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Galileo's Medicean Moons: Their Impact on 400 Years of Discovery

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Edited by

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GALILEO'S MEDICEAN MOONS: THEIR IMPACT ON 400 YEARS OF DISCOVERY

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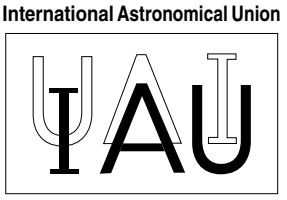

GALILEO'S MEDICEAN MOONS: THEIR IMPACT ON 400 YEARS OF DISCOVERY

PROCEEDINGS OF THE 269th SYMPOSIUM OF THE INTERNATIONAL ASTRONOMICAL UNION HELD IN PADOVA, ITALY JANUARY 6–9, 2010

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Preface

Magnifico Rettore, Sindaco della Città di Padova, Autorità, dear Colleagues and students.

It is my greatest pleasure to welcome you in Padova. We have three intense days of work ahead of us, with a large number of oral papers and poster presentations, the surest indication of the interest aroused by the Symposium nr. 269 of the International Astronomical Union. Indeed the first IAU symposium of 2010, but also one of the great events which characterized the International Year of Astronomy. Our great predecessor in this University, Galileo Galilei, has been celebrated in many ways all over the world, and this Symposium will indicate how important his discoveries of 1609-1610 were in the subsequent 400 years, and will be for the several decades of already planned researches from the ground and from space. Many Institutions and persons have contributed to the success of the Symposium, in primis the International Astronomical Union, the European Space Agency ESA, the Committee on Space Research COSPAR, the Italian Space Agency ASI and the Italian National Institute for Astrophysics INAF. It is my pleasure to acknowledge the support received from the University and the Galilean School of Higher Education. As you have seen from the program, the concert will be played by students of our University; Padova has a wonderful musical tradition, with an impressive number of Internationally renowned groups and musicians. We felt however that our young students should be given the opportunity to perform in front of such distinguished audience of scientists coming from all over the world. Although busy with their exams and theses, they accepted with enthusiasm our proposal. Maestro Terrel Stone, one of the world leading liute player, also volunteered to open the concert with two pieces, one quite possibly from Galileo himself and the other from his brother Michelangelo. Padova hosts a scientific and technological park carrying the name of Galileo, http://www.galileopark.it/. This park promotes innovation and transfer of technologies to new, small enterprises of the territory, enterprises often sprung out of novel ideas of our students. The Galileo Park has given five students the opportunity to register at the Symposium. The Mayor of Padova, Mr. Flavio Zanonato, offered the Palazzo San Gaetano facilities. The firm Salmoiraghi and Viganò and the Association of the Friends of the University have also generously contributed. My sincerest thanks to the many persons which have supported the organization of the Symposium, first of all Dr. Monica Lazzarin, who chaired the Local Organizing Committee and coordinated the several students who voluntarily assisted the participants. Dr. Elisa Segato made a very artistic composition for the conference poster and website cover. Silvia Roi and Stefano Salvadori were responsible for the web site www.astro.unipd./galileo. The site contains the whole program and some oral contributions which did not came in time to be included in the Proceedings. This book could not have been produced without the great skill and dedicated effort of Silvia Cervesato.

Cesare Barbieri,
Chairman of the Scientific Organizing Committee
University of Padua, Italy, 6 January, 2010

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Figure 1. Registration under the severe eyes of Galileo from his chair.

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Figure 2. The Rector of the University of Padua, Prof. Giuseppe Zaccaria (top panel), and the President of IAU, Prof. Roger J. Williams (bottom panel), greet the authorities and the participants in the magnificent Aula Magna of the University of Padua.

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Figure 3. The Director of the Galilean School of Excellence, Prof. Carlo Umiltà, and the Chairman of the Scientific Committee, Prof. Cesare Barbieri, greet the participants to the Concert (top panel). A moment of the concert, a piano solo (bottom panel).

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Figure 4. A view of the conference dinner held in Palazzo Zacco (Army's Officers Club), and the gorgeous cake.

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Figure 5. An intense expression of Maestro Terrell Stone playing a composition by Michelangelo Galilei on his lute.

Figure 6. The beautiful images of the Medicean Moons prepared by P. Schenk, displayed in the Agorà of Palazzo San Gaetano.

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Address by the Rector of the University of Padua Prof. Giuseppe Zaccaria

Authorities, Dear Collegues, Dear speakers, Ladies and gentlemen On behalf of the University of Padua, I am very happy to welcome you to this prestigious Symposium of the International Astronomical Union.

The discovery of the Medicean Moons by Galileo Galilei took place in Padova from January 7 to 15, 1610. The discovery added four new worlds to the known solar system and blew the Earth-centered universe. *Sidereus Nuncius* not only had a major influence on the development of astronomy and science, but also upon religious and philosophical theories and social behaviour.

The conference, taking place in the very same place of the discovery and exactly 400 years later, will address the following themes:

- The discovery of the Medicean Moons, their history and influence on science and humanity
- The Medicean Moons, Jupiter's system, the legacy of NASA's Galileo mission, future missions to Jupiter
- Our solar system after Galileo Galilei, the grand vision
- New telescopes, new solar systems, new people out there?

The main aims are:

- to recall the memorable event and examine its influence on science and humanities
- to examine the status of present knowledge of Jupiter, the Medicean Moons, and the full Jovian system, including prospects for advancing our understanding by future space missions and future telescopes
- to expound the contemporary vision of our solar system, of the many extra-solar planetary systems, and the expectations of discovering new intelligent inhabitants beyond our solar system.

Galileo and the natural philosophers of the 17th century envisioned the planets and moons in our solar system to be habitable worlds.

By the mid-20^{th} century, the view had changed: the Plurality of Worlds applies to objects in orbits around stars elsewhere in the Galaxy.

Today, at the beginning of the 21st century, ongoing and planned space missions to our Moon, to Mars, to Jupiter and the Medicean Moons, to Saturn and Enceladus, again reveal a fascination with alien life in our solar system, but this time the focus is on potential host sites for extremely primitive forms of life nurtured by the presence of water. Water and other crucial molecules for sustaining life will undoubtedly be discovered on some of these neighboring worlds by the Extremely Large Telescopes and dedicated orbital missions of the next decades. The prospects for finding Earth-like, habitable, and perhaps even inhabited worlds are real and clearly before us. Galileo's discovery of the Medicean Moons thus continues to point the way towards a deeper understanding of our place in the Universe - but now from the linked perspectives of the physical and life sciences.

The conference is attended by many distinguished scientists from all Europe, Russia, Ukraine, the United States of America, Brazil, Hong Kong, Taiwan.

Among them, two 'laureati honoris causae' of our University, Father George Coyne S.J. (Specola Vaticana) and Dr. Torrence V. Johnson (Jet Propulsion Laboratory, California Insitute of Technology).

The conference therefore not only celebrates a crucial event in the past history of our University, but also underlines its continued primary role in ongoing and future astronomical researches.

I thank you all for you participation in this important scientific event and wish you a very fruitful Symposium and a pleasant story in Padua.

Giuseppe Zaccaria, Rector of the University of Padua
Padova, 6 January 2010

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Address by the President of the International Astronomical Union
Prof. Robert Williams

Galileo's observations of Jupiter's satellites are among the most important astronomical observations ever made. With one simple observation he demonstrated that 2000 years of belief was incorrect and the earth was not the center of all objects in the universe. Some ideas die hard, especially when they represent established dogma. Thus, Galileo's observations and conclusions met serious resistance. As Simon & Garfunkel wrote in a popular song from the 1960s: "A man hears what he wants to hear and disregards the rest." We must acknowledge that even we scientists are not immune to our own dogma. We have similar tendencies, but there is an important difference. The difference in science is that questioning and doubt and re-evaluation of conclusions, based on new data, are accepted and expected. They are valued as a part of the process of understanding. Getting the public to appreciate this is one of the most important aspects of science.

We are now 400 years after Galileo's observations of the Medicean satellites, and these satellites are once again the focus of attention for another important question: might life exist in one of them or is life unique to earth. There is as much dogma about this question as there was about the geocentric universe in Galileo's time. The answer to this question would have implications as profound as Galileo's demonstration that the earth was not the center of the universe. We will not be able answer that question this week.

This is the fascination of astronomy. We address important questions. The entire Jovian system has remained a subject of intense study in astronomy. Whether comets strike it or it becomes the archetype of exoplanets, which we call 'hot Jupiters'. The IAU is pleased to sponsor this meeting as a means for understanding Jupiter's satellites better, and on behalf of the IAU I am pleased to add my welcome to you as participants.

Robert Williams, President of the IAU
Padova, 6 January 2010

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