Invitation from STFC's Solar System Advisory Panel
to debate the future direction of Solar System research in the UK

STFC has revised and renewed its advisory panel structure, and re-established a Solar System Advisory Panel (SSAP). The current membership and Terms of Reference of the panel can be found at http://www.stfc.ac.uk/About+STFC/5355.aspx

The first task that the panel has been requested to carry out is to provide input to the Programmatic Review that Science Board will be undertaking in 2013. We have been asked to:

i. Identify the top major scientific challenges in the next 20-30 years
ii. Match the current and future programme to scientific roadmap priorities and
iii. Identify what are our highest priorities

In order to do this, the SSAP has to have an understanding of what the research community recognises as its scientific challenges and priorities. The most recent record of such a roadmap is that produced by the previous incarnation of SSAP, the NUAP, in its report of November 2009 (see http://www.stfc.ac.uk/Resources/PDF/MergedNUAPDraftStrat161109.pdf). However, the scientific remit of SSAP has different boundaries from that of NUAP, so the roadmap needs updating and revising.

We invite members of the Solar System Research Community to a Town Meeting on **Monday 10th September 2012**, to discuss the contents and priorities of a Solar System Roadmap. This will build on the NUAP report, but will be focussed in the Solar System, not the Near Universe. The meeting will be in London, at the Royal Astronomical Society, and will start at around 10:30. Further details will be published at the start of September.

In the weeks preceding the Town Meeting, we invite you to become a 'friend' of the SSAP, by joining its Facebook group (http://www.facebook.com/SolarSystemAdvisoryPanel). We will use social media (fb, twitter) to start a discussion, which we hope will provide a platform from which to launch the Town Meeting.

As a start to the discussion, the "Challenges" identified by NUAP are reproduced below. Preliminary modifications to the 'challenges' have been made by the SSAP, to conform to its brief (rather than NUAP's), but we need suggestions from the community as to the content and structure of our final list.

We need to know whether these are still the grand challenges that we should be addressing: what facilities and instruments are required? Which space missions? What new technologies? Do we have the correct balance in the programme between current and future opportunities, between the different research sub-fields and between operations and exploitation?

If you have any comments, or questions, please contact either myself (m.m.grady@open.ac.uk) or Simon Haynes (simon.haynes@stfc.ac.uk).

Looking forward to hearing from you,
Monica Grady

Solar System Advisory Panel (Chair)

The NUAP report of November 2009 recognised the following Science Challenges over the next 10-15 years. Are these still the appropriate Challenges?

(Text that has been struck through is the original wording from the NUAP report. The modifications are by the SSAP, to focus the Challenges on the SSAP's remit, which is different from NUAP's. *Possible new questions are italicised* – we pose these as prompts to promote discussion. It is probable that there will be several iterations before we home in on the final list. But this is the starting point.)

1. What controls the properties and evolution of ~~stars including~~ the Sun?

    1.1. What are the processes that lead to convection and the generation of ~~stellar~~ solar magnetic fields, how do they evolve and what is their role in controlling activity?

    ~~1.2. What are the stellar content and stellar distribution in the Milky Way?~~
    ~~1.3. How do low mass, intermediate mass and massive stars evolve?~~
    ~~1.4. How do binary and multiple systems, including those that emit gravitational radiation or become Type IA supernovae, evolve?~~

    1.2. What drives formation of active regions and how can we understand their evolution in order to predict the occurrence of solar flares and coronal mass ejections (CMEs)?

2. How does the Sun affect its ~~and other stars affect their~~ environment~~s~~?

    2.1. How does solar activity affect the near-Earth space environment as well as those of other planets, and how does the Sun affect civilization?

    2.2. ~~How do evolved stars lose mass and w~~ What is the history of stellar ejecta present in ~~young stars and~~ planetary systems?

    ~~2.3. How do star formation triggering and feedback work and affect the Galaxy locally and globally?~~

    2.3. How do CMEs interact with the background solar wind and how does this influence their propagation?

    2.4. How can we determine the magnetic properties of CMEs far ahead of their arrival at Earth?

    2.5. How does the energy contained within large solar wind structures down-scale into planetary environments?

3. ~~How are stars born and h~~ How do planetary systems, including ~~our own~~ the Solar System, form and evolve?

    3.1. What processes, including those leading to prebiotic molecules, are important in the evolution of molecular clouds to form stars and planets?

    3.2. What are the physical characteristics of exoplanetary systems (including different types of host stars) and how do they evolve?

    3.3. How did the Solar System form and what can it tell us about other planetary systems?

    3.4. Is there a universal model of magnetospheres and atmospheres?

    3.5. How have surfaces and atmospheres evolved in the Solar System?

    3.6. How have volatiles, particular water, been transported?

    3.7. How do planetary bodies evolve and what can they tell us about the history and climate of Earth?

4. What is the extent of habitable environments and life ~~in the Universe~~?

    4.1. What are the limits for life, past and present, in the Solar System?

    4.2. What is the frequency of habitable planets in the Universe and can we detect bio-markers in their atmospheres?

5. What fundamental processes operate in *the Solar System, and what do they tell us about astrophysical systems?* ~~astrophysical sources, including the Solar System~~?

    5.1. What are the fundamental *physicochemical processes and conditions in Solar System environments and under extreme conditions*? ~~laws of physics under extreme conditions~~?

    5.2. What are the fundamental processes that transport, convert and release energy in plasmas?

    5.3 What are the fundamental energy sources and processes which drive planetary atmospheres and how do they interact with their planetary and space boundaries?

    5.4. How and where are particles accelerated in nature?