoring in this area of astronomy or in astrophysics. Quite apart from these academic innovations, the *Journal of Astronomical History and Heritage* is now produced by the Centre for Astronomy, further reflecting James Cook University's strong commitment to history of astronomy.

This paper will elaborate on these exciting new developments.

Poster #2

Groping toward linear regression analysis: Newton's analysis of Hipparchus' equinox observations

Ari Belenkiy and Eduardo Vila Echagüe, Bar-Ilan University, Israel (belenka@mail.biu.ac.il)

Newton, in designing a new calendar contained in the manuscripts known as MS Yahuda 24 and analyzed in our recent article in Notes Rec Royal Soc Lond (59 (3), Sept 2005, pp. 223-54), attempted to compute the length of the tropical year using the ancient equinox observations reported by Hipparchus of Rhodes. Though Newton had a very thin sample of data, he obtained a tropical year only a few seconds longer than the correct length. We show that the reason lies in Newton's application of a technique similar to the modern *ordinary least squares* method. Newton also had a clear understanding of *qualitative* variables. Open historico-astronomical problems related to inclination of the Earth's axis of rotation are discussed. In particular, ignorance about the long-range variation in inclination and nutation is likely responsible for the wide variety in the lengths of the tropical year assigned by different 17th century astronomers – the problem that led Newton to Hipparchus.

Poster #3

Ernst Öpik's scientific legacy and its impact on modern astrophysics

Izold Pustõlnik, Tartu Observatory, Estonia (izold@aai.ee)

Ernst Julius Öpik (1893-1985) is one of the most outstanding figures in the XXth century astronomy. An author of more than 800 articles, several books with their topics ranging from the smallest bodies of solar system to the fundamental problems of cosmology, he astonished his contemporaries with an unbelievable wide scope of knowledge. Born in Estonia, due to a grim whim of fate he was compelled to leave his homeland at the peak of his scientific career and at the crossroads of historic battles for survival of democracy. We analyze briefly the most fundamental scientific accomplishments of E.Öpik in measuring cosmological distance scale, theoretical studies of meteor orbits and observations, stellar interiors, structure and evolution of red giants, double star statistics and its evolutionary implications, origin of the Moon and physics of giant planets.

After the World War II Öpik pursued his remarkable scientific career in Armagh Observatory in Northern Ireland, for three decades he remained the heart and soul of Irish Astronomical Journal. Being a modest man, Öpik never displayed ambitions to publish results of his fundamental investigations in the world leading astronomical journals. As a reward he managed to raise both Tartu and Armagh observatories in the eyes of his contemporaries to the position of the prominent astronomical centres.

Our report is based partially on the already published scientific biography of E. Öpik (V. Bronshten, I. Pustylnik, Nauka Publisher 2002, in Russian) and partially upon the archival data from Moscow University, Tartu observatory, Cambridge University library and US Naval observatory archival materials. A comprehensive new edition of scientific biography of E. Öpik in English based on the early Russian version is currently under preparation.

Poster #4

Nikolaev Astronomical Observatory—astro-historical monument of the northern Black Seashore

G. Pinigin, G. Petrov, Zh. Pozhalova and N. Ol'shanskaya, Research Institute "Nikolaev Astronomical Observatory", Ukraine (pinigin@mao.nikolaev.ua)

Nikolaev Astronomical Observatory (NAO) is a monument of historical, astronomical, and architectural heritage of the Northern Black Seashore. NAO is the oldest naval observatory in the East Europe. Among functional observatories of the CIS, NAO is the oldest one, which has preserved its initial make-up and basic profile of astronomical research. NAO was founded in 1821 by admiral A. Greig as the naval observatory. The main object of world heritage is the main building of the observatory, which was built in 1821-29 taking into account the astronomical requirements. The unique ancient astronomical instruments, such as, the meridian circle and portable vertical circle made by Repsold firm, were preserved in NAO. The observatory has a collection of astronomical clocks made in the 18th-19th centuries and a collection of astronomical books published in the 17th-19th centuries.

Poster #5

Archaeoastronomical fieldwork in Peru

Mike Zawaski, University of Northern Colorado, USA and *Kim Malville, University of Colorado and James Cook University* (kimmalville@hotmail.com)

During June-July 2005, sets of 14 horizon photographs were obtained by Zawaski at 10 major monumental sites of the Inca as identified in Hemming and Ranney (1982) . The photographs were merged to yield complete 360º panoramas at each of the sites. To calibrate the panoramas a Wild T-2 theodolite was used to obtain 5 pairs of altitude/azimuth measurements of the sun at each site. The standard deviation of multiple determinations of true north was typically 0.25'to 0.5'. As a check on the sun sights, a line-of-sight azimuth was also established with GPS measurements at each site. Agreement between these baselines and the sun sights are satisfactory. We find evidence of June solstice and/or Pleiades orientations at Llactapata, Sayhuite, and Ollantaytambo; cardinal orientation at Vilcashuman; June solstice established by horizon towers above Ollantaytambo; and both zenith and anti-zenith solar alignments at the tower of Muyuc Marca of Sacsayhuman. Terracing, walls, and water features at Ollantaytambo suggest interest in both June and December solstices. The statistical significance of these orientations is evaluated. A permit for field work at all of these sites was issued by the office of the Institute Cultura National in Cusco. Zawaski undertook this work as partial fulfillment of the requirements for a MA degree at the University of Northern Colorado.

Reference

Hemming, J. and E. Ranney. 1982. *Monuments of the Inca,* Boston: Little, Brown