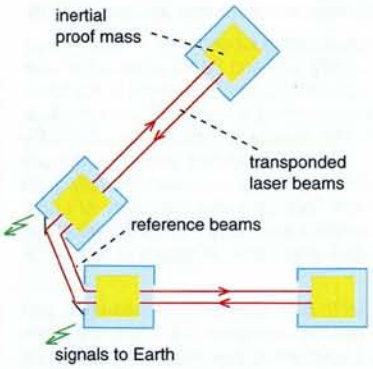
HORIZON 2000 PLUS

Missions Recommended

At its ministerial meeting in Granada in 1992, the European Space Agency's Council asked for a plan to be drawn up setting out objectives in space science once the current Horizon 2000 programme has been completed. The Survey Committee for a Horizon 2000 Plus, meeting in Paris on September 29 - October 1, made recommendations based on topical team reports.

An artist's impression of ESA's Huygens probe sitting on Titan's surface. The proposed Mercury orbiter, with planetary and magnetospheric aspects, may also not fully meet the needs of planetologists. Solar physicists meanwhile have much on their plates.



An outline layout of the proposed gravity wave interferometer LISA that keeps the door open for fundamental physics in space.

Agreement Awkward in Solar Science

The solar science community tends to be divided between those with interests in optical studies and those who favour *in situ* probes. Both groups found it awkward to reach agreement on a future programme, largely because results from several major missions which are about to be launched (SOHO next September, WIND this month, and the Advanced Composition Explorer ACE) will first need to be digested. The *in situ* community argued for a solar probe in collaboration with the US and Russia. This was ruled out by ESA as being too risky, while an independent mission would be too costly. A major (Cornerstone-class) mission to largely unexplored Mercury, involving both planetary and magnetospheric aspects, was therefore recommended. There is a danger that with a split payload covering several aspects, the Mercury orbiter will not be well suited for the communities involved.

No Clear-cut Mission

The problem of a split mission for planetary studies would repeat what has happened with the Huygens probe (of Titan) aboard NASA's Cassini orbiter (of Saturn). It has not been taken up whole-heartedly by the planetary science community as there is a large atmospheric science component. Moreover, there are doubts that Mercury (an end member of a series of planets) is a good candidate for surface mapping and other types of geology-related studies. Cassini, meanwhile, has been under budgetary pressure in the US, and after considering a space-shuttle launch, a panel recently reaffirmed a rocket as the nominal launcher for late-1997. So it is not too surprising that the community considered new techniques, notably stereoscopic (optical) observation, but this has so far not aroused great enthusiasm.

The recommendation was therefore to participate in opportunities that may arise in the framework of a medium-class mission to Mars, international solar missions, a future space station, and small- and medium-size missions by exploiting the very high resolution instruments that will be available.

Astronomers Agree

Astronomy is in a somewhat similar position to solar physics as it will be profiting from a coordinated series of space missions covering different wavelength ranges (ISO, XMM and Integral with launches in 1995, 1997 and 2003, respectively). The low-frequency astronomy team therefore recommended a Cornerstone mission in interferometry. By increasing the resolution from the milli-arcsec to the micro-arcsec range, the Global Astronometric Interferometer for Astrophysics (GAIA) would go well beyond Hipparcos (mission completed last year) which "saw" 5% (120000) of the our galaxy's objects. The principle aim is to search for Jupiter-like planets and brown dwarf companions around stars in our galaxy. GAIA will also determine the distances, motions and luminosities of tens of millions of stars in the Milky Way to a very high accuracy to better understand the evolution of the Universe, allow the study of the mass distributions of nearby galaxies, and test general relativity. Using techniques that are out of question on the ground owing to excessive cost, it could be proposed as a mission for the year 2005, after the Hipparcos Star Catalogue starts to be released in 1996 (the bulk of the analysis of the catalogue will only take about a year or two as the data handling can be well planned). So it is not surprising that there is general consensus that an interferometer is the best next step in space astronomy, and the recommendation is to develop a 500-600 MAU (Accounting Units) Cornerstone-level mission soon after 2000 Plus is completed.

A proposal to consider infrared interferometry to detect Earth-like planets around stars maybe has more potential political and public support, but its science goals are largely encompassed by the interferometer which can infer the presence of such bodies (but not directly observe them, of course).

Regarding high-energy astrophysics (essentially gamma-rays above about 50 MeV), CGRO and EGRET are in progress so a major mission was not recommended. It was decided instead to recommend analysis of the development of a major high-energy astrophysics facility in the context of the space station, while exploiting access to several large and medium-scale missions.

A Door for Fundamentals

The Survey Committee kept the door open for fundamental physics, a new field for ESA, by recommending preparatory studies for a Cornerstone devoted to the observation of gravity waves in space, especially at low frequencies. These would essentially follow on from the Assessment Study in the Medium-sized Mission cycle of a space-based laser interferometer LISA which was submitted to ESA last spring. The principle argument is that space offers an unique opportunity for a gravity wave detection system to complement major ground-based detectors that come on-stream at the end of the 1990s.

The Survey Committee felt that the important challenges justified keeping ESA's science budget at the 1994 level until 2000 and then increasing it by 4-5% for 4-5 years. The content and financial projections of 2000 Plus will now be fed into ESA Long-Term Plan which will be presented to the ministerial meeting of the ESA Council next year.