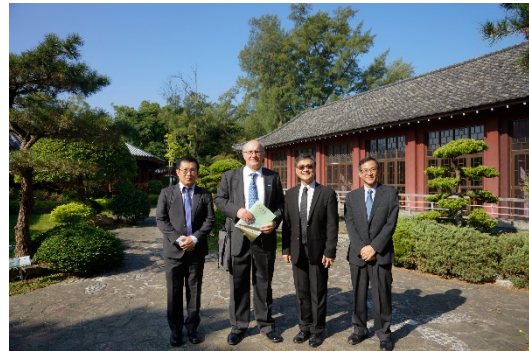


LECTURE (16)



Prof. Daniel J. Scheeres

- **University of Colorado Distinguished Professor**
- **A. Richard Seebass Chair Professor**
- **Department of Aerospace Engineering Sciences**
- **Colorado Center for Astrodynamics Research**
- **The University of Colorado Boulder**

Date: 2019.11.16

Exploring Asteroids:
Our close and (sometimes) dangerous neighbors
小行星探測：親密而偶有危險的鄰居

11/12
10:10-12:00 星期二
守謙國際會議中心有連廳

淡江大學熊貓講座
TAMKANG CLEMENT
AND
CARRIE CHAIR

丹尼爾·許爾斯 院士
Daniel J. Scheeres, Ph.D.

美國科羅拉多大學波德分校 特聘教授
美國國家工程院院士
美國航空太空學會 (AIAA) 會士
美國太空學會 (AAS) 會士
小行星 (8887) 1994LK1 以 Scheeres 命名

工學院 航太系 敬邀

活動資訊

INTRODUCTION

- Daniel J. Scheeres is a University of Colorado Distinguished Professor and is the A. Richard Seebass Endowed Chair Professor in the Smead Department of Aerospace Engineering Sciences at the University of Colorado Boulder.
- Scheeres was elected to the National Academy of Engineering in 2017, is a Fellow of the American Astronautical Society and the American Institute of Aeronautics and Astronautics and is a Corresponding member of the International Academy of Astronautics.
- Scheeres' research interests span the topics of space situational awareness, the dynamics, control, and navigation of spacecraft trajectories, optimal control theory, planetary science, celestial mechanics and dynamical astronomy.
- He has authored or contributed to over 300 papers, notes and chapters in peer-reviewed journals and books, over 600 conference papers or presentations, and has given over 150 invited seminars or interviews. Scheeres has directed or co-directed 43 PhD. theses at the University of Michigan (19) and University of Colorado (24). His students hold

positions in academia, government labs and industry.

- He is currently vice-chair of the International Astronautical Federation's Astrodynamics Committee and has served on the AIAA Astrodynamics Committee and the AAS Spaceflight Mechanics Committee in the past.
- He was awarded the Dirk Brouwer

Award from the American Astronautical Society in 2013 and delivered the John Breakwell Lecture at the 2011 International Astronautical Congress.

- Asteroid 8887 is named "Scheeres" in recognition of his contributions to the scientific understanding of the dynamical environment about asteroids.



Figure 1. Scheeres explains CU Boulder's role in the OSIRIS Rex mission



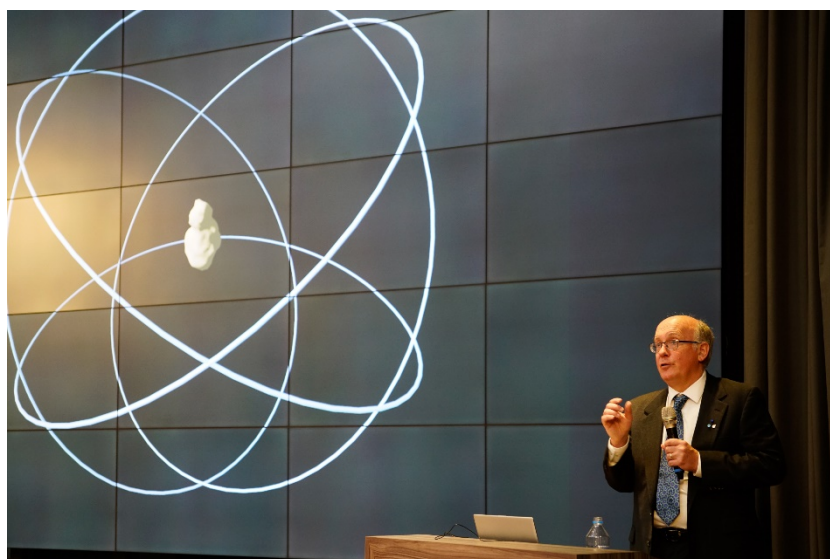
Figure 2. Prof. Dan Scheeres was inducted into Natl. Academy of Engineering in 2017

Topic : Exploring Asteroids:

Our close and (sometimes) dangerous neighbors

ABSTRACT

Asteroids frequently pass closely by the Earth, occasionally impacting and sometimes with devastating consequences for life. The last few decades of space exploration and scientific research have completely turned our knowledge about asteroids inside out – showing them to be fascinating small worlds with their own exciting lives. This talk will focus on these recent discoveries and describe what we now think asteroids are like and what humanity's current exploration plans are for these bodies.



MINUTE

A. Overview

Date	Location	Activity	Remarks
11/9 (Sat)	Arrival		
11/10 (Sun)	Tamsui, Tainan	Luncheon, night market	
11/11 (Mon)	NCKU	Visitation, invited speech	
11/12 (Tue)	Tamkang University	Tamkang Clement and Carrie Chair	
11/13 (Wed)	iCASE 2019 in Hsin-Chu	Keynote speaker	
11/14 (Thu)	Tamsui, Taipei	Tamkang University and touring Taipei	
11/15 (Fri)	NSPO, TiSpace Inc., NCTU	Visitation, invited speech	
11/16 (Sat)	Tamkang University	Keynote Speaker of 2019 AASRC conference	
11/17 (Sun)	Departure	Farewell lunch	

B. Detail Minute

1. November. 10th – Luncheon, night market

Prof. Scheeres arrived in Taiwan in the evening of November 9th. Therefore, the Chairman arranged an informal welcome luncheon for Prof. Scheeres and his wife on November 10th. After the luncheon, Prof. Fu-Yuen Hsiao brought Prof. Scheeres to Taiwan by HSR, and showed the Scheeres' family the famous night market.



Figure 3. The welcome luncheon in the Tamsui Fullon Hotel Restaurant

2. November 11th – Visitation to NCKU

Department of Aeronautics and Astronautics (DAA) in the National Cheng Kung University (NCKU) is one of the top-notching institute in the field of aerospace engineering in Taiwan. Many professors in our department collaborated with professors from DAA, NCKU on many research projects. The visitation of Prof. Scheeres to NCKU was potentially beneficial to the collaboration relationship.

In the visitation, Prof. Scheeres delivered a lecture, entitled “The Computation and Application of Quasi-Periodic Orbits in Space Trajectory Design.” After lunch, a visit to Prof. Chuang’s Cubic Satellite Laboratory was arranged. At the end of the visit, Prof. Scheeres was led to the Rocket Laboratory, supervised by Prof. Chao, in the Gui-Ren Campus. Prof. Chao currently is collaborating with Prof. Tang and Prof. Wang in our department on the development of sounding rockets.

In addition to NCKU, Prof. Hsiao also showed Prof. Scheeres some of the historic sites in Taiwan. For instance, the Chihkan Tower, the State Temple of the Martial God, and the Tainan Grand Mazu Temple, etc.



Figure 4. Prof. Scheeres delivered a speech in NCKU

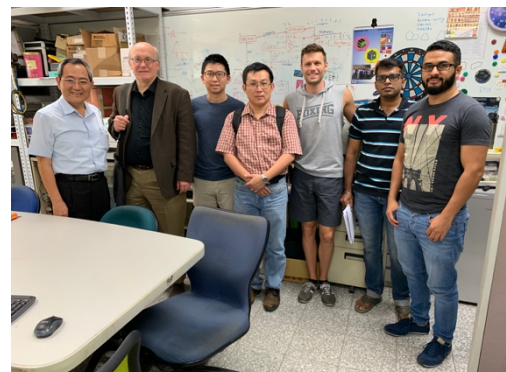


Figure 5. Prof. Scheeres visited the Cubic Satellite Laboratory

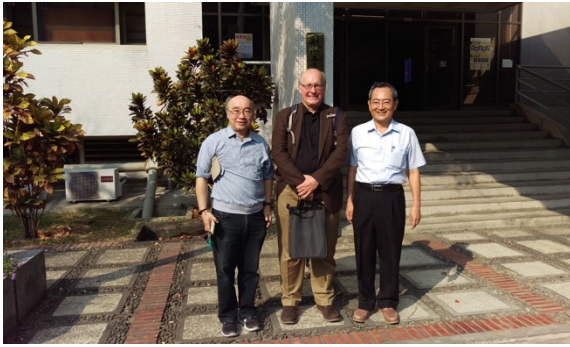


Figure 6. Prof. Scheeres took pictures with Prof. Miao and Prof. Chao.



Figure 6. Prof. Scheeres visited the Rocket Laboratory.

3. November 12th – Tamkang Clement and Carrie Chair

It was scheduled for Prof. Scheeres to deliver the speech in the Tamkang Clement and Carrie Chair on November 12th. Detail schedules are provided as follows:

- 08:30 – 09:00 Visitation to the Dean of College of Engineering
- 09:00 – 09:30 Visitation to the Carrie Chang Fine Arts Center
- 09:30 – 10:00 Visitation to the Vice President for Academic Affairs
- 10:00 – 12:00 Speech in the Tamkang Clement and Carrie Chair
- 12:00 – 14:00 Lunch with faculty in DAE
- 14:00 – 14:30 Visitation to the Chairman of the Board of Trustees
- 14:30 – 15:30 Touring the campus

The lecture by Prof. Scheeres is entitled “Exploring Astroids: Our close and (sometimes) dangerous neighbors.” All attended students were deeply impressed on the topic and materials. Prof. Scheeres also detailedly answer questions asked by the attendees.

Prof. Scheere also expressed his gratitude to the University for the reception. He was so impressed on the education and environment of Tamkang University, as well as the advance of Taiwan in many aspects. Prof. Scheers also longed for future collaboration with TKU.

*Tamkang University 70th Anniversary
Tamkang Clement and Carrie Chair*



Figure 8. Prof. Scheeres took pictures with the poster.



Figure 9. Group photograph before the Tamkang Clement and Carrie Chair



Figure 10. Prof. Scheeres introduced missions to asteroids.



Figure 11. Chairman of the DAE, Prof. Chen presented the Panda Trophy.



Figure 12. Prof. Scheeres took pictures with DAE faculty



Figure 13. The Dean presented gifts from DAE before the lunch.

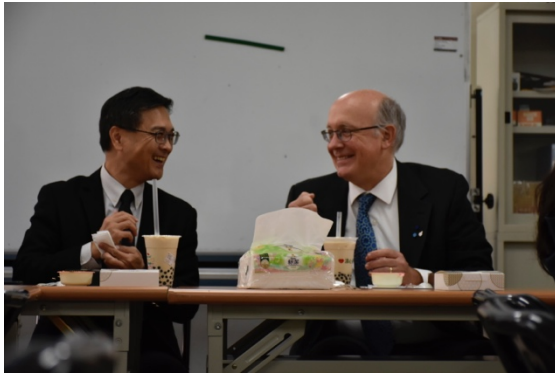


Figure 14. Prof. Scheeres talked with the Dean.



Figure 15. Prof. Scheeres talked with Prof. Feng, the ex-Vice President.

4. November 13th – 2019 iCASE

iCASE 2019 was the first international conference held by the National Space Organization (NSPO). Prof. Scheeres was invited as a keynote speaker in the conference, where he delivered a speech entitled “The Future of Asteroid Exploration and the Hayabusa2 and OSIRIS-REx Missions.” He also had a conversation with the Director of NSPO, Dr. Chun-Liang Lin, to discuss potential collaboration between CU, NSPO, and TKU. In the conversation Prof. Scheeres highly recommend Prof. Fu-Yuen Hsiao to join future projects of lunar missions of NSPO.



Figure 16. Prof. Scheeres served as a keynote speaker in iCASE 2019.

5. November 14th – Touring Taipei

Prof. Scheeres was taken around Taipei to several scenic spots. For example, the National Palace Museum (NPM), Beitou Hot spring, Maokung, and so on.



Figure 17. One exhibition in NPM

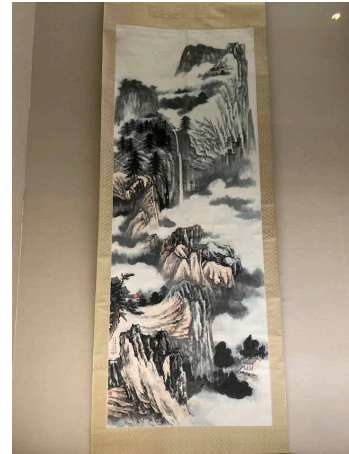


Figure 18. One exhibition in NPM



Figure 19. Prof. Scheeres' family toured the famous Beitou hot spring.



Figure 20. Prof. Scheeres had dinner in Maokung.

6. November 15th – NSPO, TiSpace Inc., and NCTU

The first stop of Prof. Scheeres' visitation was the TiSpace Inc. TiSpace Inc. is the first commercial rocket company in Taiwan. Prof. Scheeres himself also coordinates an asteroid investigation mission. Hence, he was quite interested in the fabrication and function of rockets.

The second stop was NSPO, where Prof. Scheeres delivered a speech entitled "The Computation and Application of Quasi-Periodic Orbits in Space Trajectory Design." In addition, he also toured the mission control room and satellite fabrication factory. In the lunch, several specialists in NSPO also discussed Taiwan's perspective lunar missions and future collaborations with Prof. Scheeres. In the conversation Prof. Scheeres again highly

recommend Prof. Fu-Yuen Hsiao to join future projects of lunar missions of NSPO.

The last stop was to tour the ARRC Laboratory of NCTU. ARRC Lab, supervised by Prof. Wu, is another famous rocket laboratory in Taiwan.

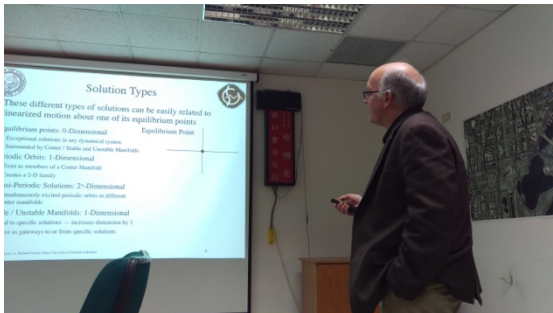


Figure 21. Prof. Scheeres delivered a speech in NSPO.



Figure 22. Prof. Scheeres tour the mission control room in NSPO.

7. November 16th – 2019 AASRC Conference

The TKU DAE coordinated the 2019 AASRC conference, and invited Prof. Scheeres to serve as a keynote speaker. He delivered a keynote speech entitled “Optimal Control, Active Satellites and Space Situational Awareness.” In the conference and banquet, Prof. Scheeres talked to many aerospace experts of Taiwan. Prof. Scheeres was impressed with the academic and industrial performance of Taiwan in the field of aerospace engineering. After the conference, Prof. Scheeres also toured Tamsui.

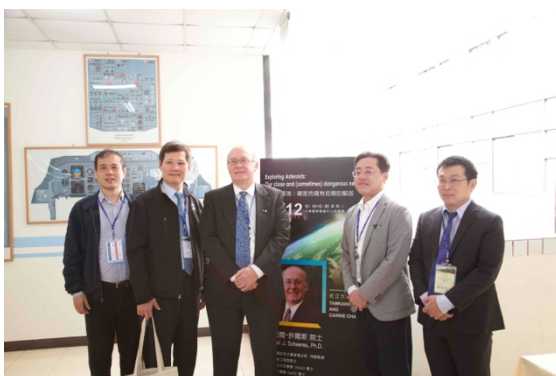


Figure 23. Prof. Scheeres attended 2019 AASRC conference.



Figure 24. Prof. Scheeres delivered the keynote speech.



Figure 25. Prof. Scheeres took pictures with Taiwan aerospace experts.



Figure 26. Prof. Scheeres talked to Taiwan aerospace experts.



Figure 27. Prof. Scheeres talked to Taiwan aerospace experts.



Figure 28. Prof. Scheeres Toured Tamsui.



Figure 29. Prof. Scheeres attended conference banquet.



Figure 30. Prof. Scheeres talked to Prof. Feng in the conference banquet.

8. November 17th – Departure

A farewell luncheon was arranged to show the gratitude of Prof. Scheeres' visitation to TKU before he left Taiwan. Dr. Peter Lai, a senior flight system engineer in NASA Jet Propulsion Laboratory, is also invited to the lunch. Prof. Scheeres and Dr. Lai were old friends for their long co-working in the Technical Committee in AIAA. The farewell lunch was not only a gathering of old friends, but also an opportunity for future collaboration.



Figure 31. The farewell lunch for Prof. Scheeres.