

THE NETWORK OF ULTRAVIOLET ASTROPHYSICS

NUVA Final Report – Porto'2008

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Objectives for FP6 and degree of fulfillment

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1. Formulate and operate an UV astronomy network
2. Exploratory analysis to define the scientific requirements for the future
3. Plan a road map
4. Critical assessment of the publicly available information in various archives

Formulate and operate an UV astronomy network

About 200 European astronomers participate in NUVA activities

The NUVA site: www.ucm.es/info/nuva

The NUVA has organized two internal meetings on UV science (Madrid, September 2004) and UV instrumentation (Madrid, November 2005)

The NUVA has collaborated actively in the organization of the Joint Discussion on "*The Ultraviolet Universe: stars from birth to death*" held at the IAU General Assembly in August 2006

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Formulate and operate an UV astronomy network

After the last session of the last day

The young generation


Small parallel meetings



El Escorial Conference May 2007

117 attendants

Astrophysicists (theorists, observers and instrument developers)

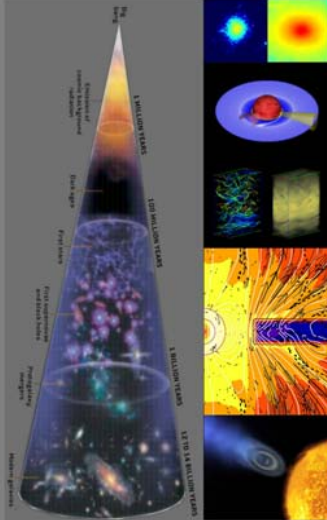


URL: <http://www.mat.ucm.es/UVConf>

SPACE ASTRONOMY: THE UV WINDOW TO THE UNIVERSE

dedicated to Dr. Willem Wamsteker

El Escorial, Spain May 28 – June 1, 2007



Key scientific problems in modern astrophysics require access to the UV range to be properly addressed. For instance, such issues are the **chemical enrichment of the Universe**, the nature of **astronomical engines**, the formation and remote detection of life-sustainable systems, and the determination of the distribution of **diffuse matter in the Universe (from ISM to IGM)**. The scientific objective of this meeting is to identify the key UV observables to ensure progress in astrophysics, and to specify the instrumentation required to obtain them.


We are limiting the spectral range considered as UV from slightly shorter than the Lyman limit to approximately 320 nm (the atmospheric limit). In this range one encounters the electronic transitions of the most abundant molecules and the signatures of plasmas from 3000 to 30000K. We do not intend to restrict the redshift range of the objects to be discussed, thus even high-*z* objects would be included in the discussion even though their intrinsic features would be emitted at wavelengths much shorter than the Lyman break.

New existing or planned UV instruments will be discussed, that will provide critical observations to address and solve the scientific issues mentioned above and an essential complement to interpret data at longer wavelengths that will be gathered by next-generation large ground-based and space-based telescopes. The role of numerical simulations in our understanding of the major observables will also be addressed.

To guarantee the proper interaction of instrumentalists with observers and theorists there will be three special afternoon sessions devoted to edge science (the cosmic web, dark energy, magnetic stability and extrasolar planets) and instrumentation (increase detector sensitivity, coatings, optical designs, large UV gratings and frontier projects such as the UV Lunar Observatories or UV interferometry).

Scientific Organizing Committee:

- Ana I. Gómez de Castro – co-chair (Universidad Complutense de Madrid, Spain)
- Neha Brode – co-chair (the Wise Observatory, Israel)
- Martin Barstow (Univ. of Leicester, UK)
- Luciana Bianchi (GALEX, USA)
- Alex Brown (Univ. of Colorado, U.S.A.)
- Jose Cernicharo (IEM-CSIC, Spain)
- Jean Clavel (ESA)
- John Davies (OPTICON)
- John Dyson (Univ. of Leeds, U.K.)
- Roger Ferlet (IAP, France)
- Gerry Gilmore (IoA, Cambridge, U.K.)
- Xiaowei Liu (Peking University, P.R. China)
- Jayant Murthy (IIT, India)
- Isabella Pagano (CAO-INAF, Italy)
- Nino Panagia (CAO-INAF, Italy)
- Jasen Prochaska (Lick Observatory, U.S.A.)
- Jose Miguel Rodríguez-Espinoza (IAC, Spain)
- Bores Shustov (INASAN, Russia)
- James Stone (Univ. of Princeton, U.S.A.)
- Affred Vidal-Madjar (IAP, France)

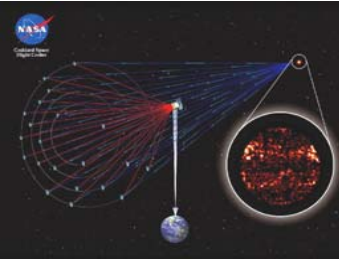


Local Organizing Committee:

- Ana I. Gómez de Castro (UCM-CSIC), co-chair
- Miguel Mas-Hesse (CSIC-CAD, LAEFF), co-chair
- Manuel Corradi (UCM)
- Elena de Castro (UCM)
- Luis Colla (DAMIR-IEM, CSIC)
- Ángeles Díaz (UAM)
- Benjamin Montesinos (CSIC, LAEFF)
- Paco Navarro (DAMIR-IEM, CSIC)
- Eva Verdugo (ESAC)
- Julia Coloma (IAG-CNSC)
- Anna Willis (ESAC-Conference Secretary)
- Monica Oerkz (ESAC)

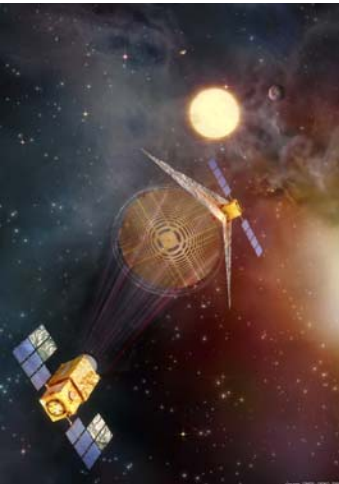


Formulate and operate an UV astronomy network

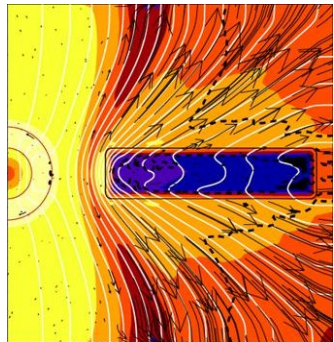
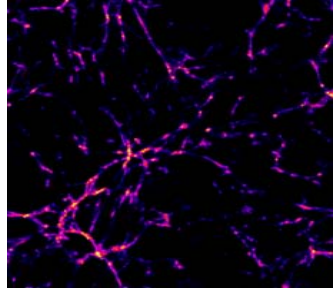


Attendants included team members from:

- ongoing missions: GALEX, FUSE, HST
- coming UV missions/instruments: HST/COS, UVIT, WSO-UV
- projects for future missions: Stellar And Galactic Environment survey (submitted to ESA's recent call), Stellar Imager (NASA) or Fresnel Interferometer Imager (submitted to ESA's recent call) plus the on-going NASA projects (MUST...)



Exploratory analysis to define the scientific requirements for the future



Key topics requiring UV instrumentation:

1. Determination of the distribution of diffuse baryonic matter in the Universe (up to $z=2-3$), its physical properties and its chemical composition.
2. Evolution of astrophysical disks to understand the role of the “disk-source of gravity” interaction in driving the observed outflows and to understand the evolution of disks when they become passive (specially in protoplanetary systems)
3. Atmospheres of extrasolar planets and astrochemistry in strong UV fields

Exploratory analysis to define the scientific requirements for the future

Books:

Summary on UV science is published by Springer-Verlag in 2006:

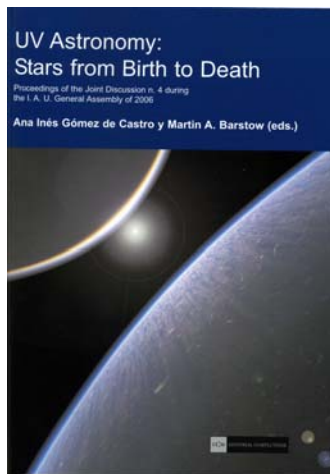
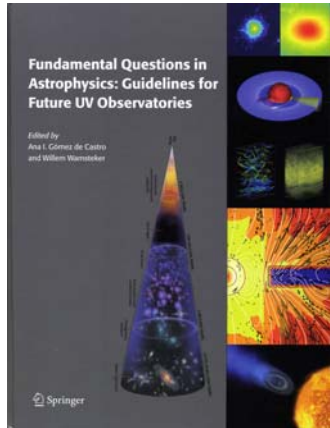
“Fundamental Questions in Astrophysics: Guidelines for future UV Observatories”

Eds. Ana I Gómez de Castro & Willem Wamsteker
ISBN:1-4020-4838-6

Scientific Proceedings of the Joint Discussion n.4 during the I.A.U. General Assembly of 2006 are published by the Editorial UCM in 2007:

“UV Astronomy: Stars from birth to death”

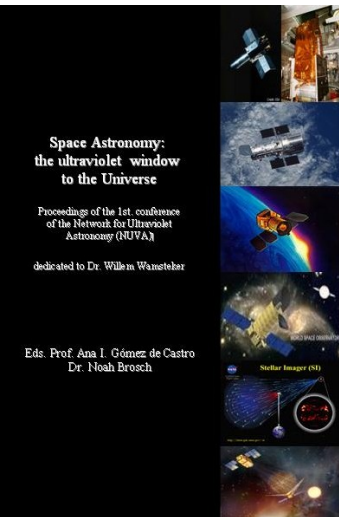
Eds. Ana I. Gómez de Castro & Martin A. Barstow
ISBN:978-84-7491-852-6



Exploratory analysis to define the scientific requirements for the future

Scientific proceedings of El Escorial conference:

“Space Astronomy: the UV window to the Universe”
Eds. Ana I Gómez de Castro & Noah Brosch
Springer-Verlag



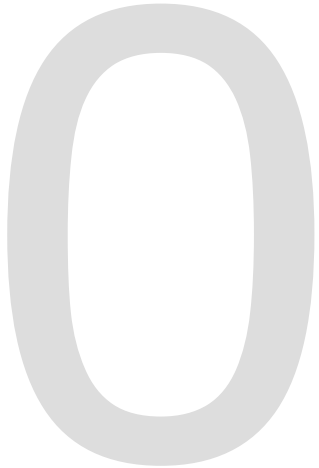
Plan a road map

Instrumentation with the highest discovery potential:

- High resolution spectroscopy
- High resolution imaging coupled with integral field spectroscopy

Time scales for instrumentation:

- In the next 10 years, on-going projects with collecting surfaces of $\sim 3\text{m}^2$, and highly efficient optics (HST/COS, WSO-UV).
- From 2020 on, large projects intended to increase the collecting surface by a factor of 10. An overlap with other spectral ranges as well as international collaboration is seek for (budget > 1000 Meuro)



Plan a road map

Understanding the Community needs:

On-line questionnaire facts:

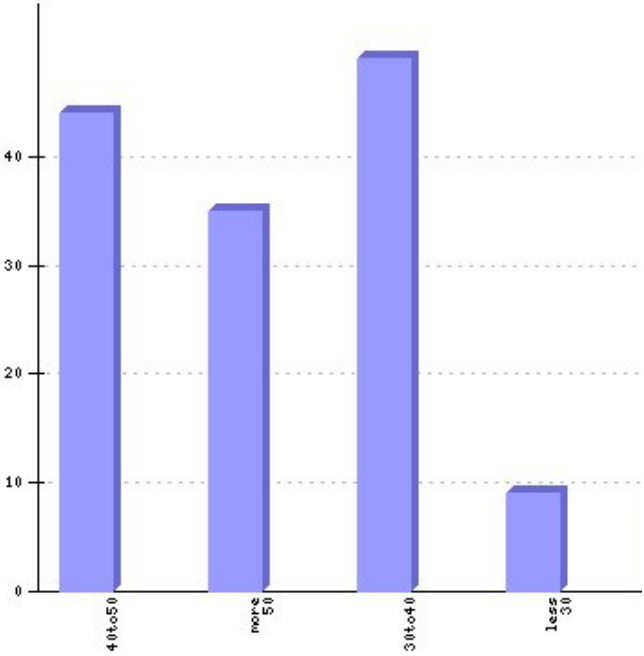
- Already answered by ~160 astronomers worldwide of those 122 European
- Europeans most interested in UV astronomy: Italy, Spain, France, The Netherlands and UK
- Foreigners more interested USA and Russia.
- Most of the astronomers demanding UV instrumentation recognize themselves as primary “optical astronomers”
- The astronomers demanding UV facilities are in the 30 to 50 years old age range
- The most demanded instrumentation is spectroscopy and them imaging
- The scientific background is stellar or extragalactic astrophysics.

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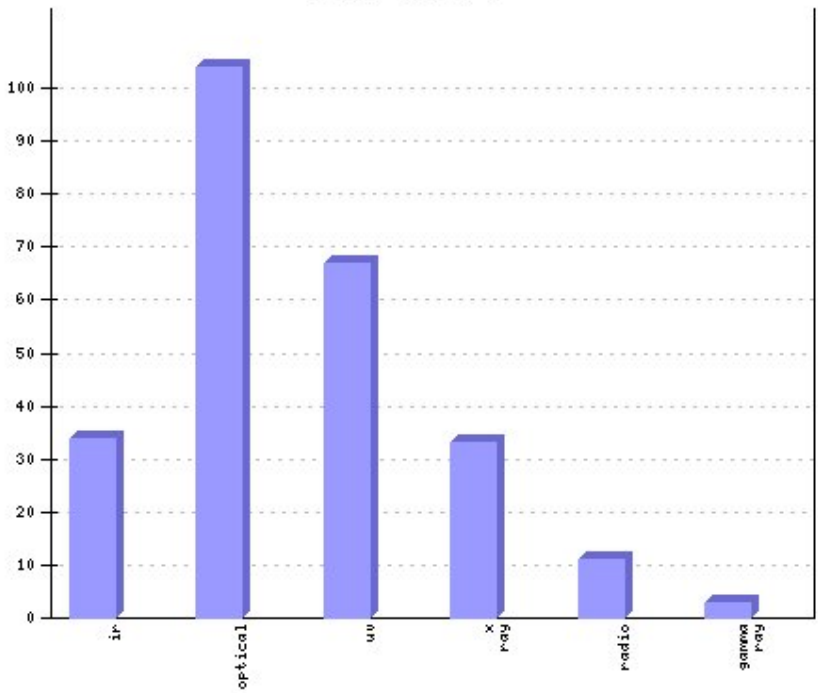
Plan a road map

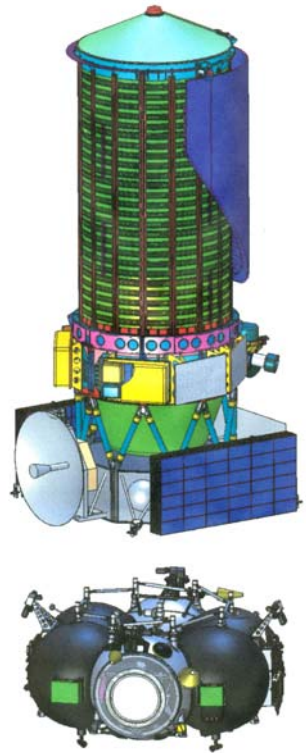
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User Age



User Observ





The next decade:

The European Union astronomical community will have access to **HST** instrumentation through ESA participation in the project.

Members of the NUVA have been actively involved in promoting the **WSO-UV Observatory**: *an international collaboration involving Germany, Italy, Spain, China and led by Russia to build, launch and operate a 1.7m ultraviolet telescope with spectroscopic and imaging capabilities. This facility will be launched at the beginning of the next decade and will be the only mission working at the UV range after HST is decommissioned. 40% of the WSO-UV time (after the first 2 years) will be open to the World-Wide scientific community with emphasis in sustaining scientific communities in developing countries.*

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>2020:

Members of the NUVA are involved in the proposals for UV Instrumentation submitted to ESA's Cosmic Vision call on 2007:

STELLAR AND GALACTIC ENVIRONMENT survey (SAGE)

A high resolution soft X-ray and Extreme Ultraviolet (EUV) spectroscopy mission to carry out a survey of Stellar and Galactic Environments (SAGE). The payload is based on novel diffraction grating technology which has already been proven in sub-orbital space mission and which is ready to fly on a satellite platform with a minimal development.

The proposal has been submitted for a Class M mission.

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Plan a road map

>2020...

The FRESNEL INTERFEROMETRIC IMAGER (FII)

A high resolution imaging/spectroscopic facility that works from the Far Ultraviolet to the Infrared providing unprecedented spatial resolution in Space.

The mission is basically a general-purpose light weight telescope, but using a novel optical concept based on interferometry, which yields high angular resolution, high dynamic range and field, while releasing constraints on positioning and manufacturing of the optically active elements.

The project is under pre-phase A study funded by CNES

A collaboration with NASA in the next large UV mission

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