



28th Workshop on Space technology
for Socio-Economic Benefits:
“Space Exploration – a source of inspiration,
innovation and discovery”

October 23rd, 2021 – World Trade Center – Dubai



An Educational Approach to **Planetary Defense** During COVID-19

Lecturer:
Nancy C. Wolfson
NancyPlanetaryDefense@gmail.com



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Objectives

- The session will focus on how an educational approach to planetary defense brings together different disciplines, promotes diversity, inclusiveness and enables everyone interested in learning about this topic to actively participate.
- We'll further share the lessons learned from recent and important educational initiatives as well as resources seeking to motivate other specialists, young professionals and students to join the PD and NEO communities' efforts.

ASTEROID DAY

30 JUNE



ENTERTAINER

Jack Black

Actor, singer, musician



CO-FOUNDER, ASTEROID DAY

Dr. Brian May

Queen co-founder, legendary guitarist and astrophysicist. Animal rights activist and stereoscopy expert



SCIENTIST, AUTHOR

Mayim Bialik

American actress, Neuroscientist, and Author



BOARD DIRECTOR, VICE CHAIR, ASTRONAUT

Dr. Dorin Prunariu

Cosmonaut; President, ROMSPACE; Chair, UN COPUOS



SCIENTIST

Lord Martin Rees

British Astronomer Royal, Cosmologist and astrophysicist



SCIENTIST

† Stephen Hawking

English theoretical physicist, cosmologist, author and Director of Research at the Centre for Theoretical Cosmology within the University of Cambridge



SCIENTIST, ENTERTAINER, AUTHOR

Bill Nye

Science educator, comedian, television host, writer and scientist



SCIENTIST, NOBEL LAUREATE

Kip Thorne

Nobel Laureate. Theoretical physicist concentrating in gravitational physics and astrophysics



ADXP MEMBER, SCIENTIST

Patrick Michel

Senior Researcher at CNRS. Leader of the



VICE CHAIR, RESEARCHER, ENTREPRENEUR

Nancy Wolfson

Ministry of Defense, in a Minsk-based IT and



Rick Armstrong

Son of Astronaut Neil Armstrong, Rick has proudly continued his father's legacy of giving



ENTERTAINER, ASTRONAUT

Chris Hadfield

Canadian Astronaut, former NASA Director of Operations in Russia



**Signatory for the
UN Asteroid Day
Declaration**

Vice Chair

**of the Near Earth
Objects
Technical
Committee**



Nancy C. Wolfson



Email: NancyPlanetaryDefense@gmail.com

Planetary Defense



NEAR-EARTH

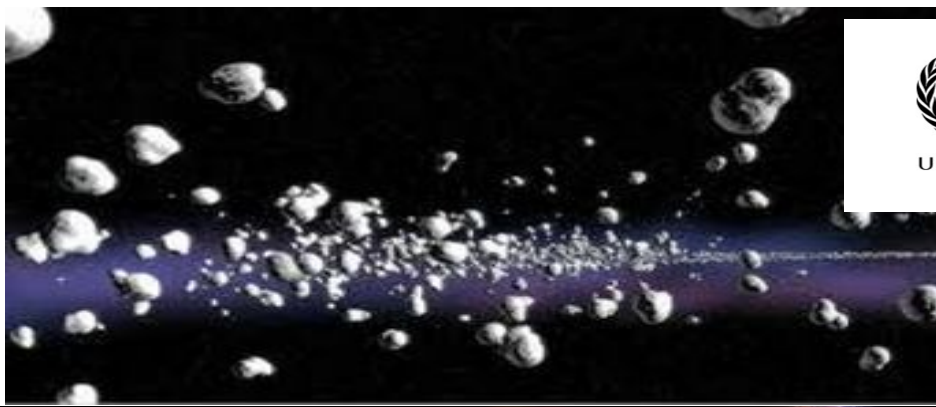
OBJECTS





United Nations
OOSA

28th Workshop on Space technology
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Asteroids

How does an
asteroid impact
affect Earth?



Space Debris

How does space
debris affect Earth?

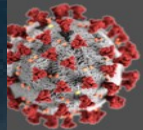


An Educational Approach to Planetary Defense During COVID-19

USING ONLINE TECHNOLOGY AND EDUCATIONAL INITIATIVES TO SUPPORT SOCIAL AND EMOTIONAL LEARNING NEEDS DURING COVID-19 TO ENGAGE STUDENTS, YOUNG PROFESSIONALS AND THE GENERAL PUBLIC IN PLANETARY DEFENSE ACTIVITIES AS WE KEEP SOCIAL DISTANCING.



Nancy C. Wolfson



CORONAVIRUS DISEASE 2019 (COVID-19)

INFORMATION & RESOURCES

**October
2021**



Stay in Place. Maintain Your Space. Cover Your Face.

Planetary Defense Collaboration and Chain of Communication Connecting the Dots in Planetary Defense

- The 11th IAWN Steering
Committee Meeting -
Virtual
23 September 2020

- The 12th IAWN Steering
Committee Meeting -
Virtual
30-31 March 2021 -- Meeting
Notes

<https://iawn.net/>

International
Asteroid
Warning
Network

Inter-agency Cooperation



Planetary Defense Collaboration and Chain of Communication Connecting the Dots in Planetary Defense

Inter-agency Cooperation

16th Virtual MEETING OF THE SPACE
MISSION PLANNING ADVISORY
GROUP (SMPAG)

SMPAG

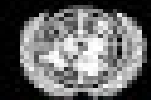
24 & 25 March 2021

WebEx Virtual meeting

SPACE MISSION PLANNING ADVISORY GROUP



Nancy C. Wolfson



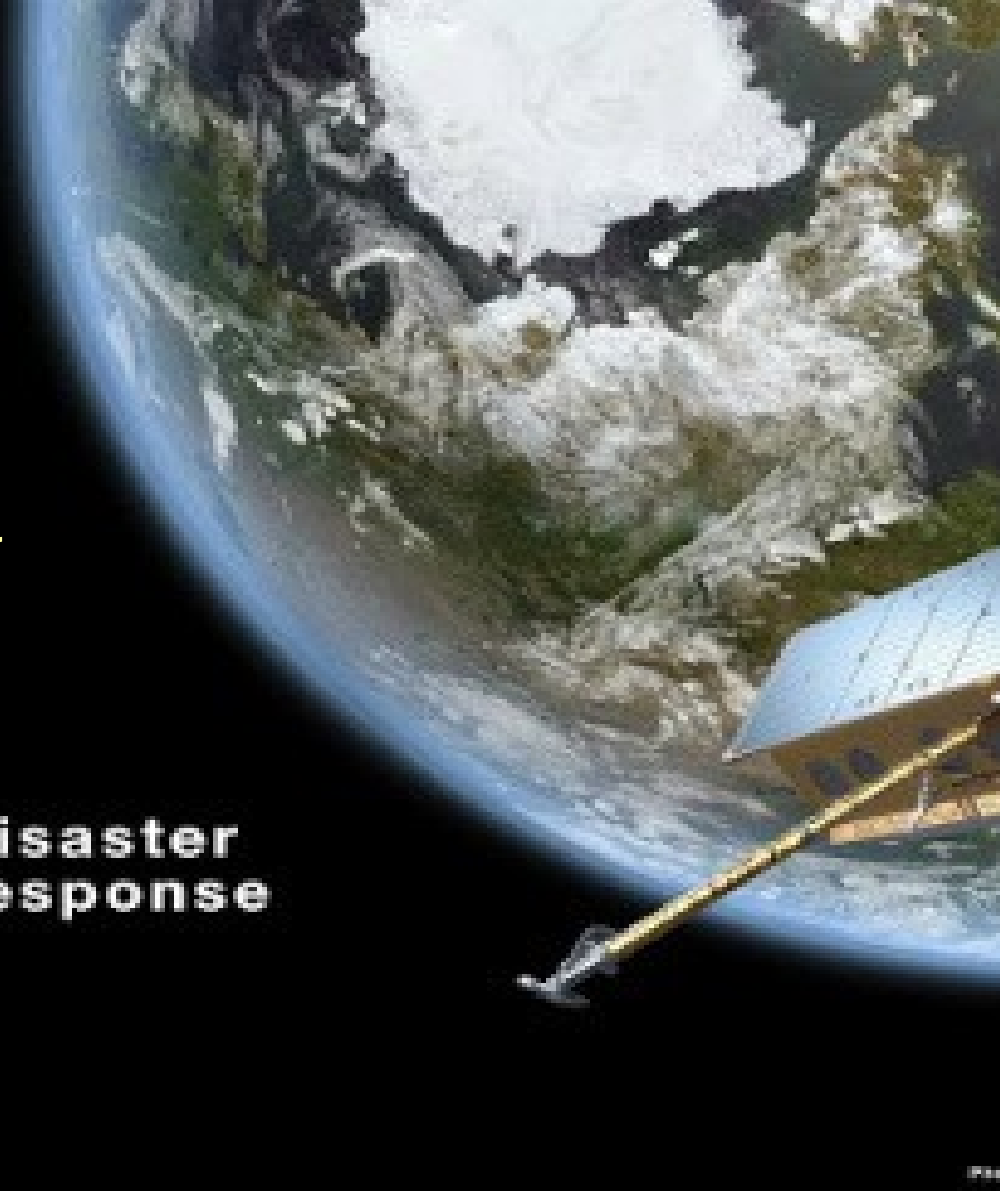
UNITED NATIONS
Office for Outer Space Affairs

UN-SPIDER

www.un-spider.org

**UN-SPIDER Bonn International
Conference will be carried out in a
virtual format from 16 to 18
November 2021.**

**Space-based information for disaster
management and emergency response**



An Educational Approach to **Planetary defense**

During COVID-19



**Community
engagement in research
& Multidisciplinary
Approach**



**Data collection on
a global scale**



Nancy C. Wolfson



**Generational
participation from
primary school
kids to great
grandparents**



**Project Mission +
Campaign = PR
and Funding
Opportunities**



Franck Marchis, senior planetary astronomer at the SETI Institute and Chief Scientific Officer at Unistellar.

Marchis has a Ph.D. in Astrophysics and is no stranger to the accolade Ada will receive. In April 2007, the asteroid numbered 1989SO8 was named "(6639) Marchis" in honor of his work in the field of multiple asteroids.



Nancy C. Wolfson is a scholar, independent researcher, speaker, entrepreneur and artist.

She is a published author and a co-founder-President of Disrupting Space LLC. She is currently the Vice Chair of the International Astronomical Federation's (IAF) Technical Committee on NEOs. A great part of Nancy's work is focused on education and communication about asteroids and contributing to the International Asteroid Warning Network (IAWN).

SETI – Unistellar Judges of the “Nicknaming an Asteroid” Campaign



Tim Russ is an American actor, director, screenwriter, and musician. He is best known for his roles as Lieutenant Commander Tuvok on Star Trek: Voyager and appeared in living rooms all over the world from 1995 to 2001. Beyond his fictional connection to all things celestial, Tim is passionate about astronomy and is a dedicated eVscope user.

Nancy C. Wolfson is part of two annual citizen science projects:

1. IASC-SGAC “Finding an Asteroid” Campaign
2. SETI-Unistellar “Nicknaming an Asteroid”

You can find the link of all the citizen science projects presented here in our resources page

International Astronomical Search Collaboration

November 9 — December 4, 2020

We hereby express our sincere appreciation to

Nancy C. Wolfson - Team Lead
Space Belong to All

In recognition of valuable contributions to observations of near-Earth objects and Main Belt asteroids by participating in the analysis of images from Pan-STARRS.

Patrick Miller
DR. PATRICK MILLER
INTERNATIONAL ASTRONOMICAL SEARCH COLLABORATION
HARVARD-SMITHSONIAN UNIVERSITY

Richard Wainscoat
DR. RICHARD WAINSCOAT
Pan-STARRS
INSTITUTE FOR ASTRONOMY
UNIVERSITY OF HAWAII

In this IASC certificate is based upon work supported by NASA under cooperative agreement No. N01NS04-000005. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Aeronautics and Space Administration.

UNISTELLAR

SETI INSTITUTE

**Name an Asteroid
Citizen Science**

Turn your app and no polar and in a few minutes.



International Astronomical Search Collaboration

International Astronomical Search Collaboration

SPACE GENERATION ADVISORY COUNCIL

SGAC + IASC presents:

Find an Asteroid 2020

NEO

?ETI INSTITUTE

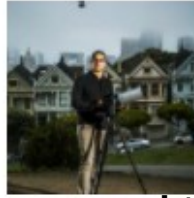


Smart and Easy to Use

Turn your eVscope on, choose an object on the Unistellar app and observe. No constellations knowledge required, no polar star alignment. **the eVscope does it all by itself** and in a few minutes.

About the Judges

An esteemed panel of judges evaluated the finalist entries based on News Value, Scientific Value, Creativity and Relevance. After a unanimous decision from the judges, AdaCarrera will now be officially recommended to the 15-person Working Group for Small Body Nomenclature of the International Astronomical Union (IAU), an international group of professional astronomers with research interests related to minor planets and/or comets. The Nickname the Asteroid judging panel included:



Franck Marchis, senior planetary astronomer at the SETI Institute and Chief Scientific Officer at Unistellar.

Marchis has a Ph.D. in Astrophysics and is no stranger to the accolade Ada will receive. In April 2007, the asteroid numbered 1989SO8 was named "(6639) Marchis" in honor of his work in the field of multiple asteroids.

<https://unistellaroptycs.com/ada-carrera/>

<https://unistellaroptycs.com/nickname-the-asteroid/>



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On-line Event Hosted by BROWN PLANETARIUM – Bell State University
All you ever wanted to know about asteroids, the Tunguska event and planetary
defense! Presentation July 13th, 2021



BALL STATE
UNIVERSITY

Charles W. Brown
Planetarium



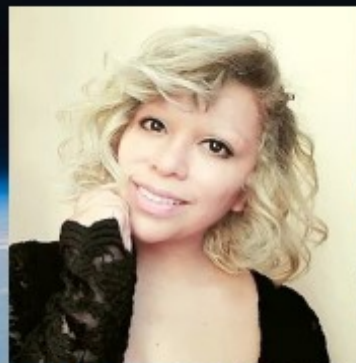
UNITED NATIONS

The United Nations Proclaims June 30 as International Asteroid Day

ASTEROID DAY

30 JUNE

**Nancy C.
Wolfson**



Vice Chair

The International Astronautical Federation
Technical Committee on NEOs



**Jeff
Woytach**



Aerospace Engineer
NASA John H. Glenn Research Center (GRC)

An Educational Approach to Planetary Defense & NEO

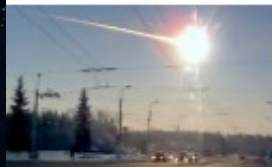
Encouraging a Global Conversation & Public Education



UNITED NATIONS
Office for Outer Space Affairs



26-30 April 2021, Online Event



7th IAA Planetary Defense Conference

Seeking Synergies for Planetary Defense During COVID-19 Lessons Learned

This work wishes to provide insights about the importance of exploring the synergies between 1. Missions, new technologies, 2. Inter-agency cooperation, 3. Raising awareness and Communicating to the general public for Planetary Defense (PD). Here we are also exploring the current global crisis due to COVID-19 pandemic that has shaken the world and disrupted many dynamics within PD. Can we make use of the global response to the pandemic and can the lessons learned in terms of readiness, cooperation (synergies) and national and international coordination be applied to a global response to an asteroid impact threat? Our experts (From the communication, technical, education and young professional perspective) are sharing with us their expertise, insights, observations and the lessons learned during this global crisis, aiming to increase our chances for a successful deflection and/or mitigation/Impact management campaign to protect Earth from asteroids in the years to come.



Smiriti Srivastava
Space Generation Advisory Council – Co-lead of the NEO Project, India

SGAC is a global NGO and network which aims to represent university students and young space professionals ages 18-35 to the United Nations, space agencies, industry, and academia. Through its broad network of volunteers from more than 150 countries, SGAC and its Near Earth



Patrick Michel
Ph.D Université Côte d'Azur, Observatoire de la Côte d'Azur, Director of Research at CNRS, Laboratoire Lagrange, France

The pandemic shows us that for very low probability risks with potentially high and global consequences, which is the case of a pandemic or an asteroid impact, it is crucial to be prepared before we need it! The organization of a global response is



Linda Billings
Ph.D consultant to NASA's Planetary Defense Program United States

The COVID-19 pandemic and the accompanying infodemic are being studied intensively by researchers specializing in science, health, and risk communication. These studies offer useful guidance for the planetary defense community in developing plans for communication in the event of an



Nancy C. Wolfson
Vice Chair of the International Astronomical Federation Technical Committee on NEO's, United States

The global crisis due to COVID-19 disrupted many dynamics within planetary defense (PD) and showed us that in case of a disaster with global consequences, synergy, Inter-agency and international collaboration are vital. This

Protecting Planet Earth from Near Earth Asteroids (NEAs)

Mariella Graziano



ITALY

**GMV's Executive Director of
Space systems**

Nancy C. Wolfson



USA

**Vice Chair of the International
Astronautical Federation TC on NEOs**

Smiriti Srivastava



INDIA

**Near Earth Objects
Project Group**

**Co-Lead of the Near Earth
Object Project Group of SGAC**

Get Ready to Protect **Earth** from Asteroids

Planetary defense in your Hands



Nancy C. Wolfson



Bill Nye



Lindley Johnson



**Dumitru-Dorin
Prunariu**



Mariella Graziano



Alex Karl

Monday, 21 October 2019, 15.00-16.30, room 146A

Educational Event Results:

- 2019 PDC Hypothetical Asteroid Impact Scenario
- 5 scenarios + polls
- 200-250 people
- 60 poll participants



Nancy C. Wolfson



Bill Nye



Lindley Johnson



Dumitru-Dorin



Mariella Graziano



Alex Karl



Multiple-choice poll

Poll#1: What is your reaction?

041

A: 1% and 8 years? Nothing to worry about.

2 %

B: Let's wait. Once we know if and where it will hit, there's plenty of time to react if needed.

5 %

C: Just in case, let's get ready. Better safe than sorry.

76 %

D: I'm really worried and losing sleep - we need to act now!

17 %

Poll #3: Jun 21, 2022: ASTEROID PREDICTED TO IMPACT NEAR DENVER, COLORADO ON OCTOBER 21, 2027: EFFORTS TO PREVENT IMPACT ACCELERATE

- 100% chance of asteroid impacting ~5 years from now.
• Contact binary, 140-220 m.
The asteroid is large enough to cause major damage over a large region around the Denver area.
to be build and launched by space agencies as well as two rendezvous spacecraft to gather data on asteroid

Poll#3: What do you think about the plans to deflect the asteroid?

061

A: We should do nothing, as I don't think it will work and will just waste resources

3 %

B: We should rather prepare Denver for impact than risking to fail and ending up in a new situation with less time

5 %

C: We need to act but must make sure we are ready for all possible outcomes

62 %

D: It is our responsibility to act when we can prevent disaster no matter what

30 %

Multiple-choice poll



Poll#2: What is your reaction?

059

A: 10% and 7 years, 9 months? Still nothing to worry about.

5 %

B: Let's wait until we know if and where it will hit and base our response on that. There is plenty of time.

2 %

C: Let's get ready and prepare for the worst. Better safe than sorry.

51 %

D: I'm really worried and losing sleep - we need to act now!

42 %

Poll #2: ASTEROID NOW HAS 1 IN 10 CHANCE TO IMPACT EARTH

- 10% chance of asteroid impacting our planet ~7.5 years from now.
• Size estimate: 140-260m (could produce serious devastation over a large region but too small to cause globally damaging effects)
• SMPAG calls meeting

Poll#4: Now what?

066

A: Space is hard, let's try again and send the nuke

47 %

B: They failed, my trust in NASA and the other space agencies is gone

2 %

C: The nuke is too risky, there must be another option for deflection

39 %

D: Too late for deflection, we must prepare for impact

12 %

: Feb 23, 2025: DEFLECTION PARTIALLY SUCCESSFUL BUT LARGE FRAGMENT REMAINS ON IMPACT TRAJECTORY, U.S. IMPACT STILL POSSIBLE

• 3 kinetic impactors were successful in deflection main body but large piece broke off, still on course
• Fragment estimated to be 50-80 m. Exact location not yet known exactly
• No active spacecraft left from original fleet • SMPAG and UN considering to launch nuclear device for deflection



Nancy C. Wolfson



Bill Nye



Lindley Johnson



Dumitru-Dorin Prunariu



Mariella Graziano



Alex Karl

Monday, 21 October 2019, 15.00-16.30, room 146A

Poll #5- Oct 11, 2027: SMALL ASTEROID TO IMPACT OVER NEW YORK CITY IN 10 DAYS

- 60m fragment to hit NY Central Park
- It was too late to launch NED
- FEMA evacuating residents and preparing infrastructure

Multiple-choice poll



Poll#5: What do you think we need to work on most urgently?

066

A: Our detection capability

14 %

B: Establishing geopolitical agreements

6 %

C: Our deflection capabilities

27 %

D: Communication with the public

53 %

CONCLUSIONS:

The Polls results showed us that an approx of 90% of the audience present during the event were in favor of being prepared and proactive when taking actions.

- Words matter when communicating with the general public in terms of risk perception (When given the 1% to 10% impact probability , the audience worrisome increased about 25%)
- The psychological aspects and effects of a warning should be considered and carefully addressed (Even when there is 90% chance that the event won't happen, with 8 years advanced warning around 40% of the people are losing sleep and worrying.
- Regarding Communication with the general public, over half of the audience thought this is a essential aspect that should be consider urgent for the specialists dedicated to the planetary defense communication and information dissemination
- Polls are recommended as they help to build a two way communication between specialist and the general public.

Presented by The American Institute of Aeronautics and Astronautics - LA/LV

Space Agencies and Global Collaboration for Planetary Defense



**Detlef
Koschny**
European
Space Agency



**Makoto
Yoshikawa**
Japan Aerospace
Exploration Agency



**Nancy C.
Wolfson**
IAF Technical
Committee on NEOs



Daniel D. Mazanek
National Aeronautics
and Space
Administration



**Alejandro
Roman**
Paraguayan
Space Agency

Participate in our Poll - Virtual Special Session Tuesday October 12th, 2021 @ 7 pm PDT

RSVP October Calendar <https://www.aiaa-lalv.org/events/>



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25 YEARS OF DEDICATED ASTEROID MISSIONS

Asteroid Day TV 1 June - 4 July

Asteroid Day LIVE 30 June

Visit asteroidday.org to participate in all of
Asteroid Day's Global events



Interested in Planetary Defense and NEO Observation Programs? Detect – Warn – Prevent – Mitigate

DISCOVER AND CHARACTERIZATION

- NEO Discovery
- NEO Characterization

LEGAL AND POLICY

IMPACT EFFECTS & DISASTER MANAGEMENT

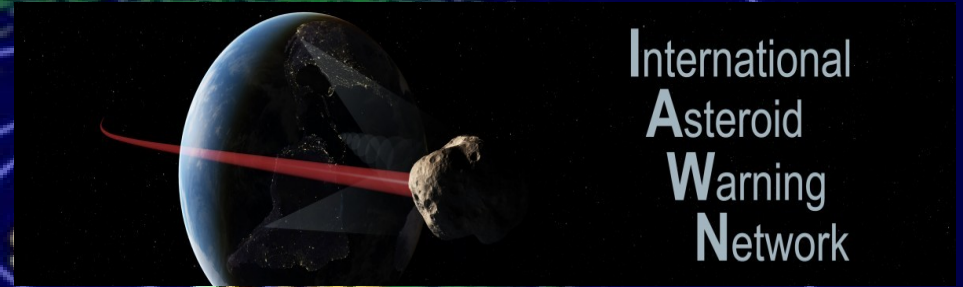
Impact Effects
Disaster Management
Communication

TESTING AND MISSION PLANNING

- Deflection
- Disruption Testing Mission
- Campaign Design
- HERA
- Hayabusa2
- DART
- OSIRIS-REx

EDUCATION & PUBLIC ENGAGEMENT

Avoid fake news and go to the right place to find the right information on planetary defense and NEOs



In here we can see some of the organizations involved Planetary Defense, we will expand on these in detail in future presentation

L4
Trojans



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Lecture by

Nancy C. Wolfson

Vice Chair of the IAF Near Earth Objects

Technical Committee Planetary Defense Research, Education & Communication

Contact me: Nancy Wolfson, Washington DC, USA @gmail.com