

First Arab Winter School for Astrophysics (FAWSA)

Final Report

Raid Suleiman & Zouhair Benkhaldoun

December 21, 2016

FAWSA

FIRST ARAB WINTER SCHOOL FOR ASTROPHYSICS
NOV. 28 - DEC. 3, 2016

HOSTED BY



OUKAIMEDEN INTERNATIONAL SCHOOL OF ASTROPHYSICS

ORGANIZED BY



PARTNERS





Introduction

In this document we present the final report of the First Arab Winter School of Astrophysics (FAWSA).

FAWSA provided a platform for astrophysics knowledge sharing, triggering collaborations between fellow Arab astrophysicists, and building a strong professional Arab community in the field.

The scope of the winter school covered the following fields:

- **Solar System and Exoplanets**
- **Solar Physics**
- **Galactic Astronomy:** Stars, Stellar Clusters, Nebulae, SNR and ISM
- **Extragalactic Astronomy:** Galaxy Formation and Evolution, and Cosmology
- **Observational Astronomy:** HRA, Adaptive Optics, Site Testing.
- **Technical Tools:** Python, IDL, iraf, and Virtual Observatory



Scientific Program

We were able to invite and secure participation from leading international institutions to provide lectures about various topics of astrophysics to many outstanding students selected from 11 Arab countries. Below is the scientific program of FAWSA.

Only one Public Conference was cancelled after the invited speakers' excuse for medical reasons.

Time	Monday 28 Nov	Tuesday 29 Nov	Wed. 30 Nov	Thursday 1 Dec.	Friday 2 Dec.	Saturday 3 Dec.
08:30- 10:00	Opening Ceremony and Keynote Speech Benkhaldoun/ Raid	Introduction to Cosmology P.G. Ferreira	(9h- 10h) Atmospheric Optics A. Ziad	Incursions in High Energy Astrophysics J. Mimouni (1h) Gamma Universe N. Guessoum (45mn)	Incursions in High Energy Astrophysics J. Mimouni	Oukaimeden Observatory Visit
10:00 – 10:15	Coffee Break	Coffee Break	Coffee Break	Coffee Break (10h15)	Coffee Break	
10:15 – 11:15	Theoretical Spectroscopy K. Chance	Theoretical Spectroscopy K. Chance	Adaptive Optics J. M. Conan	Gamma Universe N. Guessoum	Extragalactic Astronomy I. Moumen	
11:15 – 12:45	Theoretical Spectroscopy K. Chance	Standard Model and Beyond at LHC M. Chabab	Exoplanets A. Szentgyorgyi	Solar Physics R. Suleiman	Solar Physics N. Vilmer	
12:45 - 14:15	Break & Lunch	Break & Lunch	Break & Lunch	Break & Lunch	Break & Lunch	
14:15 – 15:45	Introduction to Galactic Astronomy R. As'ad	Galactic star clusters R. As'ad	Free for All & ArAs General Assembly for those concerned	Earth and Planetary Atmospheres R. Suleiman	Writing a Scientific Paper R. Suleiman	
15:45 – 16:00	Coffee Break	Coffee Break		Coffee Break	Coffee Break	
16:00 – 17:00	IRAF & Python A. Daassou & M. Kaab	Image Processing, Photometry & Astrometry A. Daassou & Z. Benkhaldoun	Exoplanets R. Ferlet	Exoplanets R. Ferlet	Research in Astrophysics N. Guessoum	
17:00 – 18:00	IDL I. Moumen & K. Malki	CCD Imaging: Spectroscopy A. Benhida & F. Sefyani		Meteoritic and Impact cratering H. Chennaoui	Remote Observatories T. De France & A Benhida	
18:30 – 20:30	Public Conference Arab and Islamic Astronomy Heritage Z. A. AL- Houssaini	Public Conference Light Pollution and Dark Sky Reserve M. Aubé	Official Diner	Cancelled	Public Conference Science at the Arab Universities N. Guessoum	Final Address

Opening Ceremony and Keynote Speech

The opening ceremony consisted of four talks. A welcoming talk was given by Hassan Hbid, Dean of Faculté des Sciences Semlalia, expressed Cadi Ayyad delight to host the First Arab Winter School for Astrophysics in Marrakech. Dean Hbid highlighted the new expansions and development the Faculté des Sciences has been going through.

Mohamed Chabab, Director of High Energy Physics and Astrophysics Laboratory (UCA), talk highlighted the UCA's activities, research and resources, which are available to support FAWSA and its activities.

Randa As'ad, FAWSA Project Co-I, highlighted in her talk the history and the initial activities that led to FAWSA.

Benkhaldoun Zouhair, Director of Oukaimeden Observatory, FAWSA SOC Co-Chair and LOC Chair, after welcoming participants, delivered a keynote speech. He highlighted the context and the history of Oukaimeden Internationale School of Astrophysics, which is hosting FAWSA.

Raid M Suleiman, Harvard-Smithsonian Center for Astrophysics, FAWSA Project leader and SOC Co-Chair, presented another keynote speech. He thanked the distinguished speakers from US, Europe and the Arab World who agreed to contribute to this project with their time, knowledge and expertise. The FAWSA team is very grateful to the IAU/OAD funds and support. He highlighted the vision of FAWSA and the goals behind it. He pointed out that this seed the FAWSA organizers planted here in Marrakech will grow and mature all over the Arab. Although the statistics of lack of Arab scientific contribution to science and astronomy is overwhelming, he emphasized that should not deter and despair us. But said we must change that and make new statistics. Let's not be bystanders but contributors to human knowledge and civilization.



Benkhaldoun's talk during the opening ceremony. From left to the right:

1. Mohamed Chabab : Director of High Energy Physics and Astrophysics Laboratory (UCA)
2. Raid Suleiman: Project Leader and FAWSA Co-Chair
3. Hassan Hbid : Dean of Faculté des Sciences Semlalia, Marrakech (UCA)
4. Randa As'ad: FAWSA Project Co-I
5. Zouhair Benkhaldoun: Director of Oukaimeden Observatory (UCA), FAWSA Co-Chair

Speakers and Invited Speakers

USA



Andy Szentgyorgyi, Harvard - Smithsonian Center for Astrophysics

Andy Szentgyorgyi is the Associate Director of the Solar, Stellar, and Planetary Sciences (SSP) at the Smithsonian Center for Astrophysics. He is the principal investigator of the GMT-Consortium Large Earth Finder (G-CLEF), the first light instrument for the Giant Magellan Telescope. With the G-CLEF scientific team, he is exploring the potential of G-CLEF to detect biomarkers in the atmospheres of habitable-zone exoplanets. His research interests include neutrino astronomy, very high energy gamma astronomy and X-ray astronomy. For the last two decades he has focused on optical high dispersion stellar spectroscopy with a focus on precision measurement of stellar radial velocities.



Kelly Chance, Harvard - Smithsonian Center for Astrophysics

TEMPO Principal Investigator. Senior physicist at the Smithsonian Astrophysical Observatory and a lecturer at Harvard University. Research interest are molecular spectroscopy, structure and dynamics and their application to atmospheric studies, including laboratory spectroscopy and balloon-, aircraft- and satellite-borne measurements of the earth's atmosphere; atmospheric composition and radiative transfer; chemical astrophysics



Raid M Suleiman, Harvard - Smithsonian Center for Astrophysics

Raid Suleiman astrophysicist at the Harvard-Smithsonian Center for Astrophysics (CfA), working in the Atomic and Molecular Physics Division. He is also affiliated with the Solar, Stellar, and Planetary Sciences Division.

He is responsible for SAO operational data products (BrO and OClO) from OMI, and NO₂ from GOME-2. He is CO-I on the NASA's project TEMPO and responsible for BrO, H₂O and Level-3 data products. He is the data manager and will be responsible for managing the Instrument Operations Center (IOC) and the Science Data Processing Center (SDPC).

Canada



Martin Aubé, Cégep de Sherbrooke/Bishops University



Ismael Moumen, Université Laval/CFHT

Ismael Moumen is a PhD Student in Astrophysics under the supervision of Prof. Carmelle Robert from Laval University and Dr. Daniel Devost from Canada-France-Hawaii Telescope. He is studying the impact of the galactic bars on the galaxy evolution using 3D spectroscopic data obtained from the first generation of the Fourier Transform Spectro-Imagers SpiOMM (installed in the Mont-Mégantic Observatory) and SITELE (installed in the Canada-France-Hawaii Telescope).

United Kingdom



Pedro G. Ferreira (Oxford University) explaining the General Relativity during the Cosmology lecture

Ferreira's main interests are in general relativity and theoretical cosmology. He has authored more than 100 publications in peer-reviewed scientific journals. With Michael Joyce, in 1997 he was one of the first to propose [quintessence scalar field](#) models as a possible explanation of [dark energy](#). Ferreira was also a member of the [MAXIMA](#) and [BOOMERanG](#) balloon-borne CMB experiments, which measured the [acoustic peaks](#) of the CMB. He is currently involved in several proposals to test general relativity using the [Euclid spacecraft](#) and [Square Kilometre Array](#) radio telescope.

France



Roger Ferlet, Institut d'Astrophysique de Paris



Nicole Vilmer (Observatoire de Paris LESIA) giving her talk on Solar Physics

Dr Nicole Vilmer is director of research CNRS at LESIA (Laboratoire d'Etude Spatiale et d'instrumentation en Astrophysique) Paris Observatory. She got her PhD and Thèse d'Etat from Université Paris 7. Her expertise is in the field of the study of solar flares and of the acceleration and transport in the solar atmosphere of energetic electrons and ions. Her research is based on the analysis and interpretation of radio, hard X-ray/ γ -ray and neutrons from solar flares as well as on the development of models of transport and radiation. She has been largely involved in the analysis and interpretation of radio observations from the Nançay Radioheliograph and of X-ray and gamma-ray solar observations in the frame of guest-investigator programs on several US missions as well as in a close collaboration with the French team at CESR (Toulouse) which was responsible for the development and analysis of the PHEBUS experiment aboard GRANAT (solar bursts in the 100 keV--100 MeV energy range). She is now Co-I on the RHESSI mission and on the STIX experiment on Solar Orbiter. She has also been involved in several studies related to space weather activities (link between solar flares, CMEs and ionospheric response). She has published more than 90 papers in refereed journals and has given more more than 30 invited reviews.

In addition to scientific research on flares, she is actively involved in the field of space weather, being the national representative for ISWI, a member of the ESA Space Weather Working team and a member of the COSPAR/ILWS space weather road map team. She has served in French advising committees, being e.g. the president of the French national Program on Solar--Terrestrial Physics from 2003 to 2009. She is currently vice-chair of COSPAR Commission D. She has given several general conferences for public.



Aziz Ziad, Lagrange, Nice University

Prof. Aziz Ziad is the head of the “optical turbulence modeling and instrumentation” team of H. Fizeau laboratory. This team gathers know-hows in the wavefront propagation in turbulent media, atmospheric physics linking the geophysical flows to optical turbulence, site-testing experiments based on well calibrated instruments, and a great expertise in real time programming allowing to develop software packages for data acquisition & processing, simulation and modeling.

This expertise allowed this team to participate in the selection of the major sites of all the greatest projects of existing telescopes in particular of the 8-10 meter class: GranTeCan in the Canary Islands, the European VLT and Southern Gemini in Chile, Keck, Northern Gemini & Subaru in Hawaii. With a unique set of instruments to probe atmospheric turbulence, our team was also involved in the site selection for the future ELT telescopes as the 40m European E-ELT and the 30 m American TMT. Our team was also involved in the qualification of the site of Dome C in Antarctica whose future potential is considerable.

United Arab Emirates



Randa As'ad, American University of Sharjah

Randa Asa'd obtained her Ph.D from University of Cincinnati - USA in 2012 and is currently an Assistant Professor at the American University of Sharjah (AUS). She has been teaching physics and astronomy at AUS for the past 4 years. Her area of research is in observational astrophysics, namely obtaining the ages of star clusters in the Large Magellanic Cloud (LMC) galaxy from their integrated spectra. Her research observations are obtained using SOAR and Blanco telescopes in Chile. In the past 4 years she published 4 peer-reviewed papers in top astronomical journals.



Nidhal Guessoum, American University of Sharjah

Nidhal Guessoum M.Sc, P.hD. is an Algerian astrophysicist. He is a professor at the American University of Sharjah, United Arab Emirates. His research interests range from gamma-ray astrophysics, such as positron-electron annihilation, nuclear gamma-ray lines, and gamma-ray bursts, to Islamic astronomy, i.e. crescent visibility, Islamic calendar, and prayer times at high latitudes, problems that have yet to be fully resolved. He has published a number of technical works and lectured internationally at many renowned universities (Cambridge, Oxford, Cornell, Wisconsin, and others).

In June 2003, he was awarded the 2nd Research Prize in Sciences, Engineering, and Architecture at his university.

In addition to his academic work, he writes about issues related to science, education, the Arab world, and Islam. Guessoum is also a columnist for *Gulf News* and *The Huffington Post*, and has made notable contributions to *Nature Middle East*. With a number of publications (including a notable book on the subject), he has recently become a prime scholar on the relations between Islam and modern science.

Algeria



Jamal Mimouni, University of Constantine

An Algerian astrophysicist, who received his higher education partly in Algeria (B. Sc. in Theoretical Physics in 1977) and partly in the States (Ph. D. in Particle Physics in 1985 from the University of Pennsylvania, Philadelphia). Besides his teaching and formal research in astroparticle physics, he has been actively involved in the organization of a series of Schools and Conferences on Theoretical Physics as well as Astrophysics which bring together researchers from the various Algerian universities and research centers as well as a number of European and African universities. He is also active in science outreach to the general public.

Morocco



Mohamed Chabab, Cadi Ayyad University

Mohamed Chabab is professor of theoretical physics at Cadi Ayyad University. He has also been visiting professor to many renowned international institutes as ICTP, Academia Sinica, King Saud University... His research interests are in high energy physics (theory and Phenomenology) with main expertise in Higgs Physics, Extension of Standard Models and black hole criticality. He has been involved in many international projects with several countries as Italy, England, France, Portugal, Taiwan and Sweden. He is also Director of the High Energy Physics and Astrophysics Laboratory (LPHEA) of which he is one of the founders in 1999. Finally, he is a Scientific Committee member of Cadi Ayyadi University."



Zouhair Benkhaldoun, Oukaimeden Observatory/Cadi Ayyad University



PhD Moroccan students during a practical data reduction session (Iraf and Python)

Participants

List of all participants

First name	Last name	Institution	Country	City
Jamal	Mimouni	University Mentouri 1 -Constantine	Algeria	Constantine
Dallel	Bouchachi	Badji Mokhtar University, Annaba , Algiers	Algeria	Annaba
Amina	LEGHMOUCHE	(LPMPS) Constantine 1 University	Algeria	Constantine
Esmâ	ZOUAOUI	(LPMPS) Constantine 1 University	Algeria	Constantine
Martin	Aubé	Cégep de Sherbrooke	Canada	Sherbrooke
Ismael	Moumen	Université Laval/CFHT	Canada	Québec
Hagar	Ghonaim	cairo university	Egypt	cairo
Jean-Marc	Conan	Onera	France	Châtillon
Roger	Ferlet	Institut d'Astrophysique de Paris	France	Paris
Nicole	VILMER	Paris Observatory	France	Meudon
Aziz	Ziad	Université de Nice/Observatoire de la Côte d'Azur	France	Nice
hanadi	Mahmoud	The University of Jordan	jordan	Amman
Jessy	Matar	Notre Dame University	Lebanon	Louaize
Suleiman	Baraka	Al Aqsa University	Palestine	Gaza
Sameh	Othman	Birzeit University	Palestine	Ramallah
Afnan	Alostaz	Al Aqsa University	Palestine	Gaza
Soboh	alqeeq	Al Aqsa Univeristy	Palestine	Gaza
Mahmoud	Awashra	Birzeit University	Palestine	Ramallah
SHROUQ	NAIROHK	student at Birzeit University	Palestine	Jerusalem
Emad	Alkhuja	King Abdulaziz University	Saudi Arabia	Jeddah
Omima	Osman Mohammed C	Khartoum University	Sudan	Khartoum
Hassan	Abdalla	University of Oxford	Sudan	Oxford
Randa	Asa'd	American University of Sharjah	UAE	Sharjah
Omar	Alaryani	American University of Sharjah	UAE	Ajman
sara	almulla	american university of sharjah	UAE	Dubai
Nidhal	Guessoum	American University of Sharjah	UAE	Sharjah
Pedro	Ferreira	Oxford University	UK	Oxford

Andrew	Szentgyorgyi	Harvard-Smithsonian Center for Astrophysics	USA	Cambridge
Kelly	Chance	Smithsonian Astrophysical Observatory	USA	Cambridge
Raid	Suleiman	Harvard-Smithsonian Center for Astrophysics	USA	Cambridge
Youssef	Moulane	LPHEA, Cadi Ayyad University PHD)	Morocco	Le Havre
Abdelhadi	Jabiri	Faculty of sciences Semlalia	Morocco	Marrakech
Tarik	Khalla	FSSM	Morocco	Marrakech
Mohamed	Lazrek	LPHEA	Morocco	Marrakech
Hasnaa	Chennaoui	Université Hassan II	Morocco	Marrakech
Abdelmajid	BENHIDA	FST Marrakech	Morocco	Marrakech
Mohamed	Chabab	Cadi Ayyad University	Morocco	Marrakech
Ahmed	Daassou	LPHEA	Morocco	Marrakech
Zouhair	Benkhaldoun	lphea	Morocco	Marrakech
meryem	guennoun	LPHEA, Cadi Ayyad University PHD)	Morocco	Marrakech
Hamza	AJEDDIG	LPHEA, Cadi Ayyad University PHD)	Morocco	Marrakech
Khalid	Barkaoui	LPHEA, Cadi Ayyad University PHD)	Morocco	Marrakech
Dalal	El Youssoufi	Leibniz-Institut Fur Astrophysik Potsdam (AIP)	Morocco	Marrakech
Bekkal	Imane	LPHEA, Cadi Ayyad University PHD)	Morocco	Marrakech
Taha	Shisseh	Hassan II university - Faculty of sciences	Morocco	Meknes
khadija	chafouai	LPHEA, Cadi Ayyad University PHD)	Morocco	Marrakech
Amal	Loutfi	LPHEA, Cadi Ayyad University PHD)	Morocco	Marrakech
Jamila	Chouqar	LPHEA, Cadi Ayyad University PHD)	Morocco	Marrakech
Hicham	Atmani	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
Ahmed	Ghout	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
salah eddine	akrame	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
Mohamed	Benamansour	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
ANASS	ES-SRIDJ	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
elhabib	jaloum	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
Mustapha	MAKAN	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech

Abdelmajid	RAHAL	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
Hanane	ZELGOUM	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
khalil	zyane	LPHEA, Cadi Ayyad University (M2)	Morocco	Safi
Abdelkarim	EL MOUNCHARIH	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
Hamza	EL-QARS	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
ABDERAHMANE	SOubkiou	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
HAIDARA	EHMOUDDA	LPHEA, Cadi Ayyad University (M2)	Morocco	ES-Semara
Abderrahim	AJIAR	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
AYOUB	HMISSOU	LPHEA, Cadi Ayyad University (M2)	Morocco	Marrakech
zineb	Ihsane	Faculty of Sciences & technologies	Morocco	Benii-Mellal
sana	abamni	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
khadija	akadir	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
aicha	barka	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
merieme	benaadad	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
Omar	El mzahar	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
safaa	mazzou	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
BELFKIR	MOHAMED	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
Asma	NEBBAG	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
Hamza	Qaibal	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
mariem	zinini	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
MOHAMED	HAMMOUD	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
Ouchemhou	Mohamed	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
Imad	Said	LPHEA Cadi Ayyad University (M1)	Morocco	Marrakech
FOUAD	SEFYANI LAKRIZI	FST University Cadi Ayyad	Morocco	Marrakech

Students supported by IAU-AOD funds

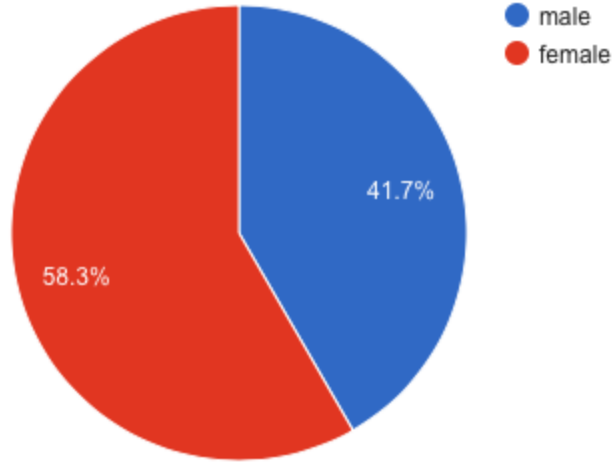
We were able to provide a full or partial financial support for a number of selected participants (depending on the funds). Full financial support for 12 students from the Arab countries was available; a limited number of partial supports was also be available. The financial support is assigned based on the financial need and scientific merit of the candidates.

In order to qualify for financial support, the applicants provided and submitted the following documents :

- A cover letter
- Your comprehensive CV
- Two signed recommendation letters (sent directly by the person who recommends the candidates)
- A Short motivation statement

List of students **supported by AOD-IAU funds:**

Name	Affiliation	Country
Hagar Ghonaim		Egypt
Omar Alaryani		UAE
Esmâ Zouaoui		Algeria
Amina Leghrouche		Algeria
Dallel Bouchachi		Algeria
Sobh El Qeeq		Palestine
Sameh Othman		Palestine
Hanadi Mahmoud		Jordan
Jessy Matar		Lebanon
Omima Mohammed Osman		Sudan
Youssef Moulane		Morocco
Taha Shisseh		Morocco



Gender distribution of students selected with full financial support



Sponsors & Partners:

ORGANIZED BY



PARTNERS



Finance:

Below is the details of how the IAU-AOD support was spent

First Arab Winter School of Astrophysics
Hosted by: Oukaimeden International School of Astrophysics
Nov. 28 – Dec. 3, 2016
Cadi Ayyad University, Marrakech, Morocco

Recettes				Etat
		MAD	US\$	
UCA		20000	1966,665	Received
CNRST		6000	589,99951	Agreement signed
Académie		6000	589,99951	Received
FSSM		20280	1994,1983	Received
LPHEA		15000	1474,9988	Received
OAD via SAO		112918,99	11103,691	Received
Registration Fee (6 participants)		18225,74	1792,1963	Received
Cotisation Diner		7400	727,66606	Received
Cotisation OUKA Trip		4800	471,99961	Received
Total recettes		210624,73	20711,415	

Dépenses	MAD	US\$
Flight Ticket	57923	5695,75692
Hotel	41016,8	4033,31531
Lunches and coffe break	37840	3720,93023
University Club Lodging	14394	1415,40882
Printing	21974	2160,77487
Transport (care + minibus rent)	6500	639,166134
Transport Frais (Essence, peage, train, chauffeu	4500	442,499631
Banquet	14190	1395,34884
Oukaimeden trip Lunch	5200	511,332907
Divers (Carte Sim, medicaments, guide, repas ..	5600	550,666208
Speakers Gifts	2650	260,583116
	211787,8	20825,783
Balance	2150	211,41649

Feedback Meeting:

The experience was very exciting for many students for whom it was the first contact with a professional telescopes and professional astronomers.



We solicited feedback from the students to improve future schools. Below is some of the feedback we received from the students.

FAWSA has been a great opportunity for me to meet all of those Arab researchers in the different fields of astrophysics research. I have been honored to meet all of them as well as the other non Arab researchers. During the school I enjoyed very much lectures and discussions on exoplanets, solar physics, galactic and extragalactic astronomy, high energy astrophysics... simply almost all. I thank everyone who stood behind the organization of this school and put effort to bring it the way it was brought. Thanks a lot.

Best regards.

**Omima OSMAN MOHAMMED OSMAN, Lecturer
University of Khartoum - Department of Physics**

Although my possibility of attending this school won't pass 10% because of the siege on Gaza, but I could not stop dreaming of the moment of arriving Morocco until it became true.

As a student, I'm proud to be participant in the First Arab School in Astrophysics which gathered students and speakers from all around the world to share knowledge, experience and last challenges in astrophysics in one place, one moment !

*FAWSA is once in a lifetime experience.
We are looking forward the next winter school .
Thanks for all your hard work*

From Afnan Ostaz

The universe still have more hidden sides to discover, and to explore. Thanks to all FAWSA speakers and participants, they gave me more curiosity and passion to do more research and to ask more questions about the universe creation and components. Absolutely, I'll be waiting for the second AWSA to discuss more, to ask and to understand more.

**Shisseh Taha
Ph.D. student on Mineralogy, Petrology and Geochemistry of Meteorites
GAIA Laboratory, Hassan II University of Casablanca
Faculty of Sciences - Department of Geology**

I am Hamza Ajeddig a PhD student at Cadi Ayyad university in astrophysics-Morocco. FAWSA was a good opportunity for us, it's a first time that I meet a professor's research from Mendel East and also from the other countries in the world. It was very interesting for me because we did a lot of workshops that will help us to improve our skills and to go ahead in our research area. The committee of organisation of the winter school were in high level in all the term of organization. I hope that I will participate in this type of activities in other Arab countries. Thank you so much Best regards.

Hamza AJEDDIG

Étudiant du LPHEA Faculté des Sciences Semlalia Marrakech-Maroc

It was an honor for me to be participated in First Arab Winter School For Astrophysics. This opportunity introduced the astronomical knowledge in inspiring way, that make me change my future studying plan. So I decide to take the astrophysics my field in higher education, and I need to thank all doctors and all participant colleagues that I met. It was fantastic idea to gathering people from Arab world in Arab country.

From Hanadi Mahmoud

I want to thanks very very much ArAS group about FAWSA, is a best opportunity for us. I want also to thanks the teachers about the presentations & Conferences are very very interesting for us.

From Khalid Barkaoui

Public Conference

Below are pictures of location of the conference (Museum with telescope in the City of Marrakesh)





First Public Conference "Arab and Islamic Astronomy Heritage" by Dr. Zine-El-Abidine Al-Husseini

Gala Dinner



View of the Gala dinner

Oukaïmeden Observatory visit

The last day of FAWSA was dedicated to the visit of the Oukaïmeden Observatory. During this visit, students and speakers were enjoyed to see 5 telescopes in the Oukaïmeden site. The Oukaïmeden Observatory located at 75km south of Marrakech (Morocco) is operated by the Cadi Ayyad University and have been inaugurated in 2007. Located in the High Atlas Mountains, at an elevation of 2750 m, the observatory benefits of good observing conditions in a semi desert area with a median seeing of 1 arcsec.

- The main Tower in the Observatory is equipped with the robotic remote telescope used for several fields of investigations monitoring by the Moroccan Researcher. The telescope is dedicating now to the spectro-photometric measurements for the variable stars and for the exoplanets radial velocity.
- The MOSS telescope has a large field of view and is mainly devoted to new minor planets search. The telescope has a 0.50m parabolic prime mirror and is used at prime focus with a Wynne corrector ($F/D=3.0$). The detector is a SBIG STL11000 based on a Kodak KAF 11000 chip. The image scale is 1.2 arcsec/pixel. The FOV is 1.5 square degrees. The MOSS telescope is used in remote control. It is operated by the three partners in Marrakech, France and Switzerland. The MOSS telescope has been installed at Oukaïmeden on November 2011.
- Lunar Telescope Project (LTN@OUCA) is an agreement between King Abdullah Bin Abdulaziz Chair for Crescent Observation and Lunar Research (KACCOLR) and UCA. The research scope of the chair is to investigate on lunar crescent visibility prediction models with the help of state of the art technology and algorithms as well as combining the different Islamic criteria of crescent research with the latest observation techniques. In addition to the lunar network, a solar network for a permanent observation of the solar activity and phenomena will be established at the same time. Moreover the chair will do other astronomical research for example on the different twilight phenomena. The LTN@OUCA Plan includes the measurement of optical images both for the crescent and for the lunar flash detection. The LTN telescope and facilities has been installed on december 2015.
- An OWL telescope consists of a 0.5 m Ritchey-Cretien type wide-field telescope and a 4K CCD with a plate scale of 0.98 arcsec/pixel that results in 1.54 degrees field of view. The hexagonal enclosure has a clamshell-type dome on the top, accommodating equipment for electricity, internet and control. The primary goal of the OWL project is Space Situational Awareness (hereinafter "SSA"): to track and monitor satellites and orbital debris; survey and characterization of Near Earth Asteroids and comets. The secondary goal of the project is scientific investigations of celestial objects of various kinds; most of the time will be devoted to the survey and characterization of astronomical objects such as bright variable stars, hot gas in the Galactic plane and optical afterglow of Gamma-Ray Bursts (GRBs). We achieved the installation of OWL-Net@Ouca on January 2016.
- TRAPPIST (TRANSiting Planets and Planetesimals Small Telescope) is a project driven by the Origins in Cosmology and Astrophysics group (OrCA) at the Department of Astrophysics, Geophysics and Oceanography (AGO) of the University of Liège (Belgium). Mostly funded by the Belgian Fund for Scientific Research (F.R.S.-FNRS) and the Liège University, TRAPPIST is devoted to the detection and characterization of planets located outside our solar system (exoplanets) and to the study of comets and other small bodies in our solar system. It consists of two 60cm robotic telescope located at the ESO La Silla Observatory in Chile and at Oukaïmeden Observatory in Morocco. We achieved the installation of TRAPPIST-North at Oukaïmeden on Mai 2016.



A group picture with LTN and MOSS telescopes in the Oukaimeden Observatory during the trip



The photo shows three from the five domes located at the Observatory (Main Tower, OWL and TRAPPIST)

Conclusion

FAWSA was a successful experiment to enhance and spread the teaching of astronomy in the Arab countries. We had logistic challenges, but all were easy to resolve with the tremendous help from the Moroccan team and Cadi Ayyad University.

The requested funds have been used to support brilliant students who do not have money to finance their participation in this event. Our request for the AWSA-II was rejected, surprisingly. Therefore, it will be difficult for us to support this category of students that we want to help enormously.

Although, we do not have the IAU-OAD financial support for the Second Arab Winter School for Astrophysics (AWSA-II), but the FAWSA team is working diligently to gather funding to organize the AWSA-II.

