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# Gondwana's Promises. German Geologists in Antarctica between Basic Science and Resource Exploration in the Late 1970s

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**Abstract**: *»Gondwanas Versprechen: Deutsche Geologen in der Antarktis zwischen Grundlagenforschung und Rohstoffsuche in den späten 1970er Jahren«.* The 1970s was a crucial period of transition in polar science, when Antarctica, as the "continent defined by and for science" (Elzinga 1993), was intrinsically linked with economic interests and global environmental concerns. This shift towards a resource-oriented research agenda will be examined in the case of the Federal Republic of Germany and its GANOVEX (German Antarctic North Victoria Land Expedition) Expeditions. They started in 1979 and aimed to erase the last blank spots on the geological map of Antarctica and thus prove that Germany can attain consultative status in the Antarctic Treaty System (ATS). In this context, scientists played a key role in negotiating the possibilities and limits of resource exploration in the late 1970s. I will discuss the so-called "Gondwana hypothesis" and its role in resource-driven research and argue that global geopolitical interests in new resource potentials motivated the geological mapping of Antarctica.

Keywords: Cold War history, environmental history, Antarctic Treaty System, earth governance, global environment.

## 1. Introduction[1]

*Hope in natural resources has always been exaggerated by scientists as a bait for politicians to sponsor expeditions. Krill and Antarctic fish in the mid-1970s when fishing yields and fishing rights faded away for distant water fleet; oil and gas after the first oil shock in 1973 and the early Antarctic indications of gas by Glomar Challenger. Theory of plate tectonics of Gondwana supported hope for valuable minerals on the Antarctic continent.*
(Hempel 1984, 136)

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[1] This paper is part of an ongoing habilitation project on German polar science in the Cold War. I thank Franz Tessensohn for the interview and helpful remarks.

In the 1970s, the US research vessel *Glomar Challenger* was not only drilling for salt domes in the world oceans indicating oil occurrences. It also provided evidence for the revolutionary, global earth science theory of plate tectonics. In this context, the geological formation of Antarctica as the former heart of the "Gondwanaland" supercontinent was also of interest for resource-driven research. In 1975, the US estimated that there were 7.5 billion tons of oil and 3.2 billion $Nm^3$ of gas in and around Antarctica (BArch 102/184068, 23/07/1975, 1). At that time the basic scientific motivation to systematically investigate the formation of continents and map the earth's geological structure was pushed by the assumption that huge reserves of mineral resources were to be expected.

While geophysical research blossomed in the early Cold War, geological investigations in Antarctica increased only in the aftermath of the International Geophysical Year 1957/58 (IGY), when modern logistics facilitated geological field trips and geological data on Antarctica increased (Ford 2006, 4). One plausible explanation was the political motivation to avoid territorial conflicts that are directly linked to practices of mapping and geological exploration. In the 1970s, the "limits of growth" and the so-called "oil shock" were motivating new strategies for resource exploration. Countries like Germany (1979), with only small natural reserves of metals and oil, and soon afterwards India (1983) and China (1983), increased their engagement in polar science for geopolitical reasons.[2] This shift towards a more resource-oriented research agenda will be examined in the case of the Federal Republic of Germany. In this context, the so-called GANOVEX (German Antarctic North Victoria Land Expedition) Expeditions will be considered. They started in 1979 and aimed to erase the last blank spots on the geological map of Antarctica and thus prove that Germany can attain consultative status in the Antarctic Treaty System. Bearing in mind that crisis and conflicts in resource consumption are of particular interest for environmental historians, this period is of importance for environmental history as well as for contemporary history, which recently focused intensively on this period "after the boom" (Uekötter 2007; Jarausch 2008; Doering-Manteuffel 2008; Doering-Manteuffel and Raphael 2010).

In the following I will look closely at the conflicting interests related to environmental protection and mineral resources in Antarctica and ask what role scientists played in negotiating the possibilities and limits of resource exploration in the late 1970s. I will argue that geopolitical considerations of new resource potentials motivated the geological mapping of Antarctica. The case of German efforts to become a consultative member of the Antarctic Treaty System confirms Aant Elzinga's claim that "science became the vehicle through

[2] Germany is one of the biggest consumers of resources worldwide. While large parts of nonmetal-mineral resources such as earth and stones, potash and brown coal can be covered from its own reservoirs, Germany depends heavily on the import and world market conditions of primary metal resources, oil, gas and stone coal (BGR 2012, 13).

which geopolitical rivalry and the quest for an Antarctic influence was channeled" (Elzinga 1993, 85).

Recently the Polar Regions have gained new attention in the history of science. In particular, the role of the Arctic during the Cold War has been investigated (Weiss 2001; Petersen 2008, 2011; Farish 2010; Korsmo 2010; Heymann et al. 2011; Martin-Nielsen, 2012, 2013a, 2013b; Kehrt 2013). Yet major works on the Polar Regions are US centered. There is a lack of studies on European countries (Roberts 2011), the Soviet Union (Gestwa 2011; Josephson 2011, 2014) and non-Western countries like South Africa, India, China (Wang 2010) and Argentina, for example (Howkins 2008). The role of East and West German polar expeditions in the period after 1945, especially in the crucial period of the 1980s, when there were new conflicts and dynamics within the expanding Antarctic Treaty System, is almost unknown, although West Germany became a major player in Antarctic scientific expeditions in the 1980s (Abbink 2009; Fleischmann 2005).[3] The geopolitical dimension of Antarctic science and the dominant role of politics and scientific internationalism are common themes in the historiography of Antarctic science (Elzinga 1993; Dodds 1997, 2010; Belanger 2006; Turchetti et al. 2008; Howkins 2008; Launius, Fleming and De Vorkin 2010; Barr and Lüdecke 2010; Roberts 2011). But questions of Antarctic resources and geological expeditions so far have seldom been dealt with by historians. Only Fogg explicitly takes into account the decisive role of British geologists in the period from the heroic phase of Antarctic exploration to the IGY; but he does not consider political interests in resources (Fogg 1992, 245-68). While geological expeditions in Greenland are researched (Ries 2012a, 2012b; Nielsen and Knudsen 2013), when and how resource-driven motives shaped Antarctic science in the period after the IGY remains an open question (Roberts 2011,147; Belanger 2006, 280; Howkins 2008, 32).

## 2. Antarctica as a Continent Defined by and for Science?

Antarctica has peculiar physical features: it encompasses about 14 million square kilometers and is almost totally covered by a 3-kilometer-thick ice sheet. It is an ice desert with few traces of life that looks more like extraterrestrial planets, while the surrounding oceans with their peculiar ecosystems are rich and diverse. Antarctic mineral resources are assumed to exist offshore in the continental shelves as well as underneath the gigantic ice sheet. Due to its ice masses, Antarctica is a global heat sink that influences weather patterns and ocean currents on a global scale. Most of its mountain ranges, ridges and land

[3] Only Benjamin Peter Abbink's policy-oriented study on Antarctica has compared Germany with the Netherlands and Belgium. Unfortunately, the well-written and informative book by Klaus Fleischmann lacks references to sources and literature.

are covered by ice. Only three to five percent of its geological structures are accessible and until the International Geophysical Year 1957/58 large parts were still unknown. In fact, this remote continent is extremely difficult to access. To get there requires modern logistics, airplanes or icebreaking ships and modern means of telecommunication and techniques such as remote sensing, as well as sheltered living units for overwintering parties. Since Antarctic expeditions are costly, the state and politics play important roles, and thus, only when there is interest from the political arena does Antarctic research become possible.

Science is the essential precondition for accessing Antarctica. Countries have to establish a permanent research station and massively invest in polar science if they want to participate in the Antarctic Treaty System meetings and negotiations. Nowadays hundreds, and in summer thousands, of scientists live there to conduct all kinds of different forms of research from astrophysics, meteorology and glaciology to geology, biology and even archaeology. It is a place to pursue general scientific questions or get more knowledge about the peculiar nature of Antarctica and the extremely interesting interactions between the lithosphere, biosphere and atmosphere. Antarctica is regulated by the Antarctic Treaty System established in 1961. The exclusive club of the Antarctic Treaty System was created by 12 mostly industrial nations in the aftermath of the International Geophysical Year 1957/58.

In Antarctica, global issues such as atomic warfare and Cold War conflicts, limits of growth and resource exploitation, the fragility of nature, environmental pollution and climate change are negotiated, mirrored and projected. I understand Antarctica as a socially constructed global knowledge space, where different actors try to realize their geostrategic goals. The last blank spot on the map of the earth was perceived as a space of opportunities that fueled the imagination of politicians and the general public and allowed scientists to pursue new research. Questions of place and space play a crucial role in global history as well as in the history of science (Livingstone 1995, 2003; Naylor and Ryan 2010; Busche 2010; Rheinberger, Wahrig and Hagner 1996; Renn 2012). Dorit Müller understands Antarctica as a knowledge space ("Wissensraum") that is construed through modern media, scientific practices and public images and representations (Müller 2012).

In the following I will locate the German case in the changing agenda of the Antarctic Treaty System in the 1970s and 1980s. The emerging tensions between new environmental concerns and the possibilities of future mineral exploration in Antarctica are analyzed. In this context the Gondwana hypothesis played a crucial role. Plate tectonics not only revolutionized geology and put Antarctica in the middle of global tectonic theories, it was also of political and economic value, since it gave a plausible explanation for assuming huge mineral resource potential in Antarctica.

## 3. The Gondwana Hypothesis and the Hope for Mineral Resources

Antarctica was at the heart of the so-called "Gondwanaland" that formed the former supercontinent including Africa, Australia, India and South America and parts of present North America and Europe (Pyne 1998, 216; Estrada, Damaske and Läufer 2009, 32). It originated in Precambrian time from fragments of Rondinia, approximately 550 million years ago in a period of "high crustal mobility in the region of the continents of the present southern hemisphere. This occurred because of the rapid generation of new oceanic crust and its subsequent subduction" (Frisch, Meschede and Blakeley 2011, 160). Gondwana, according to our present knowledge, broke up in the early Jurassic period, 180 million years ago. Many basic questions of the earth sciences relating to the origins of continents and global tectonics were and still are related to the complex puzzle of how Antarctica fits into the changing patterns and assumptions of earth history. The idea of a former supercontinent was formulated by the Austrian Eduard Suess (1831-1914) in the late nineteenth century in his four-volume *Das Antlitz der Erde*.[4] In this grand synthesis he tried to explain the basic mechanisms of mountain formation and the relation between continents and oceans in earth history that were debated during the nineteenth century. But his idea of contraction as the main mechanism of a dynamic and changing earth based on a cooling of the earth's interior that then causes a crumbling and shrinking of its crust was soon criticized (Greene 1982, 259; LeGrand 1988, 27; Oreskes 1999, 21). Suess never fully gained recognition in the USA and his contraction theory lacked geophysical evidence. As Mott Greene's careful historical interpretation of geology in the nineteenth century has clearly shown, there was no consensus and geology was a pluralistic and conflicting landscape of different approaches, methods and viewpoints:

> Geology in 1912 was as fragmented, from a theoretical point of view, as at any time since its eighteenth-century beginnings. Geology, while a mature science, functioned without a universally accepted theoretical framework for decades thereafter […]. The competition of these hypotheses through the next fifty years (1920-1970) has only recently abated, and with the general acceptance of the theory of plate tectonics, geology enjoys a degree of unification it has not experienced since the latter part of the nineteenth century (Greene 1982, 290).

In 1912, when Wegener formulated for the first time his new idea of continental drift, there was a bewildering and often contradicting pluralism of ap-

[4] The name "Gondwana" (land of the Gonds, a tribe living in northern India), and the related faunal evidence of *Glossopteris*, was already used by British scientists such as Henry Benedict Medlicott, Ottokar Feistmantel and William T. Blanford, before Suess widely popularized it (Thenius 1981, 54; Glaubrecht 2012, 293).

proaches. Wegener aimed to solve these fundamental differences by elaborating a new global tectonic theory. Like Suess, he professed the idea of a former supercontinent and based his thoughts on geological and paleontological evidence. Both looked for structural similarities and comparable patterns of flora and fauna across continents to find evidence for a former united landmass. But in contrast to Suess, Wegener did not use the concept of a cooling and contracting earth, which was contrary to the new knowledge of heat production through radioactivity; instead he preferred to adopt the revolutionary idea of a horizontal movement. Wegener's supercontinent did not in the course of events sink into the Southern Ocean. Instead he chose the idea of a breaking up and drifting apart of Gondwanaland (Oreskes 1999, 55; Wegener 1929; Krause, Schönharting and Thiede 2005). But Wegener's idea of continental drift was only one of many not fully convincing attempts to solve basic theoretical questions that for more practice-oriented American field geologists were not of prime importance (LeGrand 1988, 19; Oreskes 1999; Glaubrecht 2012, 342).

In *Our Wandering Continents* (1937), the South African field geologist Alexander du Toit (1878-1948) also tried to argue in favor of continental drift theory on the basis of his extensive work on the formation of the South African geological Karoo system, which shows similarities to structures in South America and Australia (LeGrand 1988, 82; Oreskes 1999, 292). He continued to elaborate Wegener's ideas, tried to provide further evidence for continental drift, and instead of Wegener's Pangea proposed a northern (Laurasia) and southern (Gondwana) supercontinent. But du Toit's theory and evidence were still criticized by American scientists. Only with new geophysical evidence from submarine investigations of the ocean floor in the Cold War could the already established elements and mechanisms of continental drifts be turned into a new global theory of plate tectonics (Oreskes and LeGrand 2003).

In the late 1960s and early 1970s, Antarctica attracted geologists for several reasons. First, the revolutionary theory of plate tectonics put Antarctica in the middle of the former supercontinent called "Gondwanaland" and promised new biogeographic insights into earth history in relation to the surrounding continents, as well as Antarctica's own geological formation, which for a long time was not well understood due to the lack of systematic geological knowledge of Antarctica. Up to the International Geophysical Year in 1957/58 there were no systematic seismic soundings of Antarctica land structures and the questions of whether it forms a united continental landmass or whether East and West Antarctica are separate and based on different geological structures (continental plate versus archipelago) were unsolved.

The new theory of plate tectonics helped to systematically explain larger tectonic formations and structures beyond individual findings and to get new and deep insights into earth history. In the early seventies, plate tectonics became the new framework for Antarctic geology (Craddock 1970; Fogg 1992, 260). In 1970, the International Symposium on Antarctic Earth Science of the

Scientific Committee of Antarctic Research (SCAR) dedicated a whole session to "Antarctica and Continental Drift"; its successor in Madison in 1977 no longer needed to explicitly address this already accepted theory (Ford 2006, 6). Nevertheless, the leading German Antarctic geologist, Franz Tessensohn, emphasized that there were still differences between northern and southern hemisphere geologists.[5] In 1981, he handed in a paper trying to explain mountain formations with a pre-plate tectonics geosynclinal approach.[6]

New techniques of accessing and working in this difficult environment made systematic geological research by helicopters, airplanes and ships possible[7] – even though within a comparably limited area: "Although Antarctica has a coast about three times as long as that of the USA, its total length of ice-free shoreline is probably less than that between Washington and Boston" (Holdgate and Tinker 1979, 6). But the main reason to systematically investigate the geological structure of Antarctica was new geopolitical concerns related to global living and nonliving resources:

> Although no petroleum resources are known in Antarctica and the petroleum industry is not particularly interested at present, economic and political considerations may change the industry's interest in the next few years, and exploration and exploitation are possible within one or two decades (Behrendt 1983, 22).

The assumption that in Antarctica mineral reserves similar to other continents could be expected was supported by the so-called Gondwana hypothesis (Wright 1977).

The starting point was analogous reasoning, which left a lot of space for speculation. If the former parts of Gondwanaland, like South America, Australia and South Africa, showed structural similarities with Antarctica, the probability that there would be similar mineral occurrences was assumed to be rather high. "Because the Antarctic is a continent like all the others, it means that it contains similar rock and mineral types as the others. We must treat the unknown ice-covered Antarctic continent in analogy to its better known neighbors" (Tessensohn 1984, 189). This reasoning stood at the beginning of an increased interest in Antarctica as a resource treasury for the industrial nations, which up to this point had dominated the rather exclusive club of the Antarctic Treaty System. In a first overview for the US Geodetic Survey, Nancy Wright

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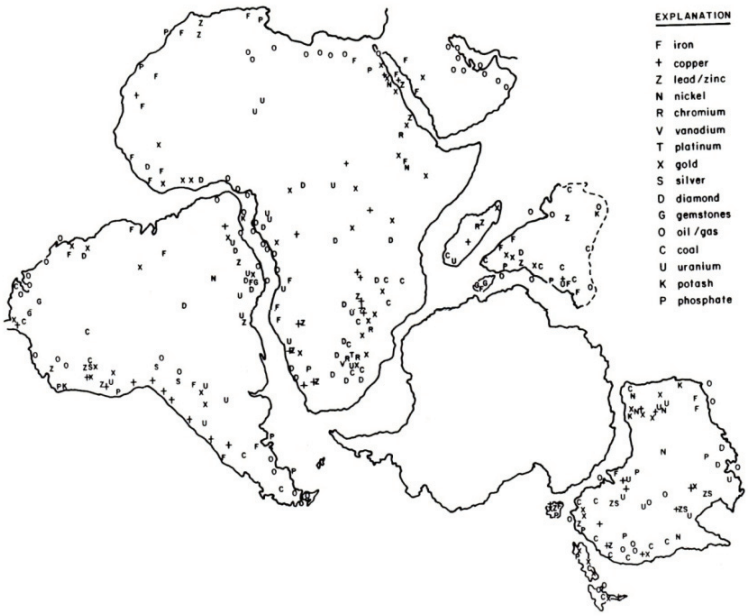
5 Interview with Franz Tessensohn, 19/12/2012.

6 It was turned down by the publishers because there was no use of plate tectonics. The concept of geosynclines goes back to the nineteenth century, especially James Dwight Dana's Contraction Theory from 1872. In its different variants it tries to explain mountain building by processes of sedimentation of ocean troughs that are then lifted upwards and fold into mountains (Frisch, Meschede & Blakeley 2011, 1). This approach remained the leading explanation for mountain building until the new theory of plate tectonics.

7 The second German North Victory Land Expedition in 1982, for example, completely failed because the ship was sunk suddenly by moving ice plates.

summarized the Gondwana hypothesis in 1975 and used it to discuss Antarctica's mineral potentials (Wright and Williams 1974, 18). But the arguments and findings of geologists left a lot of room for different and rather flexible interpretations. So while theoretically it was assumed that "(l)arge accumulations of minerals very probably occur in Antarctica, for no other continent is void of mineral deposits" (Wright and Williams 1974, 3), in practice there was no clear evidence that minerals of economic value had already been found in large quantities or would be found in the near future: "Antarctica now has no known economically recoverable resources of any category, nor does Antarctica have any known mineral districts" (Wright and Williams 1974, 2).

**Figure 1**: Mineral Deposits in Gondwanaland




Source: Craddock 1990, 4.

This indeterminate, open situation put scientists in a "challenging" position, because they could push their basic geological research by opening up the prospect of future mineral exploitation in Antarctica. At the same time they had to maintain their scientific ideals and criteria by pointing to the meager evidence and counterarguments, trying to differentiate between mineral occurrences and mineral reserves, scientific facts and economic and technological feasibility. Thus they opened the possibility of future exploitation without fully supporting it, nor totally rejecting it: "but the probability that mineral deposits

exist in Antarctica seems to be high. The crucial factor, however, is whether they can be found" (Wright and Williams 1974, 1).

Looking more concretely at the available geological evidence, gray reports concluded that so far no significant mineral deposits had been found (Wright and Williams 1974; Craddock 1970; CIA 1978; Behrendt 1983). The most likely event that eventually could also be economically feasible would be oil discoveries, but all other possible mineral occurrences, like coal and copper deposits, would be too expensive to be exploited commercially. These considerations took place without any actual indication of oil and were thus rather hypothetical.[8] Obviously, the thirst for oil and the need to look for long-term alternative resource potentials were high at the time. So even rather hypothetical accounts or extremely difficult, costly and environmentally problematic options for future oil exploitation triggered the attention of politics and secret services. In newspapers, magazines and gray reports, vague figures and overrated expectations circulated. Once these figures were out, scientists had difficulties in limiting and correcting them:

> In the last couple of months Antarctica has moved increasingly into the focus of the German public eye. News of immense resource estimations went through the press. Occurrences of oil and natural gas with reserves 'greater than in Alaska' (Süddeutsche Zeitung, 13.02.1978) or of 45 billion barrels of oil and 410 billion cubic meters of gas (Spiegel, 20.02.1978) were mentioned besides a long list of mineral resources, 'chrome, nickel, manganese, calcium fluoride, copper, diamonds, molybdenum, iron, uranium and coal' (Stern 11/78). Is this news really true? (Tessensohn 1979, 248).

A CIA report, for example, mentioned 900 possible mineral occurrences in Antarctica, but only 20 of these were accessible (CIA 1978, 14). Published maps in newspapers did not distinguish between "mineral occurrences" and "mineral reserves" or "mineral deposits," so the map of Antarctica indicating minerals was misleading.[9] In fact, there was still no real evidence for major mineral reserves and thus the whole undertaking stood on shaky ground. Beyond that, not every geological fact could be easily fitted with the Gondwana hypothesis and the puzzling movement of continents in geological time frames. The age of the rocks and sediments found in Antarctica did not always correspond with the Gondwana breakup: "One can use the Gondwana hypothesis only partly for the hydrocarbon prediction on the continental shelves, because most of the basins are younger than this event" (Tessensohn 1984, 199). Also, the so-called "ring of oil," indicating the global location of supergiant oilfields, suggested that in the former Gondwanaland countries there would be no super-

[8] Only in 1985 did the German ship *Polarstern*, drilling in the South Polar Sea, find indications of oil, a typical oily smell.

[9] Mineral reserves are defined by their economic value and availability in contrast to mineral resources, which are defined by their natural properties, location and concentration, but give no indication about costs, accessibility and possibilities of exploration.

giant oilfields (Behrendt 1983, 3).[10] Nevertheless, the Gondwana hypothesis was generally accepted in the aftermath of the plate tectonics revolution and thus could be used to stimulate political interest in future mineral reserves in Antarctica. It was vague enough to argue for more geological research, but widely accepted by the scientific community, so there was a common ground and trading zone for scientists and politicians. The chances of commercial exploitation of mineral resources on the landside of Antarctica were considered to be rather small in the near future because of the difficulties in accessing them and drilling through the several-kilometer-thick ice sheet. However, the findings of *Glomar Challenger* and other drilling ships supported the assessment to find and exploit offshore oil and gas reserves in the Antarctic continental shelf. This, however, stood in direct opposition to the concrete interests of harvesting living resources in the waters surrounding Antarctica – a fragile ecosystem that recovers very slowly from oil pollution.

## 4. West Germany's Antarctic Politics

While the German Democratic Republic participated continuously in Soviet Antarctic expeditions from the 1960s on (Fritzsche 2011), West Germany was a late starter in Antarctic exploration, due to the long-term effects of the Second World War, which caused a major break and disturbance in the earth sciences. In the 1970s, the state became interested exactly at a time when a new agenda for Antarctic research was under way. A major reason for Germany's new Antarctic strategy was its difficult position in the United Nations Law of the Sea Convention, which nationalized the offshore zones up to 200 km and excluded Germany, with its rather short coastline, from important fishing grounds in the Northern Atlantic. Therefore the prospect of gaining access to major living and nonliving resources motivated the massive engagement in Antarctica in the late 1970s culminating in the foundation of the German Polar Science Institute in Bremerhaven and a long-term membership with consultative status (Abbink 2009; Fleischmann 2005).

The most important West German actor in resource-oriented geological polar science was the Federal Institute for Geosciences and Resources (ger. "Bundesanstalt für Geowissenschaften und Rohstoffe," BGR) in Hannover, financed by the Ministry of Economics and responsible for the exploration of Antarctica's mineral potential.[11] In 1975, the BGR stated in a letter to the Min-

[10] But this was rather a generalization of actual findings and not a sound geological theory.

[11] The Federal Institute for Fisheries Research (Bundesforschungsanstalt für Fischerei, Hamburg), financed by the Ministry for Agriculture, Forests and Food (Ministerium für Landwirtschaft, Forsten und Ernährung), was responsible for the investigation of living resources in Antarctic waters.

ister of Science and Technology that a basic interest in Antarctic hydrocarbons existed because there were no major oil reserves in West Germany (BArch 102/184068, 23/07/1975, 1). From the perspective of a secret service study, this was a "hidden fight" ("verdeckter Kampf"), a geostrategically motivated diplomatic effort related to the geopolitical space ("Großraum") of Antarctica under the guise and with the help of science (BArch 102/184069, 15/06/1976, 22). This politically motivated strategy, which took science as a place holder for geopolitics, was also articulated in a letter to the secretary of state at the Ministry of Economics, Carsten Rohwedder, with regard to the consultative membership: "Vis-à-vis third countries only a general German research interest (not interest in resources) shall be mentioned. The Antarctic only allows general scientific research" (BArch 102/184071a IIIB3, 07/03/1978, 2).[12]

In this diplomatic and political context, the Gondwana hypothesis was at stake in core documents leading to the German participation in the Antarctic Treaty System. In the addendum to the official address of the Minister for Science and Technology ("Bundesminister für Forschung und Technologie," BMFT) proposing to Chancellor Helmut Schmidt the German membership in the Antarctic Treaty System, the resource potential was supported by the Gondwana theory.

> The overall evaluation of Antarctic energy and mineral resources was based until recently especially on the Gondwanaland hypothesis. Antarctica constituted the central part of the former Gondwana continent, on which South America, South Africa, Madagascar, India and Australia directly abut. The reconstruction of the Gondwana continent was the basis for a simple, statistical, analogous calculation: the number of mineral deposits in South America, South Africa, Madagascar, India and Australia was correlated with the landmass of Antarctica. According to this calculation, theoretically almost as many mineral deposits should be found (BArch 102/184071b, 30/01/1978).[13]

As the analysis of core diplomatic documents related to West German Antarctic politics in the 1970s clearly shows, Germany wanted to become part of the Antarctic Treaty System in order to have the opportunity to gain access to living and nonliving resources. Political considerations and efforts were based on a close monitoring of the activities of the US and the Soviet Union. From a

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[12] „Gegenüber Drittstaaten soll ausschließlich auf ein allgemeines deutsches Forschungsinteresse (nicht Rohstoffinteresse) abgestellt werden. Der Antarktisvertrag sieht lediglich eine allgemeine wissenschaftliche Forschung vor."

[13] „Die Gesamteinschätzung der antarktischen Vorkommen an Energie- und mineralischen Rohstoffen stützte sich bis vor wenigen Jahren vor allem auf die Gondwanalandtheorie. Die Antarktis bildete den zentralen Teil des früheren Gondwana-Kontinents, an den Südamerika, Südafrika, Madagaskar, Indien und Australien direkt angrenzten. Die Rekonstruktion des Gondwana-Kontinents war Grundlage für eine simple statistische Analogierechnung: die Zahl der Rohstofflagerstätten in Südamerika, Südafrika, Madagaskar, Indien und Australien wurde auf die Landfläche der Antarktis umgerechnet. Danach müßten dort theoretisch nahezu ebenso viele Lagerstätten zu finden sein."

German perspective, there were signs that the two superpowers were moving into resource-oriented activities, and Germany did not want to miss the opportunity to participate (BArch 102/184068, 23/07/1975; 1, BArch B 102/184069, 15/06/1976). In this context, the international cooperation with the USA played a crucial role at the beginning of Germany's future geological Antarctic expeditions. The leading Antarctic geologist of the BGR, Franz Tessensohn, participated in 1977 in an American National Science Foundation-funded expedition to investigate uranium resources in Antarctica and thus enabled a crucial knowledge transfer from the US to Germany (BArch 102/184070, 11/08/1977). He then developed a major German Antarctic program for the BGR, starting in 1979. The goal of these first geological expeditions was clear: Germany wanted to prove its scientific engagement and pave the way to becoming a consultative member of the Antarctic Treaty System. At that time this status was directly connected with the establishment of an Antarctic research station. In fact, the little "Lillie Marleen" hut erected for summer work in the North Victoria Land Mountains in 1979 was for the first (West German) Antarctic land expedition since 1938.

In the following years, the BGR conducted systematic geological research in Antarctica. The North Victoria Land between the Ross Sea and the South Pacific was chosen for long-term geological survey "because many important structure boundaries run through this area, including the gradation from the old East Antarctic shield to the younger West Antarctic Mobile Zone" (Knothe et al. 1981, 3). German geologists were interested in mapping this hitherto unknown territory, in order to develop new plate tectonic models that could explain the formation of these mountains in relation to the history of Gondwanaland: "Most of the geological problems in North Victoria Land concern structural questions of the Antarctic continent as a whole and of Gondwanaland. This is one of the reasons why this target area was chosen for the expedition" (Tessensohn et al. 1981, 39). This basic research was related to the origin of oceans and continents and the fundamental geological structures of Antarctica. Nevertheless, economic and political strategies were the driving forces behind these expeditions, which experienced new dynamics and conflicts due to economic and environmental concerns.

## 5. A New Resource-Oriented Regime of the Antarctic Treaty System

In the 1970s, questions of mineral exploitation and possible future environmental impact were on the agenda of the Antarctic Treaty meetings (Kissinger 1975; ATS 1973, 1976, 1977; NSDM 1974; Ingersoll 1975; Wolfrum 1991, 4). These debates about living and nonliving resources in Antarctica indicate a major change in the Antarctic Treaty System regime: from a Cold War geo-

physical approach to the resource-oriented agenda of the 1970s. In contrast to Cold War Arctic spaces, Antarctica was socially constructed as an antidote to Cold War spatialities, as a nuclear weapon-free, nonmilitary zone, where peaceful international cooperation supposedly prevailed over the secrecy of the Cold War (Korsmo 2010). Nevertheless, the predominant geophysical research questions of the IGY were related to the core issues of the Cold War. The military could use Antarctica as a laboratory to test material and men in extreme environmental conditions. The Antarctic research contributed to the scientific prestige of the two superpowers. Furthermore, the long-term measurements of ice, snow, wind, weather, and ocean currents were part of a global network that allowed the strategic monitoring of planet earth for scientific and military purposes.

In the 1970s, Antarctica was perceived as a treasury providing oil, gas, food and water. These new resource-oriented geopolitical interests were directly related to difficult questions of sovereignty that were frozen by the Antarctic Treaty in 1961. In the late 1970s and early 1980s, the Antarctic Treaty System was under pressure, due to the global geopolitical dimension of economic and environmental concerns of Antarctic politics (Beck 1986, 5; Wolfrum 1984, 7). New geopolitical conflicts concerning future resource exploitation, environmental protection and access of non-Western, "developing countries" to Antarctica caused a crisis within the Antarctic Treaty System. It was not clear whether the Treaty group could maintain its framework vis-à-vis the idea of a "world park" professed by Greenpeace activists (Schmidt 1995, 17; Vorfel-der 1987, 36-51; Joyner 1998, 174-9) or a UN regime (Wolfrum 1991, 81) favored by "developing countries" that did not rely any more on a major scientific contribution as the obligatory passage point and a precondition for Antarctic politics. The Antarctic Treaty members feared that the established and from their perspective well-functioning, but exclusive international regime of the Antarctic Treaty could be superseded by a new regime as was simultaneously discussed during the Law of the Sea Consultations in the 1970s.

While issues of mineral exploration were not on the agenda of the meeting in Tokyo in 1970, the following Antarctic Treaty meetings explicitly addressed new tensions between environmental protection and mineral exploration. The reports of the seventh and eighth Antarctic Treaty consultations in 1972 in Wellington and in 1975 in Oslo show that possibilities and limits of mineral resource exploration began to be intensively discussed and recommendations for handling this problem were being prepared (ATS 1973, 1976). The representatives in Oslo "*resolved* that the Consultative Parties should seek to develop an approach to the problems raised by the possible presence of valuable mineral resources in the Antarctic Treaty Area, bearing in mind the principles of the Antarctic Treaty" (ATS 1976, 44). Consequently it was decided that the "Question of Mineral Exploration and Exploitation be placed on the Agenda of the Ninth Antarctic Treaty Consultative Meeting" (ATS 1976). From these consultations it is evident that the Antarctic Treaty members felt the need to

discuss possible environmental effects of future mineral exploitation. Antarctic scientists started to organize workshops, wrote papers to evaluate environmental consequences and tried to establish a convention on mineral resource exploitation (Zumberge 1979; Holdgate and Tinker 1979, 19). These assessments and scenarios were hypothetical, since there were no actual oil findings. Nevertheless, experts discussed the already concrete problems and consequences of future oil drillings. So at least the wish to drill in the near future must have been high at the time these consultations were taking place. Experts from the Scientific Committee on Antarctic Research prepared a minerals agenda, which was ready to be signed at the end of the 1980s. But while the exploitation of living resources could be regulated by the establishment of the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) in the early 1980s, the establishment of a mineral resource regime – the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA) – failed in 1988. These tensions and dynamics of the Antarctic Treaty System show that mineral resource exploitation really was a core issue of the Antarctic knowledge regime. Then, in 1990/1991, the environmental protocol of the Antarctic Treaty realized that a compromise had been "reached between pro-mining and environmental interests, with the proposal of a fifty-year moratorium on mining exploration" (Elzinga 1993, 76). Yet the environmental protocol does not indicate the end of strategies for controlling or even extracting mineral resources in the future. This also holds true for the most important German player in resource-oriented research in Antarctica, the Federal Institute for Geosciences and Resources, funded by the Ministry of Economics. The BGR is still interested in Antarctica's mineral resource potential and therefore might develop strategies for environmentally friendly resource extraction that are in accordance with the Antarctic Treaty.

## 6. Conclusion

Germany was a latecomer in the Antarctic Treaty System. Its engagement took place at a crucial time when conflicting global economic and environmental concerns were driving new actors to Antarctica. The German krill expeditions in 1976 and 1978 as well as the geological GANOVEX expeditions starting in 1979 show that a resource-oriented agenda and geopolitical interests motivated a major engagement in Antarctica. Scientific expertise and geological knowledge played a key role in this story. Scientific theories such as the new theory of plate tectonics and new geological research triggered overly high expectations of future oil and mineral reserves. These were discussed and taken seriously by politicians, who decided to state-fund costly Antarctic expeditions and a long-term engagement in Antarctic science. However, these expectations did not correspond with the rather skeptical scientific findings at the time. Bearing in mind that

there was no concrete evidence, at least no published and accessible proof of major oilfields, we have to conclude that political and geostrategic considerations were the driving factors. In the 1970s, resource-oriented issues such as the oil crisis, the negotiations of the International Law of the Sea, the growing role of non-Western states and debates about the limits of growth determined the international political agenda. Negotiations and assessments went as far as to seriously consider the possible environmental effects of oil drills in Antarctica. In this context, experts did not argue against future resource exploitation, but tried to find a reasonable middle way between commercial exploitation and the fragility of the Antarctic ecosystems. Thus, environmental concerns were part of a new knowledge regime that aimed at future resource exploration of Antarctica, which continues to be of global geostrategic interest up to the present day.

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