ROGER BONNET

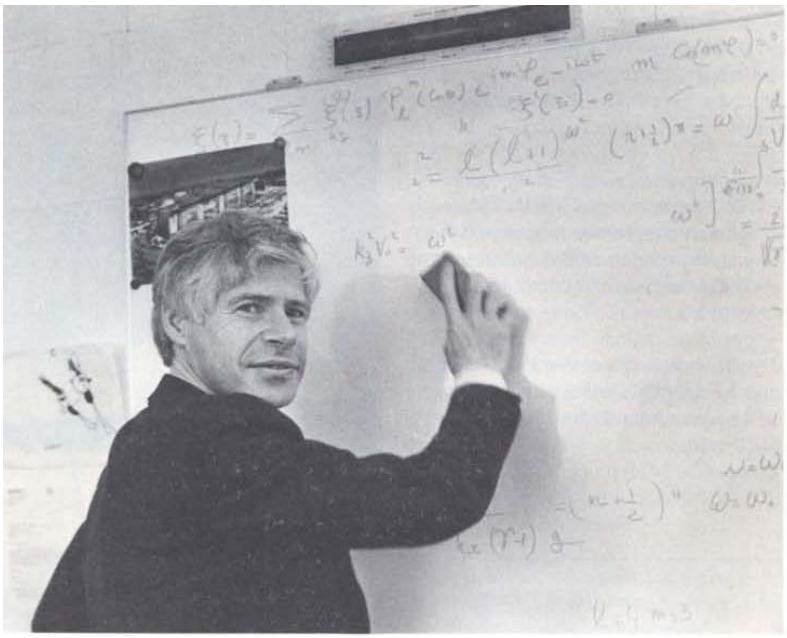
DIRECTOR OF THE ESA SCIENCE PROGRAMME 1983-2001

DIRECTOR OF THE INTERNATIONAL SPACE SCIENCE INSTITUTE ISSI 2003-2012

Roger Bonnet at ESA

(Henk Olthof and Sergio Volonte)

On 1 May 1983 Roger Bonnet took up his duties as ESA's New Director of Scientific Programmes. This was announced as follows in the ESA Bulletin 34: *At the ESA Council meeting of 19 January the appointment of Mr. Roger Bonnet to the post of Director of Scientific Programmes was unanimously approved, with effect from 1 May 1983. Mr. Bonnet, who is French and 45 years of age, is a member of CNRS (Centre National de la Recherche Scientifique) where he has held the post of Director of Research since 1977. He was appointed in brief to his present position as Director of the Laboratoire de Physique Stellaire et Planetaire in 1969. He is a prominent member of numerous scientific societies,including IAU (International stronomical Union) and COSPAR (Committee for Space Research), chairing a number ofcommittees and sub-committees. Since the start of space activities in Europe Mr. Bonnet has had close links with the scientific activities of the Agency, and was Chairman of ESA's SpaceScience Advisory Committee from 1978 to1980.*



Soon after, on 21 June 1983, he had his first interaction with the SPC as Director of the Scientific Programme and by way of introduction he stated that; *At a time when the programme had just scored a fresh success with the Exosat launch but was also in a very worrying financial situation, which could probably not be redressed for several months whatever the combined efforts devoted to this task. At a time when the Agency was drawing up its long-term plan of action it was essential to provide a sufficiently important level of activities for the Scientific Programme in order to meet the needs of the scientific community and to maintain the value of the scientific and industrial teams, experience having shown that they were the touchstone for the success of the other ESA programmes. Proposals were accordingly being prepared in order to match available resources better to existing requirements. In support of this reflective and long-term planning effort, the Director of the Scientific Programme said he intended to visit shortly all delegations in order to meet policy/ decision-makers and representatives of the scientific and industrial communities.*

At that time COS-B and GEOS-2 were finished, IUE and ISEE-B were operational, Exosat was just launched, the European contribution to the Hubble Space Telescope (HST), Ulysses, Hipparcos and Giotto were under development and ISO was just approved. This was a full palet of missions that would exhaust the available resources for a long time to come. In order to provide the expanding European scientific community an adequate level of challenging new missions a radically new approach for future planning was required.

With his closest collaborator Vittorio Manno, Roger Bonnet initiated this process by issuing to the scientific community a Call for Mission Ideas in the fall of 1983. The process was coordinated by a Survey Committee chaired by Johan Bleeker and composed of the Space Science Advisory

Committee (SSAC), the top advisory committee of the Science Programme, expanded by other scientists from different areas of fundamental science. After extensive evaluation and prioritization of the submitted proposals a long term plan for the period 1985-2005 referred to as "Space Science Horizon 2000" (H2000) was created. (See ESA HSR-24: ESA's Scientific Programme towards the turn of the Century). The plan was designed to ensure that Europe would play a key and balanced role in space science beyond the turn of the century. The report on this programme (ESA SP-1070) was enthusiastically received by the SPC at its meeting in November 1984.

H2000 was based on 4 major science themes corresponding to the highest priorities identified by the Survey Committee, to be implemented as flagship missions" the Cornerstones". They included Solar/Plasma heliospheric missions, a mission to Primordial Bodies with return of Pristine Material, a High Throughput X-Ray Spectroscopy mission and a High-Throughput Heterodyne Spectroscopy mission. As these missions required extensive new technology developments, they were to be approved on the basis of the level of their scientific and technical maturity. H2000 included a flexible part made of a mix of medium missions (M) and smaller projects to be selected competitively from proposals submitted by the community. In addition, the plan identified a number of longer term science endeavours "the green dreams" to be studied in preparation of post-H2000 missions. Missions already approved before the advent of H2000 were integrated into the plan. Giotto (1985), Hipparcos (1989), HST and Ulysses with NASA (1990) and ISO (1995).

To implement Horizon-2000 over a period of about 25 years a 7% increase of the annual budget for Science was requested to reach a steady level over a decade. Thanks to this completely new strategic approach the ESA Council meeting at ministerial level in Rome in 1985 approved the H2000 plan. To provide the financial means to execute H2000, the ESA member states approved a progressive budgetary increase of 5% per year from 1985 (instead of the 7% requested) for an initial period of 5 years with no guarantee for the time thereafter. The H2000 plan was endorsed by the SPC in November 1985. The ministerial meeting of 1987 confirmed the continuation of the 5% yearly increase beyond 1989.

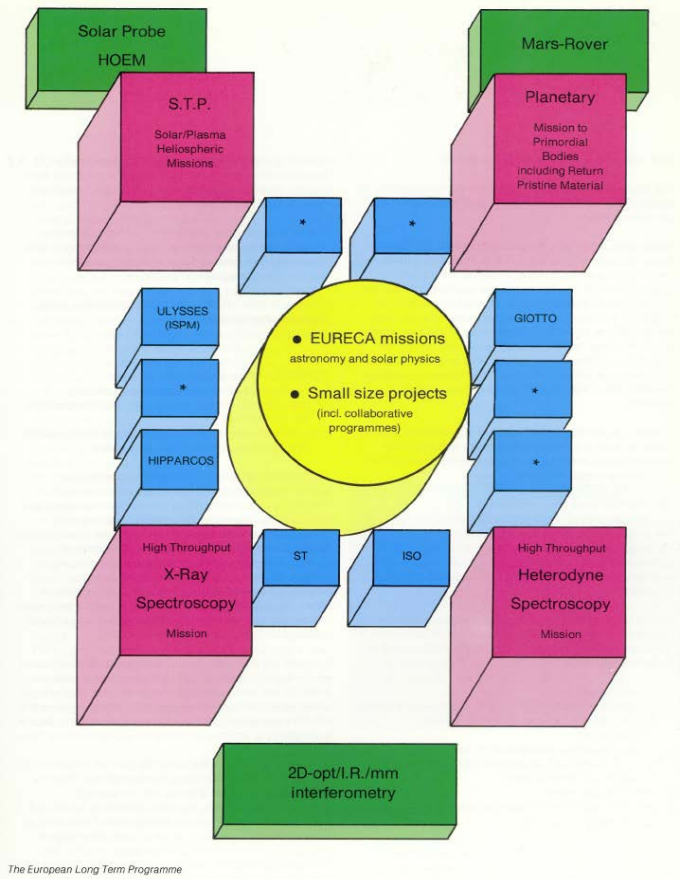


Fig. 1 *The Horizon 2000 plan as approved in Rome in 1985*

Implementation of H2000 started in 1986 when the SPC approved the first cornerstone (CS1) which combined two missions, SOHO and Cluster, into the Solar-Terrestrial Science Programme (STSP). In the period until 1993, after approval of the High Throughput X-ray Spectroscopy mission, XMM-Newton as CS2 in 1989, the implementation of the plan went on with the approval of CS3 (Rosetta, a comet rendez-vous mission) in 1993. As a result, the sub-millimetre astronomy mission FIRST, later renamed Herschel, became de facto the last of the series (CS4). In the same period the first two medium missions were approved; M1, the ESA Huygens probe to Titan on board NASA's Cassini mission to Saturn and M2, Integral-the International Gamma-Ray Astrophysics Laboratory to be launched by a Proton rocket in cooperation with Russia.

In 1993, at mid-course into its development, the implementation and performance of H2000 was reviewed. Managerial, technical and political issues arose. Delays due to launcher problems induced cost overruns affecting the purchasing power of the Science Programme. The loss of the Challenger shuttle in January 1986 led to a 4-year delay to 1990 of the Ulysses and the HST missions both to be launched by the shuttle with consequent significant cost increases. This impacted on the implementation of H2000, in particular the STSP cornerstone (CS1). These problems were overcome through management redirections and negotiations with the NASA partner allowing to maintain the overall objectives of the plan. In parallel, preparatory work began on a follow-up plan to cover the period 2006-2015. As for H2000, the approach involved consultation with the community and analysis by a Survey Committee under the chairmanship of Lodewijk Woltjer. The structure of the new plan called Horizon 2000 plus (H2000+) was similar to H2000. It comprised 3 new cornerstones and a number of medium and smaller missions. The new cornerstones included a mission to Mercury, an interferometric observatory for astrometry or infrared astronomy and an observatory for low frequency gravitational waves. Taken together, H2000 and H2000+ were jointly termed Horizons 2000.

The new Horizons 2000 plan was presented at the ministerial meeting held in Toulouse in November 1995. Although the plan was approved, the ministers imposed a 3% annual reduction in the level of resources of the Science Programme as of 1996, a trend that lasted until 2001. In addition to the severe programmatic and financial problems resulting from this decision other issues emerged at the same time.

Under pressure from the Mars community and the Member states involved in the Russian Mars-96 mission lost in November 1996, the decision was made in early 1997 to develop the ESA Mars Express mission making it "faster and cheaper" by taking larger risks and capitalising on the re-use of the Rosetta platform and elements of the Mars-96 payload. A similar approach based on Mars Express was used later for Venus Express.

In the course of 1996, NASA invited ESA to participate in the New Generation Space Telescope (NGST, later renamed James Webb Space Telescope-JWST), the successor of the Hubble Space Telescope (HST). This proposal was immediately supported by the astronomy community, not hesitating to sacrifice, if necessary, some of the missions foreseen in Horizon 2000 and Horizon 2000 Plus. The ESA involvement in this NASA led mission was eventually decided in 1998.

The Cobras-Samba mission (later renamed Planck) to investigate the Cosmic Microwave Background (CMB) radiation was selected by the SPC as the third medium mission (M3) of H2000 and confirmed in November 1996.

Moreover, the Cluster mission making up with SOHO the STSP Cornerstone (CS1) was lost in June 1996 with the failure of the maiden launch of Ariane 5. In early 1997 the decision was made for a reflight of the mission thanks to the opportunity to use the Russian Soyuz launcher. The initiative was crowned with success when the mission renamed Cluster 2 was placed into orbit using two successive Soyuz launches from Baikonour in July and August 2000 thus safeguarding the full scientific capability of the first cornerstone of H2000.

As a result of these new constraints coupled with the reduced funding level arising from the 1995 ministerial meeting, the new Horizons 2000 plan was substantially restructured. The Cornerstones were maintained but with a lower cost envelope. For the same reason and also to keep sufficient flexibility of planning, the medium missions were replaced by 2 classes of less costly projects: Flexible missions (F) with purely scientific goals and SMART missions (Small Missions for Advanced Research in Technology) to provide in orbit proof of technologies particularly needed for cornerstones but also carrying scientific experiments as a secondary goal.

In November 1998 CS4 (Herschel) and M3 (Planck) were approved by SPC on the basis of a single industrial programme to be launched together on the same Ariane 5. In fact, the launch was delayed 4 years to 2009 due to serious problems affecting the development of the very advanced technologies on which both missions were resting. Mars Express was conditionally approved as the first flexi mission (F1) and confirmed with a special allocation following the Ministerial meeting of May 1999. The mission was launched in 2003 and was followed by Venus Express launched in 2005.

In October 2000, the SPC endorsed a package of missions planned for launch in the period 2008-2014. The package included BepiColomb, a mission to Mercury in collaboration with Japan, as CS5 and GAIA, an astrometry mission to chart a three-dimensional map of our Galaxy, as CS6. LISA was also included as the Gravitational Wave Cornerstone to be implemented in collaboration with NASA at a later time. At the same meeting Solar Orbiter as flexi-F2 and ESA's contribution to JWST as flexi-F3 were selected; both to be implemented in collaboration with NASA in an order depending on NASA's schedule for JWST.

Another element of the original H2000 concept was the small mission category which included Space Station and Eureka utilization flight opportunities (Fig.1) which did not materialised. However, within this scheme ESA participated at a low level in Corot, a stellar seismology and planet finder mission of the French space agency (CNES) and in the Chinese Double Star mission that complemented Cluster. The only H2000 small mission that was implemented as such was SMART-1, a lunar mission testing solar electric propulsion launched in 2001. The second one, SMART-2, later renamed LISA Pathfinder finally launched at the end of 2015, evolved into an M mission as a precursor to the H2000+ LISA Cornerstone. Furthermore, participation in the HST servicing missions and a large number of mission extensions including most of the Cornerstones were funded as extended scientific opportunities of the small mission category.

Figure 2 below summarises the missions developed within the H2000 and H2000+ schemes over the time frame 1985-2015. With the exception of GAIA launched in 2013, the other missions included in H2000+ will be launched in the period beyond 2015 corresponding to the follow up Cosmic Vision plan established under Roger Bonnet's successor, David Southwood.

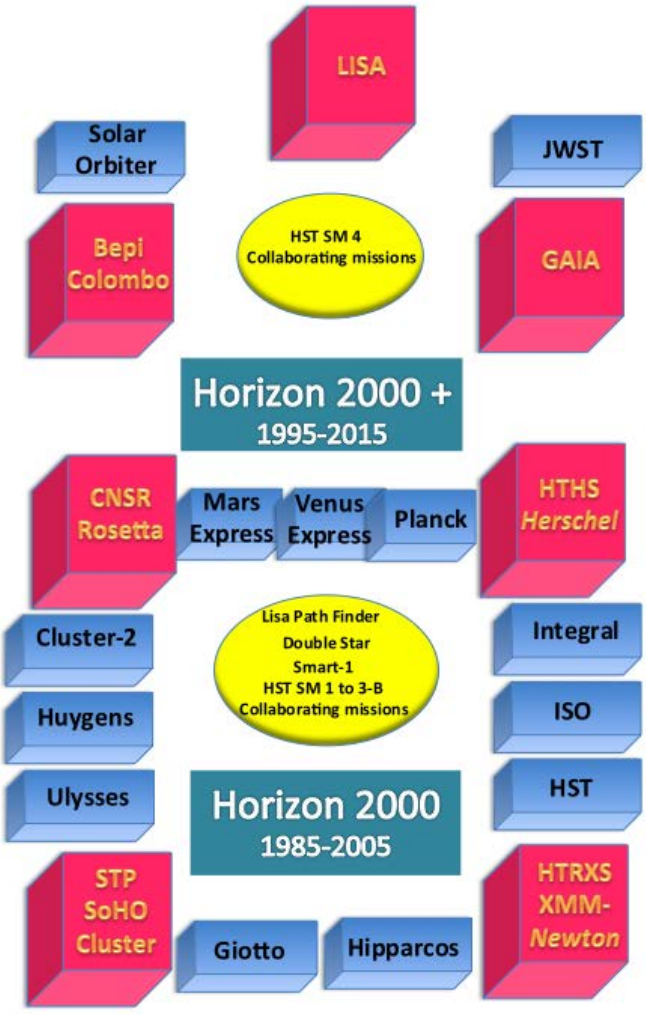


Fig. 2. *The Horizon 2000 plan and its extension Horizon 2000+ spanning the period 1985-2015. The Cornerstones in carmine boxes are placed in chronological order from the bottom with astronomy missions on the right and Solar System missions on the left. The medium/flexi missions in blue boxes also arranged in chronological order and placed clock wise for Solar System missions and counter clock wise for the astronomy components.*

To ensure a timely implementation of the plan within the approved financial boundaries Roger Bonnet imposed a strict control on the science programme budget and on all the projects to maintain them as much as possible within their approved envelopes. On the science side, the advisory structure (working groups and SSAC) was kept permanently involved to advise the director of science and the SPC in carrying out the plan. This contributed to ensure the scientific credibility of the plan as well as the strong support of the community.

As many ESA science missions were done (and are still) in cooperation both with national agencies in ESA member states and international partners, e.g. NASA, Japan, Russia, China, etc., H2000 became a true example of international collaboration not only among the European countries but also at world-wide level. As a result, H2000 was considered as a credible plan for space science in Europe and became a stable reference for the ESA Member States as well as for other the space-faring nations. In fact, Roger Bonnet has always worked to increase international collaboration in space research.

Another illustration of Roger's effort towards international cooperation was the IACG, the Inter-Agency Consultative Group. For many years IACG was the only forum where the space agencies from EU, USA, Japan and Russia could coordinate their missions addressing common science objectives with the aim of maximising the overall scientific output. Examples were the missions to comet Halley and the STSP programme.

With its many successful missions the H2000 planning approach introduced thanks to Roger Bonnet has allowed the European scientific community to play a leading role in many areas of space science such as high-resolution astrometry, X, IR and Sub-mm astronomy, cosmology, solar physic as well as in Solar System exploration.

Through his dedication to space research and promotion of international cooperation, his enthusiasm, political sense and determination to maintain the continuity and integrity of the plan, Roger Bonnet has played a leading role in raising the ESA science programme to a level of excellence which has made it a stable and undisputable element on the worldwide scene of space science.

Roger Bonnet leaves ESA on 30 April 2001 after 18 years of an intensive and successful activity entirely devoted to the Science Programme. A very special event is organised by his closest collaborators to mark his departure. As Roger is a real amateur of opera, the famous baritone Jose Van Damme is invited to give a recital in his honour. When Roger enters the theatre he is welcomed with a standing ovation by the 600 people attending the event. This is a total surprise to him as can be seen on his face. It is the expression of a well-deserved recognition by the ESA staff and the many scientists present of his contribution to the agency and to space science.

The main decisions taken during Roger Bonnet's mandate

November 1985:	Endorsement of the Horizon 2000 plan
February 1986:	Confirmation of Cornerstone 1:SOHO and Cluster and Cornerstone 2: XMM/Newton
November 1988:	Approval of the Huygens capsule for the NASA Cassini mission.
June 1993:	Approval of the INTEGRAL mission

November 1993:	Confirmation of Cornerstone 3: Rosetta and Cornerstone 4: First, later renamed Herschel
February 1996:	Endorsement of the Horizon 2000+ Plan
July 1996:	Approval of the Cobras-Samba mission later renamed Planck mission
February 1997:	Approval of the Cluster recovery mission
June 1997:	Endorsement of the follow-up Horizon-2000+ Plan
May 1998:	Merging of Herschel and Planck into one single development programme
November 1998:	Approval of the Mars-Express mission.
September 1999:	Approval of the SMART-1 Lunar mission.
October 2000:	Confirmation of Cornerstone 5: GAIA and Cornerstone 6: BepiColombo
February 2001:	Approval of the SMART-2 Lisa Pathfinder mission.

ROGER BONNET AT ISSI

(Rafael Rodrigo)

ISSI was set up as a Foundation under Swiss law with an Endowment by Contraves AG on January 31, 1995.
Start of operations: May 1995.
First WS "The Heliosphere in the Local Interstellar Medium": November 6-10, 1995.
Official inauguration of ISSI: November 10, 1995.

ESA contribution was agreed by ESA Council unanimously in mid-December.
When ISSI was founded at 1995, RMB was ESA Director of Science and his contribution and efforts need to be recognized.

On 1 January 2003 Roger Bonnet took up his duties as Executive Director of ISSI. (After two renewal of his contract, his term ended on December 31, 2012).

Three months later, first **Open Call for International Teams** (March 14, 2003). New procedure for selecting scientific teams following a call for ideas and resting on the advice of the Science Committee. (Clarification of the procedure and adding visibility to ISSI).

Soon after, he signed, as one of his first actions as Executive Director, an Agreement for the nomination of Johannes Geiss (the founder and father of ISSI) as Honorary Director of ISSI. (**Picture**)

Implementation of a New Tool: ISSI-Forum. An ISSI Forum is understood as an informal and free debate on open questions by some ten to fifteen high-level participants, who met for a couple of days at ISSI. First Forum on "Astrobiology", November 9-10, 2004.

Contract ISSI-ESA/EOP. Third ISSI Forum on Earth Science from Space, March 2-3, 2006. The goal of the Forum was to assess the need for an ISSI-like institute in the field of Earth sciences, the adequacy of ISSI's present mode of operation and tools to increasing the science return of space missions in Earth sciences. The success of the Forum allowed discussions to start with ESA and the Swiss Space Office, in order to assess the needs necessary to support this new development. One year later, the first Contract with ESA/EOP was signed for three years.

Participation in Europlanet project. The project started on 2007 within the Sixth Framework Program of EU, and its main objectives are to enhance the output of the European Planetary Missions, the creation of a virtual observatory for

planetary science and outreach and education. First WS “Planetary Atmospheric Electricity” June 23-27. Now ISSI is a full partner of Europlanet since FP 7.

Opening the ISSI tools to Young Scientists. As a consequence of the discussions during the 4th ISSI Forum dedicated to “Space Science and Education” (12-13 June, 2007), ISSI invited Teams to increase their allocated support by 15% to be reserved for Young Scientists and additionally funded by ISSI. This activity was very well received and is still having a great success.

Russian Academic of Sciences Contribution. Natural consequence of many years of fruitful collaboration of Russian space scientists in the framework of ISSI. Agreement signed in 2009.

Maintenance of the level of Resources. ESA, Swiss Government and others.

Starting **negotiations with NSSC China**. MoU signed on February 14, 2012. This task was finished with the implementation plan, giving place to the establishment of ISSI-BJ. AoC signed on July 15, 2013 and inauguration on July 17, 2013.

During the mandate of Roger Bonnet, 27 Volumes of Space Science Series of ISSI have been published, as well as seven ISSI Scientific Reports and 21 numbers of the SPATIUM magazine. 34 Workshops and 10 Forum were organized.