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COMMISSION 5 DOCUMENTATION AND ASTRONOMICAL DATA
(DOCUMENTATION AND ASTRONOMICAL DATA)

PROCEEDINGS OF BUSINESS SESSIONS, 3–7 August 2009

1. Introduction

Commission 5 and its working groups have continued to operate at a high level of activity over the last three years. In an era when the volume of astronomical data generated by next-generation instruments continues to increase dramatically, and data centres and data tools become increasingly central to front-line astronomical research, the activities of Commission 5 are becoming even more significant. However, most of the activities of Commission 5 take place through its working groups. That was reflected in the meetings at the IAU GA, where there was only one short Business Meeting of the Commission as a whole, but several vigorous meetings of the working groups.

2. Commission 5 Business Meeting, Mon 3 August 2009. Chair: Masatoshi Ohishi

2.1. *New Officers of Commission 5*

Nominations were requested from all members of Commission 5 for the new Organising Committee (OC), and all Commission 5 members were then invited to vote for the nominees, as a result of which the following people were appointed:

- Masatoshi Ohishi (Japan): President
- Bob Hanisch (USA): Vice President
- Ray Norris (Australia): Past President
- Heinz Andernach (Mexico)
- Marsha Bishop (USA)
- Elizabeth Griffin (Canada)
- Ajit Kembhavi (India)
- Tara Murphy (Australia)
- Fabio Pasian (Italy)

2.2. *Future Directions of Commission 5*

Although the interpretation of observations has always been central to astronomical research, new frontiers open up when major repositories of digital data are efficiently federated, which place the curation and management of astronomical data in a position of increasing relevance and importance. The activities of Commission 5 and its Working Groups and Task Force are

consequently becoming increasingly central to many facets of present and planned research. The meetings held at the recent GA and detailed below reflect both the diversity and the interdependence of those facets.

2.3. *ICSU Data Issues*

The International Council for Science (ICSU) is the umbrella body for scientific unions such as the IAU, and acts on a number of interdisciplinary issues, such as science data, which cut across scientific disciplines. In 2007, ICSU created the SCID (Strategic Committee on Information and Data), which included IAU Commission 5 members, to consider strategic directions for data management across science. Its report, published in June 2008, made a number of recommendations, including merging and restructuring FAGS (Federation of Astronomical and Geophysical data analysis Services) & WDC (World Data Center system) to form a new body, the World Data Services (WDS), which should be better placed to serve the needs of data centres and their users. It also recommended the creation of a new body, the SCCID (Strategic Coordination Committee on Info and Data) to provide ICSU with broad expertise and advice on strategic directions in the area of Scientific Data and Information. Both these recommendations have now been implemented and the IAU is represented by Commission 5 members on each of these new bodies.

2.4. *Possible merging of roles of WG for Astronomical Data (WGAD) and Commission 5*

It was pointed out that there is a great deal of overlap between the WGAD and Commission 5 itself, both in their roles and in their officers, so perhaps the WGAD role should be taken over by Commission 5 OC. Furthermore, while the name of Commission 5 is "Documentation and Astronomical Data", the focus is almost entirely on "data" with very little on "Documentation", so it might be time to rename the Commission.

The suggestion has triggered significant discussion. It was tabled for consideration by the WGAD at its own business meeting, and is to be pursued throughout the triennium.

2.5. *Any Other Business*

It was pointed out that many astronomers still used cgs units in papers, although for several decades almost all students have been taught in the SI system. It is an IAU recommendation that astronomers should use SI units rather than cgs units. The IAU recommendations for SI and non-SI astronomical units can be found on http://www.iau.org/science/publications/proceedings_rules/units/, which is based on the IAU style manual (1989) prepared by G.A. Wilkins (then President of Commission 5).

3. WG – Libraries, Mon 3 August 2009

3.1. *WG Scope and Goals - Bob Hanisch*

The IAU Commission 5 Working Group on Libraries exists to foster communication and understanding between research astronomers and the librarians who support them. Librarians have long been an essential resource to astronomers, helping to track down hard-to-find resources, maintaining access to bibliographic databases, and managing the complex finances associated with journal and book collections. The role of the library and librarian are changing as information becomes increasingly digital in format and increasingly available on the Internet, but the librarian is no less essential than before. We hope that by informing the research community of the librarians' needs, concerns, and aspirations, and providing a forum for hearing the concerns of scientists, that this strong partnership between astronomers and librarians will continue and that libraries and librarians will find strong advocacy regarding their financial needs from the research community they serve.

3.2. *HST bibliographic database and library renovations at STScI – Jill Lagerstrom*

- Library as place: renovating and downsizing
- Metrics: The new HST Bibliography
- see full presentation on http://www.eso.org/sci/libraries/IAU-WGLib/iau09/LagerstromRio.pdf

3.3. *Metrics: Facility identifiers: how they are (or aren't) used – Chris Erdmann*

- Tracking use of ESO data through published papers
- Difficult because authors are very inconsistent in citation of facilities
- Requires major human effort; facilities sometimes identified in text, sometimes in footnotes, facility names can be misspelled
- Common facility list (AAS, Greg Schwarz? based on VO identifiers), incorporated into AASTeX markup
- Authors who do list facilities make mistakes, omissions
- Chris developed tool called FUSE to glean facilities metadata from papers (PDF form)
- Can authors be required to include facilities tagging?
- Arnold noted that dataset identifiers are also not being used often
- FUSE being used by four observatories

Another challenge in metadata management! How does it really work? Uses list of terms, acronyms, as filter followed by human inspection. Can use stop words to eliminate confusing terms like hubble flow. (See http://www.eso.org/sci/libraries/IAU-WGLib/iau09/FacilityIDs_ce_ug.pdf and http://www.eso.org/sci/libraries/IAU-WGLib/iau09/Fuse.pdf for full presentation)

3.4. *Data Curation and Strategies for Survival in the Brave New World of Librarianship - Marsha Bishop*

- Data curation spans small bibliographic records to large data sets
- Metadata: simple? constrained? combination? extent (how many items)?
- Record types: highly structured?
- Updates: who makes updates? under what conditions?
- Data management: who does it? IT staff, library, end-user.
- Preservation: how long to keep data?
- Access: open, closed, or combination
- Exposure: awareness, marketing
- Metadata changes (e.g., facility names can change)
- Data curation requires passion for data retention: librarians.
- Also requires domain expertise! Data scientist.
- Data curation is one small part of libraries responsibilities.
- How can libraries survive current epoch of downsizing, budget cutting/
- Marion Schmidt: what happens to metadata when journals eliminate page numbers? Replace with DOI.

See http://www.eso.org/sci/libraries/IAU-WGLib/iau09/IAU-Pres_DataCura.pdf for full presentation.

3.5. *Links in the Astronomy Data Network - Alberto Accomazzi*

- Types of links include internal, external, computed, curated, contributed
- Useful for attribution, aggregation, preservation, discovery
- Links can be based on graph theory, semantic web, OAI/ORE
- Topic clusters
- Linked Open Data: resource names are URIs, metadata is in RDF format
- Links in astronomy are URLs, static, untyped, and do not use standard vocabularies; not actionable by applications
- How to increase value of links in astronomy? Start with observing proposals and track things forward. OAI/ORE defines how to label the links and relationships in a publication and track the publication through its various states.
- Datanet Data Conservancy
- VAO collaboration: bring semantic awareness to VO applications
- Key technologies are RDF, LOD, OAI/ORE
- Arnold: need to identify the software used for the data processing and analysis.

See http://www.eso.org/sci/libraries/IAU-WGLib/iau09/IAU09.pdf for full presentation.

4. WG – Virtual Observatories, Data Centers and Networks, Mon 3 August 2009

The International Virtual Observatory (IVO) is a truly global endeavour in astronomy. Many projects, each with its own goals, have been set up around the world to develop the IVO. The International Virtual Observatory Alliance (IVOA) links together the VO projects, with the aims of managing communication between VO projects, defining a common roadmap, and managing proposals for the definition and evolution of IVO standards through the IVOA Working Groups.

The IAU WG on Virtual Observatories, Data Centres, and Networks (WG VODC&N) is the standard-bearer of the International Virtual Observatory at IAU, and is the primary point of contact between the IVO and the IAU. Its primary role is to provide an interface between IVOA activities, in particular IVOA standards and recommendations, and other IAU standards, policies, and recommendations. In particular, it promotes VO-related topics (e.g. symposia, GA sessions) which need to be handled by the IAU (Commission 5, Division XII and executive level). It helps facilitate the adoption of VO standards in the broader community, particular in liaison with national and international data centres, and it provides outreach for VO and data management efforts in related fields within the IAU (planetary science, solar astronomy, etc.).

The WG VODC&N brings to the attention of the IVOA Executive any topics it considers to be important for the IVO. It can be consulted by the IVOA Executive on any topic relevant to the international development of the VO. The WG VO consists of members of IVO projects, together with others bringing an external view on the long term vision of the VO, and other stakeholders. It also includes the president of Commission 5, the chair of the IVOA, a representative of the WG FITS (Commission 5), a representative of the WG on Astronomical Data (Commission 5), and a representative of the WG on International Solar Data Access (Division II).

5. WG – Designations, Tue 4 August 2009

5.1. *Purpose*

• The Working Group Designations of IAU Commission 5 clarifies existing astronomical nomenclature and helps astronomers avoid potential problems when designating their sources.

• The WG Designations oversees the IAU Registry for Acronyms for newly discovered astronomical sources of radiation (The Dictionary): http://cdsweb.u-strasbg.fr/cgi-bin/DicForm which is sponsored by the WG and operated by the Centre de Données de Strasbourg (CDS).

• The Clearing House, a subgroup of the WG, screens the submissions for accuracy and conformity to the IAU Recommendations for Nomenclature http://cdsweb.u-strasbg.fr/iau-spec.html

5.2. *Membership*

The WG has 17 members, with one member leaving, and four proposed new members.

5.3. *Acronym registration*

• Over the last three years, 79 proposed acronyms have been received. 61 were accepted, and 9 were revised.

• Lanie Dickel: "The Registry seems to be being used for many of the big surveys at about the amount of submissions per year that we can handle. I think it should continue - a valuable service - and its availability advertised at the IAU."

• There are still problems with conflicting or ambiguous designations, such as MOST which can either mean "Microvariability and Oscillations of Stars" (a Canadian Satellite launched in 2003) or "Molonglo Observatory Synthesis Telescope" (an Australian telescope built in 1960 – 1980).

5.4. *Changes in designations*

• How have the nomenclature rules changed and how should they be changed in the face of database-oriented astronomy (e.g. case-sensitivity; special character handling; dealing with spaces in names; the name being an index key and not the RA/Dec position, etc.)?

• "Special" characters include Greek letters, hyphens, and spaces

• There is a need for a uniform policy for naming stars and non-stellar objects in other galaxies (and, of course, such objects found in intergalactic space)

• Case-sensitive designations appear in the Literature. E.g. HD 41004B is a star, HD 41004 B b is a planet in Exoplanet Encyclopedia, HD 41004Bb is the name in SIMBAD

• L. Dickel: "... we need to check with the exosolar planet community as they are the ones in the IAU who are designating such objects if I am not mistaken. I think they agreed with the binary/multiple star people to use their kind of designation."

• See: http://ad.usno.navy.mil/wds/wmc/wmc_descrip.txt or
http://www.iau.org/PLANETS_AROUND_OTHER_STARS.247.0.html.
An extract follows: "In order to facilitate international research in the field, and as part of these discussions, the IAU is also developing a system for clear and unambiguous scientific designation of these bodies at all stages during their study, from tentative identification to fully-characterized objects. Such a system must take into account that discoveries are often tentative, later to be confirmed or rejected, possibly by several different methods, and that several planets belonging to the same star may eventually be discovered, again possibly by different means. Thus, considerable care and experience are required in its design."

5.5. *Large Surveys*

• How can we be proactive in communicating with very large survey projects before they start naming things (e.g., Pan-STARRS, LSST)? E.g. "PSO" was submitted by Pan-STARRS, but without a format.

• There needs to be some discussion of how to deal with nomenclature (that is becoming increasingly cumbersome) for the very large surveys either underway now or planned for the immediate future.

• Is it too early to think about GAIA designations?

• Are there other surveys in the pipelines?

5.6. *Journal/Author interactions*

• There needs to be closer interaction with journal editors to ensure consistent adoption of correct nomenclature.

• How do we get individual authors to check the Dictionary before publication?

5.7. *Changing venue for identifying objects*

• Perhaps more controversial: have catalogues grown beyond their usefulness and should we regard images as the basic tools of astronomy? Can we bootstrap our discipline away from the mindset that reduces the cosmos to a collection of elliptical gaussians?

• Coping with and archiving huge piles of data seems to be a continuing problem in astronomy (and elsewhere).

6. WG – FITS Data Format. Tue 4 August 2009

The FITS Working Group is responsible for maintaining and updating the FITS Data Standard Document, which includes specifying standard conventions for time & date, and ensuring that coordinate information attached to data follows the World Coordinate System, and that transformations between systems are well-understood, well-documented, and are specified in the meta-data attached to each FITS file. Data acquired by different systems can then be compared and combined, and data can be transformed from one coordinate system to another without distortion.

The FITS WG has been very active over that past 3 years. The most significant recent development was the release of a new FITS standard, which was formally approved in July 2008 and is now publicly available on the FITS Support Web site at http://fits.gsfc.nasa.gov.

The other main activity of the WG-FITS during that period was to create a registry on the FITS Support Office Web site for documenting the many existing FITS conventions that are in use within the FITS community. As astronomical instrumentation continues to expand in scope and capability, it is inevitable that the FITS standard will continue to evolve.

The success of the FITS WG in managing this process is widely regarded as one of the most effective parts of the IAU. There is a strong need for the FITS WG to continue its role as the international control authority for the FITS data format.

7. TF – Preservation and Digitization of Photographic Plates, Mon 3 August 2009

Many members are involved in studies of long-term variability, which require monitoring over a time-base well exceeding that available through born-digital observations alone. Historic data reproduced accurately from archived plates are thus central to such research. New results can be read in the literature, and are not cited here. Several projects involve *Carte du Ciel* plates; in 2006 the WG-CdC was merged with the PDPP.

Plate Preservation: A North American Astronomical Plate repository has been established at PARI (Pisgah Astronomical Research Institute, North Carolina). The Cambridge (UK) plate store was dismantled and the contents repatriated or disseminated. Requests to create user-friendly access to the RGO plates currently stored in London and to transfer a limited set to the ROE were unsuccessful.

Direct plates: Measurements (accurate to 0.5 μm) of Black Birch, AGK2 and Hamburg Zone astrograph plates with the USNO StarScan plate measuring machine have been completed; the repeatability of StarScan has an error of 0.2 μm. The new data will contribute to the UCAC3 (as reported under Commission 8). Century-old plates from the Sydney Observatory Galactic Survey yield positions and magnitudes that have now been catalogued; early analyses of those data are already contributing new science. A proposal is being formed to provide for a comparison between Gaia results (when available) and CdC measurements along an equatorial belt, to search for changes. A discussion in Paris of the benefits of the unfinished *Carte du Ciel* project heard about the detection of the ISM from CdC plates. At the DAO, part of a 14×14-inch plate from Palomar thought to have imaged an elusive comet was digitized, along with an appropriate control plate. A catalogue of Vatican Observatory Schmidt plates (now digitized), plus 'thumbnail' scans, will be posted on a web-site (yet to be named). In China, the preservation and digitization of the substantial historic collections of direct and objective-prism plates from the National, Qing Dao and Purple Mountain Observatories under the auspices of the Chinese VO project is hampered by lack of resources and a working PDS.

Spectroscopy: The digitizing of selected spectrograms borrowed from various US observatories for telluric ozone research has re-started at the DAO following a major downtime and upgrade of its PDS. A collaboration with the Carnegie Institution to digitize a subset of Mount Wilson spectra for the same purpose is now commencing. The 10-10 PDS from KPNO has been brought in as a first step in setting up an international scanning laboratory. Requests to scan specific spectra continue to arrive. The major objective-prism survey of the Byurakan Observatory has now been digitized, and is in the public domain; early scientific results are already impressive.

8. Meeting of the WG – Astronomical Data, held on Fri 7 August 2009

8.1. *Introduction*

The Working Group on Astronomical Data (WGAD) is the gateway to ICSU CODATA, and enables the astronomical community to comment on, and influence, cross-disciplinary initiatives such as the Science Data Commons, and international legislation which might affect our ability to maintain large public domain databases. WGAD also serves as an electronic forum to discuss data issues, such as the challenge of handling huge data sets resulting from new generation astronomical instruments. For example, a WGAD e-discussion took place in the lead-up to the 2009 IAU GA, and is summarised by Andrew Hopkins below.

WGAD also serves as a forum to debate issues arising from ICSU, such as the Strategic Committee on Information and Data in Science, whose recommendation to restructure FAGS (Federation of Astronomical and Geophysical Services) and WDC (World Data Centres) have now been implemented.

WGAD membership has recently increased from 34 to 58. Other activities over the past three years have included

- Playing an active role in ICSU's "Strategic Committee on Information and Data", resulting in a restructuring of the systems of World Data Centres and Astronomical Data Services, and
- Running a session on "Astronomical Data and the Virtual Observatory" during the CODATA General Assembly in Kiev in October 2008.

In the next three years, WGAD activities will include running a session on "Petabyte databases for next-generation astronomical instruments" at the CODATA GA 2010 in South Africa. The WGAD Chair will continue to represent the IAU at CODATA meetings.

8.2. *WGAD Officers*

Following a nomination and voting process involving all WGAD members, Oleg Malkov has been appointed as Deputy Chair. He is expected to succeed to the Chair when the present holder (Ray Norris as chair when Ray steps down in 2010 (a date chosen to synchronise with CODATA activities).

8.3. *The challenges of petabyte astronomical databases (George Djorgovski)*

George Djorgovski gave an inspirational presentation outlining the challenges and opportunities faced by astronomy as we move into the Petabyte era. He pointed out that time-domain astronomy is possibly the "Killer Application for the Virtual Observatory".

8.4. *The Astronomers Data Manifesto revisited (Ray Norris)*

The Astronomers Data Manifesto was launched in 2006 (see http://www.ivoa.net/cgi-bin/twiki/bin/view/Astrodata/DataManifesto) partly to articulate a future direction for astronomical data, and partly to raise awareness of astronomical data issues. It has already been successful in raising awareness, and had high visibility at the 2006 IAU GA in Prague. It has also been adopted by US National Virtual Observatory as a set of guiding principles. However, awareness has so far largely been confined to the "converted", and data issues still have low visibility amongst the broader astronomical community. Ray Norris argued that Commission 5 should aim to propose it as an IAU Resolution in 2012. However, to achieve that, it needs to gain a broader support base within the IAU. This could be achieved by (a) discussing it with Presidents of other IAU Divisions/Commissions, and (b) by Commission 5 members introducing data-related talks at IAU Symposia and other astronomical meetings.

8.5. *Future Directions of Astronomical Data (Andrew Hopkins)*

A lively e-discussion had been conducted by Andrew Hopkins and WGAD members in the months preceding the IAU GA. The full discussion can be found on http://wgad.pbworks.com/. Key discussion points included:

- The implications of terabyte astronomical databases on the future of the VO and data centres,
- How telescope users might access their data in the future,
- The "Moore's Law" of Sky Surveys,
- How the VO and data mining of surveys could change the way we do our Science,
- How we could improve the flow of data from journals to data centres,
- Managing and preserving legacy data,
- Conquering the digital divide,
- Open access to astronomical archives,
- Using digital object identifiers for astronomical datasets,
- Enabling career recognition for those who manage data, and
- Cross-fertilisation between disciplines.

8.6. *Managing Yesterday's Data: Creating a Resource Worth Having Elizabeth Griffin*

Elizabeth Griffin expressed concern that the Data Manifesto appears to promote the archiving of data that appears in a paper, and argued that the data archive should contain the complete, entire, calibrated dataset and accompanying metadata. What is published in a journal is likely to be only a subset of the original data, and frequently constitutes a subjective selection for a specific interpretation, whereas the original data are an objective record of what was observed. Ray Norris explained that when the Data Manifesto used the word "data", it was intended to refer to published end results such as redshifts, which was what was of interest to most users rather than the original data.

The meeting agreed that the Manifesto's use of the word "data" in that context should be replaced by words such as "published results". It would be amended accordingly.

8.7. *CODATA Report (Ray Norris)*

CODATA is the "Committee on Data for Science and Technology" of the International Council for Science (ICSU). Despite being named a "Committee", it actually functions much like a Scientific Union, with national members, an executive, and a bi-annual General Assembly. However, unlike a union, CODATA transcends all scientific disciplines and so has members from Scientific Unions as well as National members.

The IAU benefits from CODATA in a number of ways. For example, CODATA

- acts in the interest of data for all areas of science (e.g. combating the proposed WIPO legislation),
- explores cross-disciplinary initiatives (e.g. Global Scientific Commons),
- runs a Science Data Conference every two years,
- runs the Data Science Journal,
- is responsible for setting fundamental standards (e.g. speed of light, the charge of the electron),
- may in the future be responsible for other services, such as a registry of registries, ontologies, etc.

CODATA highlights in the last triennium have included:

- New National Members (Both UK and Australia joined CODATA in 2008).
- The CODATA International Conference in Kiev in October 2008.This was attended by about 400 scientists, with the theme of "cultivating an open access environment to scientific data". It included a successful one-day session on "Astronomical Data and the Virtual Observatory".
- a new Strategic Plan.
- ten new Task Groups.
- two new CODATA Initiatives: ("Building European Activities in Public Domain data" and "Collaboration with Global Earth Observation System of Systems").

(see http://www.atnf.csiro.au/people/rnorris/WGAD/ for details).

8.8. *Debate: If WGAD didn't exist, would we invent it? (Initiated by Elizabeth Griffin)*

Elizabeth Griffin argued that it was not clear that we needed both a Commission and a separate WGAD, since the latter's role now overlapped with the goals of Commission 5 and appeared in effect to be doing the job of Commission 5.

Ray Norris argued that:

- Historically, WGAD was set up as a conduit of information between IAU and CODATA, with the WGAD chair being the IAU delegate, and the WGAD being the group of people he/she consults in interactions with CODATA. However, this is not necessarily an argument for continuing in the same way.
- Commission 5 covers "Documentation & Astronomical Data", not just data, and so the interests of WGAD are not congruent with those of Commission 5.
- In recent years, WGAD has also become a valuable forum for e-discussion of data issues. Some of these are triggered by the interactions with CODATA, or by other events, and there has been a wiki discussion in the lead-up to the last two IAU General Assemblies.
- Commission 5 currently has 177 members, and WGAD has 57 members. Only about half the members of WGAD are Commission 5 members, and not all WGAD members are IAU members.
- So if we merged WGAD and Commission 5, we would either need to (a) stop the e-discussions, which would be a loss, (b) include all Commission 5 members in those discussions, which would cause unnecessary "spam" for those Commission 5 members with no interest in data discussions, (c) set up a separate subset of Commission 5 consisting of those people who were interested in participating in e-discussions on data.
- This subset would essentially consist of the current WGAD members, so we would have re-invented WGAD.

Bob Hanisch made the additional comment that dividing up Commission 5 into working groups reduced the size of meetings such as this to below critical mass. There was general agreement with this point.

The meeting then moved on to a more general discussion, including the following key points.

- There was general agreement that the six Commission 5 working groups (WG Astronomical Data, WG Libraries, WG FITS, WG Designations, WG Virtual Observatories, Data Centers &

Networks, Task Force on Preservation & Digitization of Photographic Plates) each served a valuable function and should continue.

• There is a perceived problem that the IAU regards working groups as short-term entities, whereas the reality is that many working groups have a valuable (and widely supported) long-term role. Thus, while we have no objection to justifying the existence of each WG every three years, the IAU needs to recognise (in the wording of the bye-laws and working rules) the reality of WG with a long-term role. An action resulted on Division and Commission chairs to raise this with the IAU Executive Committee.

• However, there was also general agreement that splitting up the IAU GA meetings into individual task group meetings was counter-productive, resulting in sub-critical attendance at Commission and WG meetings.

• Poor attendance at Commission 5 and WGAD meetings was perceived to be a problem, although it is acknowledged that most of the real work occurs (mainly by email) between GA, and the low attendance at GA meetings does not indicate low interest in the work of the group as a whole.

• It was therefore agreed that, at the next IAU GA, all the working groups should combine their meetings into a more general Commission 5 meetings, which would include reports from individual WG chairs. However, this needs to be ratified by the majority of Comm5/WG members who were not then present. The Commission 5 President and WG chairs should canvas membership on this issue.

• This does not of course preclude individual specialist WG meetings taking place in those few cases where discussions amongst a few members are appropriate.

• Another problem is that Commission and WG meetings are poorly advertised at the GA, and their agendas are hard to find in the Program. Calling them "Business Meetings" is likely to discourage astronomers who are not interested in "Commission Business" but who may well be interested in excellent general talks such as George Djorgovski's this morning. This resulted in an action on the Commission and Division chairs to raise this matter with the IAU EC.

• There was a discussion on how to raise awareness of data issues amongst the wider astronomical community. IAU GA Sessions on topics such as data management tend to end up preaching to the converted. Instead, we need to ensure that data/VO issues are raised in other symposia and meetings. This resulted in an action on all members to propose talks on astronomical subjects involving data/VO issues at other astronomical meetings which involve data/VO issues.

• A suggestion was made, initially by Elizabeth Griffin, and then widely supported and amplified by other participants, of proposing an IAU Symposium on "Time-Domain Astronomy", which as George Djorgovski pointed out, is possibly the "Killer Application for the VO". Action: the Chair will explore this further with potentially interested people, and (if supported, propose an IAU Symposium in 2011 by 1 Dec 2009.

• Bob Hanisch and Andrew Hopkins also suggested that the IAU should sponsor international astro-informatics or VO workshops. (Later, in the Decadal Plan meeting, Bob suggested to George Miley that this should be part of the IAU Decadal Plan).