



**12th United Nations/European Space Agency Workshop on Basic Space Science
hosted by the China National Space Administration,
on behalf of the Government of P. R. China**

(24 – 28 May 2004, Beijing , P. R. China)

Local Organizing Committee (LOC):

**LUO Ge
LIU Xiaohong**

International Scientific Organizing Committee (ISOC):

G. Ai (P. R. China)
R. Albrecht (ESO) Session Virtual Observatories
M.-J. Deutsch (USA) Session Concurrent Design Capability
G. Eichhorn (USA) Session Astrophysical Data Systems
L. Friedman (TPS) Session Planetary Exploration
H.J. Haubold (UN, Chairperson) Session Nonextensive Statistical Mechanics and
Astrophysics
M. Kitamura (Japan)
P. Martinez (South Africa) Session TRIPOD – Results and Follow-up
A.M. Mathai (India)
M. Othman (Malaysia)
B. Shustov (Russia)
J. Truemper (Germany)
C. Tsallis (Brazil)
W. Wamsteker (ESA) Session Space Missions in Astrophysics
A.P. Willmore (COSPAR)
G. Wu (P. R. China)

DATE/TIME	SUBJECT	SPEAKER
Sunday, 23 May 2004	ARRIVAL of Participants	
Monday, 24 May 2004		

08:30 – 09:00	Registration	
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09:00 – 10:00	<i>Opening of the Workshop</i>	
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|---|---|---------------|
| 1 | Welcome Address (5min): Government of P. R. China, Administrator of China National Space Administration | SUN Laiyan |
| 2 | Developing Basic Space Science World-Wide: A Decade of UN/ESA Workshops | |
| | ◆ United Nations (10min): | H. J. Haubold |
| | ◆ European Space Agency (10min): | W. Wamsteker |
| 3 | Welcome Address (5min): China National Space Administration | VIP |
| 4 | Keynote Address (10min): | VIP |
| 5 | Keynote Address (10min): | VIP |
| 6 | Chinese Academy of Sciences (5min): | VIP |

09:45 – 10:00	Break	
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<i>Session: Keynote Lectures (Chairperson: H. J. Haubold, United Nations)</i>		
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|---------------|---|--------------------------|
| 10:15 – 11:00 | Current Perspectives of the Basic Space Science Programmes of P. R. China | G. Ai
(P. R. China) |
| 11:00 – 11:45 | The Powerful New X-ray Missions | J. Truemper
(Germany) |
| 11:45 – 12:30 | Sun, Moons and Planets | K. R. Lang
(USA) |
| 12:30 – 13:00 | The ESA Scientific Programme | W. Wamsteker
(ESA) |

13:00 – 14:00	Lunch	
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***Session 1: Astrophysical Data Systems, Archives and Knowledge Distribution
(Chairperson: G. Wu, P. R. China)***

14:00 – 14:15	Linking the Literature with On-Line Data	G. Eichhorn (USA)
14:15 – 14:45	The History of the NASA ADS and it's Query System	M. J. Kurtz (USA)
14:45 – 15:15	Making the Full Text of the Astronomical Literature Available On-line	G. Eichhorn (USA)
15:15 – 15:45	Mirroring Technique and Other Mirror Site Issues	S. Ponrathnam (India)
15:45 – 16:00	Mirroring the ADS in Moscow: Experience, Results and Perspectives	A. Kilpio (Russia)
16:00 – 16:30	Applications of Astronomical Data in China	H. Guo (P. R. China)

16:30 – 16:45

Lunch

***Session 2: Virtual Observatories
(Chairperson: M. R. Hidayat, Malaysia)***

16:45 – 17:05	AstroGrid: Building a Working Virtual Observatory	K. Noddle (UK)
17:05 – 17:20	ISAS Data Archive and Transfer System (DARTS)	H. Baba (Japan)
17:20 – 17:35	Russian Virtual Observatory	A. Kilpio (Russia)
17:35 – 17:50	Chinese Virtual Observatory	C. Cui (P. R. China)
17:50 – 18:10	Virtual Observatory Developments in Europe and in the US	R. Albrecht (ESO)
18:10 – 18:20	Experience from the COSPAR Capacity-building Workshops	P. Willmore (COSPAR)

18:20 – 18:40	The ESA XMM-Newton Science Operations Center: Are We Making Basic Space Science Available to the Whole Scientific World?	C. Gabriel (ESA)
18:40 – 19:00	Space-based Data : Between Pure Science and Down to Earth Application in Indonesia	T. Djamaluddin (Indonesia)

19:00 – 20:00 **Break**

20:00 – 22:00 **WORKING GROUP A**

Astrophysical Data Systems and Virtual Observatories
(Chairpersons: G. Eichhorn, USA and R. Albrecht, ESO) with
Contributions from J. C. Saucedo Morales (Mexico), Y. J. Chong (Singapore)

Poster:	Subaru Telescope Science Archive System: SMOKA	M. Enoki (Japan)
Presentation:	The ADS Mirror Site in Argentina	G. Eichhorn (USA)
Contribution:	Search and Study of the Properties of Compact Groups of Galaxies in Public Galaxy Catalogs	J. Saucedo (Mexico)

08:30**Tuesday, 25 May 2004**

***Session 3: Nonextensive Statistical Mechanics and Astrophysics
(Chairperson: H. J. Haubold, United Nations)***

08:30 – 09:15	Nonextensive Statistical Mechanics: Introduction and Dynamical Foundations	C. Tsallis (Brazil)
09:15 – 09:45	Liouville Dynamics and Generalized Thermostatistics	A. R. Plastino (Argentina)
09:45 – 10:15	Maximum Information Growth and Least Action Principle for Nonequilibrium Systems	Q. A. Wang (France)
10:15 – 10:45	Generalized Simulated Annealing Algorithm and its Application to the Thomson Model	X. G. Gong (P. R. China)

10:45 – 11:00**Break**

11:00 – 11:30	q-generalized Bose-Einstein Condensation Based on Tsallis Entropy	J. Chen (P. R. China)
11:30 – 12:00	On Generalized Fractional Kinetic Equations	A. M. Mathai (India)
12:00 – 12:30	Unified Fractional Kinetic Equation and a Fractional Diffusion Equation	R. K. Saxena (India)
12:30 – 13:00	Metastability of Astrophysical Electron-Nuclear Plasmas: Conditions and Signals	P. Quarati (Italy)

13:00 – 14:00**Lunch**

***Session 3 continued
(Chairperson: H. J. Haubold, United Nations)***

14:00 – 14:30	Variation of the Solar Neutrino Flux Over Time in the Homestake, Gallex (GNO), SAGE, and Super-Kamiokande Experiments	K. Sakurai (Japan)
14:30 – 15:00	Fractality and Nonextensivity: Statistical Mechanics Around a Black Hole	S. Abe (Japan)

15:00 – 15:30	What Does the Nonextensive Parameter q ? 1 Stand For in Self-Gravitating Systems?	J. Du (P. R. China)
15:30 – 16:00	Magnetic Field and Solar Activity	H. Zhang (P. R. China)

16:00 – 16:15

Break

16:15 – 16:45	Cosmology of Vacuum	V. Burdyuzha (Russia)
16:45 – 17:15	The Impact of High Spatial Resolution and Spectroscopy in X-rays on AGN	T. Wang (P. R. China)
17:15 – 17:45	Self-Interacting Dark Matter in the $SU(3)_C \otimes SU(3)_L \otimes U(1)_N$ Models	L. Nguyen Quynh (Vietnam)

17:45 – 19:30

Break

19:30 – 22:00

WORKING GROUP B

**Nonextensive Statistical Mechanics
(Chairperson: C. Tsallis, Brazil)**

08:30

Wednesday, 26 May 2004

**Session 4: TRIPOD – Results and Follow-up
(Chairperson: P. Martinez, South Africa)**

08:30 – 09:00	Proposal of Cooperative CCD Observations of Variable Stars with Small Telescopes Including Related Prospective Japanese ODA Ones	M. Kitamura (Japan)
09:00 – 09:30	Using the 45-cm Telescope in Paraguay	F. A. Doncel Invernizzi (Paraguay)
09:30 – 10:00	Activities of Development, and Utilization of GOTO 45-cm Reflector and New Instruments at Bosscha Observatory, Lembang, Indonesia	H. L. Malasan (Indonesia)
10:00 – 10:30	The Design of Malaysian Astronomical Robotic Observatory	M. R. Hidayat (Malaysia)

10:30 – 10:45

Break

10:45 – 11:15	The Uruguayan Automated and Robotic Telescope “B U S C A”	G. Tancredi (Uruguay)
11:15 – 11:45	The Observational Study of Binary Asteroids	X. Wang (P. R. China)
11:45 – 12:15	The Korean Science Passengers	B. G. Kim (South Korea)
12:15 – 13:00	Data Archive and its Web-page for Tela-byte NEO Observational Data	S. Isobe (Japan)

13:00 – 14:00

Lunch

VISIT to Beijing Astronomical Data Center

19:30 – 22:00

WORKING GROUP C

Astronomical Telescope Facilities (Chairperson: M. Kitamura, Japan) with Contributions from M. Z. Zainuddin (Malaysia), H. M. K. Al-Naimiy (United Arab Emirates), N. Dinh Huan (Vietnam), L. W. Kebede (Ethiopia), A. T. Al-Mousli (Syria), and A. H. Sultan (Yemen)

Special Presentation:

The Southern African Large Telescope

P. Martinez
(South Africa)

08:30

Thursday, 27 May 2004

***Session 5: A Concurrent Design Capability for the
Development of International Space Missions
(Chairperson: R. E. Oberto, USA)***

08:30 – 08:50	Mars Telecom Orbiter Mission Operations Concept	M.-J. Deutsch (USA)
08:50 – 09:10	Towards a Systems Approach to Risk Considerations	L. Meshkat (USA)
09:10 – 09:30	Application of Virtual Mission Operation Framework	W. Lu (USA)

09:30 – 12:30

***Concurrent Engineering Demonstration Through Life Video Link Between
Workshop Venue (Beijing, P. R. China) and JPL (Pasadena, USA)***

12:30 – 13:30

Lunch

***Session 6: Space Missions in Astrophysics and Solar System:
New Opportunities?
(Chairperson: Y. Yan or G. Ai, P. R. China)***

13:30 – 14:00	The Future Outlook of Space Astrophysics	W. Wamsteker (ESA)
14:00 – 14:30	World Space Observatory: Status Report	B. Shustov (Russia)
14:30 – 15:00	Space Astronomy Observations on Board of Chinese Spacecraft of SZ-2	Y. Ma (P. R. China)
15:00 – 15:30	Gamma-Ray Burst Astrophysics and China's Future Space Missions on High Energy Astrophysics	S. N. Zhang (P. R. China)

15:30 – 15:45

Break

Special Presentations

15:45 – 16:15	Science Publishing and the Developing World	H. Blom (The Netherlands)
16:15 – 16:45	Space Science and Technology Benefits	M.-I. Piso (Romania)
16:45 – 17:15	Crisis Management in Tightly Coupled and Complex Systems	M.-J. Deutsch (USA)

08:30

Friday, 28 May 2004

***Session 7: Planetary Exploration
(Chairperson: L. Friedman, TPS)***

08:30 – 09:00	What We Know and Want to Know About the Moon	J. Burke (USA)
09:00 – 09:30	ESA's SMART-1 Mission and International Lunar Exploration	B. Foing (ESA)
09:30 – 10:00	Japanese Current and Future Lunar Missions	H. Mizutani (Japan)
10:00 – 10:30	Scientific Aspects of Chandrayaan-1, The Indian Lunar Polar Orbiter Mission	N. Bhandari (India)

10:30 – 10:45

Break

10:45 – 11:15	American Moon to Mars Exploration Programme	J. Garvin (USA)
11:15 – 11:45	Special Presentation (to be confirmed)	B. Aldrin (USA)
11:45 – 12:30	Discussion: International Cooperation Ideas (A Lunar Way-Station)	

12:30 – 13:30 **Lunch**

***Session 7 continued
(Chairperson: N. F. Chen, P. R. China)***

13:30 – 14:00	Evolution of the Medium Size Icy Satellites	J. Leliwa-Kopystynski (Poland)
14:00 – 14:30	Preliminary Science Results of the Mars Exploration Rovers: Spirit and Opportunity	R. Anderson (USA)
14:30 – 15:00	In Situ Investigation of Planetary Subsurface Layers: Technical Tools, Missions, and Future Developments	N. I. Koemle (Austria)
15:00 – 15:30	Long-term Trends of the Ionosphere Observed at Chong-qing, China	J. Wu (P. R. China)

15:30 – 15:45 **Break**

15:45 – 17:00 **OBSERVATIONS AND RECOMMENDATIONS**

***Session: Observations and Recommendations
(Chairperson: W. Wamsteker, ESA)***

International Heliophysical Year 2007: Putting the “I” in I*Y 2007	H. J. Haubold (UN)
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17:00 – 18:00 **Closing of the Workshop**

***Government of P. R. China
China National Space Administration
Chinese Academy of Sciences
European Space Agency
United Nations***

**Saturday, 29 May 2004
DEPARTURE of Participants**

**12TH UN/ESA WORKSHOP ON BASIC SPACE SCIENCE,
HOSTED BY THE CHINA NATIONAL SPACE ADMINISTRATION
ON BEHALF OF THE GOVERNMENT OF P. R. CHINA
(24 – 28 MAY 2004, BEIJING, P. R. CHINA)**

DEVELOPING BASIC SPACE SCIENCE WORLD-WIDE: A DECADE OF UN/ESA WORKSHOPS

When the first United Nations/European Space Agency Workshop for Basic Space Science was planned in 1991, few of those involved could expect that a unique forum was going to be created for scientific dialogue between scientists from developing and industrialized nations. As the format of the first workshop was on purpose left free with time for ad hoc presentations, working group sessions, and plenary sessions, the workshop was left to find its own dynamics. After a decade of UN/ESA Workshops, the deliberations of the 12th Workshop bring together information on the historical activities, the plans which have been developed over the past decade in different nations, and the results which have materialized during this time in different developing and industrialized nations. Results addressed in this Workshop are results of truly collective efforts from all involved in all UN/ESA Workshops. Over time mutual support from workshop participants has helped significantly to implement some of the recommendations that emanated from the Workshops. Workshop participants are coming from all economic regions of the world, as defined by the United Nations (Africa, Asia and the Pacific, Europe, Latin America and the Caribbean, Western Asia). This will allow better recognition of the importance of a regional (and at times) a global approach to basic space science for developing and industrialized nations world-wide. The Workshop programme highlights five specific scientific investigations which have been achieved successfully in the various nations. The selection of the topics for the sessions of the Workshop was based on an assessment of the published ten volumes of Workshop proceedings containing scientific papers presented in the workshops from 1991 to 2002 and the decadal report on the Workshops titled "Developing Basic Space Science World-Wide: A Decade of UN/ESA Workshops".

<http://www.seas.columbia.edu/~ah297/un-esa/index.html>

1. TRIPOD CONCEPT FOR ACCELERATING THE DEVELOPMENT OF BASIC SPACE SCIENCE IN DEVELOPING COUNTRIES

In the very first UN/ESA Workshops on Basic Space Science, a concept was devised to promote basic space science in developing nations. This concept, which has come to be known as the "Tripod" comprises three legs. The first leg is the provision of basic research tools at a level appropriate for a developing nation, such as an astronomical telescope facility. Consequently, astronomical telescope facilities were established in Chile, Colombia, Egypt, Honduras, Jordan, Morocco, Paraguay, Peru, The Philippines, Sri Lanka, and Uruguay and continue to be in operation. The second leg was the provision of teaching materials to allow the introduction of basic space science into established physics, mathematics, and chemistry curricula in university courses in those nations. The third leg was the implementation of original research programmes in basic space science, at an appropriate level for the existing facilities and state of scientific development, such as variable star observing programmes supplemented by computer

science, mathematics, physics, and astronomy. Access to scientific literature and databases will form essential components to Tripod. The Workshop will review the progress in the implementation of this Tripod approach and make appropriate recommendations for its future implementation.

<http://www.oosa.unvienna.org/SAP/bss/index.html>

2. VIRTUAL OBSERVATORIES

State-of-the-art observing facilities on the ground and in space are producing large quantities of high quality data. These data are being captured in science archives with the goal of exploiting them in an optimum manner. The next logical step is to interconnect these archives, in order to allow the users to retrieve the data in a simple and uniform way, and to maximise the scientific use of these expensive resources. At the same time it is useful to supply a suite of science visualisation and analysis tools in order to facilitate the handling of the data. Funded by the European Commission and by the United States National Science Foundation, with contributions from major organisations such as ESA, NASA, and ESO, Virtual Observatory concepts are being developed in the United States and in Europe. On a smaller scale, Virtual Observatories are also being developed in other nations, such as the P.R. China. To avoid redundancy care is being taken to coordinate the efforts. This is being done through the International Virtual Observatory Alliance, which also provides coordination with other VO activities world-wide. The Workshop will show ways and means on how developing nations can contribute to and benefit from VO activities.

<http://www.nvosdt.org/>

<http://us-vo.org/>

<http://www.eso.org/projects/avo/>

3. ASTROPHYSICAL DATA SYSTEMS

The NASA ADS Abstract Service is a NASA-funded project which provides free World Wide Web abstract search services. ADS currently has over 3.6 million references in four databases: 1) Astronomy and Planetary Sciences; 2) Physics and Geophysics; 3) Space Instrumentation; and 4) Astronomy Preprints. Each database contains abstracts from hundreds of journals, publications, colloquia, symposia, proceedings, PhD Theses, and NASA reports. ADS' eleven mirror sites in France, Germany, Japan, Chile, Britain, India, Russia, Brazil, Argentina, Korea, and P.R. China help to provide better global access. The ADS Article Service provides free access to the full-text of over 340,000 scientific papers published in astronomical journals, conference proceedings, newsletters, bulletins and books, for a total of 2.5 million scanned pages. 6.5 million links in the ADS system allow the user easy access to on-line data and other information related to the articles in the ADS.

<http://adswww.harvard.edu/>

4. NONEXTENSIVE STATISTICAL MECHANICS AND ASTROPHYSICS

A great variety of complex phenomena in many scientific fields exhibit power-law behaviour, reflecting a hierarchical or multifractal structure. Many of these phenomena seem to be susceptible to description and understanding using approaches drawn from thermodynamics or statistical mechanics, particularly approaches involving the maximization of entropy. During recent years, a good deal of study in many nations has been devoted to a nonextensive generalization of entropy and of Boltzmann-Gibbs statistical mechanics and standard thermodynamics. That generalization has intrinsically nonlinear features and yields power laws in natural way. The Workshop will address interdisciplinary applications of these ideas, particularly in the field of astrophysics, and also on various phenomena that could possibly be quantitatively describable in terms of these ideas.

<http://tsallis.cat.cbpf.br/biblio.htm>

5. A CONCURRENT DESIGN CAPABILITY FOR THE DEVELOPMENT OF INTERNATIONAL SPACE MISSIONS

Concurrent design capability, as available at JPL and ESA, will be employed for an interactive demonstration of the early design stages of an international planetary mission. The demonstration calls for the establishment of a remote video conferencing link and data link between Team X located at JPL and the Workshop participants. The purpose of this demonstration is to (i) establish a proof of concept for concurrent and interactive mission design across international boundaries. This concept is an important step in establishing a capability for common mission design with ESA and other space agencies. The demonstration will also show how a space mission concept is developed to an international body of scientists, many from developing nations, attending this Workshop. Similar demonstrations have been undertaken at the workshops in France (2000) and Argentina (2002).

FRACTALITY AND NONEXTENSIVITY: STATISTICAL MECHANICS AROUND A BLACK HOLE

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The time series of the energy of X-rays coming from Cyg X-1 is studied based on multi-fractal analysis and is found to be mono-fractal. This nontrivial self-similar structure leads to deformation of the standard extreme-value statistics. It is shown that the energy distribution is given by the deformation of Gumbel statistics and is characterized by the maximum Tsallis-entropy state. A possible physical origin of the fractality and the relevance of extreme-value statistics to the observed X-ray data are discussed.

VIRTUAL OBSERVATORY DEVELOPMENTS IN EUROPE AND IN THE US

R. Albrecht, ST-ECF

R. Hanisch, STSci

P. Padovani, ST-ECF

Space Telescope European Coordinating Facility (ST-ECF)

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State-of-the-art observing facilities on the ground and in space are producing large quantities of high quality data. These data are being captured in science archives with the goal of exploiting them in an optimum manner. The next logical step is to interconnect these archives, in order to allow the users to retrieve the data in a simple and uniform way. At the same time it is useful to supply a suite of science visualisation and analysis tools in order to facilitate the handling of these data.

Funded by the European Commission and by the US National Science Foundation, with contributions from major organisations such as ESA, NASA, and ESO, Virtual Observatory concepts are being developed in the US and in Europe. To avoid redundancy care is being taken to coordinate the efforts. This is being done through the International Virtual Observatory Alliance, which also provides coordination with other VO activities world-wide.

This paper presents the concepts, status, and plans for these developments.

ASTRONOMY IN SYRIA

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Many projects in different applications were carried out since GORS was established in February 1986 in cooperation with national or international institutions and bodies.

(GORS) has been cooperating with Prof. F. R. QUERCI, UN expert on Basic Space Science on Western Asia since 1997 in NORT project, specially Syria was nominated to establish Regional Center for Basic Space Sciences and Technology Education, include observatory for two meter diameter for professional and one meter diameter for students and training.

We used space images from Landsat in false color composite FCC and we find many sites testing and we will choose the most suitable site to establish the Syrian National Observatory SNO.

UN-General Assembly A/AC 105/657 –13-Dec-1996.

We carried out a pilot study entitled:

- ◆ "GORS Contribution to NORT* Project".

NORT*: The Network of Oriental Robotic Telescopes.

PRELIMINARY SCIENCE RESULTS OF THE MARS EXPLORATION ROVERS: SPIRIT AND OPPORTUNITY

R. C. Anderson¹ and the Athena Science Team¹

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The Mars Exploration Rover *Spirit* landed successfully in Gusev Crater on January 4, 2004 (UTC), followed three weeks later with the successful landing in Meridiani Planum of its twin, *Opportunity*. Both rovers are in excellent health and all the instruments are working properly.

Gusev Crater: The landing site at Gusev Crater lies on a densely populated rock-strewn plain. Rocks identified around the lander range in a variety of sizes and angular shapes. Preliminary results of the rock textures show that a majority of the rocks consist of fine-grained volcanic and several (Adirondack) appear to contain some sort of surface coating. Three sets of measurements have been made on Adirondack, one on the natural rock surface, one on the same area after the surfacing coating (dust) was removed by the RAT brush, and one of the interior of the rock at the same spot after removing 3 mm of rock with the RAT. The concentrations of presumably dust-borne elements like sulfur and chlorine decrease and you go deeper into the rock. All of the observations of Adirondack are consistent with the rock being classified as an unweathered olivine, magnetite-bearing, low silica basalt.

Meridiani Planum: The Opportunity landing site lies inside a 20 m diameter impact crater. The lander came to rest near an exposed layer (roughly 12 m long; 0.5 m high) of bedrock in the crater wall. Initial results from microscopic images (MI) data suggest this unit consist a fine-grained rock with a variety of sedimentary structures consisting of cross-bedded, thin layer of sediments. Alpha Particle X-ray Spectrometer (APXS) suggest a high concentration of sulfur. Embedded within the outcrop and weathering out are highly spherical granules.

ISAS DATA ARCHIVE AND TRANSFER SYSTEM (DARTS)

H. Baba

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Center for Planning and Information Systems
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We have developed the Data ARchive and Transfer System (DARTS), which releases various kind of original archival datasets obtained with the X-ray/IR/radio/solar/magnetspheric space missions of ISAS. DARTS is operated and maintained by the Center for PLAnning and INformation Systems at ISAS (PLAIN/ISAS) in cooperation with various ISAS satellite teams.

DARTS includes data of the following missions: ASCA, an X-ray astronomy satellite, Yohkoh, a solar physics satellite, Halca, a radio astronomy satellite, Akebono, a magnetospheric satellite, Geotail, a magnetospheric satellite, and IRTS, an infrared astronomy telescope on board the SFU space flyer unit. We'll soon release reconstructed data from Ginga, a previous X-ray satellite.

In addition, DARTS provides mirroring datasets of W3Browse by HEASARC, NASA/GSFC, ROSAT All-Sky Survey by MPE, BeppoSAX X-ray data, and CDAWeb geophysical data, as a service to Japanese space science community.

In the near future, we will incorporate and release public additional data of the forthcoming satellites, such as an infrared astronomy satellite ASTRO-F, an X-ray astronomy satellite, Astro-E2 and a solar physics satellite, Solar-B. The data in the DARTS can be accessed via the Internet. The system provides: (1) storage of calibrated scientific database obtained by ISAS satellites; (2) facilities to search and transfer data through the Internet; and (3) supporting analysis tools. We also plan to provide on-line data analysis capability under the high performance ISAS computer facility.

**THE ESA CONCURRENT DESIGN FACILITY (CDF)
A TOOL TO SUPPORT INTERNATIONAL COOPERATION IN SPACE RELATED
PROJECTS**

M. Bandecchi

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The Concurrent Design Facility (CDF) was established at ESTEC (the Research and Technology Centre of the European Space Agency) in 1999, with the objective of creating a multi-disciplinary mission design environment dedicated to the assessment of future space missions. Several scientific and application missions at pre-Phase A level have been assessed.

In addition, the CDF infrastructure has been used to perform industrial work reviews, prepare specifications, co-ordinate international project work, educational purposes.

The experience has shown that the application of the concurrent engineering method, supported by appropriate informatic tools and appropriate data exchange mechanisms, has greatly improved the efficiency of the mission design activities reducing the duration of a typical pre-Phase A study down to a few weeks in average, while featuring a high standard in quality and level of design details.

This presentation will introduce the background, the main features and typical applications of the ESA CDF.

Plans and ideas for improvements, future advanced applications and utilisation for more effective international cooperation in space project development, will finally be discussed.

SCIENTIFIC ASPECTS OF CHANDRAYAAN-1, THE INDIAN LUNAR POLAR ORBITER MISSION

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Chandrayaan-1 is a lunar polar orbiter mission planned by the Indian Space Research organisation for remote sensing of the lunar surface. The scientific objectives of the proposed mission are simultaneous geochemical, mineralogical and photogeological mapping of the whole lunar surface. The payloads include hyperspectral imager (HySI) for mineralogical mapping, X-ray fluorescence spectrometer (LEX) for elemental mapping, low energy gamma ray spectrometer (HEX) for mapping some radioactive elements, a Terrain mapping camera (TMC) and a Laser altimeter (LLRI), leaving a provision for some additional instruments, possibly as international collaboration, which may enhance the capability of this mission in achieving its objectives. A plausible launch scenario using the Polar Satellite Launch Vehicle (PSLV) suggests that a lunar craft, weighing about 440kg (dry weight) can be inserted in a 100km altitude polar orbit round the Moon, carrying adequate fuel to maintain its orbit reasonably well for two years of observations. The payloads mentioned above should weigh about 60kg. It should be possible to cover the whole surface of the Moon in visible and X-rays during this period. The results would be useful in understanding the chemical and mineralogical evolution of the Moon.

Science Publishing and the Developing World

Harry (J.J.) Blom

Astronomy, Space Science & Space Technology

KLUWER

Van Godewijckstraat 30

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3300 AA Dordrecht

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The majority of the commercial and non-commercial academic publishers are (still) operating from countries in the developed world. From this fact, one could be tempted to draw an easy conclusion, i.e. research results from developing countries are submitted to the "rich countries" where these results are relatively well distributed and/or sold back to the developing countries. In this presentation, I will try to demonstrate that this picture is far from complete, leading to an interesting, almost opposite conclusion.

COSMOLOGY OF VACUUM

V. Burdyuzha

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Evolution of a vacuum component of the Universe (cosmological constant) is shortly discussed. This is an evident fact that our Universe for cooling was losing the symmetry by means of the relativistic phase transitions. These processes were accompanied by production of vacuum condensates of quantum fields. Also it is probably that topological microstructures of different dimensions (worm-holes, micromembranes, microstrings, monopoles) could be produced as the result of the Universe creation from "nothing" when a gravitational vacuum condensate has appeared. After Universe inflation these microdefects smoothed, stretched and broken up. A part of them has survived and now they are perceived as the structures of lambda-term (quintessence) and an unclustered dark matter. Besides the Zeldovich's solution as the first approximation on limits of the cosmological constant has discussed. The problem of the cosmological constant can not be solved in the terms of the current quantum field theory which works with Higgs and nonperturbative vacuum condensates. This problem can not fully solved in geometrodynamics of Wheeler-deWitt. The phenomenological solution of this problem is the compensation of initial positive vacuum energy by condensates of quantum fields (selforganization of vacuum).

WHAT WE KNOW AND WANT TO KNOW ABOUT THE MOON

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This presentation reviews existing information on the Moon's character and history in the light of evolution of the solar system, then indicates gaps in present knowledge, with suggestions for ways to obtain needed new data. In addition the discussion focuses on, and advocates, a concept for incremental advances through lunar robotic outposts developing scientific understanding, engineering experience, and operating skills in a program coordinated with similar activities at Mars. The goal at both the Moon and Mars is to prepare the way for subsequent human missions.

MARS TELECOM ORBITER MISSION OPERATIONS CONCEPTS

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The Mars Telecom Orbiter (MTO) relay capability enables next decadal missions at Mars, collecting gigabits of data a day to be relayed back at speeds exceeding 4 Mbps and it facilitates small missions whose limited resources do not permit them to have a direct link to Earth. In addition MTO performs significant technology demonstrations for the Laser Communication Demonstration and the Orbiting Sample Detection. This paper addresses the tall tent pole scenarios and operations concepts that drive the design and operation of MTO. The relay concept explores a "week in the life" of MTO. We address the steps required to execute the technology demonstrations, the commissioning of the flight system, and the critical events. And finally we cover the operations architecture. The concepts and scenarios define the mission in a more realistic setting and support the formulation of the requirements, interfaces, design, plans and cost.

CRISIS MANAGEMENT IN TIGHTLY COUPLED AND COMPLEX SYSTEMS SUCH AS SPACE SYSTEMS

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Normal accidents when occurring in tightly coupled and complex systems can turn into whole system failures and even escalate into a crisis. Systems that are prone to this behavior are nuclear power plants, chemical plants, and space missions among a number of other systems. Long before a major crisis occurs there are warning signs or prodromes that are not recognized and dealt with in an effective manner by the organization. Early identification and management of those prodromes can help prevent an incident from escalating into a failure and a crisis.

Taking our lead from the Columbia Accident Investigation Report (CAIB), our team interviewed managers at JPL and at NASA. The analysis consisted of looking through multiple lenses, the political lens, the cultural lens and the organizational lens. The list of prodromes at JPL overlaps those found by the CAIB report.

(This paper was originally written by Marie Deutsch, Grace Lee, Tom Ludwig, EMBA students at the Drucker School of Management)

SPACE-BASED DATA: BETWEEN PURE SCIENCE AND DOWN TO EARTH APPLICAATION IN INDONESIA

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Clear night for astronomical observation and clear day for solar observation are some constrains in making space science observation. Space based data are very important to overcome such constrain. First work on space base data was done by using IRAS data in analyzing young stellar objects. Unbiased and (almost) all-sky coverage data are very important in studying the evolution of young stellar objects. Such pure science research can be done by using the on-line or on CD ordered data. For developing countries Indonesia, space science observation face another problem due to lack of sophisticated observational facilities. Moreover, in any research budget proposal sometime should be included the application (directly or indirectly) of the results, not purely science for science (except in the university). While fulfilling the affordable facilities, such as small telescope and data processing computers, the internet accessible space based data is very rich to be used in research for application. Solar physical dan Solar-Terrestrial Physical space based data mainly used in , what is called, "down-to-Earth" research application on space sciences, beside groundbased observation.

USING THE 45-CM TELESCOPE IN PARAGUAY

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In the present work we observed variable star DY Her δ Scuti type star using ST-8 CCD camera attached to the 45 cm telescope. We present the intermediate report by seven night observation for this variable star using software AIP4WIN to make data reduction.

WHAT DOES THE NONEXTENSIVE PARAMETER $q \neq 1$ STAND FOR IN SELF-GRAVITATING SYSTEMS?

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Self-gravitating systems are usually believed to be in the hydrostatic equilibrium rather than in the thermal equilibrium. In this work, the property of the nonextensive parameter q in Tsallis statistics is studied for the self-gravitating systems. We deduce for first time an explicitly analytic expression of the nonextensive parameter q based on the solid mathematical theory about the generalized Boltzmann equation and the q - H theorem and the generalized Maxwellian q -velocity distribution in the framework of Tsallis statistics. We thus obtain a clear physics of $q \neq 1$ concerning temperature gradient and the gravitational potential of self-gravitating systems, which is related to the non-isothermal nature of self-gravitating systems that the nonextensive parameter is $q \neq 1$ if and only if the temperature gradient is $\nabla T \neq 0$.

*The full text can be found at <http://arxiv.org/abs/nlin/0404039>

LINKING THE LITERATURE WITH ON-LINE DATA

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The astronomical literature has been searchable on-line for 10 years. One important aspect of the on-line literature is the connection to on-line data that are relevant to this literature. The ADS has been providing such links from the very beginning. Recent efforts of the Astrophysics Data Center Executive Committee (ADEC) in the USA has been focusing on extending this cross-linking between the literature and on-line data. This should make it easier to locate such data and to access them directly.

MAKING THE FULL TEXT OF THE ASTRONOMICAL LITERATURE AVAILABLE ON-LINE

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The Astrophysics Data System (ADS) is the major repository for much of the astronomical literature. All major journals and many smaller journals have been scanned back to volume 1 and are available on-line at no cost. We have currently about 2 million scanned journal article pages on-line.

In collaboration with a preservation project at the Harvard University Library we also make available historical observatory publications. We have currently about 300,000 pages of observatory publications on-line and expect to increase that to nearly 1 million.

We will describe some aspects of the scanning of journals and the technology of making the scans available on-line in various formats.

The scanned pages are currently parsed with Optical Character Recognition (OCR) software to create searchable text for all scanned articles. This will enable full text searching of the entire collection of articles in the ADS in the near future.

SUBARU TELESCOPE SCIENCE ARCHIVE SYSTEM: SMOKA

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Data archive is the system which keeps and supplies observational data for astronomical researches or educational purposes. We introduce the the Subaru-Mitaka-Okayama-Kiso-Archive (SMOKA) that is the science archive system maintained by Astronomical Data Analysis Center (ADAC) of National Astronomical Observatory of Japan (NAOJ).

Through the WWW, the SMOKA provides access to the data of the Subaru Telescope, the 188 cm telescope at Okayama Astrophysical Observatory (OAO), and the 105 cm Schmidt telescope at Kiso Observatory/University of Tokyo.

The SMOKA is primarily archives and distributions public data of Subaru Telescope. Subaru Telescope is an 8.2 meter optical-infrared telescope at the summit of Mauna Kea, Hawaii, operated by the NAOJ. Subaru has a suite of nine instruments providing imaging and spectroscopic capabilities over the full range of wavelengths from optical to mid-infrared. The data obtained with First Light instruments since January 1999 are registered in the SMOKA database. Some data of open use are also public. The user can now retrieve about 270,000 frames from the Archive of Subaru data.

The SMOKA also provides the CCD data of Spectro Nebular Graph (SNG), infrared imaging data of Okayama Astrophysical System for Infrared Imaging and Spectroscopy (OASIS) and the data of High Dispersion Echelle Spectrograph (HIDES) taken with the 188cm Telescope of OAO. Further, the SMOKA has also the data of the prime focus optical CCD cameras of the Kiso 105cm Schmidt telescope.

The SMOKA has three kinds of user interfaces; Simple Search, Advanced Search and minor bodies (MB) Search. In the Simple Search, a list of object name observed by each instrument is shown. The user can search data just selecting an object name. In the Advanced Search, the user can search data specifying various constraints simultaneously (object name, search radius, instruments, data type and so on). In the MB search, the user can search data of minor bodies in the solar system search. The interface enables the user to search data of objects which

move on the celestial sphere specifying various constraints simultaneously (object name, orbital elements, instruments and so on). Then, the user can browse the Quick-Look Images and Header Information (HDI) of each frame from the search result, and can search appropriate calibration frames from SMOKA Archive Search together with science frames.

Further, the user can also browse the data on weather, humidity, and temperature, which provide information of the image quality. A request for data can be submitted in a simple manner.

ESA'S SMART-1 MISSION AND INTERNATIONAL LUNAR EXPLORATION

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SMART-1 is the first of Small Missions for Advanced Research and Technology as part of ESA science programme "Cosmic Vision". Its objective is to demonstrate Solar Electric Primary Propulsion (SEP) for future Cornerstones (such as Bepi-Colombo) and to test new technologies for spacecraft and instruments. The spacecraft has been launched on 27 Sept. 2003, as an Ariane-5 auxiliary passenger. SMART-1 orbit pericenter is now outside the inner radiation belt. The current status of SMART-1 will be given at the symposium. After a 15 month cruise with primary SEP, the SMART-1 mission is to orbit the Moon for a nominal period of six months, with possible extension. The spacecraft will carry out a complete programme of scientific observations during the cruise and in lunar orbit.

We present first results from SMART-1's science and technology payload, with a total mass of some 19 kg, featuring many innovative instruments and advanced technologies. A miniaturised high-resolution camera (AMIE) for lunar surface imaging, a near-infrared point-spectrometer (SIR) for lunar mineralogy investigation, and a very compact X-ray spectrometer (D-CIXS) with a new type of detector and micro-collimator which will provide fluorescence spectroscopy and imagery of the Moon's surface elemental composition. The payload also includes an experiment (KaTE) aimed at demonstrating deep-space telemetry and telecommand communications in the X and Ka-bands, a radio-science experiment (RSIS), a deep space optical link (Laser-Link Experiment), using the ESA Optical Ground station in Tenerife, and the validation of a system of autonomous navigation (OBAN) based on image processing. SMART-1 lunar science investigations include studies of the chemical composition of the Moon, of geophysical processes (volcanism, tectonics, cratering, erosion, deposition of ices and volatiles) for comparative planetology, and high resolution studies in preparation for future steps of lunar exploration. The mission could address several topics such as the accretional processes that led to the formation of rocky planets, and the origin and evolution of the Earth-Moon system.

The SMART-1 observations will be coordinated with Japanese missions Lunar-A and SELENE, to answer open questions about comparative planetology, the origin of the Earth –Moon system, the early evolution of life, the planetary environment and the existence of in-situ resources necessary to support human presence (e.g. water, oxygen). With science and technology, SMART-1 can help in the preparation of robotic missions such as Chandrayaan-1, Chang'e, South Pole Aitken Basin Sample return, Reconnaissance orbiters and future soft landers, as well as a step towards human exploration of the solar system.

Keywords: Moon, planetary, science, technology, exploration, ESA, international

THE ESA XMM-NEWTON SCIENCE OPERATIONS CENTRE: ARE WE MAKING BASIC SPACE SCIENCE AVAILABLE TO THE WHOLE SCIENTIFIC WORLD?

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XMM-Newton is a major X-ray observatory of the European Space Agency (ESA). Its observing time is open to astronomers from the whole science community on a peer reviewed competitive basis. The Science Operations Centre, located at ESA's premises in Villafranca del Castillo, Spain, is responsible for the instrument operations, as well as for all the tasks related to facilitating the scientific exploitation of the data which the mission has been producing since its launch in December 1999. Among them, one may list:

- ◆ distribution of scientific data in different formats, from raw telemetry, up to processed and calibrated high-level science products, such as images, spectra, source lists, etc;
- ◆ development and distribution of dedicated science analysis software, as well as of continuously updated instrument calibration;
- ◆ regular organisation of training workshops (free of cost), for potential users of XMM-Newton data, where the procedures and techniques to successfully reduce and analyze XMM-Newton data are introduced;
- ◆ access to the data through state-of-the-art, in-house developed archival facilities, data retrieval is possible through the Internet or via CD-ROM;
- ◆ continuously updated documentation on all aspects of spacecraft and instrument operations, data reduction and analysis;
- ◆ maintenance of a comprehensive set of project web pages, with particular focus on the most important scientific results obtained by XMM-Newton;
- ◆ a competent and responsive HelpDesk, providing dedicated support to individual XMM-Newton users.

Everyone can be an XMM-Newton observer. So far, astronomers from 36 countries submitted observing programs. Public data can be accessed by every scientist in the world through the XMM-Newton Science Archive (XSA).

Despite all these efforts, one can't help noticing an asymmetric level of scientific exploitation in the realm of X-ray astronomy between developing and developed countries. The latter have traditionally enjoyed the comparative advantage of deeper know-how, deriving from direct experience in hardware and mission development. The XMM-Newton Science Operations Centre's efforts act to alleviate this situation through, for example, increasing the usage of the web for data and information dissemination, as well as by supporting actively such initiatives as the COSPAR Capacity-Building Workshops, specifically designed to create long-lasting bridges between researchers in developing and developed countries.

GENERALIZED SIMULATED ANNEALING METHOD AND ITS APPLICATION

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In this talk, I will briefly review the basic idea of generalized simulated annealing method (GSA). The efficiency of GSA is compared with the so-called fast and classical simulated annealing method through a few practical examples. We find that GSA is intrinsically better than the traditional simulated annealing method. Some application in the Thomson model and in materials science will also be discussed.

APPLICATIONS OF ASTRONOMICAL DATA IN CHINA

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Data applications in Chinese astronomical community including NASA/ADS data, CDS data and other astronomical data, especially, the data from space missions will be introduced in this talk. We have established several data mirror sites e.g. ADS mirror site, CDS mirror site etc. Those data facilities are greatly benefit to the astronomical users. We will report the situations of data applications e.g. users distribution, the data requirements, the frequency of the data using, and the investigation about the data resources and applications. He Beijing Astronomical Data Center is a service organization for Chinese community. It has collaborated with most of the astronomical organizations in China for instance, the Purple Mountain Observatory, The Shanghai Observatory and other astronomical stations to establish an astronomical data service network and serve all of the data we get for all Chinese astronomical community. We also join the Chinese Digital Library Project to offer many interested data to the public.

PUTTING THE "I" IN I*Y 2007

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The following text is contained in UN Document A/AC.105/823: Report of the Scientific and Technical Subcommittee (of UN COPUOS) on its forty-first session, held in Vienna from 16 to 27 February 2004, pages 27-29 (paras 151-158).

In accordance with General Assembly resolution 58/89, the Scientific and Technical Subcommittee considered agenda item 13, "Solar-terrestrial physics", as a single issue/item for discussion.

1. The representatives of Canada, China, Cuba, France, India, Japan and the United States made statements under the item.
2. The Subcommittee heard the following scientific and technical presentations on the subject of solar-terrestrial physics:
 - (a) "The Sun-Earth plasma environment", by the representative of Austria;
 - (b) "CORONAS-F: contribution to solar-terrestrial physics", by the representative of the Russian Federation;
 - (c) "The scientific importance and socio-economic efficiency of the implementation of programmes on solar-terrestrial physics", by the representative of the Russian Federation;
 - (d) "International Living with a Star (ILWS)", by the representative of the United States;
 - (e) "European view on International Living with a Star", by the representative of ESA;
 - (f) "Report of the Task Force on Radio Astronomy and the Radio Spectrum", by the representative of the Organisation for Economic Cooperation and Development.
3. The Subcommittee agreed that solar-terrestrial physics was important in exploring the solar corona and understanding the functioning of the Sun; understanding the effects that the variability in the Sun can have on the Earth's magnetosphere, environment and climate; exploring the ionized environments

of planets; and reaching the limits of the heliosphere and understanding its interaction with interstellar space. The Subcommittee also agreed that, as society became increasingly dependent on space-based systems, it was vital to understand how space weather, caused by solar variability, could affect, among other things, space systems and human space flight, electric power transmission, high-frequency radiocommunications, global navigation satellite system (GNSS) signals and long-range radar, as well as the well-being of passengers in high altitude aircraft.

4. The Subcommittee noted that severe magnetic storms resulting from coronal mass ejections had caused failures of many geostationary orbit communication satellites, radio blackouts and power outages on Earth. The Subcommittee agreed that the ability to predict space weather accurately could assist in preventing or minimizing impacts of severe magnetic storms on space-based services and systems and on ground power systems.
5. The Subcommittee noted that several scientific missions had been undertaken by space agencies to study the interactions between the Sun and the Earth. These included the Cluster mission, the Double Star mission, the Enhanced Polar Outflow Probe (ePOP), the Solar and Heliospheric Observatory (SOHO) and the Yohkoh mission.
6. The Subcommittee agreed that international cooperation in research and development activities in the field of solar-terrestrial physics was important to all countries, in particular developing countries, owing to the high cost of such activities.
7. The Subcommittee noted that the International Living with a Star (ILWS) initiative was a collaborative programme in solar-terrestrial physics that had been undertaken to stimulate, strengthen and coordinate space research to understand the governing processes of the connected Sun-Earth system as an integrated entity. ILWS consisted of an international fleet of more than a dozen international space missions acquiring data on the behaviour of that system by observing the Sun and its variability and measuring conditions in interplanetary space. The Subcommittee also noted that new space missions were under development to contribute to ILWS in the coming decade. These included the CORONAS-PHOTON project, the Picard micro-satellite mission, the Solar-B satellite and the Solar Probe, among others.

ASTROPHYSICAL THERMONUCLEAR FUNCTIONS FOR BOLTZMANN-GIBBS STATISTICS AND TSALLIS STATISTICS

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We present an analytic proof of the integrals for astrophysical thermonuclear functions which are derived on the basis of the Maxwell-Boltzmann distribution. Among the four different cases of astrophysical thermonuclear functions, those with a depleted high-energy tail and a cut-off at high energies find a natural interpretation in nonextensive statistical mechanics as developed by Tsallis. This nonextensive statistical mechanics seems to be a natural generalization of Boltzmann-Gibbs statistical mechanics. Consequences for astrophysical thermonuclear functions will be discussed.

THE DESIGN OF MALAYSIAN ASTRONOMICAL ROBOTIC OBSERVATORY

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The availability of powerful automated telescope and CCD Cameras have revolutionized observational astronomy, because of the technology's practical, economic, precise and efficient operation. ATSB on behalf of The Government of Malaysia has been initiated the realization of constructing Malaysian Astronomical Robotic Telescope for research and education purposes. The paper will describe the method of designing the observatory, from the beginning to the operation phases. The method of site selection, instrumentation selection and integration, communication concept via internet until the concept of operation will be explained in this paper.

DATA ARCHIVE AND ITS WEB-PAGE FOR TELA-BYTE NEO OBSERVATIONAL DATA

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Observations at the Bisei Spaceguard Center will soon produce tel-byte data per every month during NEO observations using 10 times 2kx4k CCD camera. Each image does not contain only asteroids but also the other interesting objects which are certainly interested by many people. We are now preparing data archive system to distribute those data for interested people. Here, we will show its current status and future using method.

MIRRORING THE ADS IN MOSCOW: EXPERIENCE, RESULTS AND PERSPECTIVES

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We describe the mirror site for the ADS Abstract Service (<http://ads.inasan.rssi.ru>) in the Institute of Astronomy, Moscow, Russia. We discuss the process of the ADS mirror installation and upgrade, as well as the software and hardware characteristics of the mirror server. In our report we present some statistics demonstrating the mirror site usage by Russian and FSU users. Our future plans are to use the faster Internet connection for Web-access to the ADS mirror and to improve and enlarge the data storage system.

RUSSIAN VIRTUAL OBSERVATORY

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The Russian Virtual Observatory (RVO) has been officially recognized as one of the key projects of the Scientific Council on Astronomy of the Russian Academy of Sciences since December 2001.

The ultimate goal of the RVO initiative is to integrate resources of astronomical data accumulated in Russian observatories and institutions, and to provide Russian data to the rest of the world. RVO will be merged naturally into the International Astronomical Observatory.

One of the principal goals of the project is to provide Russian researchers with on-line access to the rich volumes of data and metadata that have been and will continue to be produced by astronomical survey projects. RVO architecture, main tasks and roadmap are discussed in the presentation.

**PROPOSAL OF COOPERATIVE CCD OBSERVATIONS OF VARIABLE STARS
WITH SMALL TELESCOPES INCLUDING RELATED PROSPECTIVE
JAPANESE ODA ONES**

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The following are successively explained, with emphasis on the last item (3). (1) Reflecting Telescopes Donated by Japanese ODA, (2) Case of Ethiopia as an Example of the Present Application, (3) Importance of Cooperative Photometric Observations of Southern Variables by the Donated Telescopes.

IN SITU INVESTIGATION OF PLANETARY SUBSURFACE LAYERS: TECHNICAL TOOLS, MISSIONS, AND FUTURE DEVELOPMENTS

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Generally the exploration of a planet or other solar system object by space probes is a step by step process, beginning with fly-by probes, followed by orbiting satellites and subsequently by landers. While orbiter missions can provide a global view of the body and map the surface features, many key parameters are only accessible by landers, or at least need *in situ* measurements to calibrate the data obtained from remote sensing instruments. The next logical step in planetary research is the development of tools that allow access to subsurface layers, in order to measure variations in composition, thermo-physical properties, and other parameters with depth and time. Several types of tools can be applied to accomplish this goal: (i) drilling and coring devices; (ii) penetrators and hammering devices, and (iii) melting probes.

From the point of view of the scientific output a drilling and coring device would be preferable, because it preserves not only the original composition, but also the texture of the material. However, such tools are mechanically complicated and have a high power consumption as compared to the two other methods. Penetrators and hammering devices are preferable from the point of view of simplicity and power consumption.

The third probe type mentioned above can only be used for ice sheets or possibly permafrost layers with a low soil content. They are equipped with a heated tip, which provides the thermal energy to melt the underlying ice and thus to open a channel through which the probe can sink downwards, driven by its own weight. Such probes are mechanically rather simple, because they contain no moving parts like drill bits, etc., and also have a relatively low energy. Another big advantage of melting probes is the large penetration depth they can reach, which in principle is only limited by the length of the attached cable needed for power supply and data transmission and by the thickness of the ice sheet.

We describe first the current state of art regarding the development of subsurface tools for extraterrestrial bodies, with emphasis on instruments developed for the ESA missions ROSETTA, MARS EXPRESS, and BEPICOLOMBO. Subsequently, ongoing work aiming at the construction of melting probes for future planetary

missions to Mars and Jupiter's satellite Europa is presented. Finally tentative cooperation opportunities between European and Asian space research institutions are outlined.

THE HISTORY OF THE NASA ADS AND IT'S QUERY SYSTEM

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The NASA Astrophysics Data System Abstract Service (ADS) was conceived in the late 1980's, was finally constructed during 1992, and went on-line in 1993. From the beginning the ADS has used query techniques which substantially improve on the state of the practice.

We began using natural language querying with an extensive subject specific ontology and a combination of evidence technique for simultaneous queries. We quickly added the capability to perform remote joint queries with the SIMBAD database of astronomical objects operated by the Centre des donnees astronomique de Strasbourg.

By 1997 we had integrated a citation database into the query system, allowing queries such as: "what are the most heavily cited papers containing the phrase 'redshift survey'?"

In 2001 we completed implementing a set of second order bibliometric query operators, which, by using databases of citations, references, and article readerships, distil the collective judgements of thousands of astronomers. These operators may be combined, both with each other and with the standard query system to form a query algebra of great power.

SUN, MOONS AND PLANETS

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We highlight some of the significant scientific results of current and past space missions in the solar system. For the Sun, these missions include the *Ramaty High Energy Solar Spectroscopic Imager*, or *RHESSI* for short, the *Solar and Heliospheric Observatory*, abbreviated *SOHO*, *Yohkoh*, and *Ulysses* spacecraft. Missions concerned with the Moons and Planets include the *Apollo*, *Clementine*, *Deep Space 1*, *Galileo*, *Giotto*, the *Hubble Space Telescope*, *Lunar Prospector*, *Magellan*, *Mars Pathfinder*, *Mars Global Surveyor*, *Mars 2001 Odyssey*, *NEAR-Shoemaker*, and *Voyager 1 and 2* spacecraft.

There will be a thematic presentation of some of the most startling discoveries using an educational web site located at <http://ase.tufts.edu/cosmos/>. The material is arranged thematically within the Sun or Moons and Planets sidebars. For each theme, there is an overview, which gives pithy bullets describing the main discoveries; a tutorial that consists of an abridged form of the author's two recent books, *The Cambridge Encyclopedia of the Sun* (2001) and *The Cambridge Guide to the Solar System* (2003); and numerous spacecraft images and line drawings with thorough captions.

The presented themes for the Sun will include the motions within the solar interior, explosions on the Sun with their consequences for humans on Earth, and the warming and cooling of our planet by the Sun, from global warming to the ice ages. The themes for the Moons and Planets will include atmospheres and magnetospheres, impact craters and volcanoes, and water and possible extraterrestrial life.

EVOLUTION OF THE MEDIUM SIZE ICY SATELLITES

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Classification of the satellites according to:

- ◆ Orbital properties. This is related to the origin of satellites. The present-day satellites could be originated as the result of
 - Condensation of protoplanetary nebula (regular satellites);
 - Collisional evolution (collisional shards or re-accretion);
 - Capture.
- ◆ Size and density of the satellites. This is related to interval of pressure in the interiors as well as to composition of the satellites.
 - Large rocky satellites: Moon, Io, Europa. Density above 3000 kg m⁻³.
 - Large icy satellites: Ganymede, Callisto, Titan, Triton. Density about 2000 kg m⁻³.
 - Medium size icy satellites. Radii of the range 200 to 800 km. Density 1000-1700 kg m⁻³:
 - ❖ **Saturn: Mimas, Enceladus, Tethys, Dione, Rhea, Iapetus,**
 - ❖ **Uranus: Miranda, Ariel, Umbriel, Titania, Oberon,**
 - ❖ **Neptune: Protheus, Nereid,**
 - ❖ **Pluto: Charon.**
- ◆ Activity of the satellites as seen on their surfaces:
 - Unmodified: Traces of activity from the remote past only (Mimas, Rhea);
 - Modified: Present-day activity or recent activity (in the geological time-scale).
 - ❖ Observed volcanism (Io), and geysirism (Triton);
 - ❖ Tidal-originated surface features (Europa);
 - ❖ Depositing of external material on the surfaces (**Iapetus**).

Ice (better: ices) as the main component(s) of the **Icy Satellites**:

- ◆ 2D phase diagram of the water ice H₂O. Variables: pressure p, and temperature T.
- ◆ 3D phase diagram of a complex ice. Water-ammonia (H₂O)_{1-x}(NH₃) system as an important example. Variables: p, T, and concentration x.

Models of the internal structure of the satellites:

- ◆ Differentiated (Io, Europa, Ganymede),
- ◆ Partially Differentiated (Callisto),

- ◆ Non-Differentiated (smaller satellites that belong to the group of medium size satellites).

Sources of energy within the satellites:

- ◆ Gravitational energy:
 - Accumulated during accretion stage,
 - Produced as heat during self-compression from more porous to less porous state,
 - Produced as heat during differentiation process.
- ◆ Energy of the phase transitions in ice (does not concern the medium size satellites)
- ◆ Radiogenic energy (radionuclides are dispersed in mineral component but not in ice).
- ◆ Tidal energy of planet-satellite gravitational interaction.

Evolution of the satellites in the processes of:

- ◆ Gravitational differentiation from the primordial non-differentiated state to the present-day differentiated state.
- ◆ Solid-state flow of the high-viscous satellite-forming materials. It leads to:
 - Densification due to pressure- and temperature-driven closing of the pores.
 - Global scale convection (possibly Enceladus, Tethys, ...).
 - Sub-surface convection (Europa).

Self-references (a choice of) related to the icy satellites as well as to the physics of ice:

Czechowski, L., Leliwa-Kopystynski, J. *Celestial Mech. Dynamical Astronomy* **87**, 157-169, 2003.

Leliwa-Kopystynski, J., Maruyama, M., Nakajima, T. *Icarus* **159**, 518-528, 2002.

Leliwa-Kopystynski, J., Kossacki, K. J., *Planet. Space Sci.* **48**, 727-745, 2000.

Leliwa-Kopystynski, J., Kossacki, K. J., *Planet. Space Sci.* **43**, 851-861, 1995.

Leliwa-Kopystynski, J., Makkonen, L., Erikoinen, O., Kossacki, K. J., *Planet. Space Sci.* **42**, 545-555, 1994.

Kossacki, K. J., Leliwa-Kopystynski, J. *Planet. Space Sci.* **41**, 729-741, 1993.

The most important results of these papers will be presented.

SPACE ASTRONOMY OBSERVATIONS ON BOARD OF CHINESE SPACECRAFT OF SZ-2

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A Space Astronomy Monitor System was operated on board of Chinese Spacecraft of SZ-2 in order to detect gamma-ray bursts and solar flares. The monitor system comprises 3 detectors with the name of SXD, XD and GD, which cover the energy band of 0.2-2keV, 10-800 keV and 300keV-10 MeV respectively. SZ-2 was launched in 10 Jan 2001 on the orbit of 400km with the inclination of 42° and stop the data retrieval in 25 June. During the period, the monitor system successfully observed a lot of burst like events, including tens of gamma-ray burst, a hundred of solar flare events and so on. The system also recorded the particle precipitate events during the recent solar activity cycle. The introduction of the monitor system and the relevant results will be presented.

**ACTIVITIES OF DEVELOPMENT, AND UTILIZATION OF GOTO 45-CM
REFLECTOR AND NEW INSTRUMENTS AT BOSSCHA OBSERVATORY,
LEMBANG, INDONESIA**

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The GOTO 45-cm (F 12.0) cassegrainian reflector, now in its fifteenth year of operation, has been used for photoelectric photometry and, to some aspects mainly of educational purposes, photographic spectroscopy. Several imaging type of observation either video or integrated CCD have been explored between 1993-1999. With the acquirement of a CCD camera in 1999, its utilization has been enhanced and extended to imaging type of observations.

Obsolescence in control system has been suffered by this telescope since 1995 and, therefore, replacement of old system along with introduction of a modern control system. The telescope has been extensively used to base activities on instrument development and testing, i.e. compact low and high resolution spectrograph, astro-video, CCD photometric system and fiber optics.

This talk describes aspects of present development of the telescope and its new auxiliary instruments with emphasize in the utilization of a versatile compact spectrograph both for research and educational activities.

THE SOUTHERN AFRICAN LARGE TELESCOPE

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The Southern African Large Telescope (SALT) is a 10-m class spectroscopic survey telescope currently under construction by South Africa and its international partners. SALT has adopted the design paradigm of the Hobby-Eberly Telescope (HET), with a number of adaptations based on the HET experience. This talk will describe the main design features of SALT, and the progress to date in the construction of this new large scale facility, which is due to be commissioned in 2005.

ON GENERALIZED FRACTIONAL KINETIC EQUATIONS

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In a recent paper the authors developed the solution of three generalized fractional kinetic equations in terms of the Mittag-Leffler functions. The object of the present paper is to further derive the solution of further generalized fractional kinetic equations. The results are obtained in a compact form in terms of generalized Mittag-Leffler functions. Their relation to fundamental laws of physics is briefly discussed.

UNIFIED FRACTIONAL KINETIC EQUATION AND A FRACTIONAL DIFFUSION EQUATION

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In earlier papers the authors derived the solutions of a number of fractional kinetic equations in terms of generalized Mittag-Leffler functions which extended the work of Haubold and Mathai (2000). The object of the present paper is to investigate the solution of a unified form of fractional kinetic equation in which the free term contains any integrable function $f(t)$, which provides the unification and extension of the results given earlier by the authors. The solution has been developed in terms of the Wright function in a closed form by the method of Laplace transform. Further, we derive a closed-form solution of a fractional diffusion equation. The asymptotic expansion of the derived solution with respect to the space variable is also discussed. The results obtained are in a form suitable for numerical computation.

JAPANESE CURRENT AND FUTURE LUNAR MISSIONS

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We are preparing two lunar missions: Lunar-A and Selene. The Lunar-A aims to study the lunar interior using two penetrators which contain seismometers and heat flow probes. The Selene aims to make global mapping of various geophysical and geological data using 14 remote sensing instruments. Although the launch dates of the above missions are being reconsidered in association with recent reorganization of Japanese space agencies, we are also planning future lunar missions like a soft-lander mission and a lunar network mission. We believe these missions provide the important data for better understanding the origin and evolution of the Moon and for acquiring technologies for human expansion to outer space from the Earth.

ASTROGRID: BUILDING A WORKING VIRTUAL OBSERVATORY

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AstroGrid is a £7.7 million UK funded project to build a working Virtual Observatory for UK and worldwide astronomers. The project is heavily involved in the International Virtual Observatory Alliance, helping to shape decisions and design architectures which will ensure that VO projects across with world can inter-operate.

This talk will present the background to AstroGrid, how we have gone about designing and building the infrastructure, the initial science problems we are trying to solve and the current state of development. It will further show how the components that make up AstroGrid can be taken by other VO projects and used to extend the VO anywhere there are data and tools to be shared or research to be undertaken. The talk will also touch briefly on where we see AstroGrid and other VOs going in the future.

AN INTERNATIONAL CONCURRENT DESIGN CAPABILITY FOR THE DEVELOPMENT OF SPACE MISSIONS

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We propose to coordinate and develop a Team X concurrent and interactive demonstration of the early design stages of a Mars Sample Return Mission. The demonstration will include a remote video conferencing link and data link between Team X located at JPL and the UN Workshop located in Beijing, China. The purpose of this demonstration is to establish a proof of concept for a concurrent mission design across international boundaries. This concept is an important step in establishing a capability for common mission designs with international agencies.

SPACE SCIENCE AND TECHNOLOGY BENEFITS

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The role of space exploration in societal and economic benefits is discussed. Three major pillars of the space science programs are taken into consideration:

- ◆ technology driver and spin-off benefits;
- ◆ generator of non-tangible assets to become values in the post-industrial era;
- ◆ provider of security.

Examples are given for cases of space powers, space-faring and developing countries. Particular details are given for the recent progress in the development of the European space policy. The conclusions suggest the real efficiency of the space science development within a country and globally.

LIUVILLE DYNAMICS AND GENERALIZED THERMOSTATISTICS

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We revisit some aspects of the foundations of the q -non-extensive thermostatical formalism which are particularly relevant to its astronomical applications. Escort mean values and escort distributions constitute fundamental ingredients of the q -generalized non-extensive thermostatics, and their dynamical properties play a fundamental role when applying the generalized non-extensive maximum entropy principle to the study of astrophysical N -body systems like galaxies. Here we analyze some important features of escort mean values and escort distributions, in connection with the dynamical evolution of ensemble probability distributions associated with the statistical description of general classical dynamical systems. Furthermore, we compare the roles played by escort mean values and escort distributions when studying classical N -body systems at the levels of (i) the Liouville equation and (ii) the Vlasov equation. We pay special attention to the q -invariant aspects of these evolution equations. In particular, we show that for dynamical systems of constant phase space flow divergence, the dynamics associated with the Liouville evolution equation is q -invariant.

MIRRORING TECHNIQUE AND OTHER MIRROR SITE ISSUES

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The bandwidth in India and the developing world is quite expensive. Internet bandwidth in India can cost five to ten times as much as it does in the United States. The Indian users have to go to either US sites or European sites for even simple downloads using their meagre bandwidth available to them. Thus mirroring is of vital importance for improved availability, response time and of course, to save bandwidth.

IUCAA (University Centre for Astronomy and Astrophysics) was established in 1988 as a premier centre to promote Astronomy and Astrophysics in India. It extends state of the art computing and library facilities to our Associates from the Indian Universities and visitors from India and abroad. By setting up mirrors of ADS (Astrophysics Data System) and VizieR (that provides access to the most complete library of published catalogues) in IUCAA, we aim to bridge the gap between the download sites and the users. Having mirror sites related to Astronomy and Astrophysics in IUCAA have helped the Indian Astronomers and Astrophysicist to have fast access to current scientific information within India. ERNET (Educational and Research NETWORK) has set up a backbone network for connecting Universities, educational and research institutions in India. IUCAA is one of the 14 backbone ERNET centres in India. The main aim of ERNET is to be a content oriented network. We envisage setting up mirror sites in different branches of science in all corners of India where ever ERNET has backbone centres so that our Indian scientific and academic communities get the access to the information within India, thus saving the precious bandwidth.

Various public domain mirroring tools are available on the Internet. The main purpose of mirroring tools is to replicate the content of one server (source) and to other geographically distributed servers (mirrors) and to maintain the consistency between the mirrored servers and the source server. The commonly available mirroring tools such as wget and rsync which are available under GPL license; mirror program from Imperial College, London; will be discussed in detail.

There are many incentives/motives to replicate/mirror data at the present time. They are: 1. Load balancing; 2. High availability; 3. Multilingual replication; 4. Franchises/Local Versions; 5. Database Sharing; 6. Virtual Hosting and 7. Maintaining Pseudo Identities.

Issues such as performance, cost, optimization and data integrity related to mirroring will be explored. I will conclude by sharing my experience in setting up ADS and Vizier mirror sites in IUCAA.

METASTABILITY OF ASTROPHYSICAL ELECTRON-NUCLEAR PLASMAS: CONDITIONS AND SIGNALS

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We discuss the condition of minimum of free energy density of an electron-nuclear astrophysical plasma (like a stellar core) and its implication with the appropriate momentum distribution function to be used in the evaluation of atomic and nuclear rates. We discuss physical processes, taking place in such a plasma, that can be described by considering its state as a stationary, non-Maxwellian, non extensive, stable (or metastable) state, with a good agreement with the experimental observations.

SELF-INTERACTING DARK MATTER IN THE $SU(3)_C \times SU(3)_L \times U(1)_N$ MODELS

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We investigate the possibility that dark matter could be made from CP -even and CP -odd Higgs bosons in the $SU(3)_C \times SU(3)_L \times U(1)_N$ (3-3-1) model with right-handed neutrinos. This self-interacting dark matters are stable without imposing of new symmetry and should be weak-interacting.

VARIATION OF THE SOLAR NEUTRINO FLUX OVER TIME IN THE HOMESTAKE, GALLEX (GNO), SAGE, AND SUPER-KAMIOKANDE EXPERIMENTS

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Up to now, many technical papers have been written about the possibility of a periodic time variation in the fluxes of the neutrinos from the Sun. A paper, which suggests that these fluxes might vary quasi-biennially was published by Sakurai in 1979 by using the observational records obtained at Homestake. In this paper, a possible causal relation was suggested between this periodic variation in the fluxes of the solar neutrinos and the time variation of the sunspot activity, though the latter was always delayed from the former by about half a year. Since 1979, observational records of additional radiochemical and real time solar neutrino experiments became available for analysis. Today's analysis of the records of Homestake, Gallex (GSO), SAGE, and Super-Kamiokande experiments confirm the existence of a harmonic content in the data, including a quasi-biennial variation.

SEARCH AND STUDY OF THE PROPERTIES OF COMPACT GROUPS OF GALAXIES IN PUBLIC GALAXY CATALOGS

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New computer code has been developed to find compact groups of galaxies in galaxy redshifts catalogs. The code is applied to public catalogs available in the Internet, such as the 2dF and LEDA, as well as to other catalogs. The resulting lists of groups are then compared to the most recent results obtained with the *Friends of Friends* algorithm (the code most commonly used for this kind of studies) for the 2dF catalog. Considerable emphasis is made to study the degree of compactness and isolation of the groups, since these parameters are very important for finding probes to study the evolution of galaxies in isolated regions of space. This work is presented as an example of the kind of projects that can be done with the use of public astronomical data. A similar example of the use of astronomical space data will also be discussed.

UNIFIED FRACTIONAL KINETIC EQUATION AND A FRACTIONAL DIFFUSION EQUATION

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In earlier papers, Saxena, Mathai and Haubold [**Astrophysics and Space Science 282 (2002), 281-287** and **Physica A (2004)**] derived the solutions of a number of fractional kinetic equations in terms of generalized Mittag - Leffler functions which extended the work of Haubold and Mathai [**Astrophysics and Space Science 273 (2000), 53-63**]. The object of this paper is to investigate the solution of a unified form of fractional kinetic equation, in which the free term contains an integrable function $f(t)$, which provides the unification and extension of the results mentioned in the above two papers. The solution has been developed in terms of the H function in a closed form by the method of Laplace transform. Further we derive a closed – form solution of a fractional diffusion equation. The asymptotic expansion of the derived solution with respect to the space variable is also obtained. The results derived are in a form suitable for numerical computation.

WORLD SPACE OBSERVATORY: STATUS REPORT

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The World Space Observatory project model was first introduced in the 5th UN/ESA workshop. Over time, the original concept has been further developed to evaluate how such project could become a reality. An assessment study has been made of the WSO-Ultraviolet (WSO/UV) as this was considered the best implementation model since the world-wide need for such project in the astrophysics community clearly exists. Therefore WSO/UV presents the best chance of success for the next stage in the accelerated BSS evolution needed for sustainable development in the pre-industrial countries. The WSO/UV Implementation Committee (WIC), composed of scientists from some 14 countries, is the leading organization in this project. The implementation model for WSO/UV and highlight the scientific importance as well as some technical details and the plans for the future are described.

THE URUGUAYAN AUTOMATED AND ROBOTIC TELESCOPE "B U S C A"

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The efforts to discover NEOs have been concentrated up to now in the Northern Hemisphere where there are already 6 big NEO surveys functioning. The Observatorio Astronómico "Los Molinos" obtained a grant to install a new observatory dedicated to the NEO survey in the countryside of Uruguay (South America). The new telescope has started operations in mid 2002. The name of this program is "Búsqueda Uruguaya de Supernovas, Cometas y Asteroides - BUSCA".

NONEXTENSIVE STATISTICAL MECHANICS: INTRODUCTION AND DYNAMICAL FOUNDATIONS

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Exponential sensitivity to the initial conditions suffices for understanding the essential of the dynamical foundations of Boltzmann-Gibbs statistical mechanics. But it appears to be not necessary for having a meaningful statistical mechanics. Indeed, power-law sensitivity (which corresponds to an entropic index q different from unity) yields, in a variety of natural and artificial complex systems, to the nonextensive generalization of BG entropy and statistics. We shall briefly introduce the subject and discuss its state of the art. Specific mention will be made to systems long-range interactions and astrophysical applications.

THE FUTURE OUTLOOK OF SPACE ASTROPHYSICS

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The global future of space astrophysics is explored. This is done taking into consideration the existing plans of the space agencies which are currently involved in the development and operation of space missions for Astrophysics. This is considered against the context of the historical -the past 50 years- evolution of Space Astrophysics. The relation (complementary or otherwise?) of future space facilities and ground facilities is also highlighted and we will try to clarify what the expectations can be for the scientific community and in which way the present instrumentation is preparing us for the future.

THE ESA SCIENTIFIC PROGRAMME

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The history, present and future of the ESA Scientific Programme will be presented. Its organizational structure and its implementation process will be illustrated. Scientific highlights of the various missions will be identified. The present status of the Programme is extremely exciting, with missions studying the Sun and Heliosphere (*SOHO*, *Cluster* and *Double Star*) in orbit, *Huygens* ready to enter the Hydrocarbon atmosphere of Titan, the only spectroscopic X-ray mission (*XMM-Newton*), the first Comet Lander (*Rosetta*) on the way to an extended encounter with Comet 67P/Churyumov-Gerasimenko, the *Mars Express* mission orbiting Mars, and *Smart-1* on the way to the Moon. The near future will show the launch of *Herschel/Planck* studying in unprecedented detail the IR Universe and the CMB, as well as the *Venus Express* in preparation. Also the importance of the archival value of these missions in the ESA Science Programme will be illustrated through examples and expectations. The presence of many international collaborations represents an important enrichment to the global value of the Programme.

MAXIMUM INFORMATION GROWTH AND LEAST ACTION PRINCIPLE FOR NONEQUILIBRIUM SYSTEMS

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A path information is defined in connection with different possible paths of chaotic system moving in its phase space between two cells. On the basis of the assumption that the paths are differentiated by their actions, we show that the maximum path information leads to a path probability distribution as a function of action from which the well known transition probability of Brownian motion can be easily derived. This probability distribution shows that the most probable paths are just the paths of least action, which suggests that the principle of least action, in probabilistic situation, is equivalent to the principle of maximization of information or uncertainty.

It is shown that the above path information can be related to the difference of entropy between the two cells, where the entropy is defined *à la Shannon* with the natural invariant measure of the nonequilibrium system evolving between the two cells. Hence the principles of least action and of maximum path information suggest the maximum entropy change in order to derive the most probable invariant measures for nonequilibrium systems.

The above result is applied to some chaotic systems evolving in fractal phase space for which a relative entropy change is given by $R = \sum_i p_i - \sum_i p_i^q$, where q is a positive real parameter characterizing the geometrical features of the phase space and p_i a natural invariant measure. This entropy change can be related straightforwardly to several generalized entropies (Renyi, Tsallis, for example). Its maximization (or extremization) with appropriate constraints can lead to several power law measures for complex dynamic systems.

THE IMPACT OF HIGH SPATIAL RESOLUTION AND SPECTROSCOPY IN X-RAYS ON AGN

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Recent high resolution spatial and spectroscopic experiments in the X-rays have improved substantially our understanding of the physical processes in active galactic nuclei (AGN). In this talk, the main results obtained by Chandra and XMM observatories are critically reviewed, with respect to the physics of massive outflows, the X-ray line emitting plasma and the structure of relativistic jets in AGN. Major issues raised by recent observations are outlined. A number of key problems that can be solved by next generation X-ray observations are discussed with emphasis the needs of multi-wavelength observations.

THE OBSERVATIONAL STUDY OF BINARY ASTEROIDS

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The asteroids represent the only existing remnant planetesimals during the formation of the solar system. So the physical study of asteroids can help us to understand the formation and evolution of the solar system and itself fairly. The physical parameters of binary asteroids contained direct information of collision are more important.

In order to detect the binaries in main belt, some C-type asteroids with intermediate size were observed. The richness of binaries in main belt and the mechanism of formation will be the important data for the study of asteroids' evolution and formation in future. Up to now, two asteroids among the targets we have observed are suspected binaries. Such observation will be continued, and the advanced research work will also be continued in future.

LONG-TERM TRENDS OF THE IONOSPHERE OBSERVED AT CHONG-QING, CHINA

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With long-term ionosonde records from 1947 to 2001 at Chong-qing, China, we show long-term trends of the ionospheric parameters, the E-layer critical frequencies foE , F1-layer $foF1$ and F2-layer $foF2$, the E-layer height $h'E$, and the F2-layer peak height $hmF2$, respectively. Using an approach of discrete wavelet decomposition arithmetic, we have got the long-term components in the variations of the ionospheric parameters. It does exist nearly linear long-term decreasing trends of above ionospheric parameters from 1947 to 1990, then a nearly linear increase from 1990 to 2001. The decreases are approximately by 0.35MHz, 0.4MHz, 2MHz, 20km, respectively, for foE , $foF1$, $foF2$ and $hmF2$, but increase by 4km for $h'E$, from 1947 to 1990. Simultaneously, we find similar long-term trends in the variations of 10.7cm solar radio flux and sunspot number. The long-term components of the ionospheric parameters have extremely high correlation with that of 10.7cm solar radio flux and sunspot number. This implies that solar activities are the control factor of the long-term trends of the ionosphere. We confirm above results with the long-term data from Slough station, UK.

MAGNETIC FIELD AND SOLAR ACTIVITIES

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The magnetic field plays a key role of solar activities in the solar atmosphere and also the space weather. In this paper, the solar magnetic fields and the relationship with solar activities (such as, solar flares and coronal mass ejections) have been presented based on observations of the Huairou Vector Magnetograph at National Astronomical Observatories of China, SOHO, TRACE, and Yohkoh Satellites etc.

The following problems will discussed:

1. The diagnostics of vector magnetic fields in the solar atmosphere and the corresponding researches in China.
2. The configuration of magnetic field and the relationship with electric current and magnetic (current) helicity in solar atmosphere inferred from the observational data.
3. The possible processes on the storage, development and relax of non-potential magnetic energy in solar active regions and the relationship with solar eruptive phenomenon, such as flares and coronal mass ejections.

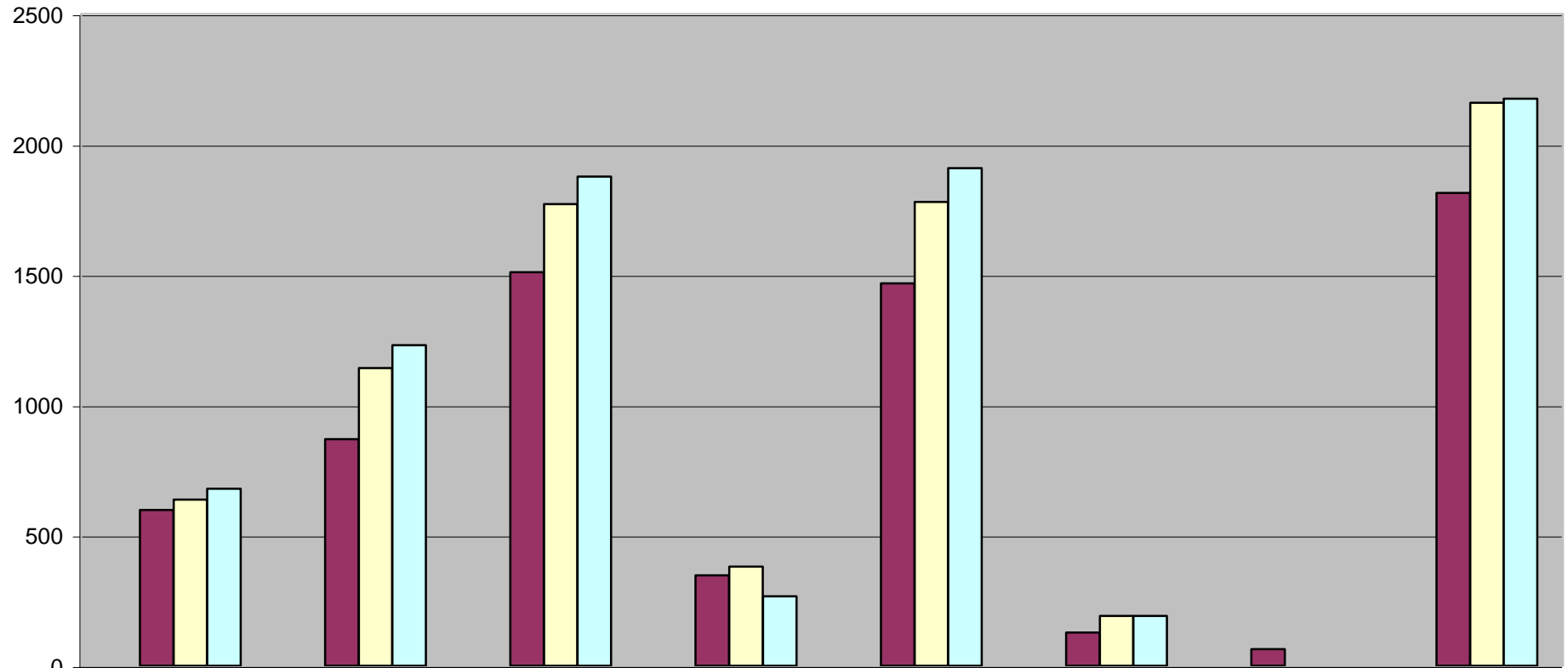
GAMMA-RAY BURST ASTROPHYSICS AND CHINA'S FUTURE SPACE MISSIONS ON HIGH ENERGY ASTROPHYSICS

S. N. Zhang

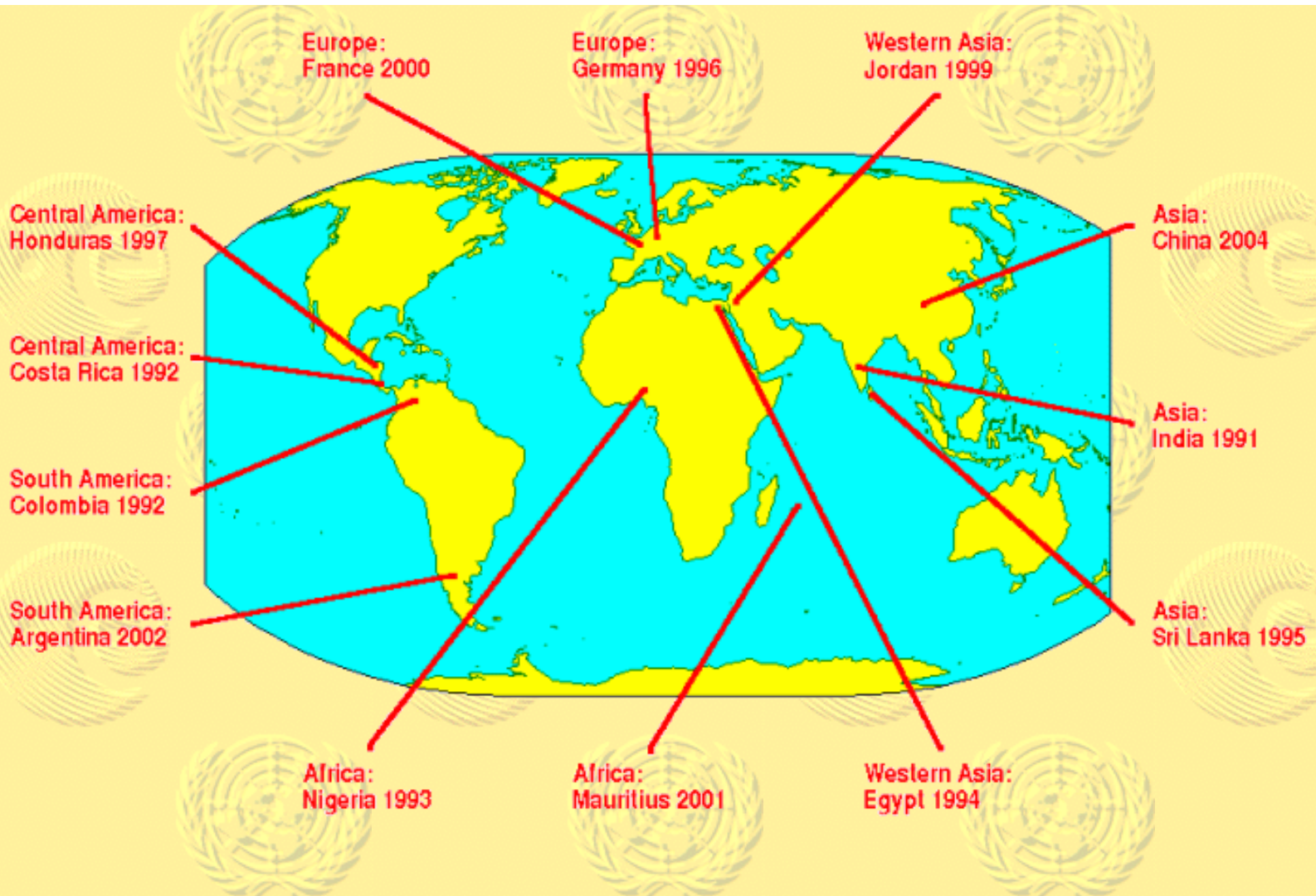
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A major class of gamma-ray bursts have been identified to be produced at cosmological distances, and thus may be used to probe the conditions of the early Universe, such as the ending of the "dark age" of the Universe, as well as the formation and evolution of the earliest stars and black holes. Two future space missions on high energy astrophysics in China are under intensive development, which will make significant contributions to the study of black holes, neutron stars, gamma-ray bursts and many other high energy astrophysical phenomena mechanisms.

BSS Database Statistics



	Contacts NO eMail Addresses	Contacts WITH eMail Addresses	Hard Copy Mailings	Non-Active	Active	Member States CONTACTED	Member States NOT Contacted	Total Dabase Count
■ 1989	0	0	0	0	0	0	0	0
■ 25-Jun-03	598	869	1510	347	1467	127	64	1814
■ 01-Jan-04	637	1142	1771	380	1779	191	0	2159
■ 11-May-04	679	1230	1876	266	1909	191	0	2175



Of the 191 countries that are Member States of the United Nations, "nearly 100 have professional or amateur astronomical organizations. Only about 60 of these countries, however, are sufficiently involved in astronomy to belong to the International Astronomical Union. Only about 20 countries, representing 15% of the world's population, have access to the full range of astronomical facilities and information. This does not include most of the Eastern European, Baltic, and former countries of the Soviet Union, whose fragile economies keep them from achieving their full potential, despite the excellence of their astronomical heritage and education."

(John R. Percy, IAU, Mercury, Vol. 24, 1995, No. 2, p.15)

Please send all comments to [H. J. Haubold](#) and [W. Wamsteker](#) for content and to [A. Haubold](#) for implementation.



[Decadal Report Developing Basic Space Science World Wide](#)

This Webpage was originally developed by [Rudolf Albrecht](#) of the [Space Telescope European Coordinating Facility](#) in February/March 1994. It was the first Webpage in the United Nations System and was registered with *What's New With NCSA Mosaic* on March 22 1994.