**Coping with a new Age:**

**The Max-Planck-Society and the Challenge of Space Science**

**in the early 1960s**

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In its recent communique "On the future development of the Research System in Germany", the National Research Council adresses the new challenges, which are the concern of this conference: Applicability of research, Information Technologies, Internationalization. The Research council states: "As at the end of the 1950s, it is again necessary, that Federal Government, State Governments, Research Institutions and Industry cooperate in order to resolve these tasks."

The research council was clearly alluding to frontiers of research which - 40 years ago - were considered of highest importance for the future development of the country. Two of the most prominent of these frontiers at that time were Nuclear Physics and Space Research. If it is true - as the Research Council suggests - that the present situation parallels the one at the end of the 1950s - then it might be useful for our discussions here, to look somewhat more closely at one of these past frontiers.

In this talk I would like to present you a particular historical case which has its root in the late 1950s - though most of the action happened in the following decade: The response of the Max Planck Society to the advent of Space Science. My goal is here, to arrive at some observations, which might be instructive for our discussion concerning the new frontiers of today. What do we hope to observe from such case?

Ideally, answers to questions like

- What triggered the MPG to embark upon this particular field of science in the fist place?
- What alternatives did the decision-makers have in giving the new field an institutional form?
- Which alternative did they choose and why?
- How did the decision-makers look for qualified scientific staff?
- Were they successful in terms of innovative research?
- What traits of MPG-policy might be given the credit for success or failure?

My story may be roughly devided in four phases as seen here in the outline of my talk. To begin, let me first say a few words about

**Science in the Space Age**

When did the Space Age dawn? Since our concern is basic research, for us the Space Age began when particular technological means became available to scientists:
The means for lifting scientific instruments far enough above the earth's surface, to detect types of radiation from outer space which are absorbed in the atmosphere but carry information of highest interest to a range of physical sciences from Astronomy to Geophysics. Space Science in this sense - Extraterrestrial Physics as it was also called - is therefore defined by its means rather by its subject.

These means are rockets and satellites. Rockets became available to the victorious nations of the Second World War from exploiting the know-how of Peenemünde. Know-how, one must add, which had been accumulated in service for a criminal regime and at the cost of thousands of slave-labourers. Rocketry was the key to a technological revolution - but first for the

military. It didn't take long, however, before the new technology was also employed by pure scientific pursuit, thereby opening a new window to the universe.

The new window didn't really open wide until Sputnik was launched in October 4, 1957. For science, however, the important date was February 1, 1958. On this day the first scientific device reached orbit on board of Explorer-1, the first successful American Satellite. With this instrument, James van Allen and his team at the University of Iowa discovered the radiation belts - regions around the earth where charged particles are trapped in the terrestrial magnetic field. Van Allen's discovery demonstrated that Space Science wasn't just an expansion of astronomy. A whole new realm of natural phenomena was waiting to be discovered out there.

Thereby, the new frontier was clearly defined: Take detectors for interesting physical entities and mount them on a rocket! But in practise it is a long way from a detector used in a laboratory to one which both survives a rocket launch and performs under space conditions. Designing rocket payloads requires a lot of tricky technology. Experience with that had been slowly accumulated during the 1950s, but only where rocketry was at the disposal of the scientists: in England, France, the Soviet Union and - of course - the United States. But not in Germany. And for this reason, no Max Planck-scientist was involved in space science until well after the Sputnik shock. This is

**Phase I: The MPG stays out (1958 -1959)**

The German abstinence was only partially a consequence of allied research restrictions. Rather, the dark legacy of Peenemünde was the major political and psychological obstacle for space research in West Germany during the 1950s. When it came to rockets, the Adenauer

administration kept as low a profile as possible. And the scientists complied with the political situation.

This isn't to say that there was no potential: The Max Planck Society hosted the largest share of what might be called West Germany's proto-space-research community: The high atmosphere - almost space and strongly influenced by extraterrestrial processes - was explored from Lindau, a small town near Göttingen. Here, at the Max Planck Institute for the Physics of the Stratosphere, the tradition of Erich Regener - a pre-war pioneer of scientific ballooning - contined. After Regener's death in 1955, the bulk of his institute was transferred to Lindau and put under the directorship of Julius Bartels, a famous Geophysicist at Göttingen University.
Next door in Lindau was Walter Diemingers institute for Ionospheric Research. Both Institutes together made up the Max Planck Institute for Aeronomy. Both very actively participated in the International Geophysical Year of 1957/58. This was a worldwide enterprise of coordinated geophysical research which also provided the scientific legitimation for the early Soviet and American satellites. The other proto-space center within the Max Planck Society had just been moved from Göttingen to Munich: That was Ludwig Biermanns Institute for Astrophysics, entirely theoretical by orientation and a sub-institute of the Max Planck Institute for Physics and Astrophysics under post-war Germany's most prominent physicist: Werner Heisenberg.

The research fields of all three institutes were to become profoundly revolutionized by space technology. However, this technology was not yet available, so in 1958 they were occupied with other things: Bartels and Dieminger were flooded with data from the International Geophysical Year. Biermann, on the other hand, was busy with Plasma Fusion Physics. His institute was the germ cell of what soon became the Max Planck Institute of Plasma Physics. Nobody in the Max Planck Society seemed to have even thought of space.

The situation instantaneously changed late in 1959, the beginning of our

**Phase II: MPG decides to join in (1960 - late 1961)**

On virtually the last business day of the decade Biermann, Dieminger and Bartels jointly proposed to president Otto Hahn that the Max Planck Society should embark upon space science. Why this sudden initiative?
The immediate cause probably was a conversation between Biermann, Heisenberg and the federal Minister of nuclear affairs, Siegfried Balke, which took place at one of the Christmas days of 1959. What exactly was spoken is not recorded, but there is evidence that Balke positively addressed the possibility of extra federal funding if the Max Planck Society were willing to go space borne.

However, the idea that it was time for West German science to enter the space age was not born in Bonn - but in Washington. There, Sputnik had triggered a profound reshaping of the institutional structures of America's space activities, most notably the foundation of NASA in October 1958. The US Space Program had now been taken out of the hands of the military and this considerably altered the attitude towards international collaboration in the science sector.

In March 1959, NASA officials began to tour Western Europe offering American support to West European space scientists. The American offer included West Germany. NASA's representatives also approached senior German scientists like Walter Dieminger of the Max Planck Society. However, the offer from across the ocean was first appreciated by the politicians. They were appealed by the prospect of transatlantic cooperation - and participation in a technology the economical significance of which was surely hard to

underestimate. For Balke in particular, this was the chance for accumulating more responsibility expanding his comparatively small department against the claims of other ministries such as transportation, economy and interior.

Balke early realized that the Max Planck Society was the perfect vehicle for joining the space age on the science track and championed Space Science as pure basic research, clearly separated from Astronautics. This excluded various institutes already committed to things like jet-propulsion research. Furthermore, Space Science was an endeavor, too new and too complex to be pursued by scattered university chairs.

Balke contacted Heisenberg concerning the Space issue in September 1959 - around the same time Dieminger met with the NASA. But is was not until three months later - after the Christmas chat - that Bartels, Dieminger and Biermann came up with their proposal. The internal discussion, which must have preceded, is not recorded - except in the recollections of Professor Dieminger, the only participant still alive. According to him, there was no disagreement about installing a new group in Munich - instead of redirecting resources in Lindau. He and Bartels, Dieminger recalls, were just too busy with the International Geophysical Year and glad that Biermann was willing to take all the trouble. The proposal was quickly accepted by President and Senate of the Max Planck Society. The plan was to establish an "extraterrestrial research group" at Biermanns theory-institute in Munich - or rather in a wooden cabin in Garching some 30 km north of the city.

Now the problems began. It was not money. That was promised from Bonn. It also was not ideas. A programmatic list of interesting research fields - the very same which were already en vogue in the US and elsewhere - was quickly established. No, the real problem was manpower. All that existed so far was a group of senior Max-Planck scientists eager to promote a new field, but no one to actually do the work.

For this was the golden age of nuclear physics and gifted young researchers interested in Geo- or Astrophysics were hard to come by - and even harder to keep from leaving for the thriving researchscapes overseas. Above all, Biermann needed someone to head the new group and to specify the first research topic to attack. But there wasn't anyone with experience in the specific hardware and organizational issues of space research. At least not in West Germany. There was of course considerable experience in Pasadena or Chicago - but who would leave places like that for a Garching cabin?

Maybe Peter Meyer would. Meyer had been a postdoc in the Göttingen days of Heisenberg's institute, before he went to the University of Chicago where he learned the business of space-borne instrumentation. He had become very successful in this field - and was just about to get tenure in Chicago. Meyer surely was the kind of distinguished scientist around which Max Planck Institutes are built. So he was Biermanns top candidate for the job and though a separate institute for extraterrestrial research was not yet on the agenda, Heisenberg quickly offered him scientific membership in the Max Planck Society. The negotiations lasted almost two years - until autumn of 1961 - lost time in the end since Meyer didn't accept.

A lost time? Not completely. Meanwhile two things happened in

**Phase III: MPG warms up (late 1961 - early 1963)**

which would become crucial for the later developments of Max Planck Society's extraterrestrial endeavor: Firstly, the context for international cooperation shifted from transatlantic to European.
Throughout the year 1960, European scientists had made an effort convincing their governments to pool resources in order to compete with the superpowers in the field of space science. CERN served as a role model. Julius Bartels from Max Planck Institute for

Aeronomy was among these scientists, but he couldn't find time to attend the European meetings which were taking place with increasing frequency. Instead a young theoretical Astrophysicist from Biermanns institute found himself on the European stage as German representative. This was Reimar Lüst, who had just been appointed scientific member of the Munich MPI and thus kept from leaving for the USA. Lüst soon played a pivotal part in the European space efforts. Early in 1961, a preparatory committee for what was to become the European Space Research Organization ESRO was created by international agreement. Lüst became coordinating secretary and participated in drafting ESRO's first scientific program.

The accelerating European development pressed the Max Planck Society to begin its space science activity - with Meyer or without - and Lüst eventually took on the job to assembling a tiny group of scientists and technicians from the staff of the experimental department of Heisenberg's Institute. They moved into the Garching cabin in late 1961. Biermann and Heisenberg weren't too happy to see a theoretician in charge of a decidedly hardware-oriented research group. In terms of professional experiences, Lüst simply was not qualified. But they soon became very much aware of the advantages: The same home-grown Max-Planck Scientist who was building up the Society's group for developing scientific payloads was simultaneously - on the European level - organizing the means with which those payloads were to be flown.

The second important development was an idea of Ludwig Biermann, who had theoretically worked out a way to probe electromagnetic fields in space: A rocket could carry a special mixture of combustible chemicals into space which on ignition would produce an ion cloud. In twilight, such a cloud would be observable from ground revealing the structure of those extraterrestrial fields. The necessary experimental setup was pleasingly simple: How the French space scientists Jacques Blamont once put it: "good science, no instruments on board

but a strong box filled with cheap chemicals, and spectacular phenomena in the event of success".

Ion cloud science in its basic form would not require any fragile detectors or sophisticated electronics. It was perfectly tractable for the space-novices in Garching. It was much cheaper than the "conventional" space science which Peter Meyer presumably would have undertaken - And it was brand new - nobody had ever done it before! So when the extraterrestrial group started work, their one and only commitment were those ion-clouds. Within a year the first pair of payloads were mounted on rockets.

Not on rockets provided by ESRO however, but on French Centaures. On such rockets Lüst had been offered free piggyback rides by Jacques Blamont. Blamont and Lüst first met at one of the meetings organizing the European space effort and soon developed an informal bilateral collaboration - founded essentially on a personal network. This collaboration allowed the Garching group to begin work before the Bundestag enabled Balke's officials to send the first money in June 1962 and long before ESRO came into operation in mid 1964.

MPG's extraterrestrial efforts thus finally moved on to

**Phase IV: MPG (partially) takes off (1963/64)**

Technical trouble with the Centaures prevented the launch planned for 1962. So the first successful launches of a payload assembled by Max-Planck-scientists took place a few months later, in May 1963. Ironically, the first extraterrestrial experiment made in Garching took off on the very day when the Senate of the Max Planck Society made the Garching group into an institute and promoted Reimar Lüst to the little institute's director. But Lüst also remained involved in Europe. When he was offered the position of ESRO's scientific director

later that year, the Max Planck Society immediately agreed that he could execute the ESRO-position parallel to his directorship.

Space science in the Max Planck Society had finally taken off. The Max-Planck-Institute for Extraterrestrial Physics in Garching, or MPE as its was called in short, subsequently expanded gradually. It grew more and more branches of space science, including the "classic" ones with which Peter Meyer would probably have started. But the ion-cloud science, MPE's child and midwife in one, remained the institutes backbone-activity for many years

And what happened to Max Planck Society's other "proto-space center", the Aeronomy-Institute in Lindau? Well, it did enter space age - but in a considerable slower pace. One reason for that was mentioned before: The leading scientists were already busy when the space frontier opened up.
They then stuck to their traditional pattern of research in the formative years - while the European Space Research Organization was still under construction and the federal responsibilities for funding space projects had yet to be settled. Then Lindau suffered a dire blow when Julius Bartels suddenly died in early 1964 and no successor could be found. This caused a painful reorganization in the course of which Dieminger launched an attempt to establish an extraterrestrial institute also in Lindau. Dieminger even discussed the possibility of transferring the young MPE from Garching to Lindau in order to concentrate Max Planck Society's space research efforts there. This proposal, however, came too late. Garching had long got in the lead.

So much for this short account, which, of course, had to skip a whole lot of interesting issues. Let me conclude my talk with

**Some Observations**

which are not intended to bluntly deliver "lessons from history" but rather to fuel our discussion on how to deal with contemporary new frontiers in basic research.

First, we observe in the beginning a strong
Primacy of Politics: Max Planck Society's late start into Space Science was above all a consequence of the political context rather than the initiative of scientists. The decision-makers in the Max Planck Society faced an already defined frontier quasi given to them in a top-down manner.

In order to cope with this frontier, the decision makers took
- Advantage from New Institutional Structures the establishment of which, however, happened at least partially out of circumstances.
The comparison Lindau-Garching shows that this provided the Max Planck Society with the more flexible research capability to respond to the top-down definition of the frontier in a creative (bottom-up) way.
This flexibility enabled
[- Advantage from ] what may be called "Adapted Creativity":
The Garching group succeeded in doing innovative research, not only because there was a good idea (Biermanns Ion clouds) but also because this idea matched very well their comparatively humble capabilities of the early days.

After they got started that way, the dynamics with which these capabilities developed were very much determined by the
[- Advantage from] International Connectedness of its chief scientists, who actively got involved with the international level - and at the same time remained in active research. Doing these splits, however, also required flexible institutional support, which was conceded

without much fuss. Perhaps even more important in the beginning was the informal network between Garching and the French group of Jacques Blamont.

The laborious way in which the Max Planck Society found its extraterrestrial chief scientist displays both

E. Advantage and Disadvantage from focus on Personality

Unfavorable external circumstances were aggravated by Max Planck Society's traditional preference for someone with proven excellence in the research-field under consideration. The matter was eventually closed by the dynamics of two concurring developments: (1) The efforts towards a European Space Research Organization and Max Planck Society's involvement therein. And (2) the quick adoption of a complete new research idea. Both developments took clear advantage from the strong positions which the protagonists already held as scientific members of the Max Planck Society. This reveals an ambiguity of the so-called "Harnack Principle":

While it was absolutely crucial for an innovative response to the new research possibilities, this policy was problematic in singling out the "excellent scientist" of a new field in the first place. One may even argue that - in a setting like this - mere professional excellence as a guideline for scientific head-hunting holds the danger of impeding innovation by narrowing the scope down to what is already being done elsewhere.

To summarize:

The institutional framework of the Max Planck Society in the early 1960s did successfully deal with the new frontier of Space Science. Successful in the sense that it managed to form innovative - and therefore competitive - research capabilities from scratch. A specific institutional tradition of the Max Planck Society which attaches special importance on scientific personalities did contribute its share to this success.

Was this success hence due to the Harnack-Principle understood as the selection of the absolutely best scientist available, which in hindsight is often cherished as MPG's central guiding principle for setting up institutes and choosing directors?

Maybe, but if the Harnack-Principle in this sense was at work here, then the MPG would have simply been lucky that its first choice according to the standards of excellence implied by this principle - Peter Meyer - declined, since he would evidently not have been the ideal person in the context. But then, if such absolute standards of excellence make any sense, Lüst as a scientist would just have been second choice.

However, according to the historical analysis presented here, it seems more probable that - at least in this case - the explanation of the success by the Harnack Principle is merely a myth and that the institutional wisdom involved was not hampered by the naive belief in such absolute standards of excellence. Instead, the specific historical constellation of challenges was taken into account when in the end somebody was chosen whose excellence ideally matched the context.