

Gravitational biology and space life sciences: Current status and implications for the Indian space programme

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Supplementary material

Supplementary Web resources

Gravitational and space biology organizations and journals

American Institute of Aeronautics and Astronautics (AIAA). The site covers a wide range of activities and publishes books on space biology. <http://www.aiaa.org>

American Society for Gravitational and Space Biology (ASGSB). Founded in 1984 it publishes an excellent multidisciplinary journal *Gravitational and Space Biology*, a newsletter released 3 times a year and periodical fact sheets, white papers. Also supplies useful slide sets. The special 25th anniversary issue contains important articles on plant, microbe and human responses to gravity and the importance of International Space Station for life sciences. <http://asgsb.org/index.php>

Astrobiology Magazine. An online popular magazine sponsored by NASA. <http://www.astrobio.net/aboutus.php>

Astrobiology Society of Britain. <http://www.astrobiology.society.org/welcome.html>

Astrobiology Society. Publishes the journal “Astrobiology”.

Australian Centre for Astrobiology <http://www.aca.abcociety.org/aca/>

Australian Government’s Space Portal. <http://www.space.gov.au/Pages/default.aspx>

Austrian Physiological Society. <http://www.meduni-graz.at/physiology/>

Beginning of era of manned spaceflight. 2011.

http://www.space-travel.com/reports/Beginning_Of_Era_Of_Manned_Spaceflight_999.html

Canadian Space Agency (CSA). <http://www.asc-csa.gc.ca/eng/default.asp>

China National Space Administration (CNSA). The site has a White Paper on China’s Space Activities. <http://www.cnsa.gov.cn/n615709/cindex.html>.

Comisión Nacional de Actividades Espaciales, (CONAE) is the National Commission on Space Activities for Argentina. <http://www.conae.gov.ar/principal.html>

COSPAR. Committee on Space Research was established in 1958 by the then International Council of Scientific Unions (now the International Council for Science). COSPAR organizes colloquia, seminars, workshops and biennial Assemblies, and publishes two key journals ‘Advances in Space Research’ and ‘Space Research Today’. <http://cosparhq.cnes.fr/About/about.htm>

Dayanandan P 2011 Gravitational and space biology: current status and implications for Indian space program. Abstract of paper presented at the Space Summit of the 98th Indian Science Congress. pp 56–58. <http://www.isc2011.in/pdf/plenarysession-abstract.pdf>. Email the author for a copy of the full paper.

DESC. The Dutch Experiment Support Center (<http://www.descsite.nl/Frames.htm>)

DLR is the German Space Agency. The site provides up-to-date information on German as well as European space activities. Publishes short accounts titled 'Countdown'. <http://www.dlr.de/rd/>

European Low Gravity Research Association (ELGRA). Conducts ELGRA symposia and <http://www.elgra.org/>

European Space Agency. ESA conducts Life Science Symposia and the website has information on all current activities. <http://www.esa.int/esaCP/index.html>

Gagarin anniversary: Are manned missions a waste of space? Space Daily April 12, 2011 http://www.space-travel.com/reports/Gagarin_anniversary_Are_manned_missions_a_waste_of_space_999.html

Gravity and Biology. A good primer by Emily Morey-Holton. <http://www.dsls.usra.edu/biologycourse/workbook/Unit1.2.pdf>

Greek Aerospace Medical Association & Space Research (GASMA). Provides useful information on response of humans to microgravity and space environment. http://www.gasma.gr/ereuna.asp?side_menu=4&menu=1

Habitation, International Journal for Human Support Research (Formerly Life Support & Biosphere Science.) publishes articles related to new technologies to support human activities within controlled environments. <http://www.cognizantcommunication.com/filecabinet/Habitation/hab.html>

Indian Space Research Organization (ISRO). The site provides information about activities, milestones and organizational structure. Emerging interest in space biology and exploration of solar system and future human spaceflights are provided in the links. <http://www.isro.gov.in/> Volume 93 (2007) of *Current Science* has a special section on Indian Space Programme.

The International Society for Gravitational Physiology. ISGP and the Galileo Foundation have been publishing the *Journal of Gravitational Physiology* since 1994. Proceedings of their Annual Meetings are very valuable. <http://www.isgp.org/>

International Space Exploration Coordination Group. ISECG is a fourteen-nation group interested in exploration of space for future human settlement in other bodies of the Solar System. See the Global Exploration Strategy document of these countries ((Australia, Canada, China, European Space Agency, France, Germany, India, Italy, Japan, Republic of Korea, Russia, Ukraine, United

Kingdom, and United States of America). <http://www.globalspaceexploration.org/>

International Space Station (ISS). Website that provides information on: International Cooperation, Living & Working, Building & Assembly, Ground Facilities, Images & Videos, Facts & Figures, and News & Media Resources. http://www.nasa.gov/mission_pages/station/main/

International Union of Physiological Sciences (IUPS) has a commission on gravitational physiology devoted to physiological responses to gravity. The proceedings are published in the IUPS journal *Physiologist*. <http://www.iups.org/>

Japanese Society of Aerospace and Environmental Medicine. JSASEM also publishes the *Japanese Journal of Aerospace and Environmental Medicine* <http://wwwsoc.nii.ac.jp/jsasem/English/index-e.html>

NASA Astrobiology Institute. <http://astrobiology.nasa.gov/nai>

NASA Science/Science News provides up to date information on NASA activities useful for researchers, citizen scientists, educators, students and children. <http://science.nasa.gov/>

NASA-Human Spaceflight. The site provides information on history and all current programs involving human space flights and vehicles. <http://spaceflight.nasa.gov/home/index.html>

National Aeronautics and Space Administration. NASA has the most extensive website providing information to specialists, general public and school children. There are many useful links included in this website. <http://www.nasa.gov/home/index.html>

National Space Society of Phoenix (NSS) founded in 2000 promotes human spaceflight, space tourism and space settlement Veronica.Zabala@NSS.org

O/OREOS Nanosatellite Mission: <http://ooreos.engr.scu.edu/dashboard.htm>

The Planetary Habitability Laboratory (PHL) is a virtual facility designed to characterize the habitability of Earth, the Solar System, and extrasolar planets. <http://sites.google.com/a/upr.edu/planetary-habitability-laboratory-upra/library/media/vpemods>

The Planetary Society was founded in 1980 by Carl Sagan and others. It is said to be the largest and most influential

public space organization group on Earth. It promotes space exploration of the solar system and seeks life beyond Earth. <http://www.planetary.org/about/>

Russian Federal Space Agency. ROSCOSMOS is a major resource for extensive information on the history and accomplishments and current programs of the Soviet/Russian space activities. <http://www.federalspace.ru/main.php?lang=en>. Also see the following independent web resource for coverage of Russian space activities. <http://www.russianspaceweb.com/>

SETI Institute founded in 1984 is a private, nonprofit organization exploring and explaining the origin, nature and prevalence of life in the universe. <http://www.seti.org/page.aspx?pid=1581>

Space Biology Laboratory, China. China's Space Biology Laboratory is a subsidiary of Chinese Academy of Space Technology. The focus of life sciences research is on the effects of microgravity on cells and tissues, cancer biology, muscle and bone loss, hematopoietic differentiation, microbial system, and plant development. Studies also focus on the use of space environment for biomedical and biotechnological applications, and creating new technologies for diagnoses and manufacturing pharmaceutical products. Universities interact with the Space Biology Laboratory. http://www.sapaweb.org/new/jobs/SpaceBiology_SAPA_ad.pdf

Space Daily. Provides daily info on all developments in space science, including space biology. Has links to space travel and daily news on Sun, Mars, energy etc. <http://www.spacedaily.com/>

Space Life Sciences Academy (SLSA) is part of the Johnson Space Center. It provides curricula and coursework in space life sciences and human health for those associated with NASA as well as non-NASA individuals. <http://www.nasa.gov/centers/johnson/slsd/education/SLSA.html>

Space News (<http://www.spacenews.com/>) and **Space.Com.** (<http://www.space.com/news/>) also provide information and a discussion section on space biology.

Spinoff is NASA's annual publication featuring successfully commercialized NASA technology. <http://www.sti.nasa.gov/tto/>. Also see 'NASA Technologies benefit Our Lives'. http://www.sti.nasa.gov/tto/Spinoff2008/tech_benefits.html.

Springer -The Journal of Technology Transfer. Volume 27, Issue 4 (2002) provides information on technology transfer in space sector at international level with special reference to Russia, USA, Canada and Europe. <http://ideas.repec.org/s/kap/jtecht1.html>

UK Space Agency (UKSA). Previously known as the British National Space Centre. <http://www.ukspaceagency.bis.gov.uk/default.aspx>

United Nations Office for Outer Space Affairs (UNOOSA). Established in 1958 UNOOSA provides information on UN policy on space and various resolutions and treaties including activities governing Moon and other celestial bodies. <http://www.oosa.unvienna.org/oosa/en/OOSA/index>.

Universities Space Research Association (USRA) was established in 1969 by the US National Academy of Sciences to promote knowledge of space science and technology among partner institutions and government. Currently USRA has 95 US and 10 non-US institutions (from Canada, England, Germany, Israel, Australia and China). All 105 institutions have space science or related engineering programs. USRA has many units including the **Division of Space Life Sciences (DSLS)** in Houston. <http://www.usra.edu/>

Wikipedia articles:**Gravitational biology:** http://en.wikipedia.org/wiki/Gravitational_biology;

Astrobiology: <http://en.wikipedia.org/wiki/Astrobiology>;
Space colonization: http://en.wikipedia.org/wiki/Space_colonization

Wisconsin Center for Space Automation and Robotics (WCSAR) founded in 1986 by NASA provides information on space flight hardware, robotics and controlled environmental technologies. <http://wcsar.engr.wisc.edu/>