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Long-Term Visions, Strategic Interventions: A History of the European Space Sciences Committee, 1974-1985

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ESSC

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Cover Image: Depicts the ESSC|ESF|NSF workshop at the Max Planck Institute (25-27 April 1984)

Foreword

The 50-year celebrations of the European Space Sciences Committee (ESSC) in 2024 highlighted a significant gap: despite its profound role in shaping European space science and the European Space Agency itself, the body lacked a formal documented history.

To address this, I approached my colleague, Prof. Jon Agar of the Department of Science and Technology Studies (STS) at University College London, to explore the possibility of a student Master's project focused on the ESSC's history and impact. Jon responded with enthusiasm, and a project was subsequently approved and awarded to Francesca Seymour.

In her application, Francesca wrote:

"In this dissertation, I would investigate the ESSC's role in governance and diplomacy, exploring how the organisation balances scientific independence, political neutrality with its overall strategic aims. With use of evidence from existing literature, the archival collections in Florence, and (potentially) interviews, I would like to address some key questions:

- *How has the ESSC shaped European space policy and governance frameworks through its science advice?*
- *In what ways has the ESSC maintained its independence while influencing political and institutional agendas?*
- *Over the past 50 years, how has the ESSC responded to evolving policy challenges, including international competition, technological change and shifting geopolitical landscapes?*
- *How has the ESSC's strategic advice impacted Europe's positioning in space governance and its interactions with other major global space powers?*

Through a critical STS lens, this historiographical research will aim to situate the ESSC within the broader context of science diplomacy in Europe. I would like to explore the interconnected dimensions of: institutional design and evolution, policy advisory mechanisms, interactions with key stakeholders and impacts on relevant international negotiations over the past five decades. Particularly interesting for me would be STS framings of risk and uncertainty in science policy/governance, power relations, and the establishment and legitimisation of 'expertise'. For example, how has the ESSC legitimised its advisory role amidst competing stakeholder interests?

To take a step back, I hope this research would somewhat contribute to our understanding of expert advisory bodies in global science governance, particularly in how they operate in the context of complex multilevel governance systems. The research could even gain insights into some of the challenges associated with science governance and institutional coordination given the varying and often competing scientific, political and economic priorities across Europe and beyond".

The thesis that follows admirably fulfils Francesca's objectives. Focussing on the period 1974-1985, it documents and explains how the ESSC (originally the SSC) constructed its advisory authority without holding formal decision-making power. Furthermore, it demonstrates how the committee successfully transformed fragmented national scientific communities into a cohesive European framework, establishing key international collaborations and positioning Europe as an equal partner on the global stage.

I would like to congratulate Francesca on this impressive and highly valuable contribution to the record of European space history. My thanks also go to Mariette Desmartin-Vandermersch of the ESSC Secretariat, whose support was instrumental - particularly in facilitating Francesca's visit and access to original ESSC records held in the Historical Archives of the European Union (EUI) in Florence.

Prof Chris Rapley CBE, MAE
Chair, European Space Sciences Committee

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I would also like to thank my academic supervisor, Professor Brian Balmer of the Department of Science and Technology Studies, UCL, for his insight and encouragement throughout this research.

Abstract

This dissertation examines how the European Space Sciences Committee (SSC) and its predecessor bodies established legitimacy in European space governance between 1974 and 1985. Through documentary analysis of archives from the Historical Archives of the European Union, Florence, the study traces the committee's evolution from Sir Harrie Massey's Provisional Space Science Advisory Board to a permanent European Science Foundation committee. Drawing on theories of boundary organisations and performative authority, the analysis reveals three mechanisms through which the SSC constructed legitimacy. First, it performed authority, intervening in ESA's formation and major mission negotiations without formal standing. Second, it established jurisdiction by focusing on "long term" strategic issues whilst avoiding operational matters. Third, it produced boundary objects enabling coordination across fragmented communities: reports that reframed problems, workshops that built epistemic communities from disconnected national groups, and partnership frameworks that established principles for collaboration with the United States. These mechanisms reveal how boundary organisations operate in multilateral contexts, navigating multiple national systems whilst maintaining independence from governmental influence. By examining how the SSC transformed European space science from dispersed national efforts into coordinated programmes, the dissertation demonstrates that scientific advisory bodies don't simply transmit expertise but actively construct both their own authority and the fields of activity they represent.

Introduction

In April 1984, European and American scientists gathered at the Max Planck Institute in Heidelberg to discuss joint ventures in planetary exploration. The workshop, co-organised by the Space Sciences Committee (SSC) of the European Science Foundation (ESF) and the US National Academy of Sciences' Space Science Board (NAS-SSB), would lay the groundwork for Cassini-Huygens, one of the most successful planetary exploration missions in history. This collaboration exemplified the SSC's distinctive role in constructing European space science autonomy whilst facilitating international partnerships. Yet the European committee orchestrating this collaboration operated without formal decision-making powers or budgetary control. The SSC was purely advisory, its influence dependent on building scientific consensus and maintaining credibility with multiple institutions.

This dissertation examines how the SSC constructed authority as a scientific advisory body between 1974 and 1985. During these crucial years, European space governance was transforming. Space science risked marginalisation within programmes dominated by applications satellites and launchers, whilst European scientists remained dependent on NASA for flight opportunities (Krige and Russo 1994, pp.103-122; Massey and Robins 1986, pp.246-247).

In response, in 1974 Sir Harrie Massey convened fourteen scientists under Royal Society auspices to form the Provisional Space Science Advisory Board for Europe (PSSAB). This group evolved through several institutional transitions. In 1976, it was adopted by the ESF as an ad hoc committee, achieving standing committee status in 1979. The committee later became the European Space Sciences Committee (ESSC) in 1991, continuing to provide independent advice today. For historical accuracy, this dissertation refers to the committee by its contemporary designation: PSSAB (1974-1975) and SSC (1976-1985). By 1985, the committee had helped lay the groundwork for Horizon 2000, the European Space Agency's (ESA) first long-term science programme that introduced flagship cornerstone missions, providing Europe with a unified framework for space science (Bonnet and Manno 1994; Krige et al. 2000, pp.199-215).

Despite this significant influence on European space policy, the committee remains one of the lesser-studied institutions in the history of European space development. The committee's influence poses a puzzle for understanding scientific advice in policy making. Operating outside ESA's formal structure from its base in the ESF, the SSC lacked the institutional mandate that typically underpins advisory authority. Its reports nonetheless shaped policy debates, its workshops built scientific consensus, and its partnership frameworks enabled missions that neither Europe nor US could accomplish alone. Understanding how this authority emerged raises questions about expertise and governance. The central research question asks: How did the SSC construct legitimacy as a scientific advisory body across science-policy boundaries in European space governance between 1974 and 1985? This breaks down into three subsidiary questions:

1. How did the SSC perform and construct advisory authority without formal decision-making powers, and what strategies enabled it to gain credibility within European space governance?
2. How did the SSC contribute to integrating fragmented national space science communities into a cohesive European framework for setting scientific priorities?
3. How did the SSC shape frameworks for international collaboration, particularly with the US, and what role did this play in positioning Europe as a credible partner in space exploration?

These questions matter because they show how European scientific communities constructed channels for a collective voice within fragmented governance structures and multilateral decision-making systems. The SSC had to build credibility simultaneously with space scientists seeking representation, national delegations protecting sovereignty, ESA management balancing competing priorities, and international partners evaluating European reliability. Each audience required different forms of legitimation.

STS scholars term such institutions boundary organisations, entities that mediate between scientific and political domains whilst maintaining credibility in both (Gieryn 1983; Guston 2001). Yet existing theories primarily address bilateral science-policy interfaces within single nations. The SSC's multilateral context required more complex navigation, coordinating across different national systems whilst presenting unified European positions to the US. This demanded continuous recalibration across multiple, sometimes conflicting, jurisdictional claims.

The dissertation analyses recently available materials from the Historical Archives of the European Union (HAEU) in Florence, Italy, employing documentary analysis to trace how authority was performed through texts and interventions. The temporal scope from 1974 to 1985 captures a complete institutional cycle: from the committee's provisional establishment through its evolution into permanent infrastructure for European space science. During these years, the SSC developed what Hilgartner (2000, p.13) terms a distinctive institutional 'persona' through visible practices including high-profile meetings, authoritative reports and strategic involvement in major projects.

The dissertation proceeds as follows. Part 2 establishes the historical context and theoretical framework; Part 3 outlines the research methods employed. Part 4 traces how Massey's provisional board became a standing committee (1974-1978), demonstrating how the committee performed authority through strategic interventions. Part 5 examines how workshops and partnerships built the epistemic community and established frameworks for long-term planning (1979-1985). Part 6 synthesises how advisory legitimacy emerges from continuous boundary work, offering lessons for scientific advice in complex governance systems.

Three key mechanisms emerge from the archival evidence. First, the committee performed authority before possessing it, intervening decisively in governance decisions without formal standing. Second, it established jurisdiction through careful positioning on long-term strategic issues that avoided competition with existing bodies. Third, it produced what Star and Griesemer (1989) call 'boundary objects': documents and frameworks enabling different communities to coordinate whilst maintaining distinct interpretations. These mechanisms reveal that advisory authority emerges not from institutional position but from continuous strategic practice.

The dissertation makes several contributions to existing scholarship. It provides a comprehensive institutional analysis of the SSC's first decade, using newly accessible archives. It advances theoretical understanding of how scientific advisory bodies construct authority in multilateral contexts. And, it documents how scientific institutions facilitated European integration through mechanisms beyond formal political structures.

Historical Context

The formation of the PSSAB in 1974 came at a pivotal moment in European space cooperation when fragmented efforts were consolidating into more coherent institutional frameworks. By tracing developments from the early Cold War through the early 1970s this section situates the committee within the maturing institutional landscape of European space science.

COLD WAR SCIENCE AND AMERICAN HEGEMONY

The Cold War transformed science and technology into central instruments of state power and international influence. Scientific capability became essential not only for national security but also for projecting power internationally. The nuclear domain represented the most dramatic expression of this relationship (Oreskes 2014), with nuclear capability serving as what the French defence minister called in 1963 the difference between being "nuclear or negligible" in international affairs (Krige and Barth 2006).

The space race between the US and Soviet Union epitomised this competition (McDougall 1997), yet it also created opportunities for the superpowers to extend their influence through scientific cooperation with allies. Krige's (2014) analysis of US-French cooperation in the 1960s reveals how NASA helped French engineers build their first satellite whilst carefully managing technology transfer. American assistance included training in both technical and managerial practices, but launcher technology that might contribute to missile development remained restricted. This selective knowledge sharing reflected American efforts to strengthen European scientific capabilities within the Western alliance whilst preventing independent military technologies that might challenge US hegemony or contribute to proliferation. Throughout the Cold War, both superpowers used scientific and technological cooperation as mechanisms for building spheres of influence. The US promoted programmes like Atoms for Peace and space cooperation to tie allies and non-aligned nations into its technological framework, whilst maintaining strict controls over sensitive dual use technologies that could enable independent nuclear or missile capabilities.

THE AMERICAN MODEL

In 1958 the US NAS established the SSB to provide independent strategic advice to NASA and other federal agencies (Massey and Robins 1986, pp.54-58). Operating autonomously within the Academy, the SSB brought together leading scientists to evaluate programmes, identify long-term research opportunities and make recommendations (NRC 1998). The SSB's independence gave it credibility with the wider scientific community while enabling it to influence policy at the highest levels. Through reports, workshops and specialised working groups, the Board coordinated disciplinary interests and ensured that scientific priorities were not subordinated to short-term political or industrial pressures (NRC 1998, pp.12-17; Massey & Robins 1986, pp.55-57). For European scientists observing these developments, the SSB offered a model of how an independent advisory body could guide strategic direction while remaining separate from operational agencies. Its perceived success directly inspired proposals for an equivalent structure in Europe (Massey and Robins 1986, pp.244-246).

EARLY EUROPEAN SPACE EFFORTS: ELDO AND ESRO

In the early 1960s European nations launched independent space initiatives, but fragmented efforts struggled to compete with the scale of US and Soviet programmes, with NASA's budget dwarfing combined European expenditure (Krige and Russo 1994, pp.103-122; Krige and Russo 2000, pp.110-114). In the context of 20th century European integration, to pool resources, European governments created two organisations: the European Launcher Development Organisation (ELDO) in 1962 and the European Space Research Organisation (ESRO) in 1964. Both organisations were created without clearly articulated objectives, which complicated coordination and funding efforts (Krige and Russo 1994, pp.103-122).

ELDO adopted a distributed management structure, with different nations responsible for separate rocket stages, but the lack of central authority led to repeated technical and managerial failures. In contrast, ESRO, modelled on CERN's centralised governance with strong scientific representation, achieving more notable success (Krige and Russo 2000, pp.13-29). Between 1968 and 1972 it launched seven research satellites and fostered a thriving scientific community. ESRO introduced a principle, later formalised in ESA as 'juste retour,' which guaranteed that industrial contracts were allocated in proportion to each country's financial contributions (Bonnet 1987; Bonnet and Manno 1994; Krige and Russo 1994, pp.103-122). While juste retour secured member-state participation, it also created recurring tensions between technical efficiency and geographical fairness, shaping ESA's industrial policy for decades. By the late 1960s, ESRO faced mounting pressure to shift towards applications programmes - including telecommunications, Earth observation and meteorology - producing growing friction between scientific priorities and industrial objectives (Krige and Russo 1994, pp.103-122; Krige and Russo 2000, pp.254-291).

THE TRANSITION FROM ESRO TO ESA

By the early 1970s European space governance had reached a decisive turning point. ELDO's persistent launcher failures had undermined confidence in Europe's autonomous launch ambitions, leading to its liquidation in 1973 (Krige and Russo 1994, pp.103-122). Meanwhile, ESRO's scientific successes created expectations for institutional consolidation (Krige and Russo 2000, pp.198-210). Ministers recognised that fragmented arrangements were unsustainable and began preparing for structural reform.

Between 1971 and 1975, a series of European Space Conference ministerial meetings reshaped the policy landscape. Following complex negotiations, the outcome was the December 1972 'package deal', negotiated under the leadership of Italian physicist G. Puppi, then ESRO Council chairman (Krige and Russo 1994, pp.103-122; Krige et al. 2000, pp.1-23). Through considerable compromise, political agreement was finally secured, with three major programmes serving as the basis for ESA's activities:

- Ariane (French-led launcher)
- Spacelab (German-led science module for NASA's shuttle)
- Marots (British-supported maritime communications satellites).

A major scientific achievement of the negotiations was the decision to establish a mandatory science programme, with contributions from all member states proportional to their gross national product (Krige et al. 2000, p.137). Yet science remained politically vulnerable: funding for the mandatory programme stagnated through the 1970s, accounting for a dwindling share of the total budget (Bonnet and Manno 1994; Krige and Russo 1994, pp.103-122). Taking over from ESRO, ESA was formally created when the ESA Convention was signed in May 1975. Among ESA's institutional innovations were the Science Programme Committee (SPC), which managed the mandatory science programme, and the Science Advisory Committee (SAC), which provided technical evaluations but operated strictly in an internal advisory capacity without independent authority.

THE ESF: A NEW MODEL

The ESF was founded in Strasbourg in November 1974 as a coordinating body for European research outside direct intergovernmental control (ESF 2014). Its creation balanced competing visions: while Altiero Spinelli at the European Commission supported a stronger supranational role, national research councils insisted on autonomy. The result was an association of national academies and funding bodies, ensuring that scientists led in setting research priorities (Nedeva and Stampfer 2012; Unger 2020).

From its earliest discussions, space science was identified as a strategic area requiring special coordination because of its costs, international scope, and dependence on long-term planning (ESF 2014). At the same time, the creation of ESA exposed a governance gap: ESA's SAC evaluated proposals but lacked independence, while broader strategic priorities were decided through political bargaining (Massey and Robins 1986, pp.240-242; Bonnet and Manno 1994). European scientists therefore recognised the need for an independent advisory mechanism similar to NAS's SSB. The ESF's institutional distance from ESA, combined with its scientific credibility, made it a natural home for such a body.

Theoretical Framework

The establishment and operations of the PSSAB and later the SSC require theoretical tools that capture the interplay between scientific authority, political legitimacy and institutional development. This section brings together several areas of scholarship to develop the theoretical framework for understanding the SSC as a scientific advisory body navigating between expertise and policy.

BIG SCIENCE AND THE TRANSFORMATION OF SCIENTIFIC PRACTICE

The term Big Science, first articulated by Weinberg (1961) and popularised by Price (1963), refers to the emergence of large-scale, resource-intensive research programmes after the Second World War. Such projects required substantial public investment, advanced technological infrastructure and coordination between multiple institutions and disciplines (Capshew and Rader 1992). They also transformed the relationship between science and the state. Scientific research increasingly served political, economic and military purposes, while governments assumed responsibility for directing and sustaining costly programmes.

Space science exemplified these characteristics. American programmes such as Apollo and Soviet achievements like Sputnik illustrated how investments in exploration were simultaneously scientific and political during the Space Race. Space research operated as mission-oriented Big Science, combining long-term scientific goals with symbolic demonstrations of technological capability and national prestige (Agar 2012, pp.357-377). For Europe, Big Science created unique challenges in space. Unlike particle physics at CERN, space activities were closely linked to industrial competitiveness and security priorities, making national governments reluctant to surrender autonomy (Krige 2014; Krige and Russo 2000, pp.13-29). Research efforts were spread across national agencies, bilateral agreements and emerging multilateral institutions, resulting in duplication, competition and fragmented priorities. Developing collective European frameworks capable of supporting Big Science while preserving national interests became essential for any meaningful participation in space research.

SCIENCE ADVICE, BOUNDARY ORGANISATIONS AND EPISTEMIC AUTHORITY

Traditional models of science advice have often portrayed the relationship between experts and policymakers as a straightforward transfer of neutral knowledge from science to policy. Such assumptions were central to post-war science policy regimes but have since been widely critiqued for failing to capture the institutional and political complexity of advisory processes (Jasanoff 1998; Pielke 2007; Sarewitz 1996). Advisory bodies do not simply provide evidence to decision-makers but operate within contested environments where authority is negotiated and where credibility depends on institutional positioning as much as on technical expertise. Jasanoff (2005) further illustrates how different political cultures shape science governance, with European and US systems reflecting distinct relationships between expertise and democracy.

To understand these dynamics, Hilgartner (2000) argues that advisory bodies do not inherently possess authority but must perform it through carefully staged practices. Credibility is constructed rather than assumed, emerging through visible actions designed to project competence, neutrality and legitimacy. Public reports, workshops and formal meetings serve as performances through which advisory bodies craft collective identities and position themselves as trustworthy actors. Authority, in this sense, is enacted: it is achieved by behaving as though it already exists and by persuading audiences to recognise it. Bijker et al. (2009) extend this perspective by describing the paradox of scientific authority. Advisory bodies derive influence by presenting themselves as neutral arbiters above political conflict, yet they gain relevance by engaging in political negotiations and institutional bargaining. To manage this tension, advisory processes often differentiate between frontstage and backstage domains. Frontstage outputs, such as polished reports and consensus statements construct an image of evidence-based decision-making. Backstage,

however, disagreements are negotiated, compromises are brokered, and scientific framings are shaped by institutional and political constraints. This underscores that advisory authority is not a property of knowledge itself, but a performance strategically maintained across settings and audiences.

This interpretation is enriched by Pielke's (2007) framework, showing that advisory roles are strategically chosen depending on context. Science advisors can act as pure scientists, providing knowledge without policy engagement; as science arbiters, clarifying facts when asked; as issue advocates, pushing for policy outcomes; or as honest brokers, expanding the range of options available to decision-makers. Crucially, the same advisory body may adopt different roles for different audiences, depending on institutional constraints and strategic goals. This insight links directly to Hilgartner's and Bijker's accounts: the performances that make authority credible vary depending on the goal.

These dynamics are embedded within institutional arrangements through Guston's (2001) concept of boundary organisations. These occupy an intermediary position between scientific and political domains, translating priorities while maintaining credibility with both sides. They are characterised by dual accountability, producing outputs that are useful to policymakers while retaining legitimacy within scientific communities. Such organisations facilitate communication and cooperation by creating frameworks in which different actors can work together without fully resolving underlying tensions between political and scientific objectives. Gieryn's (1983, 1995) concept of boundary work complements this view by showing how actors strategically demarcate and manage the borders between science and policy. Scientific authority is strengthened when experts successfully define what counts as legitimate knowledge and position themselves as neutral arbiters, but these boundaries are constantly negotiated and redrawn in response to institutional pressures and political expectations. Star and Griesemer's (1989) concept of boundary objects further illuminates how coordination is possible across disparate communities. Boundary objects are entities that are flexible enough to accommodate multiple interpretations while maintaining stability across contexts. In advisory settings, reports, assessments and strategic frameworks often function in this way. They allow scientists, policymakers and other stakeholders to work together without requiring complete agreement on meanings or priorities, enabling collective action despite differences in institutional agendas and epistemic perspectives.

Haas's (1992) framework of epistemic communities highlights another mechanism through which expertise influences governance. Epistemic communities are transnational networks of professionals who share causal understandings, normative beliefs and policy goals, enabling them to frame issues and propose solutions with a relatively unified voice. In complex policy environments where uncertainty is high, these communities provide interpretive frameworks that help decision-makers evaluate competing claims. While expertise refers to having knowledge, epistemic authority requires social validation of the right to speak authoritatively on matters. Jasanoff (1998) extends this argument by showing that advisory legitimacy depends not only on the production of credible knowledge but also on persuading audiences to accept the terms on which that knowledge is defined and mobilised.

Together, these perspectives suggest that advisory authority emerges from practices, relationships and institutional positioning rather than from expertise alone. Scientific advice is neither neutral nor straightforward; it involves continuous negotiation of boundaries, performances of credibility and the creation of shared frameworks that enable coordination across diverse stakeholders. These concepts provide tools for analysing how advisory bodies operate in multilateral governance contexts and how they seek to establish legitimacy in environments characterised by competing interests, institutional complexity and epistemic uncertainty.

Research Methods

RESEARCH DESIGN AND RATIONALE

This dissertation employs qualitative documentary analysis of archival materials to examine the institutional development of the SSC between 1974 and 1985. Documentary analysis was selected as the primary method because the committee's activities were extensively recorded and its authority operated through textual practices including reports, correspondence and meeting minutes. These documents represent not only traces of events but also the means through which authority was constructed and negotiated.

The empirical sections are organised chronologically around the SSC's first two chairs. Part 4 analyses the Massey era (1974-1978), when the PSSAB was established and evolved into a recognised ESF committee. Part 5 examines the Geiss era (1979-1985), when the standing committee consolidated its position and established frameworks for long-term planning that culminated in the approval of ESA's Horizon 2000 programme. This structure maintains chronological coherence whilst allowing attention to how different leadership styles shaped institutional development.

ARCHIVAL SOURCES

The empirical foundation draws on materials from the HAEU. Research was conducted during a two-week period in June 2025, following Hill's (1993) archival strategies for systematic document collection. Documents were photographed for subsequent detailed analysis, allowing for thorough examination after the archive visit. The research examined 75 folders (66 physical, nine digitised) containing over 500 individual documents across three primary fonds. Folders were selected based on catalogue descriptions indicating SSC/PSSAB content or correspondence between ESF, ESA and national bodies during 1974-1985, supplemented by references found within documents pointing to related materials. The fonds comprised:

- ESF: PSSAB and SSC meeting minutes, internal correspondence, governance debates, reports on cooperation with the US SSB, and documentation of scientific input into ESA planning exercises including Horizon 2000.
- ESA: SPC/SAC records, PSSAB predecessor materials, planning documents for major European space initiatives, and materials on the science-industry interface.
- ESC: Background on institutional foundations and negotiations leading to ESA's creation (1970-1975), including records of international scientific cooperation.

Document types included meeting minutes capturing planning documents and internal deliberations, official correspondence revealing self-presentation strategies, reports articulating expertise claims, and position papers demonstrating public-facing activities.

ANALYTICAL APPROACH

Documents were selected using Scott's (1990) evaluative criteria: authenticity (genuine origin), credibility (freedom from error), representativeness (typicality within the corpus), and meaning (clarity and comprehensibility). Selection prioritised materials revealing institutional identity construction, particularly moments of strategic positioning, jurisdictional negotiation, interactions with other institutions and episodes of uncertainty or conflict.

The analytical approach was primarily inductive, allowing themes to emerge from close reading rather than imposing predetermined categories. This was informed by Clark et al. (2021, pp.425-428) and following Miles' (2020) framework for qualitative analysis, manual coding proceeded iteratively. Initial coding identified explicit content: decisions made, stated objectives, formal relationships. Subsequent coding examined rhetorical strategies, boundary work and how documents functioned to establish authority.

This iterative process generated key themes including 'performing authority,' 'jurisdictional positioning,' and 'partnership frameworks.' For instance, when analysing the 1979 Space Science in Europe report, initial coding captured its documentation of funding gaps and fragmentation. Further analysis revealed how the report functioned strategically: using statistics to establish crisis, deploying NASA comparisons to create urgency, and framing recommendations to avoid threatening existing institutions.

The three mechanisms identified in this dissertation emerged through constant comparison across documents. When multiple texts repeatedly emphasised 'long-term' planning, this pattern suggested jurisdictional boundary work. Similarly, interventions without formal authority appeared across different episodes, revealing a pattern of performing authority to gain it. Working iteratively between documents and theoretical concepts from Chapter 2, codes were grouped into broader themes that became the analytical framework. Documents were manually organised by theme and chronology using spreadsheets to track patterns across the material. This interpretation was inevitably shaped by training in STS, which oriented the analysis towards examining how authority is constructed.

Triangulation enhanced analytical robustness by comparing different document types, tracking evolution over time, and identifying patterns across sources (Clark et al. 2021, p.664). For example, the ESA Convention intervention appeared in SSC minutes, ESF correspondence and ESA records, with each version emphasising different aspects. These variations revealed how messages were framed for different audiences.

ARCHIVAL LIMITATIONS AND CHALLENGES

Archives are selective constructs shaped by institutional priorities (Stoler 2010). The HAEU holdings privilege formal documents over informal correspondence, consensus over conflict, and institutional perspectives over individual voices. Lewis-Beck et al. (2004) note that archives are products of 'sedimentation' and thus research must consider what survives and what doesn't.

Reconstructing the SSC's early development proved challenging due to scattered records. The committee's multiple name changes and institutional transitions meant relevant documents appeared across different fonds. Key materials from the foundational period were found in ESF General Assembly files, ESC negotiation records and ESA predecessor documents, requiring extensive cross-referencing.

The absence of certain materials shapes the narrative that can be constructed. Personal correspondence between committee members, informal discussions and national delegations' internal assessments remain largely inaccessible. What survives are documents deemed worth preserving, like official minutes, reports or public statements. Durepos and Thurlow (2025) describe these archival silences that reveal institutional dynamics through their very absence.

These limitations don't invalidate the analysis but do shape its focus. The gap between internal minutes and public reports reveals conscious choices about self-presentation. Limited documentation of dissent suggests either consensus or effective management of disagreement. Both possibilities inform understanding of how the committee operated.

ETHICAL CONSIDERATIONS

A risk assessment completed prior to archival research categorised the activities as low risk. The research raised minimal ethical concerns as it involved analysis of institutional documents held in publicly accessible archives and was conducted in accordance with HAEU guidelines. All materials cited are properly attributed and access restrictions

were respected. Ethical approval (STSEth438) was obtained to permit interviews, the archival record proved sufficiently comprehensive for addressing the research questions.

The Massey Era (1974–1978), Building a Collective Voice for European Space Science

How do scientific advisory bodies establish legitimacy across science-policy boundaries at critical moments? The formation of the Provisional Space Science Advisory Board for Europe (PSSAB) in 1974 under Sir Harrie Massey's leadership provides valuable insights into this process during a period of significant institutional transformation in European space governance discussed in Part 2. This section traces how Massey's PSSAB developed into the standing Space Science Committee (SSC) of the ESF by 1979, and how that evolution provided ESA with a stable channel for scientific advice. The argument advanced is that authority was not simply granted by statute; it was constructed through strategically staged interventions comprising organisational design, targeted advocacy and carefully framed collaboration. The SSC continuously negotiated its position relative to ESA's intergovernmental structure, ESF's pan-European scientific mandate, and the US National Academy of Sciences' Space Science Board's (SSB) practices, ultimately establishing itself as an integral part of European space science infrastructure.

THE PROVISIONAL SPACE SCIENCE ADVISORY BOARD

The story begins with a meeting at the Royal Society of London in November 1973. Herbert Friedman, an American physicist representing the US SSB, had expressed concern about the lack of effective advisory mechanisms for international space science collaboration (Massey and Robins 1986). Friedman warned that at an international scale, without "an independent and respected source of scientific advice", space activities "may be overly influenced by aerospace industry requirements" (Massey and Robins 1986, p.244). This concern exemplified one of Big Science's central tensions: scientific objectives competing with industrial and political priorities for control of research agendas.

In the US, NASA benefited from independent advice from the NAS-SSB, whose working groups and studies provided mechanisms for space scientists to build consensus and set priorities (Massey and Robins 1986, pp.54-58). At the time, European scientists had no equivalent channels for coordinating and disseminating their own collective voice. This was important given the recent rise in geopolitically motivated US-European collaborative space projects driven by mounting "budgetary restrictions" (Massey 1975a). Though pan-European space cooperation could pool resources to keep up with superpower capabilities, they remained reliant on the US for major projects.

This was compounded by the broader structural challenges facing European space science in the early-mid 1970s that became increasingly urgent during the ESRO-ESA transition in the historical context discussed in Part 2. Unlike ESRO, which had focused primarily on space science, ESA would resemble NASA in encompassing all space activities, including applications satellites, launchers and industrial programmes. This shift risked marginalising space science both financially and institutionally, creating a science-policy coordination gap.

At the November meeting, Friedman was joined by key figures in European space science, including Sir Harrie Massey, an Australian physicist who served as Physical Secretary of the Royal, who would become the driving force behind the European response (Massey and Robins 1986, pp.244-246). The exchange established a crucial principle: sustained transatlantic cooperation required institutional symmetry. If US advisory authority derived from the SSB's standing within the National Academy of Sciences, Europe needed a comparable body that could speak for its scientific communities with similar legitimacy. Fragmented advice could undermine both effective collaboration and

European parity. The Europeans proposed establishing an independent advisory body for Western Europe first, before attempting anything on the wider international scene. Massey, leveraging his Royal Society position and extensive networks, convened a meeting of senior European space scientists (Massey 1975a).

Following consultations with senior figures in European space science, including ESRO's acting Director-General (and first ESA Director-General), Roy Gibson, Massey issued invitations for a two-day meeting at the Royal Society in April 1974 (Massey and Robins 1986, pp.245-246). This brought together a group of Western European space scientists and three SSB members. The meeting proved decisive: the outcome was the creation of the PSSAB chaired by Massey, operating under the auspices of the Royal Society (Massey 1974).

The PSSAB was established as an "independent and influential" (Massey and Robins 1986, p.245) advisory body on European space science (Massey 1975a). Initially, the PSSAB would advise national space agencies and ESA on three key areas (Massey 1974):

- (i) The role and significance of studies carried out by the use of spacecraft...
- (ii) The level of space activities...in the context of the total space activity in Europe...
- (iii) The balance within space science of programmes in which the nations of Europe might be involved

Massey emphasised the PSSAB would "not be concerned with short term problems but with long term issues" and thus operate in a similar way to the US SSB (Massey 1975b). This focus on long-term strategy rather than short-term operational matters distinguished the PSSAB from existing committees. In the context of the emerging ESA, the PSSAB was intended to address several interconnected challenges: the growing complexity and expense of space projects, the requirement to link scientific objectives with technological capabilities, and the imperative to maintain US cooperation whilst building European independence (Massey 1975b). This required members who could operate effectively at the science-policy interface - people who understood both how science was done and how science policy was made (Massey 1975a). Two design features are significant.

First, the PSSAB's composition constituted an epistemic community (Haas 1992): beyond scientific eminence, participants were selected for connectivity to national policy circuits and to existing scientific institutions. The idea was to form a "fully representative group, [with] each member being able to express independent informed views" (Massey 1975a). This process reveals sophisticated network building. Appointed Deputy Chair was astrophysicist Reimar Lüst, who held deep connections to German science policy and would become ESA Director General in 1984 (Massey and Robins 1986, p.246). Each member brought essential disciplinary networks that would legitimise the PSSAB across European science communities. The full list of PSSAB members can be found in the Appendix (Massey 1975a).

Second, the PSSAB incorporated the transatlantic dimension as a central design feature. Three members of the US SSB had already participated in the April 1974 founding meeting (Massey and Robins 1986, p.245). The PSSAB also asserted their "duty" to collaborate with the US SSB to effectively coordinate international scientific experiments in space (Massey 1974). While addressing Friedman's original concern by creating a reliable channel for information exchange and agenda coordination, this commitment would institutionalise transatlantic cooperation, later evolving into formal liaison arrangements between the two committees (Massey and Robins 1986, p.248).

These design choices reflected sophisticated boundary work (Gieryn 1995; Guston 2001). Careful selection of figures already moving between academic research, national programmes and European institutions was central to ensuring the PSSAB's outputs would carry both scientific and political authority (Pielke 2007). They could speak the languages

of both laboratory and committee room, enabling the PSSAB to produce statements that carried weight across multiple audiences. Through this strategic composition, the PSSAB performed authority before achieving formal recognition (Hilgartner 2000).

INTERVENING IN THE ESA CONVENTION (1975)

One of the PSSAB's first major interventions concerned ESA's emerging constitutional framework. Drafts of the Convention (due to be signed in May 1975) provided for a mandatory science programme but no scientific body for advising and overseeing that programme (Massey 1975c). The risk, as perceived by the PSSAB, was that programmes would be steered primarily by intergovernmental bargaining of budgets and industrial returns rather than the science (Massey and Robins 1986, p.248).

Massey's response demonstrated the power of coordinated scientific authority, swiftly mobilising the PSSAB send a telex with 14 signatures to the ESC committee responsible for devising ESA governance infrastructure (Massey and Robins 1986, p.248):

"The [PSSAB] welcomes the inclusion in the draft convention for [ESA] of the provision of a mandatory science programme... [which] can only be adequately safeguarded by an equally mandatory Science Programme Committee [SPC] as the decision-making body under the council on matters which affect the science programme" (Massey 1975c).

The language was carefully calibrated: it did not oppose ESA's orientation toward applications but framed the SPC as the minimal institutional structure necessary to protect the integrity of scientific decision-making. The PSSAB's collective action secured the SPC as a permanent fixture in ESA's governance, ensuring scientific voice in policy decisions. Two dynamics explain the intervention's effectiveness. First, timing: a rapid, unified statement from Europe's leading space scientists was difficult to ignore. Second, despite lacking formal standing in ESA or ESF, the PSSAB successfully performed scientific authority (Hilgartner 2000). Acting as issue advocates (Pielke 2007) rather than neutral advisors, they insisted on mandatory scientific governance. This public display of collective expertise constituted boundary work (Gieryn 1983, 1995) at a critical moment in ESA's formation. Without this intervention, ESA would have lacked robust mechanisms for scientific input: "if the PSSAB had not been in existence at the time it would have been much more difficult to achieve the desired aims" (Massey and Robins 1986, p.249).

SEEKING INSTITUTIONALISATION (1975-1976)

Massey had established the Board under Royal Society as a provisional measure, recognising that European space science needed urgent coordinated representation (Massey and Robins 1986, pp.244-245). The PSSAB's temporary arrangement through the Royal Society could not provide the pan-European legitimacy required for sustained advisory work. Unlike in the US, where the SSB operated under the NAS, Europe lacked an equivalent institutional structure. The ESF's formation in November 1974 offered a compelling solution (Massey and Robins 1986, p.246). The new foundation was still taking its 'first tentative steps' in deciding which scientific fields to prioritise to initially concern itself with, as ESF President Sir Brian Flowers noted to ESRO Director-General Gibson in January 1975 (Flowers 1975).

The ESF attracted numerous scientific groups seeking institutional homes, creating competition for recognition and resources (Executive Council 1975a). Navigating this required proactive advocacy work as committees sought to demarcate their expertise. For space scientists, the urgency was heightened by ESRO's imminent dissolution, with the ESA Convention due to be signed in May 1975.

Massey's efforts during 1974-5 reveal the delicate advocacy required, demonstrating how legitimacy was established through performance for different audiences (Hilgartner 2000; Bijker et al. 2009). Writing to Flowers, Massey reiterated the rationale for the PSSAB's formation, reinforcing the Board's claim to protect European scientific integrity in international space projects (Massey 1975a). He delineated jurisdictional boundaries, stressing the PSSAB would focus on "long term issues" whilst avoiding interference with ESA's "day-to-day activities." Massey acknowledged from the outset that the Board would be "dissolved immediately" if another body was set up for a similar purpose (Massey 1974). This demonstrates Massey's awareness that the PSSAB's survival depended on demarcating a unique and defensible domain within the emerging European scientific governance structure, constituting classic boundary work (Gieryn 1995).

PSSAB strategically cultivated institutional support: Massey's approach included inviting key officials to meetings, creating opportunities for direct observation of the Board's work. After attending the PSSAB's March 1975 meeting, Gibson noted the group was "obviously aiming to achieve recognition from the [ESF]," declaring that it "seems a very useful body" (Gibson 1975a). Gibson subsequently wrote to Flowers, expressing support for the PSSAB whilst enquiring about ESF views on potential relations with Massey's committee (Gibson 1975b). Such behind-the-scenes advocacy from within ESA/ESRO proved crucial; Gibson helped position the PSSAB as a legitimate advisory body that stood out.

The timing was strategic: just before the ESF Executive Council's decisive April meeting, this provided important validation when the Council was weighing multiple committee applications. The minutes record that "considering the urgency of the problem, especially with the setting up of the [ESA], the Council agreed to set up an ad hoc Committee in space research" (Executive Council 1975a, p.9). Nonetheless, the Council granted only provisional status. The Space Sciences Committee (SSC) would face review after two years and required "some small modifications in the membership" (Massey and Robins 1986, p.247). This conditionality reflected institutional uncertainties about overlapping jurisdictions and the appropriate scope of space science advice in Europe. Between 1975 and 1976, the committee underwent the required restructuring, with the Council dropping one British participant whilst adding French and German representatives to ensure geographic representation (Executive Council 1975b). By February 1976, the membership was finalised "according to the wishes of the Assembly and the Executive Council", completing the transformation from Massey's informal network to ad hoc ESF SSC (Executive Council February 1976, p.3).

The ad hoc SSC navigated multiple challenges in establishing its role within European space governance. Two developments proved particularly significant: the ESF-ESA relationship negotiations, and coordination of European participation in the Space Telescope - later renamed Hubble (Massey and Robins 1986, pp.249-257).

ESA-ESF RELATIONS (1976)

The ESF-ESA agreement negotiations of 1976 provided a major test. As Gibson noted to the ESA SPC, "several delegations felt the need for more information about the [ESF]" (Gibson 1976), revealing anxieties about introducing an external advisory body into a domain ESA had been created to manage. As discussed in Part 2, European space cooperation had developed through careful balancing of national sovereignty with collective goals; adding another layer of governance risked destabilising delicate arrangements. The SSC handled these sensitivities through strategic positioning. The agreement specified that "The SSC will normally concern itself with long-term issues related to the future of space science in Europe" (ESA 1976). By establishing themselves as providers of "long-term" strategic (rather than acute operational) advice, the committee could engage with agenda-setting without duplicating the work of ESA's SAC. The agreement functioned as a boundary object (Star and Griesemer 1989), enabling ESA-ESF coordination despite their different institutional activities and goals.

THE SPACE TELESCOPE

The Space Telescope (ST), launched in 1990 as Hubble, would revolutionise astronomy by situating a powerful optical telescope into low Earth orbit. NASA had been developing the project since the early 1970s, but soon approached ESRO seeking European participation, initially envisioning Europe providing instruments and solar arrays (Massey and Robins 1986, p.250). The SSC recognised a critical challenge: how to ensure genuine scientific partnership.

The joint SSB/SSC Williamsburg conference of January 1976 established the framework for collaboration. Massey stressed the need to "advertise the potential of the [ST] to the astronomical community" whilst emphasising "the importance that ESA and ESF attached to the project" (SSC 1976, p.2). The conference reached two crucial agreements: the telescope would "exceed those of all other likely developments in optical astronomy over the next few decades", and a Science Institute would be created with international participation rather than NASA control alone (Massey and Robins 1986, p.252). Following Williamsburg, an SSC Working Group defined concrete requirements for European participation, insisting European astronomers serve on all Science Institute committees and proposing a European coordinating facility for data access (ST-WG 1979). When NASA and ESA struggled to finalise arrangements in September 1976, the SSC intervened to protect scientific interests (SSC 1976).

The breakthrough came in August 1977 with creation of the NAS/ESF Advisory Committee on the ST, "independent of the NASA body examining the faint objects camera proposal" (NAS/ESF 1977). The October 1977 NASA/ESA Memorandum (ESA 1977) codified their success: guaranteed observing time and meaningful participation in the Science Institute controlling telescope operations (Massey and Robins 1986, p.253). This secured equitable European scientific participation and, in the process, established the precedent for future collaborations.

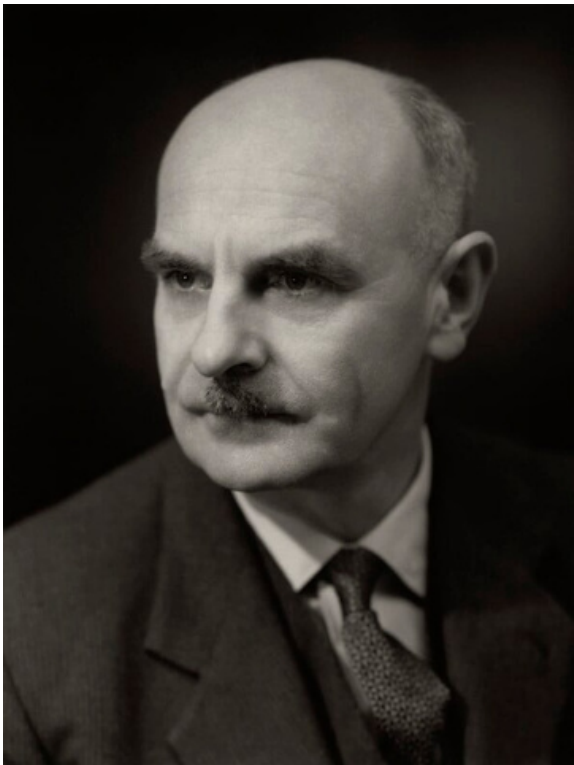
THE CASE FOR PERMANENCE

The SSC continued with momentum towards permanent status. By 1978, the committee had recognised that the coordination gaps it filled were not temporary problems but enduring features of European space governance (Massey and Robins 1986, pp.257-258). Massey's supporting paper for permanent status articulated the fundamental rationale: whilst "good collaboration existed between NASA and [ESA], [and] with individual scientific groups in Europe, there was no link between the main scientific communities on both sides of the Atlantic" (Massey 1978, p.1). This framing extended the committee's boundary work from defining what it did to establishing why no other institution could fulfil this role. The October 1978 Spitzingsee conference on X-ray and gamma-ray astronomy, jointly organised with the SSB, demonstrated this transatlantic coordination in practice (Assembly 1978a).

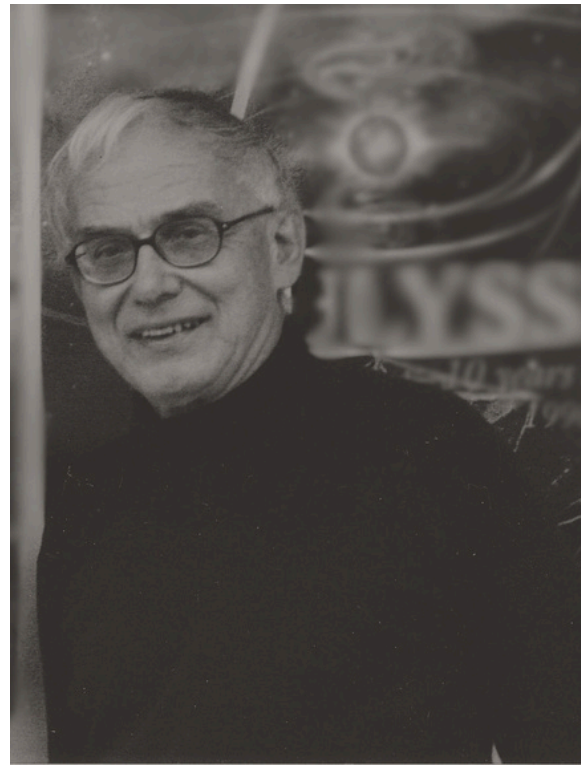
The proposal for standing committee status was submitted and endorsed by the ESF Executive Council in 1978 (Assembly 1978b). At the ESF General Assembly in November 1978, Lüst presented the case: "space research in Europe was... at an important stage of future development" with ESA discussing programmes for the next 5–8 years (Assembly 1978a, p.9). The committee had positioned itself as essential for shaping long-term decisions whilst maintaining credibility with both scientists and policymakers. The Assembly approved "the setting up, as of 1 January 1979, of a Standing Committee on Space Science" (Assembly 1978a, p.9). The Terms of Reference codified roles developed through years of practice: advising ESF on European space science activity, maintaining collaboration with the US SSB, cooperating with ESA per the 1976 agreement, and reporting annually to the ESF Assembly through the Executive Council (Assembly 1978c). The Assembly thanked Massey "for his contribution [for] the development of Space Science in Europe" and appointed Johannes Geiss as Chair, who "had strong support both in Switzerland and in the scientific community as a whole" (Assembly 1978a, p.10). This shift symbolised the committee's evolution from Massey's provisional board to a pan-European institution.

CONSTRUCTING AUTHORITY

This chapter examined how the PSSAB/SSC evolved from informal network to boundary organisation within European space governance's Big Science context. The transition from Massey's provisional PSSAB to the ESF's permanent SSC reveals how an epistemic community (Haas 1992) of space scientists built authority through strategic practice rather than formal mandate. Three mechanisms shaped this development. First, the committee performed authority before possessing it (Hilgartner 2000; Bijker et al. 2009). The 1975 ESA Convention intervention provides clear evidence: without official standing, the PSSAB mobilised fourteen leading scientists to secure mandatory scientific governance within ESA. Second, boundary work established the committee's jurisdiction (Gieryn 1983, 1995): focusing on long-term matters differentiated the SSC from ESA committees. The Space Telescope case validated this positioning, as strategic rather than technical advice secured genuine partnership for European scientists. Third, the committee built institutional symmetry with the US SSB whilst preserving European autonomy. Joint conferences at Williamsburg and Spitzingsee established collaboration conventions that would endure for decades. By 1979, the SSC had become essential infrastructure in European space science.



Sir Harrie Stewart Wilson Massey
by Bassano Ltd
half-plate film negative, 17 December 1958
NPG x170022
© National Portrait Gallery, London



Johannes Geiss
International Astronomical Union, CC BY 4.0_
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Workshops, Partnerships, and the Path to Horizon 2000 (1979-1985)

By the late 1970s, European space science operated within severe structural constraints. National programmes remained fragmented, ESA's mandatory science programme commanded minimal resources compared to applications and launchers, and European scientists increasingly depended on NASA for flight opportunities (Massey and Robins 1986, pp.250-254). The fundamental question was how Europe could sustain credible space science without adequate funding or institutional frameworks for long term planning.

This section examines how the Space Science Committee (SSC) addressed these challenges by constructing an epistemic community capable of articulating European priorities and negotiating as equals with American counterparts (Haas 1992). Operating as a boundary organisation (Guston 2001), the SSC produced reports, workshop recommendations and partnership frameworks that enabled coordination across previously disconnected scientific and policy domains. The analysis traces three key developments: the 1979 report documenting European space science's structural problems; the 1980 Strasbourg workshop unifying fragmented planetary science communities; and the Joint Working Group with the US SSB established in 1982, culminating in the 1984 Heidelberg recommendations that shaped missions like Cassini-Huygens. The chapter argues that the SSC reframed the problems in European space science: by demonstrating that Europe possessed scientific expertise but lacked institutional and financial resources for collaboration, the committee's work between 1979 and 1985 made long-term planning essential.

'SPACE SCIENCE IN EUROPE' REPORT

In 1979, Johannes Geiss became Chair of the standing SSC of the ESF, with a five-year operational mandate (Assembly 1978a). Geiss, a Switzerland-based physicist with extensive US experience, brought crucial transatlantic connections to the role. Regularly attended by US SSB, ESA, and ESF representatives, the committee would meet twice yearly, alternating between Paris and other ESF member states, enabling members to report on space science activities of their respective nations. The full membership of the standing SSC, as of 1979, can be found in the Appendix (Executive Council 1980). Their first major undertaking would be a comprehensive assessment of European space science that would become the influential "Space Science in Europe" report.

The groundwork began during Massey's chairmanship. At the SSC's February 1978 meeting, Roger Bonnet (of ESA's SAC) stressed that long-term planning required "knowledge of funding available, European expertise and activities outside of Europe" (SSC 1978, p.6). The challenges documented at the committee's first meeting in February 1979 were stark. The assessment was blunt: opportunities had been "reduced seriously after 1971" and the situation had become "completely unsatisfactory," with American space science funding exceeding Europe's "by more than five times" (SSC 1979a, p.12). Beyond inadequate funding, fragmentation plagued European efforts. Space science exemplified Big Science, requiring resources and coordination at superpower scale, yet European programmes remained scattered. Members noted that outcomes would improve if "cooperation between at least three or four [European] countries could be achieved" (SSC 1979a, p.11). Unlike the US SSB operating within a unified programme, the European committee had to construct authority across multiple national systems. Their legitimacy would depend not on formal mandate but on their ability to articulate a credible pan-European voice. The SSC appointed a small group to begin drafting these discussions into formal recommendations.

By May 1979, information gathering evolved into a systematic survey exemplifying the preparation of scientific advice (Hilgartner 2000; Bijker et al. 2009). Questionnaires sent to senior national representatives requested data on four

key areas: active scientists in space research, funding levels for 1976-1979, contributions to ESA's scientific programme, and organisational structures within each country (Gustavsson 1979). The responses revealed striking diversity, for example: Denmark centralised through the Ministry of Education Research Administration, France through CNES with advisory bodies, whilst Italy scattered activities across several laboratories with limited coordination (SSC 1979b). This mapping exercise served multiple purposes. Empirically, it substantiated the committee's claims about fragmentation of European space science. The act of assessment became a form of authority-building (Hilgartner 2000). By creating a comprehensive map of the landscape, the SSC positioned itself as the body with oversight of European capabilities and challenges, transforming disparate national data into a coherent European narrative.

SSC minutes reveal lively debate over presenting funding demands and whether to directly challenge ESA's policies (SSC 1979c). The transformation from June draft to final August report reveals strategic calibration. The draft offered blunt diagnosis: ESA's science budget was only 15% of NASA's, and "the lack of adequate flight opportunities" was the weakest link, with European groups interacting mainly with American colleagues while having limited impact on their own continental community (SSC June 1979d, pp.3-4).

The final 80-page 'Space Science in Europe' report retained these critiques but reframed them strategically (SSC 1979e). While acknowledging ESA's technical excellence, it presented dependency on NASA as future risk rather than past failure: "It is not at all certain that these opportunities will be maintained in the future... the future of space science in Europe should not depend on free flight opportunities being offered by NASA." The SSC therefore positioned science as playing "a central and uniquely integrating role" in ESA (SSC 1979e, pp.3-7). This, they argued, could only be fulfilled with increased funding, noting that ESA's successful applications programme was built on confidence harnessed by earlier scientific missions. The committee advanced three recommendations:

- Increasing ESA's mandatory scientific budget for stable baseline funding.
- Creating optional scientific programmes to enable interested nations to pursue ambitious projects beyond the mandatory minimum.
- Reconsidering charging policies that incentivised using American over Europe's Ariane launch systems.

The November 1979 General Assembly revealed the SSC's success in establishing epistemic authority. The Assembly praised the committee as "an independent scientific body, free from governmental influence" (Assembly 1979, p.8), capturing the essence of boundary organisation operation: maintaining independence whilst exercising influence across scientific and political domains (Guston 2001). The report's endorsement and circulation to member organisations, ESA and the US SSB demonstrated how boundary objects function in practice, being interpreted differently by various audiences whilst enabling coordination (Star and Griesemer 1989).

Geiss recognised that producing reports wasn't sufficient for effecting change. The SSC needed to actively construct networks of influence, with Geiss urging members to ensure the document reached "government authorities, national scientific committees" to influence "discussions on the national level about the future of space science in Europe" (Geiss 1979). In the same letter, Geiss announced the committee's next moves: a European workshop on planetary sciences in 1980 and intensified engagement with US SSB. This shift from passive dissemination to active mobilisation reflects what Bijker et al. (2009) identify as the performative dimension of scientific advice: authority must be continuously enacted through strategic staging.

The SSC's response was instructive: they intensified efforts through direct letters from the ESF President to key officials and "influential individuals" in each country (SSC 1980, p.14). Several members expressed concern that the initial distribution "had not been efficient enough," and that academic channels were insufficient: this evolution from

conventional dissemination towards multimedia advocacy demonstrates the committee adapting its boundary work strategies (Gieryn 1983, 1995) to maintain relevance. Despite favourable reception of the 'Space Science in Europe' report by the ESF Assembly and national delegations to ESA, there were "no significant signs of increase of the funds for space science" yet (Executive Council 1980, p.4).

The SSC's experience illustrates fundamental tension in science advisory work. Despite establishing scientific credibility and institutional legitimacy, translating expertise into policy change required continuous strategic adaptation. The SSC discovered that epistemic authority alone couldn't overcome structural funding issues: "support in Europe for space research by no means corresponds to its scientific potential" (Executive Council 1980, p.4). This gap between scientific consensus and political action would shape the committee's evolving strategies throughout the early 1980s, pushing them toward more direct forms of advocacy whilst risking the perceived neutrality that underpinned their authority.

BUILDING COMMUNITY: THE STRASBOURG WORKSHOP

Planetary science was strategically chosen for the SSC's first community-building effort. As the report documented, planetary sciences work was scattered across national groups with more links to the US than to one another (Executive Council 1979). The proposed remedy involved constructing an epistemic community: a network of experts who could influence decision-makers (Haas 1992). At the Geiss' request, a small working group (WG) drafted a proposal for a European planetology workshop. The group found a lack of institutional coordination, with "no international nor European organisation in planetology " (Executive Council 1979). The WG's assessment noted that whilst European planetary science was "widely recognised as being comparable to that of the more numerous groups in the USA," it remained fragmentary due to the lack of ESA missions in the field. This vacuum created opportunity; planetary scientists needed the organisational framework the SSC could help construct.

The SSC discussed the WG's proposal in February 1979, but finding the outline too vague, requested a more precise programme and participant list (SSC 1979a). Concerns soon emerged about timing and scope that revealed the delicate politics of scientific coordination. One member worried that "the situation was not ripe" for a 1979 workshop and warned that "a failure would be disastrous" (SSC 1979f, p.12), recognising that unsuccessful coordination attempts could worsen the situation. By April 1980, plans had solidified for a September 1980 workshop in Strasbourg with about forty invitees. A revealing tension emerged around American participation: one member noted that while the committee had agreed to keep the workshop entirely European, there was "considerable interest on the American side." Thus, the SSC decided to invite a handful of scientists from the USA, USSR and Japan (SSC 1980, p.10). This hesitation reflected lessons from the 1979 report: Europe needed to assess its own capabilities before negotiating international partnerships.

When presenting Strasbourg findings in April 1981, the SSC's Professor Runcorn called it "a very valuable opportunity to bring together for the first time the full spectrum of European groups," establishing "a common strategy for the rest of the century" (SSC 1981, pp.11-12). The workshop had successfully created an epistemic community from previously fragmented groups. Yet the central conclusion accepted Big Science realities: "for the large planetary missions Europe could not go alone in the present financial situations."

By November 1980, the shift toward structured transatlantic collaboration was underway. The SSC helped formalise a NASA-ESA reciprocity resolution, establishing principles that would govern future joint ventures: while "European space scientists have, on many occasions, benefitted from space flight opportunities offered by the [US]," ESA should reciprocate "by making available announcements of opportunity" to American scientists (Executive Council 1981,

p.1). The resolution functioned as a boundary object (Star and Griesemer 1989). For NASA, reciprocity meant continued European support for joint missions; for ESA, it signified equal partnership rather than dependency; for scientists, it promised expanded research opportunities.

The reciprocity principle faced immediate testing when NASA unilaterally cancelled its ISPM spacecraft in 1981. One ESA representative made clear this breach of the Memorandum was "totally unacceptable" (SSC 1981, p.5). The SSC stressed that this incident had revealed a potential weakness in ESA-NASA co-operation based on signed Memoranda, and rather than escalate politically, decided to appeal through scientific channels. Geiss urged ESF President Curien to contact the US NAS to "find ways by which the successful completion of agreed co-operative missions can be safeguarded" (Geiss 1981). The crisis validated both the 1979 report's dependency warnings and the value of the scientific networks the SSC had cultivated.

LEVERAGING PARTNERSHIP: JOINT WORKING GROUP AND THE PATH TO HORIZON 2000

Following the Strasbourg workshop's conclusion that Europe could not pursue large planetary missions alone, further cooperative efforts emerged. After preparatory meetings in 1982, correspondence between the NAS and ESF led to establishing a SSC/SSB Joint Working Group on Planetary Sciences (JWG) at the SSC's meeting in Paris (SSC 1982a, p.9). The JWG adopted transformative criteria refined by January 1983: candidate missions must be "naturally and readily divisible into two technically separate but scientifically integrated elements" requiring "roughly equal resources" to address important scientific questions and involving disciplines across Europe and the US (SSC 1983a, pp.7-8).

By the SSC's 1983 meeting in Leiden, the JWG presented three missions: a Titan Probe and Saturn Orbiter for 1992, a Multiple Asteroid Orbiter for 1994, and a Mars Surface Rover for 1996 (SSC 1983b, pp.3-4). Their report exposed the structural problem – scheduling was "constrained entirely by the limited fiscal resources of the present agency programs" (JWG 1984, pp.1-6). The JWG refined its recommendations through continued workshops, including a meeting at the Max Planck Institute in Heidelberg in April 1984, where European and American scientists further developed the Saturn-Titan mission concept that would later become Cassini-Huygens, reinforcing the equal partnership principles the JWG had established.

Parallel to the JWG, ESA's Survey Committee was developing a long-term science plan. The SSC provided the critical link, ensuring the Survey Committee incorporated not just specific missions but partnership principles from years of transatlantic collaboration. The Survey Committee created an architecture with four cornerstones: Solar Terrestrial Physics, Planetary Mission Programme, Heterodyne Spectroscopy and X-ray Spectroscopy, proposing a gradual increase to nearly double ESA's mandatory science budget (SSC 1984). Bonnet, appointed ESA's Science Director in 1983, provided crucial political leadership for the programme. His December 1984 letter to the scientific community captured the transformation: where a year earlier he had highlighted "the critical situation of the mandatory scientific programme," now "four cornerstones define the orientation of the programme and ensure both its identity and solidity" (Bonnet 1984). But final approval would require "vigorous and continuous support" of the scientific community.

The Rome ministerial meeting in January 1985 delivered a qualified victory. Ministers approved Horizon 2000 as ESA's first long-term science programme, guaranteeing stable funding through the 1990s. This commitment was revolutionary: European scientists could plan for missions that would actually fly, industries could maintain specialised teams, and NASA could trust ESA for extended projects. The official record credited the SSC for helping "propose and promote this long-term plan" (SSC 1985, p.2). By September, Bonnet confirmed that the planetary cornerstone would be a "Saturn Orbiter and Titan probe jointly studied by NASA and ESA," essentially realising the JWG's first

recommendation (SSC 1985, pp.6-7). This mission would eventually launch in 1997 as Cassini-Huygens: NASA's Cassini orbiter would study the Saturnian system for over a decade, whilst ESA's Huygens probe would descend through Titan's atmosphere in 2005, becoming the first landing in the outer solar system.

Horizon 2000's approval validated the SSC's strategy: using international partnership to leverage domestic investment. Europe finally had its coherent space science programme, though implementation would bring new challenges. The funding constraints meant difficult negotiations lay ahead, and the JWG's partnership principles would face testing through actual mission development. Yet the essential framework was now in place. The SSC had transformed fragmented national efforts into strategic capability, establishing the institutional architecture that would guide European space science through the decades ahead.

FRAGMENTATION TO FRAMEWORK

This chapter has examined how, under Geiss, the SSC helped transform European space science from fragmented national efforts into a coordinated long-term programme from 1979-1985. The committee faced a fundamental challenge: Europe lacked resources for autonomous space science yet needed to demonstrate capability to secure those resources. The SSC's approach departed from conventional advisory strategies. Rather than asserting expertise to demand resources, the committee documented vulnerabilities to create political urgency. The 1979 report's assessment provided evidence for advocacy, the Strasbourg workshop unified previously disconnected communities whilst acknowledging the need for partners, and the JWG demonstrated that Europe could contribute equally to major missions. Through this process, the SSC constructed an epistemic community capable of articulating European priorities and negotiating as equals with American counterparts (Haas 1992).

Operating as a boundary organisation, the SSC maintained credibility across scientific and political domains (Guston 2001). JWG criteria functioned as boundary objects that enabled NASA, ESA and scientific communities to coordinate whilst pursuing different objectives (Star and Griesemer 1989). Horizon 2000 validated this strategy: the programme incorporated the JWG's recommendations, with Cassini emerging as the planetary cornerstone. However, budget constraints forced difficult choices about programme scope, with earth sciences and microgravity excluded. The SSC could influence how problems were defined but not always the resources allocated to solve them. This showed how scientific communities could use international partnership to build institutional capacity, even if securing adequate resources remained an ongoing challenge.

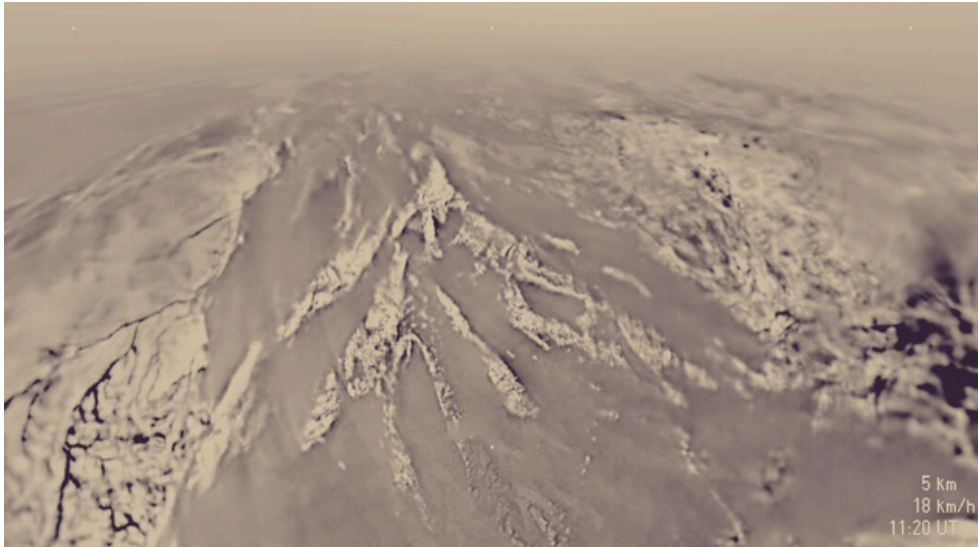


Figure 3: Huygen's descent to Titan's surface. ESA/NASA/JPL/University of Arizona

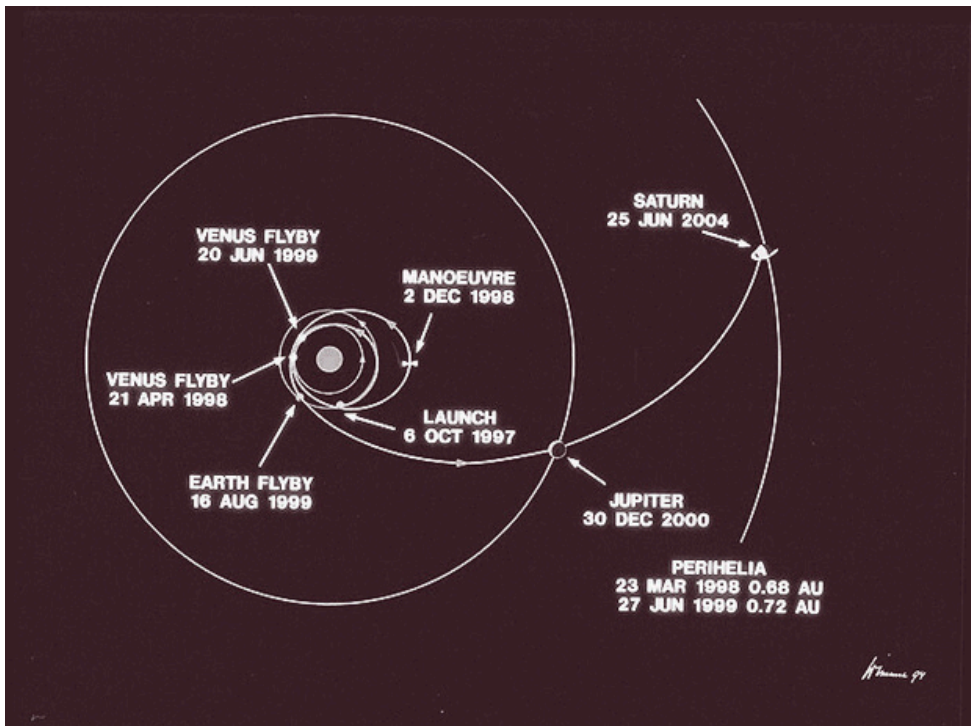


Figure 4: Cassini's trajectory to Saturn. ESA

The origins of the Cassini-Huygens mission, along with the Horizon 2000 programme, can be traced back to the 1985 ESA Ministerial Conference in Rome—a meeting strongly influenced by the European Space Science Committee (ESSC)

Conclusions

This dissertation examined how the Space Sciences Committee constructed legitimacy as a scientific advisory body across science-policy boundaries in European space governance between 1974 and 1985.

PERFORMING AUTHORITY, BUILDING COMMUNITY AND SHAPING PARTNERSHIPS

The first research question asked how the SSC constructed advisory authority without formal decision-making powers. The evidence reveals the committee built legitimacy through strategic practice rather than formal mandate. When Massey mobilised fourteen scientists to intervene in ESA's Convention negotiations in 1975, they lacked official standing yet secured mandatory scientific governance within ESA's constitutional framework. This demonstrates that authority could be enacted to create conditions for its own recognition rather than waiting for formal appointment. The SSC established a distinctive role by focusing on long-term strategic issues, avoiding competition with ESA's committees whilst claiming unique advisory space. The Space Telescope negotiations exemplify this positioning: by providing strategic rather than technical input, the SSC helped secure genuine European partnership including guaranteed observing time and Science Institute participation. The committee's institutional positioning within ESF rather than ESA proved crucial, and prioritising diverse membership enhanced legitimacy as a European voice for space science. Focus on long-range planning minimised conflict with ESA's internal committees. Every intervention required balancing scientific credibility with political relevance, navigating this tension through continuous adjustment depending on audience and context. Independence emerged not from isolation but from the ability to translate between scientific and political domains whilst maintaining credibility in both.

The second question examined how the SSC transformed fragmented national communities into a cohesive European framework. The 1979 Space Science in Europe report provided the conceptual foundation, reframing fragmentation as organisational rather than scientific failure. European scientists possessed world-class expertise but lacked coordination mechanisms. The 1980 Strasbourg workshop addressed this, bringing planetary scientists together as Europeans for the first time to actively create consensus. Scientists arrived representing national programmes and left as members of an emerging European network. The SSC didn't just channel existing knowledge but produced the communities capable of generating it. Through continued workshops and working groups, the SSC created sustained forums for interaction and collective priority-setting. By 1985, this had transformed isolated national efforts into a coordinated community capable of shaping ESA's Horizon 2000 programme. The committee made long-term planning possible by fostering collective identity and consensus on shared priorities.

The third question addressed how the SSC established frameworks for international collaboration positioning Europe as equal partner. The committee recognised Europe lacked resources for fully autonomous large missions but could achieve parity through appropriate frameworks. From its founding, the SSC created institutional symmetry with the US SSB. Early joint workshops at Williamsburg and Spitzingsee established patterns of bilateral scientific exchange. The Joint Working Group established in 1982 developed criteria ensuring missions would be naturally divisible into equal contributions to address highest priority science. These weren't merely technicalities but tools to facilitate NASA and ESA collaboration whilst maintaining distinct institutional identities. These frameworks shaped actual missions, such as the Saturn-Titan concept that became Cassini-Huygens. These cooperation frameworks supported the push for Horizon 2000, which addressed the funding crisis caused by fourteen years of budget stagnation. By showing Europe could set its own priorities whilst working effectively with NASA, the SSC helped establish Europe as a credible partner for international collaboration.

LIMITATIONS AND FUTURE DIRECTIONS

This analysis relies primarily on archival materials from ESA and ESF, which privilege institutional perspectives and may obscure informal negotiations or dissenting voices. The temporal scope focuses on the SSC's formative years, with

its later transformation into the ESSC and role in implementing Horizon 2000 beyond this study. The study centres on European and US interactions, with less attention to other international partners including the Soviet Union.

While the findings provide insights into mechanisms of legitimacy-building, they reflect one advisory body in a specific historical setting. Future research could compare the SSC with other scientific advisory structures to test whether similar strategies operated across different policy domains. Oral histories could reveal nuances lost in official documentation.

FINAL REMARKS

The mechanisms identified have broader relevance for understanding scientific advice in multilateral governance. The SSC created the conceptual and institutional infrastructure making European space science possible as more than the sum of national programmes. In multilateral contexts, constructing legitimacy required creating frameworks enabling coordination whilst preserving the autonomy making participation politically acceptable. Reports and planning documents actively shaped authority beyond simply communicating decisions, helping define relationships and institutional roles.

Between 1974 and 1985, the SSC's interventions enabled European space science to emerge as a transnational enterprise capable of engaging with NASA from a position of strength. The SSC demonstrates that advisory bodies must continuously perform the authority they seek to exercise. Success lay not in possessing formal powers but in establishing legitimacy through consistent practice. In Big Science, where technical ambitions and political realities are inseparably linked, advisory bodies actively construct the spaces within which scientific priorities and political constraints can coexist.

Fifty years after Massey convened fourteen scientists at the Royal Society, the ESSC continues to shape European space science policy. The frameworks established during 1974-1985 remain the foundation of how the committee operates today: providing long-term strategic advice, facilitating international partnerships, and building consensus across European communities. What began as an ad hoc grouping without formal authority has become an established institution serving as the voice for European space science.

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Acronyms

CERN – European Organisation for Nuclear Research

CNES – Centre national d'études spatiales (French national space agency)

COSPAR – Committee on Space Research

ELDO – European Launcher Development Organisation

ESA – European Space Agency

ESF – European Science Foundation

ESRO – European Space Research Organisation

HAEU – Historical Archives of the European Union

NAS – National Academy of Sciences

NASA – National Aeronautics and Space Administration

PSSAB – Provisional Space Sciences Advisory Board for Europe

SAC – Science Advisory Committee of ESA

SPC – Science Programme Committee of ESA

SSB – Space Sciences Board of the US National Academy of Sciences

SSC – Space Sciences Committee of the ESF, ESSC after 1991

ST – Space Telescope

Appendix

1. Provisional Space Science Advisory Board for Europe: Membership (21 March 1975)

Nation	Name
United Kingdom	Sir Harrie Massey (Chairman) Professor R.L.F. Boyd Professor H. Elliot Professor S.K. Runcorn
Federal Republic of Germany	Professor R. Lüst (Deputy Chairman)
Belgium	Professor H. Florin Professor P. Swings
Denmark	Professor B. Peters Professor B. Strömgren
France	Professor J.E. Blamont
Italy	Professor E. Amaldi Professor G. Occhialini
Netherlands	Professor C. de Jager Professor H. Van de Hulst
Sweden	Professor N. Herlofson Professor C-G Rällhammer
United States	Dr H. Friedman Dr T. Goody Professor P.S. Johnson
Switzerland	Dr J. Geiss

Appendix

2. Standing Committee on Space Science - Membership (1979-1980)

Name	Country/Organisation
Professor J. Geiss	Switzerland (Chairman from 1 January 1979)
Professor E. Amaldi	Italy and European Space Agency
Professor J.E. Blamont	France
Professor A.G.W. Cameron	US National Academy of Sciences (Space Science Board)
Father J.D. Cardús	Spain
Professor H. Curien	ESF Executive Council
Professor C. de Jager	Netherlands
Professor C-G. Fälthammar	Sweden
Mr R. Gibson	European Space Agency
Professor J.T. Houghton	United Kingdom
Professor H.C. van de Hulst	Netherlands
Professor P.S. Johnson	US National Academy of Sciences (Space Science Board)
Professor A. Johnsson	Norway
Dr A. McLaren	United Kingdom

Additional Members from 18 May 1980:

Name	Country/Organisation
Professor R. Lüst	Germany (Chairman of ESF Standing Committee on Astronomy)
Sir Harrie Massey	United Kingdom (Former Chairman)
Professor F.M. Neubauer	Federal Republic of Germany
Professor C. O'Ceallaigh	Ireland
Professor H. Ögelmann	Turkey
Professor J.P. Peppersack	Belgium
Professor B. Peters	Denmark
Dr M. Petit	France
Professor K. Pinkau	Federal Republic of Germany
Mr E. Quistgaard	European Space Agency
Professor W. Riedler	Austria
Professor E.T. Sarris	Greece
Professor G. Setti	Italy
Professor P. Smeyers	Belgium

Secretary: Dr J.E. Gustavsson

SPACE SCIENCE IN EUROPE

An Assessment by the Standing Committee on Space Science of the European Science Foundation

SUMMARY

General This is a special report by the Standing Committee on Space Science of the European Science Foundation. The task of the SSC is to give advice on all aspects of space research in Europe, to maintain contact with the Space Science Board of the US Academy of Sciences and to cooperate with the European Space Agency (ESA), as well as with national space research organisations.

Research in space is today one of the major roads by which many scientific disciplines proceed towards new knowledge. In combination with ground based observations and experiments, space research is producing an enlargement of the observable world and a deepening of our understanding of it which may well be comparable to the impact produced by the advent of the telescope and the microscope in the 17th century. If Europe is to participate in this important scientific and cultural development, there is an urgent need for improving the present unsatisfactory conditions under which space research is pursued in Europe. In this report we analyse the situation and recommend actions to be taken.

1 THE FIELD OF SPACE RESEARCH

What is Space Research Space research is an area of scientific activity serving several scientific disciplines by using the unique conditions offered by observation from space and by experimentation in space:

Special opportunities of space Getting above the Earth's atmosphere: Particles and the whole spectrum of electromagnetic radiation emitted by the Sun and by an immense variety of galactic and extragalactic objects can be observed from space, unimpeded by atmospheric absorption, scattering or emission.

Getting there: Space flight enables *in situ* measurements and direct observations of the planets and satellites in the solar system, and of plasmas in conditions not reproducible on Earth.

Figure 5: The introductory page of the 1979 report; "Space Science in Europe: An Assessment by the Standing Committee on Space Science of the European Science Foundation"



**Science and
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