To venture beyond the Atmosphere

Aspects of the Foundation of the Max Planck Institute for Extraterrestrial Physics

Ulf von Rauchhaupt

1 Introduction

The foundation of an institute of the Max-Planck-Gesellschaft (MPG) is nothing unusual. In fact, it is considered a defining part of MPG's policy to establish new institutes where promising new fields of basic reseach are opening up that can not, or not yet, easily be pursued within the framework of the universities[1]. As outlined in section 3 of this paper, this was definitely the case for extraterrestrial physics in West Germany in the early 1960s. At the heyday of the cold war, quite suddenly a completely new area of reserch became accessible for West German scientists. The Max Planck Institute for Extraterrestrial Physics (MPE[2]) came into being in this historical context suggesting that its foundation was in fact triggered by the advent of space age in West Germany. The aim of this paper is to look at this this procedure in some detail.

At first glance, the process of MPE's foundation looks simple indeed: On May 15, 1963, the senate of the MPG bestowed upon a small research group of some 15 people the status of a third Institute within the Max Planck Institute for Physics and Astrophysics in Munich. The group's leader, Reimar Lüst, was appointed director[3]. The small department had only existed 18 months, but its head was an internationally renowned scientist, who had just turned forty. This looks as if the Harnack Principle had been applied in a rather pure fashion. This principle has the reputation of defining the other important part of the foundation-policy of the MPG and its forerunner, the Kaiser-Wilhelm-Gesellschaft (KWG). Explicitly formulated by Adolf von Harnack as late as 1928[4] at the KWG general assembly in Munich it reads:

[1] Comp. e.g. the adress of MPG-president Adolf Butenandt at the 1961 general assembly in Berlin (Butenandt 1961) p. 7ff, where he also explicitly refers to space research (p.9).

[2] Until 1991, when the *Max-Planck-Institut für Physik und Astrophysik* (MPIPA) became separated into three legally independent institutes (see Figure 1 on page 7), MPE's official name was "*Institut für Extraterrestrische Physik am Max-Planck-Institut für Physik and Astrophysik*" (IEP at MPIPA). But the handy abbreviation "MPE" was used already very early - first for labelling boxes with instrumentation to be shipped in an expedition (Interview Jakob Stöcker, April 14, 1999). For briefness I will use "MPE" also for the institute before 1991.

[3] 45. SP, p. 23f

[4] The expression "Harnack Principle" ("Harnack-Prinzip"), however, is somewhat younger. Rasch (1996, p. 173) suspects that it wasn't around before the late 1980s, but in fact it was already used in 1964 by Butenandt (Niederschrift über die Sitzung des Wissenschaftlicher Rats der MPG am 9.6.1964 in Hamburg, Bericht des Präsidenten, p.28, AMPG II. Abt. Rep. 1A,I).

> "The director ist the principal figure to such an extent, that one could also say: The Society chooses a director and builds an institute around him"[5]

There is a plethora of aspects of the Harnack Principle throughout the history of KWG and MPG. A good deal of it has already been subject of study and some of the more recent results have been collected in the book edited by Bernhard vom Brocke and Hubert Laitko (1996)[6]. The essence of the Harnack Principle is that research in the MPG is personalized. This still applies today, but before the 1964 revision of the MPG-statutes[7] it basically meant that the director was the sovereign in his institute: Ideally, he had the complete freedom to define what research is done in his MPI - within the (generally soft) boundaries drawn by the institute's name. To this end, he could freely dispose of a budget and, to some extent, employ whoever suited him. Also, the Harnack Principle implicitly defines who qualifies for directorship: Only the best and the brightest, the most distinguished (but not nessecarily yet established) scientist available in the field.

For us, this suggests a rather short story: A new research field (extraterrestrial physics) has opened up, the MPG decided to join in, and chose an eminent scientist (Reimar Lüst) to build the institute around. That the foundation of the Max-Planck-Institute for Extraterrestrial Physics did happen more or less according to this pattern was believed very early in the Institute's history: The manuscript of the address which MPG president Butenandt gave at the inauguration of MPE's new building in February 1965 shows how the Harnack Principle was perceived to have been exercised here:

> "Also in this case, there preceded a long and determined process of growing and becoming. ...Saying this, I just wanted to point to the Max Planck Society's long approved method of purposefully building up an institute: A particularly qualified assistant is made responsible for a working group. This working group becomes a division, the division is made independent within the institute and - if it further proves successful - it is promoted to an institute, either within an association of institutes, as it is the case here, or to a separated Max Planck Institute."[8]

Such language is naturally prone of being taken beyond the literal meaning of the words towards some sort of ontological bedrock. May founders come and go and historical

[5] "In einem so hohen Grade ist der Direktor die Hauptperson, daß man auch sagen kann: Die Gesellschaft wählt einen Direktor und baut um ihn herum ein Institut" (Quoted in: Vierhaus 1996, p. 129). All English translations of originally German quotations presented here are by the author of this paper.

[6] See e.g. the contribution of Vierhaus and the introduction of Rasch's paper for further reference.

[7] Comp. Henning & Kazemi 1998, p. 150.

[8] "Ein langer aber zielstrebiger Prozeß des Wachsens und Werdens ging auch hier voraus. ...Ich wollte damit nur auf das in der Max-Planck-Gesellschaft lange bewährte Verfahren des zielbewußten Aufbaues eines Institutes hinweisen: Einem besonders qualifizierten Assistenten wird eine Arbeitsgruppe unterstellt. Diese Arbeitsgruppe wird eine Abteilung, die Abteilung wird im Rahmen des Institutes verselbstständigt und wird, wenn sie sich weiter bewiesen hat, zum Institut erhoben, sei es in einem Institutsverband wie hier oder zu einem selbständigen Max-Planck-Institut." (Ansprache des Präsidenten bei der Einweihung des Neubaues des Institutes für extraterrestrische Physik in Garching am Montag, den 15. Februar 1965, AMPG Inst.Betr. MPE, Ordner: "Extraterr. Physik bis 31.12.1971 allgemein BY 07c")

contexts change. The Principle remains and guarantees quality whatever research field for its application may pop up next. As a recipe that seemed to have worked fine so far, it may also convince the more pragmatically inclined. Even if the concept isn't always quite matched by historical reality, it surely did considerably contribute to MPG's (self-)image.

It is, however, not the goal of this paper to portray the Harnack Principle as a mere myth to be readily deconstructed. And it is also not at all intended to meticulously show how Butenandt was wrong in constructing this neat linear story. Of course the shortcomings of such an account will concomitantly become apparent, but in itself such a critique would be neither fair nor interesting. Rather, this paper tries to give an account of the earliest history of MPE which can illuminate how this important foundation in the early 1960s took place. This could also provide some hints on what Harnack's Principle meant here *in praxi*. A number of questions arise from every generalizing paraphrase of Harnack's terse formulation but can be answered only by looking at particular institutes. Who decided on joining a new research field, founding an institute and finally appointing a certain person director - and on what grounds? Were these really the decisions and were they made in this order? For the Harnack Principle as a method of how to found a MPI is not legally codified[9]. As an explicit formulation it just existed - and still exists - in memoranda and speeches like the two quoted here. But what corresponded to it in the historical course of events which led to the foundation of an institute?

While this investigational perspective requires some focus on human protagonists, due reference to the relevant political and scientific contexts is essential. In the case of the MPE this context especially features the beginning of the space age and the European efforts to join it. This topic has already been covered by quite a few studies, notably those published in the ESA History Study Reports series[10]. An overview from a particular German perspective is provided e.g. in Helmuth Trischler's Book on Air and Space research in Germany before 1970[11], which is part of a whole series of studies on the history of German big science institutes.
On the other hand, historical studies of particular Max-Planck-Institutes are less frequent. The collection edited by vom Brocke & Laitko, for instance, comprises a series of papers on several KWG-institutes, but not on MPI's after the war. Notable exceptions from this gap in the literature, into which this study tries to connect, are Susan Boenkes monograph on the early history of the Max-Planck-Institute for Plasma Physics (IPP) which has now been resumed by Ingrid von Stumm.[12] However, unlike the in many ways highly exceptional IPP, the early MPE was a much more a "traditional" Max-Planck-Institute with a single director and comparatively humble beginnings. But before we turn there, the reader may wish to become a little more familiar with the institute under consideration.

[9] Whereas, since their revision of 1950, MPG statues do explicitly define rights and duties of the directors (in §28 (3) in the current version of 1992, comp. Henning & Kazemi p. 39 and 503f).

[10] A complete list of which can be found at http://esapub.esrin.esa.it/publicat/hsr/hsr.htm.

[11] Trischler 1992, p. 285-472

[12] Boenke 1991, von Stumm 1999

2 The Institute today

2.1 Structure

In 1998, the Max-Planck-Institute for Extraterrestrial Physics employed 335 people, 183 of them scientists of all levels.[13] Most of them work in a complex of buildings situated at the nothern rim of the town of Garching, about 35 kilometers north of Munich city center. The MPE is one of four MPIs at the site, which also hosts several departments of the Technische Universität München (TUM).
The MPE has a twin-institute next door: The Max-Planck-Institute for Astrophysics (MPA) with which it shares the administration, the library and a couple of other facilities. The MPA does theoretical and computational astrophysics only. The research structure of the MPE is the following: There are six different research groups, four of them headed by a director and scientific member of the MPG:

1. **Space Physics** (Prof. Dr. Gerhard Haerendel, director).
   Development of space-borne instrumentation for in-situ space plasma, dust and particle measurements in the solar system, (i.e. magnetosphere, solar wind, solar atmosphere, comets ...), Observation & Theory.

2. **X-Ray Astronomy** (Prof. Dr. Joachim Trümper, director).
   Development of space-borne instrumentation for detection of astronomical X-rays, development of software for satallite-data reduction, Observation.

3. **Gamma Ray Astronomy** (Prof. Dr. Volker Schönfelder).
   Development of space-borne instrumentation for detection of astronomical Gamma-ray radiation, Observation.

4. **Infrared Astronomy** (Prof. Dr. Reinhard Genzel, director).
   Development of both space-borne and ground based instrumentation for detection of astronomical Infrared- and Sub-mm radiation, Observation.

5. **Laboratory Astrophysics** (Prof. Dr. Carl-Rudolf Vidal).
   High resolution spectroscopy of astrophysically interesting molecules.

6. **Theory** (Prof. Dr. Gregor Morfill, director).
   Theoretical Astrophysics, astrophysical and non-astrophysical (e.g. medical) applications of nonlinear dynamics, model-experimenting ("plasma crystal").

Trümper, Genzel and Morfill are associated with the Ludwig-Maximilians-Universität München (LMU), Schönfelder with the Technische Universität München (TUM), Haerendel with the Technische Universität Braunschweig and Vidal with the Universität Innsbruck, Austria.

[13] TB 1998, p.156

2.2 What is Extraterrestrial Physics?

The research groups for Theory and Laboratory Astrophysics evolved from research activities that once were auxiliary to "Extraterrestial Physics"[14] in the narrower sense. A definition can be readily extracted from the first four entries in the account given above: Extraterrestrial physics is

- physics
- of processes beyond the earths atmosphere
- that are not accessible by ground-based observations alone.

The last point really is the *differentia specifica* excluding Optical and Radio Astronomy. The instrumentation - much more than the subject - distinguishes the MPE from other institutions with research interests in the sky. This instrumentation is flown on a choice of platforms:

- balloons: stratosphere (10-30 km above sea level)
- sounding rockets (i.e. unmanned rockets in ballistic trajectories): upper atmosphere:
  - ionosphere (80 - 500 km)
  - magnetosphere (several 100 km to at least 65000 km)
- satellites: earth's orbit (above 300 km)
- space probes: interplanetary space or orbits around celestial bodies other than earth.

Because "extraterrestrial" is such a tongue-twisting word, I will often synonymously use the word "space research" (*Weltraumforschung* - not to be confused with *Raumfahrtforschung*[15]), although the this term is ambigiously used. Sometimes "space research" applies to space-borne in-situ measurements only, sometimes to all sorts of research done in space. Extraterrestrial physics, however, comprises both *measurements* of the immediate environmet of the instrument ("in-situ") and *observations* of objects that may be as far away as quasars. Many of those in-situ measurements aim at charged subatomic particles interacting with the terrestrial (or solar-terrestrial) magnetic fields, an area of research which tradidionally belongs to geophysics. Extraterrestial physics therefore contributes to both astronomy and geophysics.

[14] For the origin of the term "extraterrestrial" see Footnote 49 on page 13.
[15] comp. Gambke, Kerscher & Kertz 1961, p.16

2.3 The MPE within the Max-Planck-Society

The Max-Planck-Society (MPG) is astrophysically active in other parts of the spectrum too. The Institutes symbolized by the lightly shaded boxes at the top of Figure 1 are all engaged in various sorts of space-related research. With the MPI for Astronomy in Heidelberg (optical Astronomy) and the MPI for Radioastronomy in Bonn the entire electromagnetic spectrum is covered. Space Plasma Physics is also extensively studied at the MPI for Aeronomy in Lindau/Harz[16] and there is also considerable space research in the MPI for Nuclear Physics (MPK) in Heidelberg.
The bifurcating lines in Figure 1 denote the "lineage" of the institutes: The MPK grew out of the Institute for Physics from the MPI for Medical Research. The MPI for the Physics of the Stratosphere was moved to Lindau in 1955 and pooled together with the Institute for Ionospheric Research in the MPG. This double-institute was named MPI for Aeronomy (MPAe) in 1957 and eventually restructured into a single MPI in 1975. The other child-institutes went through forerunning phases (skew lines) before they became organizationally independent MPI headed by their own directors. The MPE is one of them: It was formed from a group belonging to the Institute for Astrophysics which itself by that time was a Sub-Institute of the MPI for Physics and Astrophysics (MPIPA). Both MPA and MPE legally remained Sub-Institutes until 1991, when MPA, MPE and the rest of the Physics-Institute (now named after Werner Heisenberg) became officially independent institutes. As can be seen from the numbers denoting the total staff of each institute in 1997, today's MPE is by far the biggest institute among the astrophysically active MPIs - actually its one of the biggest in MPG's Chemical-Physical-Technological section (CPT). Only the MPIs for metal research in Stuttgart (430 people), for polymer research in Mainz (454) and the Max-Planck-Institute for Plasma Physics (IPP) are bigger in terms of employees. Of all MPIs, the MPE is currently the sixth largest.

[16] Near Northeim, north of Göttingen, in the German state of Lower Saxony - not to be confused with the somewhat more known Lindau in Bavaria at the eastern tip of the Lake of Constance.

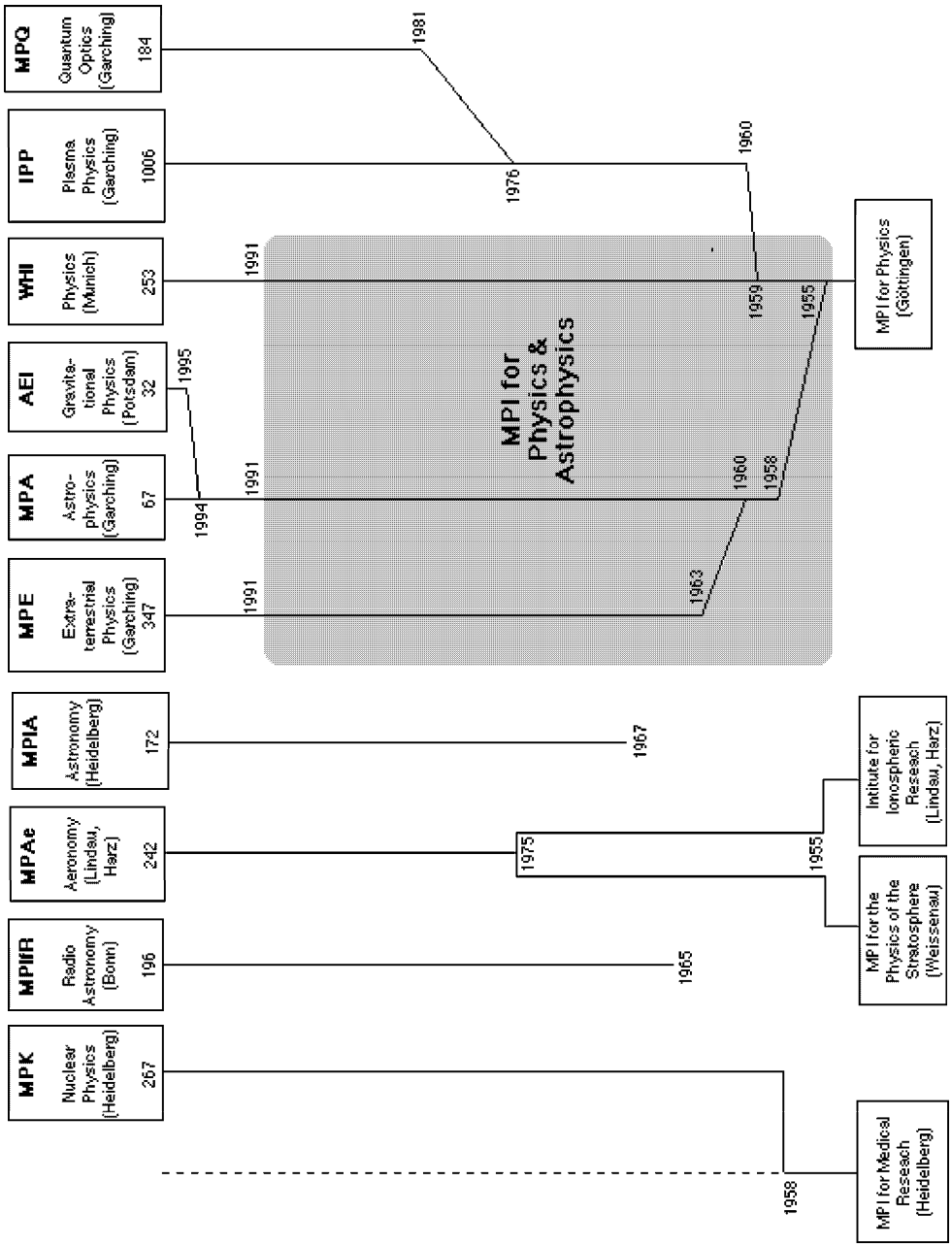

Figure 1: "Family Tree" of some MPIs (Compiled from Henning & Kazemi 1998). The lightly shaded boxes represent institutes engaged in space-related research. Before 1991 MPE and MPA legally belonged to the MPI fo Physics and Astrophysics (MPIPA), symbolized here by the dark shaded rectangular. Numbers in the boxes denote the total staff in 1997 (source: Jahrbuch der Max-Planck-Gesellschaft 1998).

3 Prehistory

3.1 The well of the past

There is always a previous history to everything. In search for the beginnings of human curiosity in the phenomena studied by extraterrestrial physics, one could of course go back in some contrived way to, say, the first human experience with terrestrial magnetism in ancient China. But as mentioned above, extraterrestrial physics is determined by its means of research rather than its objects. A few years before MPE came into being, those means suddenly experienced a qualitative improvement beyond measure. It is therefore natural to start with the object shown in Figure 2:

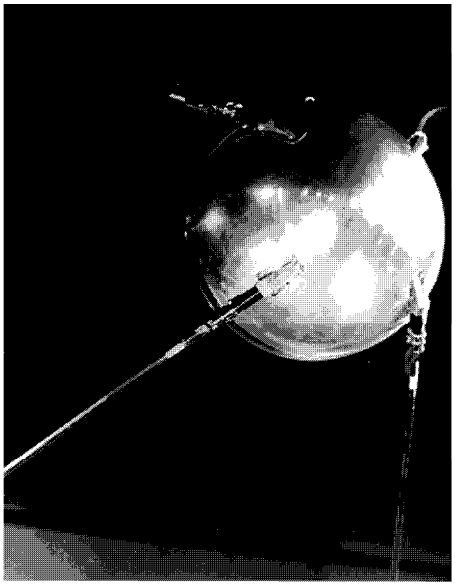

Figure 2: Sputnik-1 (Photo: NASA)

This shiny little sphere is most remembered for the frenzy it caused in the Western world, when it was launched in orbit by the Soviet Union on October 4, 1957. But despite the plethora of political and military implications, the official setting for Sputnik was a scientific one (as it was for its ill-fated American rival *Vanguard*)[17]. In the years around 1957/58 a maximum of solar activity was expected to increase intensity and variety of phenomena in the system of plasma and magnetic fields around the earth. Only a few of them can be detected from ground - such as Aurora Borealis in high latitudes, or perturbances of long-distance radio transmissions. Now, in the wake of the second World War, a new technology was becoming available that promised a new dimension of both warfare and science: Rocketry.

After 1945, both the USA and the USSR had exploited the know-how of the rocket-makers of Peenemünde.[18] Among the first scientific aims of rocketry was knowledge about the higher layers of the atmosphere, the ionosphere and the region where the gas cover of our planet continuously merges into space. This knowledge was badly needed to keep ballistic missiles on their prescribed trajectories. Consequently the first rocket-borne instruments were build by Erich Regener for the V2 Rocket. They were designed to measure densities, pressures and temperatures as well as ionization and UV radiation, but never flew before the end of the war.[19] In the early 1950s rocketry had made considerable progress. To promote what is called the "peaceful application" of the new technology during the next solar maximum, the International Geophysical Year (IGY) was proposed for 1957/58 by a group of scientists[20] and welcomed

[17] See Gavaghan 1998 for a recent account of the scientific prehistory of both sputnik and vanguard. A more political focus is provided e. g. by McDougall 1985a pp. 74-140

[18] Comp. e.g. Greschner 1987 and references therein. DeVorkin 1993 provides a comprehensive account of how the V2-technology boosted U.S. space science after 1945.

[19] DeVorkin 1993, chapter 3

[20] Among them James van Allen, Sidney Chapman, and Lloyd Berkner (Gavaghan 1998 p. 1ff).

by the governments of the cold war rivals.[21] In 1955 both super powers announced the launch of an earth-orbiting satellite as part of the IGY. The race to space began and the United States lost the first round.

The first American satellite, *Explorer-1*, was launched on January 31, 1958. It also was the first to perform extraterrestrial research. Sputnik-1 had only carried a simple radio transmitter and Sputnik-2 (launched November 3, 1957) the poor dog Laika. Yet Explorer 1 was equipped with detectors with which James van Allen eventually discovered the radiation belts - regions around the earth where charged particles from the sun are trapped by the earth's magnetic field[22]. The technological advance thus provided new research tools and the cold war created an environment in the USA where space science could thrive on: Not only was Congress now willing to spend serious money on space. The newly founded NASA took over from rivaling military services[23] or traditionally private realms of reseach. NASA provided a firm institutional setting for effectively turning tax payer's money into technological innovation, scientific progress and national glory.

France and Britain, the other two prospective nuclear powers, also joined space club, but to a considerably lesser degree: With help from former Peenemünde technicians[24] and initially for military use, the French developed the *Veronique*, a liquid-fuelled sounding rocket with which an extensive program of upper atmosphere research was undertaken during the 1950s. That was about all until Charles de Gaulle returned to power in 1958, resolved to equip France with an independent nuclear capability. Great Britain, unlike Germany, France, the USA and USSR, was a nation without any pre-war tradition in rocketry. Nevertheless the British soon began their own ballistic missile development - the infamous *Blue Streak* - in support of their nuclear weapon program.[25] Scientific interest in space arouse when on a conference in Oxford in August 1953[26] Sidney Chapman acquainted his countrymen with the American activities and the prospects this would have for geophysics, a traditionally strong field in the UK. This motivated the development of a British solid-fuelled sounding rocket, the *Skylark*, which was first tested in 1957.

Despite the "peaceful application" rhetorics, space research depended on technology of military interest. Therefore, international scientific cooperation in an institutionalized fashion was not easily established. But the Soviet success and the subsequent reorganization of the American space research changed the political context considerably. In October 1958 the International Council of Scientific Unions (which included scientists from the Soviet Union and its allies) established the Commitee on Space Research (COSPAR) . It still took COSPAR a full year of negotiations to come into operation. But when the first COSPAR Space Science Symposium took place in Nice in January 1960, the space scientists eventually had their international platform.[27]

[21] The Eisenhower administration in particular. By launching a civilian satellite, Eisenhower planned to establish a precedence which would allow future US reconnaissance satellites to fly over soviet territorry without violating international law (see McDougall 1986a pp. 118ff).

[22] van Allen 1961

[23] *Vanguard* was a Navy project (with a civilian sounding rocket as launch vehicle). The rocket which eventually lifted *Explorer 1* into space was build by Wernher von Braun under authority of the Army. With the *Atlas* rocket the young U.S. Air Force had its own project too (see McDougall 1985a, p. 167)

[24] Greschner 1987, p. 277

[25] Compare page 19

[26] Willmore 1993 p. 68, Massey & Robins 1986, p. 7f

[27] See e.g. van de Hulst 1998. According to this author, who served as COSPAR's first president,

3.2 The Situation in West Germany before 1959

It was but now that West Germany[28] became involved. Unlike the other countries mentioned, there was no national space activity of any kind until well after the Sputnik shock. This was of course a direct consequence of allied research restrictions. But the situation here was quite different from what happened in the nuclear sector for instance. The physicists who had remained in National Socialist Germany had never built an A-bomb nor even suceeded in getting their "Uranbrenner" critical. Despite allied control law No. 25 and subsequent regulations, resuming non-military nuclear research was discussed as early as 1952.[29] When the Paris Treaty of May 1955 allowed the Federal Republic of Germany to develop nuclear technology for peaceful purposes, a special federal ministry for nuclear affairs (BMAt) was set up the same year. Yet rockets remained a tacit taboo - even though the Paris Treaty allowed the Germans to resume rocketry, provided, however, they didn't construct guided missiles with a range greater than 70 km.[30]
For the terror of the V2 missiles was well remembered. London alone had been hit by some 1200 of them during the last winter of the war, 2700 people had been killed there and annother 6500 injured.[31] V2 strikes were less destructive than conventional area bombings, but since the missiles flew very high before hitting the ground with three times the speed of sound, the lack of any chance for premonition caused a "stultifying psychological impact"[32]. This legacy of the war was the major obstacle for any officially coordinated space research activity in West Germany during the 1950s. Not only that it prevented an interested military sector[33] who would have spent money on space technology. In a 1960 study report of the Deutsche Forschungsgemeinschaft (DFG) on the situation of space science the authors write in their preface: "In the Federal Republic we face not only the problem that space research requires large amounts of money and scientific resources, but also the psychological difficulty that it is based on rocketry".[34] When it came to rockets, the Adenauer administration kept as low a profile as possible.[35]
There was some upper-atmosphere research done in West Germany in the 1950s. But rocket-related space research did not exist, with the one exception of two flights in 1954, when German instruments flew on French *Veroniques*. These instruments had been built by German scientists from the former French sector: Erich Regener in Weissenau, Karl Rawer and Karl-Otto Kiepenheuer in Freiburg and Hubert Schardin, who at this time

COSPAR was founded in a hurry in order to prevent the United Nations to establish its own agency for outer space first. In his view, this would have drawn science even deeper into Cold War political dispute.

[28] All the following refers to West Germany only - though the word "West" is sometimes omitted. For a short account of the space research in East Germany (GDR) see Zimmer 1987.

[29] e.g. Boenke 1990 p. 44f, Trischler 1992 p. 286ff and the references therein.

[30] See e.g. Fischer 1994, p. 2 for references.

[31] Greschner 1987 p. 265. On the history of the V2 missile see Neufeld 1995.

[32] DeVorkin 1993 p.47

[33] However, there had been plans to establish such a sector on a European level. To this end, German defense minister Franz Josef Strauß concluded an agreement with France in 1957. The initiative was soon joined by Italy - then called the FIG Project. It aimed at joint development and production of advanced weaponry including nucler warheads and intermediate range ballistic missiles. The end of the fourth French Republic eventually prevented the implementation of the FIG Project (Fischer 1994 p. 17-20).

[34] "In der Bundesrepublik steht man nicht nur vor der Schwierigkeit, daß Weltraumforschung sehr viel Geld und wissenschaftliche Kapazität kostet, sondern auch vor dem psychologischen Problem, daß Raketen ihr Grundelement sind" (Gambke, Kerscher & Kertz 1961 p.11)

[35] Comp. Finke 1987 p. 293

worked at the Institute for Ballistic Research in St. Louis in Alsace. The contacts obviously had been made considerably below the political level[36].

3.3 Hands across the Sea (1959)

The situation changed in 1959. In September of that year the German federal ministry for nuclear affairs (BMAt), which basically served as a department of research, approached Werner Heisenberg. Heisenberg was then director of the Max Planck Institute for Physics and Astrophysics (MPIPA) in Munich and certainly the most prominent figure in post-war Germany's physics - especially in the field of science politics. He was advisor on nuclear issues to Chancellor Adenauer[37] and chaired a number of important committees. One of them was the "Arbeitskreis Kernphysik" a sub-commitee of the Deutsche Atomkommission, responsible for funding decisions in nuclear big-science. Heisenberg was not an expert in space research, though he was scientifically interested in some of its aspects, notably cosmic rays. This interest was guided by the high-energy reactions of elementary particles. Before the advent of large accelerators these were observationally accessible only in the interactions of the cosmic rays with earth's atmosphere.[38]

The federal goverment proposed to Heisenberg that the Arbeitskreis Kernphysik should now also consider space research.[39] However, the idea that West Germany should now enter the space age was not born in Bonn, but in Washington. There, Spuntnik had considerably altered the attitude towards international collaboration in space. At the NATO summit in December 1957 a scientific committee was established and the European member countries were encouraged to conclude agreements with the USA to launch satellite experiments on American launch vehicles[40]. However, the obvious political und military interests articulated here, prevented unanimous approval in the international scientific community. Instead, NATO's commendations helped triggering processes of self-organization among the space scientists - notably the foundation of COSPAR and the initiative of Auger and Amaldi towards a European Space Research Organisation[41]. It therefore took the civil NASA, founded in October 1958, and its skilled apointee for international affairs, Arnold Frutkin, to initiate cooperation between the USA and the scientists abroad.[42] In 1959, NASA officials began to tour western Europe offering American support to its space scientists.

NASA's representatives also came to Germany. At the occasion of a conference in Aachen in September 1959, for instance, Hugh Dryden and Homer Newell of NASA asked Walter Dieminger for a conversation. Dieminger was the director of the Institute of Ionospheric Research of the Max-Planck-Institute for Aeronomy (MPAe) and a leading German Scientist in upper-atmosphere resarch. They told him that the USA would be willing to fly West German experiments on American rockets or Satellites.[43] These offers obviously triggered

[36] see e.g. Pestre (1997) on the French-German collaboration in ionospheric research.

[37] See Carson 1999 on Heisenberg as scientific advisor in the early Federal Republic. Comp. Eckert 1990.

[38] Comp. Heisenberg 1943. A second edition of this book appeared 1952.

[39] Trischler 1992 p. 402

[40] Fischer 1994 p. 6

[41] See below on page 16.

[42] McDougall 1986a pp. 206-208. See Krige & Sebesta 1994 for further details and references on motivation and impact of the American offers.

[43] Dieminger to Heisenberg August 6, 1960 (WHA, folder"IEP").

West Germany's entry into space age. The Max Planck Society (MPG), Heisenberg's institutional homeland, felt especially encouraged to go space-borne. Here the largest share of the tiny West German extraterrestrial community[44] was hosted. Experimental space research was done at the two Lindau institutes which together formed the MPAe: Dieminger's Institute for Ionospheric Research and the institute for Stratospheric Physics headed by Regener's successor Julius Bartels, a famous geophysicist. Theoretical space science was covered by the Institute for Astrophysics (IAP) in Munich, a sub-institute of Heisenberg's MPIPA. Its director, Ludwig Biermann, was internationally perhaps the most respected of all german Astrophysicists: In 1951 Biermann had found evidence for the existence of the solar wind from observations of the plasma tails of comets[45] - a conclusion which was supported by van Allen's discovery of the radiation belts in 1958 and eventually confirmed by direct measurements perfomed in 1962 by Mariner-2 on its way to Venus.[46]

[44] A report given by Walter Dieminger at the Aachen meeting in September 1959 mentions three West German groups "preparing equipment for high altitude research": Hubert Schardin, Karl Rawer and finally Alfred Ehmert at MPAe (W.Dieminger, Report on Space Research in Germany, Round table discussion at the AGARD General Assembly, Aachen 1959; WHA, folder "IEP").

[45] Biermann 1951. See also the chapter on solar wind in Hufbauer 1991

[46] Hufbauer 1991, Neugebauer 1997

4 Towards the Foundation of MPE

4.1 MPG's first steps into space (late 1959 and early 1960)

Over the Christmas holidays of 1959, federal minister Siegfried Balke from BMAt, who lived in Munich, met Heisenberg and Biermann to talk about space research within the MPG.[47] However, three months after Dieminger had met the NASA officials in Aachen, the matter must already have been discussed within the MPG - informally, without leaving written traces, but to some extent. This conjecture is suggested by the fact that a fairly elaborated concept was already available when the Christmas chat now triggered immediate action. On Wednesday December 30, 1959, the three directors of space-interested MPI's, Biermann, Dieminger and Bartels, wrote a letter to MPG president Otto Hahn[48]. In this letter they proposed that their three MPIs should form an "Arbeitsgruppe für extra-terrestrische Forschung in der MPG"[49] ("working group for extraterrestrial research within the MPG") to supervise the formation of a new team at the MPI for Physics and Astrophysics in Munich. The location issue was already settled at this point: "Those of the three involved, who are not from Munich, do favour the working group to be located in Munich"[50]. In the first three years, the directors of MPAe and IAP of MPIPA should set up the extraterrestrial budget together. The idea just was to assign some 5 scientists and 8 technicians to do research with the "new research tools" that is, to plan and build scientific instruments to be flown on rockets and satellites.
The research topics specified were the ones currently undertaken abroad - especially in the USA. Top of the list were the Radiation Belts, cosmic rays and their interaction with the terrestrial magnetic field - an area Biermann's Institute had already been working on theoretically. Others were: solar activity, X-ray- and UV-Astronomy, reduction of (foreign) satellite data and upper-atmosphere research with small sounding rockets. This reads like an account of the reseach fields later covered by the MPE in the mid-1960s and after - though weights shifted considerably. But for the time being the founding fathers were not quite explicit where actually to start. Whatever this would be, 100,000 DM in the first year and a wooden cabin in Garching[51] to work in were considered sufficient.

[47] This Christmas meeting must have left some special impression on Biermann who later told Lüst this meeting with Balke having been the important first step (Interview with Reimar Lüst March 30, 199).

[48] Bartels, Biermann & Dieminger to Hahn Dec 30, 1959; WHA folder "IEP"

[49] This is the earliest recorded mention of the term "extra-terrestrial" (the hyphen got lost in the course of 1960). According to a letter of Bartels to Gentner (Oct 5 1960, AMPG Gentner file No. 158), the word had been created by Siegfried Balke for political reasons: From 1959 until the establishment of the "Deutsche Kommission für Weltraumforschung" in 1962 there was ongoing quarrel among several federal departments about who might be responsible for space affairs (comp. Trischler 1992 p. 401). The fight was especially fierce between Balke and his cabinet collegues Seebohm (transportation) and Strauß (defense). To prevent space science from becoming annother issue here, Balke looked for a name without explicit reference to "space". Bartels (and others) disliked Balkes solution because it's lack of "public appeal" (Bartels to Gentner Oct 5 1960) - but this was more than two decades before Steven Spielberg's "E.T."!

[50] "Die Nicht-Münchener der drei Beteiligten wünschen sich einen Sitz der Arbeitsgruppe in München" (Bartels, Biermann & Dieminger to Hahn Dec 30 1959). According to Walter Dieminger (Interview November 11, 1999) this point was never controversial. Both Dieminger and Bartels were busy enough with the data accrued in the IGY and didn't really need additional activity.

[51] In late 1959 the MPG had acquired an area of land in Garching, south of Heinz Maier-Leibnitz' nuclear research reactor (the "Atomei"), for its planned plasma fusion lab, the later IPP (Boenke 1991 p. 155f). According to Lüst (Interview March 30, 1999) Heisenberg opposed the idea to add another wing to the MPIPA building in Munich Freimann for the Extraterrestrians - it would have spoiled the view from

This letter of Biermann, Dieminger and Bartels to Hahn actually is the initial document of the MPE. Five days later, on January 4, 1960, the three met Hahn[52] and the issue was immediately settled: In its next meeting in March 1960, the senate of the MPG passed the bill with only two changes: Funds were slightly increased and the Max Planck Institute for Nuclear Physics (MPK) under Wolfgang Gentner joined the party.[53]

All that existed so far was this board of five high-ranked elderly Max-Planck-directors (Bartels, Dieminger, Gentner, Heisenberg, Biermann) eager to promote a new field, but no scientist to actually do the work. Indeed, manpower was even more a problem[54] than money. Above all they needed someone to head the new research group. But due to Germany's decade-long abstinence there was nobody with enough experience in the state-of-the-art hardware and organizational issues of extraterrestrial research. At least not in West Germany. There was of course considerable experience in places like Pasadena, Iowa City or Chicago - but who would leave a thriving "researchscape" to head a small group of people in a Garching cabin? Biermann - always in close touch with Heisenberg - took the initiative.

4.2 Biermann und Lüst (1959/60)

Biermann seemed to have the clearest idea of what the new research group[55] should look like. It should be experimental, yes, but with strong ties to theory and here especially to plasma theory. He was the one who first found evidence for interplanetary plasma - and that was the sort of thing he was interested in up there.

This is, when the 36 year old Reimar Lüst entered the stage. Lüst was a theoretical astrophysicist by training. He had received his Ph.D. in 1951 in Göttingen as a student of Carl Friedrich von Weizsäcker (who himself had been a student of Heisenberg) and spent 1955/56 as a Fulbright Fellow at the Enrico Fermi Institute of the University of Chicago and at Princeton.[56] In Chicago he worked with John Simpson. Together with his Chicago colleague Eugene Parker and experimentalist James van Allen in Iowa[57], Simpson was one of the doyens of a new branch of science at the intersection of nuclear-, plasma- and geophysics - the interaction of cosmic rays with the terrestrial magnetic field. This was a

Heisenberg's office into the Englischen Garten.

[52] Loc. cit. The carbon copy in Heisenbergs files has a hand-written note by Bartels: "Durchschlag Herrn Heisenberg Bespr. mit dem Herrn Präsidenten und Dr. Telschow am 4.1. sehr positiv. Soll am 28.1. vor die Verwaltungsrats-Sitzung. Julius Bartels".

[53] SP 35, S. 49. Gentner was especially interested in the nuclear reactions induced by hadronic cosmic ray particles in meteorites. This he called later the "starting point for our participation in space research" (Gentner to Bartels May 3, 1962 AMPG Gentner file No. 158).

[54] In his report at the 1959 ARGAD meeting in Aachen (see footnote 44 on p. 12) Dieminger complained: "In upper atmosphere research and in geophysics generally we suffered very badly from the draft produced by nuclear physics. For many years the number of students in geophysics was disappointingly small."

[55] The distinction between "working group" (*Arbeitsgruppe*, i.e. the inter-institutional construction directed by Bartels, Biermann, Dieminger and Gentner) and "research group" (*Forschungsgruppe* i.e. the team of scientist and technicians to be employed with extraterrestrial research") is here made for clarity. The early documents do not use a univocal term for the team of researchers before there actually existed one in late 1961.

[56] Unless stated otherwise, Lüst's biographical facts are here taken from the various curricula vitae in AMPG Lüst file "Prof. Lüst allgem. Unterlagen"

[57] On the role of Simpson and van Allen in the early days of U.S space science see Needell 1987.

research field Lüst had become interested in theoretically already after his Ph.D.[58]
Back from the United States in early 1957, he somewhat (but not entirely) shifted his research to fusion plasma physics - a very promising field in those days, especially within the MPG where discussions of what later became the Max Planck Institute for Plasma Physics (IPP) started in 1956.[59] Lüst was promoted group leader at the MPIPA and in 1959 he accepted an invitation to lecture at the New York University as a visiting professor for mathematical physics at the Courant Institute.
During this stay in New York City, Lüst received no less than three job offers - one more tempting than the other - to Rochester, New York[60] and the new Nuclear Research Center in Karlsruhe[61]. Biermann, however, was not particulary pleased. He needed Lüst as a leading plasma expert with a strong astrophysical background, now that trendy fusion plasma physics began to dominate the MPIPA. But the only way to keep Lüst was to promote him again. Biermann could not offer him a professorship, but, backed by Heisenberg, scientific membership in his institute. This was just as good from the social security point of view[62] and almost as good reputationally. In July 1959 Biermann and Heisenberg together wrote Lüst a letter. After mentioning the progress made towards a plasma fusion research lab in Garching, they wrote:

> "Naturally, this means that the importance of plasma physics won't decrease in the Institute for Astrophysics - although it is planned to do theoretical work concurrently also in Garching. In order to keep a reasonable balance in regard to Astrophysics in the narrower sense, it is intended to assign to you a position of a division leader at the Institute for Astrophysics by April 1 next year. ... we also would immediately, i.e. as soon as we know that you will stay with us, apply for your appointment as a scientific member of the institute. Considering the situtation, there is obviously no doubt that this application will be accepted ... you would be responsible primarily for the field of theoretical Astrophysics - although you are of course free to contribute to theoretical Plasmaphysics as well, as you did so far. The particular concern of the one of us (B.) [sc. Biermann] naturally is that theoretical Astrophysics, which was the basis of all the other developements in the Institute for Astrophysics, will again become stronger after the fast expansion especially of Plasma Physics. ..."[63]

[58] For instance, Lüst assisted in managing the second edition of Heisenberg's book on cosmic rays (Heisenberg 1943). His first paper on this matter (together with Arnulf Schlüter and Eleonore Trefftz) was published also in 1953 (Schriftenverzeichnis Reimar Lüst, AMPG Lüst, file "allgemeine Unterlagen")

[59] Boenke 1991 p. 98ff

[60] Biermann to Lüst of May 30, 1959 (WHA, folder "IEP", subfolder "Lüst"). In this letter Biermann already expresses his hopes that Lüst would stay in Munich, but admits that he cannot offer him any further improvement of his position there. That, however, changed within two months.

[61] Reimar Lüst, interview March 31, 1999

[62] As scientific member of MPI he was entitled to the privileges of an associate professor (Extraordinarius) of a German University: Lifetime employment with full salary after retirement (Emeritierung).

[63] "Dies bedeutet naturgemäß, daß das Gewicht der Plasmaphysik auch im Institut für Astrophysik nicht abnehmen wird, obwohl gleichzeitig auch in Garching theoretisch gearbeitet werden soll. Um hinsichtlich der Astrophysik im engeren Sinn ein vernünftiges Gleichgewicht aufrechterhalten zu können, ist beabsichtigt, Ihnen zum 1. April des kommenden Jahres eine Abteilungsleiterstelle im Institut für Astrophysik zu übertragen. ... außerdem würden wir sofort, d.h. sobald wir wissen, daß Sie bei uns bleiben möchten, Ihre Ernennung zum wissenschaftlichen Mitglied des Instituts beantragen. Nach Lage der Dinge besteht

Interestingly, the application letter to president Otto Hahn soliciting Lüst's scientific membership is delivered with a slightly different pitch: There they wrote: "Considering the importance to which the area of plasma physics has grown also in our institute in the context of fusion, we feel that especially now it would have been a great loss if Herr Lüst had left us."[64]
It helped. With the prospect of scientific membership Lüst declined all the other offers, returned to Munich and finished his habilitation in January 1960. Soon after, Lüst was offered another chair, this time at Utrecht University[65], which he also declined. Reimar Lüst was appointed scientific member on March 16, 1960, the very day the "Arbeitsgruppe für extraterrestrische Forschung in der MPG" was approved[66] - yet still there was no connection between the two[67]. But during the year 1960 two developments - one prominent and political, the other (yet) inconspicuously scientific - jockeyed Lüst into Biermann's and Heisenberg's plans for observational extraterrestrial research.

4.3 Lüst in Space (1960)

The political development concerned Europe. First calls for European cooperation in space had come up not long after the Sputnik shock let the USA look for collaborators in space among its NATO allies. An obvious model for a joint European space project was the nuclear research center CERN near Geneva. There, a 25 GeV proton synchrotron had just reached its design energy in November 1959 providing European scientists with the world's most powerful accelerator and demonstrating that European collaboration could work. This was a fortunate timing for Pierre Auger and CERN's Edoardo Amaldi. The two physicists, one French, one Italian, together had hatched the idea of a European Organization for Space Research since spring 1959. Now their plans could surface at the first COSPAR Space Science Symposium in Nice in January 1960[68]. Nice triggered a series of meetings among the most senior people of the European space science community: Pierre Auger from France, Henk van de Hulst from Holland, Edoardo Amaldi and Luigi Broglio from Italy and Sir Harrie Massey from the United Kingdom - to name just some of the most prominent. West Germany was initially represented by Julius Bartels. Bartels

wohl kein Zweifel, daß dieser Antrag angenommen werden wird ... [Sie] würden ... in erster Linie zuständig sein für das Gebiet der theoretischen Astrophysik, obwohl es Ihnen natürlich unbenommen bliebe und auch erwünscht wäre, wenn Sie auch zur theoretischen Plasmaphysik beitragen würden, wie Sie dies ja auch bisher getan haben. Das besondere Anliegen des einen von uns (B.) [sc. Biermann] ist naturgemäß, daß die theoretische Astrophysik, auf deren Boden sich im Institut für Astrophysik alles übrige entwickelt hat, nach der raschen Entwicklung, insbesondere der Plasmaphysik auch wieder stärker bearbeitet wird. ..." (Heisenberg and Biermann to Lüst, July 17, 1959 (WHA, folder "IEP", subfolder "Lüst").

[64] "Im Hinblick auf die Bedeutung, die das Gebiet der Plasmaphysik auch bei uns im Zusammenhang mit der Fusion gewonnen hat, fanden wir, daß es gerade im gegenwärtigen Zeitpunkt ein großer Verlust für uns gewesen wäre, wenn Herr Lüst uns verlassen hätte." (Heisenberg and Biermann to Hahn, September 12, 1959; WHA folder "IEP" subfolder "Lüst").

[65] Reimar Lüst, private communication October 8, 1999 (comp. van de Hulst 1983, p. 3).

[56] 35. SP, pp. 45, 48-50

[67] The first meeting of the extraterrestrial working group where Lüst was present was in early May 1960 (Interview Reimar Lüst March 30, 1999). This was on the occasion of a CPT-meeting held in Munich on May 9, 1960 celebrating the new MPIPA-Building in Munich Freimann, which, however, was in use since the MPIPA had moved from Göttingen to Munich in 1958 (Henning & Kazemi 1998 p. 103 & 113).

[68] See e.g. Krige 1992a p. 8-9 and Fischer 1994 p. 6ff and references therein; comp. van de Hulst 1998.

was a distinguished figure both in the MPG[69] and internationally (e.g. from a famous book he had coauthored with Chapman[70]). He had been attending the Nice symposium and the subsequent informal meeting at Auger's appartment in Paris and was invited to the first "official" talks among European space researchers held in London on April 29, 1960[71]. But there he sent his deputy Alfred Ehmert[72]. Bartels had to run both his MPI and a chair at Göttingen university and was very busy with the IGY. So he simply didn't have the time to engage in the European enterprise seriously. Instead, Ehmert reported from the meeting to the working group.[73] In early October 1960, when the scientists' discussions had definitively reached the political domain, the Royal Society in London hosted a meeting of a technical working group to prepare intergovernmental talks on how Western Europe could coordinate its efforts in space. Now West German scientists were needed to represent their country in serious political negotiations. Again, Bartels sent Ehmert, but now Lüst was also chosen to go.

Why him? At a first glance it seems a little mysterious, since Lüst did not have any experience preparing him for the job - neither in space-related technology nor in international science management. He was, in his own words, "a complete newcomer"[74]. But Lüst obviously attracted attention in summer 1960, when three gentlemen from the Deutsche Forschungsgemeinschaft (DFG) payed the Munich MPIPA a visit. Gotthard Gambke, Rudolf Kerscher and Walter Kertz were surveying the West German scientific community in preparation of a study report titled "Memoir on the situation of Space Research in the Federal Republic of Germany"[75] on behalf of the DFG, who had been asked for this stocktaking by the German federal government in July 1960. The memoir was explicitly ordered as a basis for the negotiations at the London meeting in October.[76]

Gambke, Kerscher and Kertz also interviewed Lüst, the leader of the institute's division for the theory of astrophysical plasmas - and eventually included him on the advisory committee whose fifteen members discussed final version the study report on September 27, 1960. Apart from Kertz, Lüst was the only non-senior scientist in this committee, which otherwise comprised only Max-Planck-directors and chair-holding full professors. A few days later, on demand of the DFG[77], he accompanied Ehmert, Gambke and Kerscher to the London meeting as German scientific delegate. Obviously, Heisenberg and Biermann very much approved.

[69] At the annual general assembly of 1962 in Düsseldorf, Bartels was honoured to give the annual public lecture - his subject, of course, was space research.

[70] Chapman & Bartels 1940

[71] J.Bartels, "Rundschreiben betr. Europ. Weltraumforschung" June 2, 1960 (AMPG Gentner No. 158)

[72] Bartels to Biermann, Dieminger, Gentner and Heisenberg April 7, 1960, AMPG Gentner file No. 158.

[73] Ehmert to Gentner May 28, 1960, AMPG Gentner file No.158

[74] Lüst 1998, p.72

[75] "Denkschrift zur Lage der Weltraumforschung in der Bundesrepublik Deutschland" Gambke, Kerscher & Kertz 1961 (comp. page 10) For further details on the DFG study report see Fischer 1994 p. 11-13.

[76] DFG president Gerhard Hess to 24 German scientists, July 23, 1960 (AMPG Gentner file No. 158). The list of adressees included Bartels, Biermann, Dieminger, Ehmert, Gentner, Heisenberg, Kiepenheuer, Rawer, Schardin and Schlüter, but did not yet include Lüst.

[77] Reimar Lüst, private communication October 8, 1999.

4.4 Biermann's Dream (1960)

That Biermann approved of his leading expert for astrophysical plasma theory practicing politics is less surprising if one considers that the situation had changed quite a bit since late 1959: Fusion plasma physics now definitively had its own home in the "Institute for Plasmaphysic GmbH", founded in June/July 1960[78], so Biermann's Institute was entirely astrophysical again. And the prospect of Extraterrestrial Research did have considerable impact in Biermanns own research interests as well.
In 1960 Biermann had worked out an idea on how to directly probe the solar wind: A spacecraft could carry a payload of a certain alkali metal into interplanetary space. Once the metal is vaporized by a sufficiant exotherm chemical reaction, the solar radiation would photo-ionize the metal atoms and excite the ions making them visible in optical wavelengths and therefore observable from the ground. This "artificial comet" would then trace the magnetic field carried by the solar wind and reveal its structure and behaviour. In 1961, a paper with detailed calculations was published by Biermann, Herrmann Ulrich Schmidt, Reimar Lüst and his first wife Rhea, who was an astronomer and expert on comet-tails.[79] The major part of the work was done during 1960 and it showed that the idea should work with just a few kilograms of metal.[80]
Here was a first project of the new extraterrestrial research group. It was new but comparatively inexpensive. It was simple, but theoretically interesting.[81] It was plasma physics, and it was in space - thus eligible for the funding now available. The final goal, however, was interplanetary space - which could only be reached with the most powerful launch vehicles of the time. A special relationship between the projected extraterrestrial research group and the political levels which would ultimately have to provide the means to make the artificial comet shine was therefore very desirable. Lüst being involved both scientifically in Biermann's promising idea and politically in the European space efforts, thus became a key figure in MPG's extraterrestrial endeavour. His excellent connections to the United States were another plus. But there was a problem: Lüst was a theoretician with no experience in hardware issues.

4.5 Waiting for Peter Meyer (1960-61)

Hardware, however, was to become the daily bread of the new group - so Lüst was not particulary qualified to lead it. Instead Biermann and Heisenberg fancied him and his division at the IAP as a sort of a theoretical partner to the leader of the planned experimental extraterrestrial group.[82] Who was that going to be?
Lüst had an old friend from the early Göttingen days: Peter Meyer, a former Ph.D. student and postdoc at the MPI for Physics, who went to Simpson's Enrico Fermi Institute for

[78] Boenke 1991 p. 133f

[79] Biermann et al. 1961

[80] See Blamont (1983) on earlier American (1955 by Ewards, Bedinger and Manring) and French (1959 by Blamont) rocket borne experiments with sodium vapour clouds. See Massey & Robins (1986) on the British experiments (Bates 1958). Sodium is not photo-ionized by sunlight and therefore cannot trace magnetic fields. Instead, one was interested in temperature measurements in the otherwise unaccessible hights of 100-200 km.

[81] Blamont on his sodium-cloud experiments: "Good science, no instruments on board but a strong box filled with cheap chemicals, and spectectular phenomena in the event of success" (loc cit. p. 162)

[82] Biermann to Meyer November 4, 1960 (WHA, folder "IEP").

Nuclear Studies of the University of Chicago in 1951. There he became very active in constructing detectors for cosmic ray research. Biermann and Lüst approached Meyer who visited Munich in summer 1960.[83]. One result of their talks was a more realistic estimate of the funds which the extraterrestrial group would need: at least 1 million DM a year, plus another million for a proper laboratory building in Garching. Minister Siegfried Balke of the BMAt was "not shocked" as Biermann reported him these numbers.[84] Hopes of getting Meyer to Garching rose.

But Meyer hesitated - even as the annual budget was raised to 3 million DM and Heisenberg made sure that Meyer would be appointed scientific member with the conditions of a full professor (Ordinarius) as soon as he came[85]. The negotiations carried on well into the year 1961, but nothing happened. Meyer did't come. His letters to Biermann and Lüst display two reasons why he eventually declined the offer. First, Meyer's wife held a good position as a physicist in the Argonne National Laboratory and would not have found any comparable employment in Munich.[86] Second, Meyer suspected that the European efforts to invest in a "not very promising"[87] launching-rocket development would eventually swallow up all the money, leaving too little for scientific payloads.[88]. This danger was quite real. In 1960 the British had begun to talk other European countries into a joint launching-craft project. They wanted their enourmously expensive *Blue Streak* missile, which as a liquid-fuel rocket had turned out to be militariliy useless, to become the first stage of a European satellite launcher.[89]

The effort to get Meyer only delayed things. Meanwhile European space efforts had gained momentum. COPERS, a preparatory commission for the planned European Space Research Organisation (ESRO) - forerunner of today's ESA - had been established on an intergovernmental conference in Meyrin, Switzerland, the end of 1960.[90] At its first meeting in March 1961 Reimar Lüst was elected coordinating secretary of the scientific-technical working group. He was nominated for this position by COSPAR president Henk van de Hulst who had been involved in the offer of a chair at Utrecht University which Lüst had received in early 1960.[91]. Soon, Lüst and his British counterpart A.W. Lines (who later became ESRO's first technical director) were assigned to draft ESRO's future satellite program.[92] At the same time the European launcher issue became a subject of fierce debate within the West German government.[93] The emerging German space industry, notably Ludwig Bölkow, demanded that any European effort had to be accompanied by a strong national space program in order to become an equal partner in the projected European Launcher Development Organization (ELDO).[94] The German space scientists thoroughly

[83]Lüst to Meyer May 31, 1960, AMPG Lüst file "Korrespondenz M"; Memo by Biermann dated February 17, 1961 (WHA file "IEP")

[84]Balke to Biermann Aug 25, 1960; WHA, file "IEP"; Biermann to Balke Jul 22, 1960; WHA, file "IEP"

[85]Biermann to Meyer November 4 1960 (WHA, file "IEP")

[86]Meyer to Lüst Nov 18, 1960 (AMPG Lüst, "Korr. M"); Meyer to Biermann Nov 29, 1960 (WHA, folder "IEP")

[87]Meyer to Lüst February 1, 1961

[88]loc. cit. and file note by Biermann dated February 17, 1961 (WHA file "IEP")

[89]comp. Trischler 1992, p. 397-399

[90]Trischler 1992 p. 399 and Krige 1992a p.25ff

[91]See page 16.

[92]See Russo 1992 pp. 16-18

[93]See Fischer 1994 pp. 13-28

[94]loc. cit. p. 33ff

agreed. Many of them soon shared Meyer's fears that the country's European devotion would eventually drain their very resources. First estimates of the German contributions to both ELDO and ELDO for 1962 yielded DM 55 million.[95] That the government should additionally spend at least twice that money on national space research projects became the scientists' mantra for the years to come.
Being both witness and participant in the discussions on Europe in space, Lüst realized that it was high time to establish a national-level space science infrastructure where these requested financial resources could be effectively allocated. Yet an important piece of this infrastructure was the extraterrestrial group in Garching. The situation called for immediate action. Following a list Meyer had given him earlier[96], Lüst started buying equipment and looking for people to employ.[97] In doing so Lüst grew into a new role. In September 1961 - Meyer had not yet definitively declined - Biermann wrote to Heisenberg:

> "even if he [Meyer] yet accepts, I would like to give Lüst a larger share of the responsibility for the extraterrestrial research than previously intended."[98]

But there was yet another reason for Biermann to improve Lüst's position. Lüst had been offered the position of a Co-Chairman of the Department of Space Research at Cornell University and shortly after a professorship at the California Institute of Technology (Caltech).[99]. But now - late 1961 - Lüst was the principal scientist representing West German space interests on the European stage. His leaving for America would have caused severe damage, not only for the Munich Institute, but for the whole West German space community. Biermann had to do something about it.
He knew that Lüst would have been interested in a professorship at the University of Munich (LMU) in combination with his position at the Max Planck Institute, but only if he could get access to Diploma students.[100] When Heisenberg approached Fritz Bopp, the head of theoretical physics division at LMU, Bopp didn't like the idea. A Max Planck scientist supervising Diploma theseis and thereby distracting young people away from the university institutes was definitively not in his interest.[101] Heisenberg's efforts to provide a professorship for Lüst remained futile for the time being.

[95] loc. cit. p. 29
[96] Meyer to Lüst November 18, 1960; AMPG Lüst file "Korrespondenz M"
[97] Lüst to Meyer February 24, 1961; AMPG Lüst file "Korrespondenz M"
[98] "Auch wenn er [Meyer] jetzt noch zusagt, möchte ich Herrn Lüst einen größeren Anteil an der Verantwortung für die extraterrestrische Forschung übertragen, als es bisher vorgesehen war." (Biermann to Heisenberg September 13, 1961 p. 2; WHA folder "IEP" subfolder "Lüst")
[99] loc. cit.; Biermann to Ballreich, January 19, 1962, AMPG Inst. Betr. MPE, Ordner "Extraterr. Physik bis 31.12.1971 allgemein BY 07c"
[100] loc. cit.
[101] Heisenberg to Biermann Oktober 17, 1961; WHA folder "IEP" subfolder "Lüst". Ph.Ds were a different matter. Max-Planck employees who were also faculty members of LMU (like Biermann and Heisenberg) were allowed to supervise doctoral students.

4.6 Die "Abteilung Lüst" (late 1961 - spring 1963)

In late autumn of 1961 a group of six people, three of them scientists, eventually took up work in the Garching cabin[102] - and Lüst had the sole responsibility. This "Abteilung Lüst" was first referred to in an important memo dated January 16, 1962 and signed by both Heisenberg and Biermann. They declare in a rather circumstantial and fuzzy way:

> "Provided a favourable development of the department - to be headed by Herr Lüst - in respect of instrumental development and staff set-up, the signatories will persue the conversion of the department of Extraterrestrial Research into an institute within the Max Planck Institute for Physics and Astrophysics. Herr Lüst shall obtain contractual warranty that he may work in an American institute every once in two years for a period up to six months, provided a substitute can be arranged."[103].

This is the first "official" document mentioning the possible establishment of extraterrestrial physics as a third Institute within the MPIPA. But presumably for at least a year the idea had been around - probably as a controversial one. In January 1961 - long before Biermann thought of giving Lüst "a larger share of the resposibility for the extraterrestrial research" - former MPG sectretary general Ernst Telschow[104] was cited in parts of the press as saying that the MPG had abandoned the concept of the inter-institutional working group and planned instead to establish an institute for extraterrestrial reseach in Munich. Telschow soon denied having said anything like this. The MPG General administration informed the the working group that there was no change of plan.[105]
An explicit proposal for a separate institute did not even come up during the negotiations with Peter Meyer, who might have been more positive towards the offer, if directorship had been at stake. That Meyer never raised the issue by himself can be read as further evidence that he never really wanted the job.[106] That Biermann or Heisenberg never raised it shows

[102] Biermann, "Vermerk über den Aufbau der Extraterrestrischen Forschung ..." dated May 19 1962, and Lüst's opening address for the new Institute building February 15, 1965; both WHA folder "IEP"

[103] "Bei günstiger Entwicklung der von Herrn Lüst zu leitenden Abeilung hinsichtlich der instrumentellen Entwicklung und des personellen Aufbaus, werden sich die Unterzeichnenden dafür einsetzten, daß die Abteilung Extraterrestrische Forschung in ein Institut im Verband des Max-Planck-Institutes für Physik und Astrophysik umgewandelt wird. Herrn Lüst soll vertraglich zugesichert werden, daß er alle zwei Jahre bis zu einem halben Jahr an einem amerikanischen Institut arbeiten darf, sofern die Vertretungsfrage gelöst ist."("Aktenvermerk betr. die zukünftige Entwicklung der Abteilung Lüst im Institut für Astrophysik", dated 16th of January 1962; WHA folder "IEP")

[104] Telschow's tenure as secretary general (or *Geschäftsführendes Mitglied des Verwaltungsrats* as this position was called until 1964) ended 1960 when he became *Geschäftsführer* of the newly founded *Institut für Plasmaphysik GmbH*. But Telschow (1889 -1988) remained influential in the MPG until he eventually retired 1967 in the age of 78.

[105] Ballreich to Biermann January 18, 1961: "Es ist nach wie vor keine Veränderung der organisatorischen Ursprungsplanung vorgesehen" AMPG Inst.Betr.MPE, Ordner: "Extraterr. Physik bis 31.12.1971 allgemein BY 07c". An identical letter was sent to Gentner (AMPG Gentner file No. 158).

[106] The conjecture that directorship wouldn't have made a difference is confirmed by a later episode: When Julius Bartels suddenly died in March 1964, the MPG offered Meyer to become Bartels' successor as director of the Institute for Stratospheric Physics of MPAe - an offer which Meyer also declined (session protocol of the commission "Zukunft des Institutes für Statosphärenphysik" December 2, 1964; AMPG Inst.Betr. MPAe, Ordner "MPI für Aeronomie allgemein ND04"). In his protocol, Meyer is seen as "the

that they didn't yet consider extraterrestrial research really something which deserved to "build an institute around" anybody for (that they also might have been reluctant to share power with a third director within the MPIPA - with an experimentalist even - is another matter). Even in mid 1962 - less than a year before the MPE was actually founded - Heisenberg was not completely enthusiastic about the idea. In the MPG administration Heisenberg was quoted merely to consider a "step-by-step realization"[107] of Lüst's plans appropriate.

Lüst, however, thought differently. In the beginning he had supported the idea of the inter-institutional working group of MPIPA, MPAe and MPK: Since extraterrestrial research didn't deal with new science but new means for science, he argued in Summer 1960, the MPG should "not yet establish a new institution, but intensify and, when required, expand the efforts of those institutes who are already interested in such questions"[108]. But now he knew from his European experience that space research was technologically and organizationally too complex an enterprise to exist as an appendix to a theoretical institute. This explains his boldness in asking Heisenberg and Biermann for the assurance cited above (that they did it all by themselves is not very likely). He probably didn't care too much that this meant turning the Harnack Principle a little upside-down. The MPG administration obviously didn't have a problem with this procedure either - though they surely expected some time to pass before "favourable development of the department" allowed actually to fulfill Lüst's goal. What they did have a problem with was the general leave of absence once every two years[109].

But this matter soon became obsolete, when Lüst's ever intensifying European duties (in 1962 he also became chair of the COPERS launching program sub-committee) made it impossible for him to accept any more visiting professorships in the USA. The last he accepted before he became director were at MIT from September to December 1961 and Caltech from January to March 1962. Considering that Lüst was now in charge of a research group literally under construction[110], it is most surprising that he was hardly present in Munich or Garching for longer periods of time. Nevertheless, within less than a year, Lüst's group assembled their first scientific payloads.

These were ion-cloud experiments inspired by Biermann's artificial-comet idea. Biermann called it "the ...first experiment [of the extraterrestrial research group] which to our

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only qualified candidate" and his refusal eventually forced the commission to install Bartels former deputies Georg Pfotzer and Alfred Ehmert as "Direktoren am Institut" - a solution which, by the way, was explicitly not considered in perfect tune with MPG's policy of appointment (i.e. the Harnack Principle) - especially not in the case of Ehmert.

[107] H.Ballreich, file note June 6, 1962: "Mit Herrn Professor Heisenberg habe ich über die Frage [der Verselbständigung Lüsts] gesprochen. Er war der Auffassung, daß die schrittweise Verwirklichung der Vorstellungen Lüsts durchaus angemessen sei." (AMPG Inst.Betr. MPE, Ordner: "Extraterr. Physik bis 31.12.1971 allgemein BY 07c")

[108] R. Lüst, "Internationale Zusammenarbeit auf dem Gebiet der Weltraumforschung und die Beteiligung der Max-Planck-Gesellschaft" p. 11, WHA folder "IEP" (without date, but most likely this essay was Lüst's report to the authors of the DFG study report which was completed in September 1960).

[109] Session protocol of the *Verwaltungsrat der MPG* March 8, 1962 (pages 32+33), AMPG Inst.Betr. MPE, Ordner: "Extraterr. Physik bis 31.12.1971 allgemein BY 07c".

[110] Biermann, "Vermerk über den Aufbau der Extraterrestrischen Forschung ..." dated May 19 1962; WHA folder "IEP'.

knowledge has not been proposed nor undertaken by any other group"[111] These initial experiments consisted of burners filled with a mixture of powdered aluminum and barium peroxide[112]. In November 1962, two were carried by French *Centaure* solid-fuelled rockets from the Ile de Levant in the mediterranean sea.

Why France? What had become of NASA's generous offer to fly German equipment on their spacecrafts? For one thing, huge spacebound rockets or even satellites were not needed for these kinds of experiments in such an early stage of development. Before any artificial-comet payload could be mounted on an expensive launching craft, the technology of generating ion cloulds had to be developed and thoroughly tested[113] in the more easily accessible part of space right above the earth's atmosphere. Of course, this region was known to be well within the magnetosphere and therefore no solar wind would be there to be probed. But the ion clouds were expected to trace the terrestrial magnetic field instead - and probably that wasn't altogether uninteresting either.

So for the time being there was no need for heavy American launching equipment. But smaller and considerably cheaper rockets were also available from the French and they - apart from being closer - were also quite generous. The first rides on the *Centaures* were free for the Munich barium burners. This was courtesy of Jacques Blamont, Scientific and Technical director of the newly founded Centre National d'Etude Spatiales (CNES) and a sounding rocket expert, who had performed the French atomic sodium-cloud experiments with the *Veronique* in 1959. Blamont first met Lüst on the occasion of his European debut at the London Meeting in October 1960.[114] When he heard from Lüst of Biermann's ion-cloud idea, he offered piggyback rides on his own rockets.[115]

It didn't work at the first attempt. Due to an engine-failure both rockets had to be destroyed shortly after launch.[116] However, Lüst's people (15 by January 1963 - among them 5 scientists)[117] had made their first step into the extraterrestrial business.

The ion-cloud experiments were the main activity of Lüst's group. Naturally, this enterprise was not yet in the phase of producing publishable results. The very first publication which may be counted as genuinely accomplished within the extraterrestrial research group had therefore nothing to do with ion clouds. It was a paper on the spectrum of geomagnetically trapped protons by Gerhard Haerendel[118], a 27 year old Ph.D. Student who was officially supervised by Arnulf Schlüter. Haerendel graduated in July 1963 with a thesis on the Radiation Belts and may be considered MPE's very first Ph.D.[119]

[111] "das ... erste Experiment [der extraterr. Forschungsgruppe], das unseres Wissens noch von keiner anderen Gruppe vorgeschlagen oder in Angriff genommen worden worden ist"(loc. cit.).

[112] TB 1963-65 p. 12

[113] NASA required that the scientific payloads for satellites be first demonstrated with sounding rockets (Krige & Sebesta 1994 p. 276). Strict environmental requirements and liability issues for launches over US territory also complicated things.

[114] Lüst 1998 p. 74

[115] Blamont 1983 and Interview Reimar Lüst 1999.

[116] Blamont 1983, p. 163; Lüst 1998 p. 74.

[117] Heisenberg to Butenandt January 10, 1963

[118] Haerendel 1962. The list of publications in the *Jahrbuch der MPG* 1962 suggests that this also was pretty much the only one in 1962. However, the extraterrestrial group was not yet dealt with separately in this edition of the *Jahrbuch*.

[119] This is a *façon de parler* since MPIs cannot grant academic degrees. Haerendel received the Ph.D. from the LMU, where Biermann was a faculty member.

4.7 The "little Institute" (May 1963)

But Biermann's battle to keep Lüst in Garching was not all over yet. During the year 1962 Lüst received once more an offer for a prestigious position, this time on a chair for theoretical Astrophysics in Göttingen[120]. It's hard to say how seriously he considered it, but he did make substantial effort to negotiate on the financial endowments of his prospective institute in Göttingen.[121] This effort payed off, since it obviously caused the Max-Planck officialdom to procure Lüst with his own little MPI much earlier than one would have expected: Before anybody could judge "favourable development"[122] of the research group from scientific results (not to speak of publications), Heisenberg wrote to MPG president Adolf Butenandt in January 1963[123]. Stressing Lüst's recent offer from Göttingen he urged Butenandt to take measures for promoting the extraterrestrial department to a third institute within the MPI for Physics and Astrophysics on the next possible occasion, which was the 1963 general assembly of the MPG in Augsburg. Naturally, Lüst was the one and only candidate for the position of the director.

But appointing a MPI director had become a time-consuming procedure just two months before when the MPG senate had agreed on a two-stage procedure.[124] First, senators where informed about the candidate. The final discussion and appointment of the candidate took place in a later session in order to allow enough time for invitation and discussion of expert opinions on the candidate's scientific and personal qualification. In Lüst's case, this scheme was readily abandoned. Butenandt himself proposed to appoint Lüst within one session.[125] Also CPT chairman Carl Wagner couldn't see any necessity for outside expert opinions on Lüst, considering the pending offer from Göttingen and the latest news from Paris, where Lüst was asked to become Scientific Director and deputy of Director General of ESRO.[126] But it was clear to everybody what the reason for this hurry was: "The gentlemen Heisenberg and Biermann have asked to speed up the procedure in order to assure Herr Lüst's remaining within the MPG"[127].

On May 15 the senate approved the creation of the MPE.[128] A popular MPE-anecdote relates that after the session Butenandt left the hall where the senators had been meeting (the famous *Goldener Saal* in Augsburg's Renaissance city hall), and on seeing Lüst exclaimed: "Da haben Sie Ihr Institütchen"("Here you've got your little institute").

[120] Niedersächsisches Kultusministerium (Ministry for Education and Culture of Lower-Saxony) to Lüst November 30, 1962; AMPG Lüst file "allgemeine Unterlagen"

[121] Lüst's correspondencs with the Kultusministerium in Hannover: AMPG Lüst, file "allgemeine Unterlagen". Lüst eventually declined the Göttingen offer in July 1963 (Lüst to Niedersächsisches Kultusministerium July 19, 1963, loc. cit.).

[122] See quote cited on page 21.

[123] Heisenberg to Butenandt January 10, 1963; WHA folder "IEP" subfolder "Lüst".

[124] Decision of the MPG Senate, November 23, 1962 (43. SP p. 37)

[125] "Bericht des Präsidenten im Senat" March 1, 1963 (AMPG Inst.Betr. MPE, Ordner: "Extraterr. Physik bis 31.12.1971 allgemein BY 07c").

[126] Wagner to Bartels, Biermann, Dieminger, Gentner, Heisenberg, Köster, Mattauch and Schlüter, March 7 1963 (AMPG Inst.Betr. MPE, Ordner: "Extraterr. Physik bis 31.12.1971 allgemein BY 07c"). Soon after he became director, Lüst also accepted the offer from Paris and became COPERS' scientific director on a part time basis until the establishment of ESRO in May 1964 (Massey & Robins p. 135).

[127] "Die Herren Heisenberg und Biermann haben gebeten, das Verfahren zu beschleunigen, um den Verbleib von Herrn Lüst im Rahmen der MPG zu sichern" (protocol from the senate session on March 13 1960, 44. SP p.7f).

[128] 45. SP, p. 23f

On that very day the institute's first sucessful experiment flew from a French military launch pad near Hammaguir in the Algerian desert[129]. This time the *Centaure* rocket worked and a load of barium was evaporated to form a cloud at a height of 155 km. This was not yet an ion cloud (those were achieved a year later[130]) and it was far from being in interplanetary space. It took another 20 years before Biermann's dream of an artificial comet eventually came true[131].

[129] TB 1963-65 p.15. Algeria became independent of France in 1962, but the aggreements of Évian-les-Bains allowed the French to keep some of their military installations. After president Ahmed Ben Bella was deposed in a coup led by Houari Boumedienne, the French had to abandon their bases in 1966.

[130] TB 1963-65 p.16 and Lüst 1965 p. 528.

[131] The artificial comet was accomplished with the AMPTE mission in December 1984 (TB 1984 p. 21ff, see also Haerendel 1996 p. 10,545f).

5 Concluding Remarks

5.1 A Child of the Space Age

The MPE is an early German child of the space age. The second World War had boosted the development of rocketry, a new technology which first remained reserved for the winners of the war. Then the Sputnik shock promoted a considerable shift in the political context. Rockets and satellites now became cold war weapons too. The USA allowed limited proliferation of space technology from the classified military domain into civil science. This change of policy, marked by the foundation of NASA in 1958, gave German researchers access to the technological means of science beyond the atmosphere. In 1959 NASA offered launching opportunities to German scientists. However, the thin German research capabilities in this field were not appropriate for immediate avail of the American offer. The MPG provided a suitable institutional framework for establishing such capability for three reasons. First, because it was part of its policy to care about newly emerging fields of science too difficult to cope with at universities. Second, because the largest share of the few space-related activities in Germany was already domiciled in MPIs. And finally because of Werner Heisenberg.
Heisenberg was a key figure in science politics in the early Federal Republic of Germany. Though he was not an expert in space science to the same extent as in nuclear or elementary particle physics, Heisenberg committed himself to promote the new field. His fellow director in the Munich MPI, Ludwig Biermann, took a special professional interest in the new research possibilities. This situation triggered the plan for a coordinated extraterrestrial enterprise among a group of senior MPG scientists led by Heisenberg and Biermann of the Institute for Astrophysics. Since the new technology was promising also for other disciplines represented in the MPG, the enterprise started as a cooperation among three MPIs. However, the unanimous decision to locate the new activity in Munich suggests that Biermann and Heisenberg dominated the discussion from early on.

5.2 The two Networks

From the very beginning, MPG's extraterrestrial enterprise was defined by its means, rather than its subject. Since these means were rockets and satellites provided from abroad, any such project had to be managed both at MPI level and in international collaboration. Therefore, a staff leader of the planned extraterrestrial group should ideally match three criteria: expertise in experimental space research, compatibility with the Munich Institute and superior international connections.
The young theoretician Reimar Lüst satisfied two of these criteria perfectly. He was a home-grown Max Planck physicist at best terms with Biermann and Heisenberg. Lüst also had spent more than a year in John Simpsons research group at the University of Chicago, definitively one of the hubs of early space physics. Afterwards, he succeeded in maintaining and expanding his personal American connections which certainly contributed to the numerous offers he received for faculty positions at choice universities. When he became involved with European space efforts in October 1960, he quickly extended his network to London and Paris.
Lüst therefore belonged to two networks at the same time. Because he was part of the "inner" MPI network he got involved with Biermann's and Heisenberg's extraterrestrial

plans in the first place. His participation in Biermann's artificial comet idea was his initial scientific step towards experimental space research. His connectedness into the "outer" international network, however, drove the dynamics of the foundation of MPE. Not only was the pace considerably accelerated by the frequent offers which Lüst received from abroad (see below). He also knew from his international experience that there soon had to be some real West German space science activity if the country were to be on an equal footing with England, France and Italy in the emerging European Space Research Organisation. This encouraged him to actively embark on the formation of the Garching research group while the negotiations with Peter Meyer were still pending. The very fact that Lüst dealt with the MPG's extraterrestrial project from an international perspective therefore enhanced his commitment for this project and eventually formed it's final - and finally sucessful - institutional setting.

5.3 Harnack's Principle revisited

The "founding fathers" Heisenberg und Biermann did not project the MPE it turned out to be. For what they had in mind was a experimental research group affiliated to Biermann's theoretical institute. Until rather late in the foundational phase (early 1962), an MPI for Extraterrestrial Physics under a director on an equal footing with Biermann was (officially) not even an issue. Nethertheless, right from the start (spring 1960) efforts were made to build the extraterrestrial group "around" somebody. This, however, was not yet Reimar Lüst but Peter Meyer, a former MPI scientists who had pursued his career overseas and who was a proven experimentalist. In a way the Harnack Principle provided a scheme of action from early on: Meyer was considered the optimal canditate and was heavily canvassed by Biermann. Until Meyer declined no other possibility was considered. The suggestions Meyer uttered during the negotiations (a much increased budget and an new lab building) were readily followed and eventually helped to further shape the project.

The subsequent dynamic towards an Institute for Extraterrestrial Physics, however, was clearly driven by Reimar Lüst - and the offers he received over and over again for prestigious positions outside the MPG. Eventually, even a fresh senate decision was readily overridden in order to keep him. To a certain extent, the foundation of MPE was an ongoing *Rufabwehr*. Lüst was indispensable - but for different reasons at different stages of the process. First (1959), because his scientific profile comprising both plasma- and astrophysics was needed by Biermann. Next, as extraterrestrial research had to be organized (1960), Lüst's close relationship with Meyer became important. Then Lüst got involved in the project scientifically in connection with Biermann's ion-cloud idea. But keeping Lüst became absolutely crucial as he quickly grew into the role of West Germany's scientific representative and a key figure at the preparations towards a European Space Research Organisation (1961-62). That Lüst was not an experimentalist became less and less important as he obviously managed to delegate the hardware-work in an efficient manner. Certainly it was important that Lüst and his crew came along with the science. But Lüst's strongest argument to urge the MPG towards providing him with his own institute was always the latest offer from outside. He made maximal use of this position. It was Lüst, who seriously brought up the idea of an institute of Extraterrestrial Physics and quite assertively solicited it from his reluctant superiors.

The notion of the institute having been built around somebody may therefore indeed describe the case of MPE to some degree. The lasting dominance of those research topics in MPE that Lüst was particulary interested in (notably the ion cloud experiments) could add further evidence. But this is hardly surprising. Even today, after all the changes the MPG underwent since the early 1960s, most MPI directors asked for their conception of the Harnack Principle would probably give this answer: It is the director's privilege to decide what research is done in his institute.
What is challenged by our examination of the sources on MPE's foundation history is the other part of Harnack's famous quote, the one put forward by Butenand in his inauguration adress of 1965 cited in the beginning. It is the statement that "the society [the MPG in this case] chooses a director". The MPG (represented here by Biermann and Heisenberg) was simply not in the position to do so. Once they decided to embark upon space research, they could not rely on any "long and determined process of growing and becoming" - they had to take chances. For the field was far too new and too dynamic. Too new for providing much of a choice among scientist with appropriate credentials, and too dynamic for evaluating such credentials for future development.
However, the story told here does suggest a certain inclination of the decision makers to favour personality over structure. Finally, it didn't really matter that much what institutional shape the extraterrestrial reseach was going to take - if only Lüst stayed and managed it. In this sense, there remains a very "harnackian" feature in the foundation of MPE - rendering the core of the concept, the ideal of the autonomous scientist, historically effective. Even more: Driven by the dynamics of the external (non-MPG and not even very much scientific) context, this very autonomy eventually transgressed the hierarchic scheme of founders and foundation.
On the other hand, when Biermann and Heisenberg did everything to keep Lüst with the MPG extraterrestrial project, they hardly decided on grounds of some principle. Their favoring personality over structure was well founded in the nature of the problem they had to solve (and that might be a typical problem when embarking upon a completely new area of science). They acted on very good reasons and on reflection might have considered themselves thoroughly pragmatic. Therefore, the notion of the Harnack Principle as a recipe for how to found an MPI, a "method of purposefully building up an institute" is quite misleading. Such a notion is an artifact of a retrospective view on something which - for a far more complex reasons - lead to success.

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Abbreviations

Abbreviations and Acronyms in Italics are made up by the author (but may accidentally be used also by other authors), the others are widely used or even official. Note that there is no standard procedure relating the abbreviations for the Max-Planck-Institutes to their full names.

AEI	Albert-Einstein-Institute (MPI for Gravitational Physics)
AMPG	Archive for the History of the Max-Planck-Society
AMPTE	Active Magnetospheric Particle Tracer Explorer
BMAt	Bundesministerium für Atomfragen (Federal Ministry for Nuclear Affairs)
CERN	Conseil Européenne pour la Recherche Nucléaire
CNES	Centre National d'Etude Spatiales
COPERS	Comité Préparatoire pour la Recherche Spatiale
COSPAR	Committee on Space Research
CPT	Chemisch-Physikalisch-Technische Sektion des wissenschaftlichen Rates der MPG (section for the chemical, physical and technological sciences of MPG's scientific council)
DFG	Deutsche Forschungsgemeinschaft (German Research Society)
ESA	European Space Agency
ESRO	European Space Research Organization
ELDO	European Launcher Development Organization
IAP	Institut für Astrophysik des MPIPA
IEP	Institut für Extraterrestrische Physik des MPIPA
IGY	International Geophysical Year
IPP	Max-Planck-Institut für Plasmaphysik
KWG	Kaiser-Wilhelm-Gesellschaft (Kaiser-Wilhelm-Society)
LMU	Ludwig-Maximilians-Universtität München
MPA	Max-Planck-Institut für Astrophysik
MPAe	Max-Planck-Institut für Aeronomie
MPE	Max-Planck-Institut für Extraterrestrische Physik

MPG	Max-Planck-Gesellschaft (Max-Planck-Society)
MPI	Max-Planck-Institute
MPIA	Max-Planck-Institute für Astronomie
MPIfR	Max-Planck-Institute für Radioastronomie
MPIPA	Max-Planck-Institut für Physik und Astrophysik
MPK	Max-Planck-Institut für Kernphysik (MPI for Nuclear Physics)
MPQ	Max-Planck-Institut für Quantenoptik
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
SP	Senatssitzungs-Protokoll (Protocols of Sessions of the MPG-Senate)
TB	Tätigkeitsbericht (MPE Annual Report)
TUM	Technische Universtität München
WHA	Werner Heisenberg Archiv
WHI	Werner-Heisenberg-Institut (MPI for Physics)

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   - **AMPG Inst.Betr. MPE**: II. Abt., Rep. 1A Institutsbetreuerakten MPI für Physik und Astrophysik, Institut für extraterrestrische Physik (only material before 1970)
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