Jan Harff – Between Worlds

Interview by Hans von Storch and Reinhard Dietrich with a foreword by Jörn Thiede

Translated by Anupa Srinivasan

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A tribute to Jan Harff, Department Head at the Institute for Baltic Sea Research Warnemünde and professor for marine geology at the University of Greifswald as well as professor at the University of Szczecin (Poland).

Through Distant Worlds and Time by Milutin Milankovitch, the title of a book published in 1936, could also have been meant for Jan Harff, who forged his own path in the geological sciences with his contributions to coastal research and sea level fluctuations. He is a wanderer between worlds (politics, science, culture), always on the go. His is a personality that cannot be understood without also considering the long-term relationship with his independent-minded wife and partner Angelika.

If you get to know him somewhat more intimately, you will be astounded to discover that he was trained in East Germany (GDR) as a concrete worker. He was, nevertheless, also able to pursue a university education (in 1964 he began studying at Humboldt University in Berlin; after the reorganization of the university geosciences in the GDR, he graduated with a MA in geology and then completed his PhD at the University of Greifswald). After various, but academically relevant activities, he was hired by the ZIPE (Central Institute for Earth Physics, a branch of the GDR Academy of Science, last located in Potsdam). He was able to develop his own independent geoscientific discipline and was made department head of “Mathematical Geology” in 1986.

This was just a few years before the great upheaval affecting the GDR and the Federal Republic of West Germany (FRG). All East German academics were then regrettably put through a test and the Science Council had a great deal of influence through its evaluations. Jan Harff “passed” the test. By then he had already begun to fall under the influence of Eugen Seibold and had become enthusiastic about marine geology. After German unification and the closing of the ZIPE, he was named section leader at the Academy of Science’s Institute for Marine Research in Warnemünde, which in 1992 became the Leibniz Institute IOW (Institute for Baltic Sea Research in Warnemünde) by recommendation of the Science Council. He was appointed professor of marine geology at the University of Greifswald in 1993. At the time, I was involved with establishing GEOMAR, the research center for marine geosciences at Christian Albrecht University in Kiel and had already found that, even before unification, contacts to the Institute for Marine Research in Warnemünde and to Russian research establishments were promising. Special experiences included introduction of the (western) BAT tariff at the IOW as well as the institute’s scientific staff participation in a *Polarstern* expedition to the Norwegian Sea, in which they oversaw part of the sediment laboratories. During this time, the GDR currency changed over to the Deutschmark and our new colleagues’ thoughts often wandered to their families, while we tried to give them the impression that everything would be fine in the end.

Jan Harff went into restless retirement in 2008, became professor at Szczecin University as well as a part-time guest professor in China, and today he pursues numerous scientific projects in marine geology and coastal research. He has been frequently honored with awards: for example, the Abraham Gottlob Werner Medal for geological sciences during the GDR period in 1986; with the Serge von Bubnoff Medal granted by the German Geological Society in 2010; and with the Mary B.

Ansari Best Research Resource Award in 2017, given by the Geoscience Information Society in the United States. This award was granted at the annual meeting of the American Geological Society in Seattle for his outstanding service as editor of Springer-Nature's *Encyclopedia of Marine Geosciences.* Jan Harff's comprehensive oeuvre documents his extensive scientific interests, his productivity and, through his co-authors, his international ties, which he has cultivated through his stays in Vietnam, the United States and Russia, in addition to China and Poland.

Jan Harff builds bridges between countries, cultures and scientific disciplines, often accompanied by his wife Angelika. He has undertaken many shared activities with her. Despite their worldliness, they are firmly rooted in Mecklenburg and have made many contributions to the cultural life in Güstrow. Their recurring presence in the local and regional press bears witness to these contributions. The bridging of Mecklenburg (Güstrow) and Poland (Szczecin), which both husband and wife have supported and developed, is an important contribution to the strong neighborly relationship between Poland and Germany.

November 2017

Jörn Thiede (St. Petersburg/ Kiel)

Editor's Foreword

Hans von Storch, together with changing partners, has been carrying out interviews with respected scientists for more than twenty years. Hans Hinzpeter in 1996 was his first interview and the interview that follows is number eight in the series (http://www.hvonstorch.de/klima/interview.htm#individuals). Nearly all interviewees have been geoscientists who can look back at long and impressive scientific careers. They are all witness to events that often lie far in the past but heavily influence our present time. These "testimonies" alone are already valuable in that they allow younger generations to understand why conditions and knowledge are the way they are today, that science is not a collection of truths, but is, as George Philander describes, a social process: *"Science is organized skepticism, a strange religion that demands of its congregation a firm commitment to the continual testing of all observational and theoretical results. The tests permit no compromises, are not democratic – if 99% of all scientists are in agreement, then they are not necessarily right – and produce results that, in the long run, are objective, independent of ethnicity, race, gender, religion, values etc*."

These interviews follow the same premise – it's not about truth, but the perception of our witnesses; it's therefore only to a certain degree about how matters were, but about how the witnesses had experienced these matters. It is naturally possible that others understood the events and conditions differently. Our partners in dialogue have control of what finally ends up in the interview – all statements were checked and approved by our interview partners.

This time I asked **Jan Harff** to carry out his retrospective together with professor **Reinhard Dietrich** as my interview partner. Dietrich is a geodesist, (most recently) from Dresden. While my experience with Jan Harff was as a coastal researcher and I have occasionally collaborated with him, particularly in regard to our contacts to Poland, Reinhard brought his expertise as a geoscientist to the table. Using this approach, we could at least attend in the first order to the two main aspects of Harff's work, namely basin geology and coastal research. We were also able to have Prof. **Jörn Thiede** write a tribute to Jan Harff in the form of a foreword.

The discussion was conducted in German and was mainly carried out in writing, but also during two personal meetings. This is an English translation, and a few other translations, into Polish, Russian and Chinese will follow.

The subject of the discussion was only science and its dynamics, but also its conditions under changing political circumstances; the subject is not the interviewed individual's personal background.

A special facet of Jan Harff is his scientific socialization, which began in East Germany, where he initially wanted to study architecture, then to his training as a cement worker and ultimately to the field of geology at the GDR's Academy of Science. After the collapse of the Wall in 1989, he managed to engage in more western traditions of scientific style – in the field of marine geology or, more precisely, in coastal research. In this respect, two worlds existed that "ticked" differently. He

later set out to explore more scientific worlds – namely, in Poland (more precisely, Szczecin) and in China, where he became well renowned as a colleague and project leader. Building bridges between worlds is really one of Jan's passions – even if his heart will always remain in Mecklenburg, with Güstrow at the center of his life.

Most Długi (Long Bridge) in Szczecin, painting by Alexander Dettmar, 2009

One problem that arose was that we needed to choose a title. One option was "Jan Harff – Wanderer Between Worlds". We found that Jan's response brought interesting insight into his thinking: *"Sure, I've been wandering my entire life and still do. But not from a desire to wander, as the proposed title suggests. It was the desire to make my contribution, to make something come together that belongs together (based loosely on Willy Brandt). This desire could have stemmed from the painful personal experience of separation – family separation (my parents separated as a consequence of the war) and the separation of one's own country. Throughout my entire life, I have felt this desire to seek out paths to communication and ways to navigate them, between scientific views (with the Regionalized Classification), between nations (my work in Russia, the United States and Poland) or between cultures (China). It is this tension between real or perceived contrasts that attracts me. I think of myself rather as an innovator or a builder of bridges (I once wanted to be an architect) than a long-distance runner. To serve as such a builder, I've published with international teams and, with my book endowments, I hope I have laid some foundations for building bridges which will be used by others (my mother was an art scholar and her library has been housed at the University of Kansas since 1991, and my grandfather's library – he was a doctor – is located today at Stettin University). The national Chinese prize—the "International Science and Technology Cooperation Award"—which I received in 2014, was of great meaning to me for this reason. Poland as our direct neighbor isn't only important to me as a scientific partner country. I also believe that we must strive as Europeans for awareness of unified cultural areas – for us and for me, this is definitely*

Pomerania. This is why, together with Angelika, I initiated an exhibition of Alexander Dettmar's paintings in 2009 at Stettin Castle. The exhibition was called "From Greifswald to Stettin". It was to describe not only the path of our life but also our shared identity in a European cultural space.

To that, I have nothing further to add.

November 27, 2017, Hamburg – Hans von Storch

The Interview

In preparation for the interview (from right to left): Jan Harff, Hans von Storch, Angelika Harff and Reinhard Dietrich. On Poel Island in July 2017.

Jan Harff, let us begin with an overview covering the different phases of your professional life.

My working life is very closely connected to the political development of Germany and Europe after the Second World War. In 1961, I graduated from high school in the city of Güstrow, located in the Mecklenburg region, which was then part of East Germany. Initially I wanted to study architecture at the Technical University in Berlin-Charlottenburg. After the border was closed in August 1961 and my plans to attend TU Berlin were blocked in the truest sense of the word, my only way forward in the GDR was to first take up practical work which would later permit me to study at a university. So then I began a concrete construction apprenticeship in the eastern part of Berlin, which I completed in 1963 as a skilled worker.

Mindestens mit „gut"

Die Brigaden Marquardt, Siebert und Feister jetzt zweischichtig

Die vielen Beispiele der Arbeiter, Angestellten und Angehörigen der Intelligenz in unserer ganzen Republik, schon jetzt mit der Erfüllung der Aufgaben zu beginnen, die sich aus den Dokumenten zum VI. Parteitag für alle Bürger ergeben, fand auch bei uns großen Widerhall.

Ende des vergangenen Jahres berichteten wir bereits über die Heizkanal- und Straßenbauer, die sich dem Aufruf der Sömmerdaer Büromaschinenwerker anschlossen.

Die Brigaden Marquardt, Siebert und Feister sowie das Bauleitungs- und Meisterkollektiv und das Maschinenpersonal der Baustelle VEB Kali-Chemie beschlossen in den ersten Januartagen zu Ehren des VI. Parteitages der Sozialistischen Einheitspartei Deutschlands, die Arbeitsproduktivität um 5 Prozent zu steigern,

den vorgegebenen Selbstkostensatz auf jeden Fall einzuhalten und nach Möglichkeit zu unterbieten,

den vorgesehenen Fertigstellungstermin der Objekte um 10 Tage vorzuverlegen und die Objekte mindestens mit dem Prädikat „gut" an den Auftraggeber zu übergeben.

Ferner beschlossen die Brigaden, für alle Arbeiten den Zweischichtenbetrieb einzuführen und die ihnen zur Verfügung gestellten Großgeräte voll auszulasten.

Außerdem erklärte sich das Baustellenkollektiv der Baustelle VEB Kali-Chemie bereit, wenn es notwendig ist, anderen Abteilungen sozialistische Hilfe zu leisten.

Die Kollegen der Brigade Marquardt verpflichten sich, ihre Objekte zehn Tage früher zu übergeben Foto: G. Schmidt

Newspaper clipping from Der Bagger, official newspaper of the Work Party Organization (Parteibetriebsorganisation, BPO), part of the Socialist Unity Party of Germany (SED) of the VEB Civil Engineering (VEB Tiefbau) Berlin: first January issue 1963 in honor of VI Party Congress of the SED. J. Harff front third from the left as a member of the Marquardt Civil Engineering Brigade (Tiefbaubrigade Marquardt).

Due to the everyday experiences involved with the construction profession, and especially due to architecture in the GDR at that time, I changed my field to a scientific occupation, where geology seemed particularly attractive. I first, however, needed to complete an additional preparatory year as a geological sampler at a Berlin geological exploration company before I was admitted to Humboldt University's renowned Geological Institute in Berlin in 1964.

Geology students at Humboldt University Berlin during a geodetic internship in Brand-Erbisdorf (Saxony) 1965, J. Harff (center)

The political bottom-up movement of the 1968ers in West Germany had its top-down equivalent in the GDR as ordered reform. This included a restructuring of the higher education and scientific landscape. We in the GDR experienced an "ordered" revolution from above: the founding of so-called scientific sections at the universities and central institutes at the GDR's Academy of Science were meant to overcome disciplinary barriers and increase economic effectiveness in science. This process was dramatic for geology in that it involved the closing of all geological, paleontological,

mineralogical and geophysical institutes while founding only two geoscientific "sections"[1]: the Geological Sciences Section at the University of Greifswald and the Geosciences Section at the Bergakademie Freiberg in Saxony. The university students and faculty from other locations were arbitrarily divided into these two sections. For the Berlin geologists, and therefore also for me, this reform meant relocating to Greifswald, where I graduated in 1969 with a master's degree.

I wrote my thesis on a topic from the field of sediment geochemistry with the aim of entering a doctoral program at what was the GDR's Academy of Science's Institute of Marine Research (IfM). I wanted to work on a sedimentological topic in the region of the southern Baltic Sea. However, due to "cadre political reasons", nothing became of these plans because I did not receive the required approval for the ship expeditions, which would have meant crossing the GDR border at sea.

After working for a year as a deposit geologist at the District Geological Survey (similar to a state geological survey), I returned as a PhD student to the Geological Sciences Section at the University of Greifswald and wrote a dissertation under the guidance of Gerald Peschel in the field of mathematical geology. My work used numerical classification methods for identification of potential crude oil horizons in Rügen carbon according to geophysical borehole measurement data. I defended my dissertation in 1974 and returned as a geologist with a PhD to the Rostock District Geological Survey until I was hired by the GDR Academy of Science's Central Central Institute for Physics of the Earth (Zentralinstitut für Physik der Erde; ZIPE), initially located in Berlin and later in Potsdam. There I created the Mathematical Geology Department.

This discipline emerged in the sixties and seventies relatively independently in the western world, mainly in the United States and France, and in what was then the Soviet Union, whereby we expected that mathematizing geology would also further its theoretical/methodological development. This was also the case in the GDR, which supported moving in this direction, primarily with the aim of optimizing deposit (especially hydrocarbon) exploration. I therefore was given relatively free rein at the ZIPE for forming a team, which also included partners from geological exploration companies and from the University of Leipzig. Together we developed a basin model for the North German-Polish basin with regard to the natural gas prospectivity of Rotliegend[2] deposits.

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[1] Large institutes at the universities were designated as "sections", corresponding to the "central institutes" within the GDR's Academy of Science. The degree subjects of geology/paleontology, geophysics and mineralogy made up the "geosciences". Occasionally, geological training continued to be provided within the context of the geography studies by faculty at some universities, such as in Berlin and Halle. What was important for me was that in the Physics Section at the University of Leipzig, they retained a geophysics subject area for research and teaching with which I could later collaborate.

[2] The "Rotliegend" is a stratigraphic phase of the Permian period during which sand was deposited in what is now northern Germany about 270 million years ago. Natural gas can be found today in its pore spaces. Deposits in the Altmark were exploited by both East and West Germany. The GDR's energy policy concept was based not only on lignite but also on the use of these natural gas

The work was attractive in that exploration data from nearly the entire basin area was available to us, as the GDR territory was also the concession region for the exploration. The German Unification Treaty not only ended the existence of the academy institutes but also the scientists' employment at those institutes on December 31, 1991.

In place of the ZIPE, the German Research Centre for Geosciences (GFZ) was founded in Potsdam in 1992, which also incorporated the Mathematical Geology Department into its structure as the "Geomodeling Project Group". I successfully applied to head this group and began my position on January 1st, 1992, but only for three months. The Institute for Baltic Sea Research Warnemünde (IOW) was meanwhile founded as a "Blue List" establishment in place of the Academy of Science's Institute of Marine Research, and the job positions had been advertised. The positions included Marine Geology Section head, for which I applied, and I was offered the job at the beginning of April 1992.

My professional plans then had come full circle, with a delay of twenty-three years, with my arrival at *the* marine sciences institute—my aim back in 1969. In the methodological sense, this change from Potsdam to Warnemünde didn't mean a change in direction in that the models that I developed and applied earlier for the formation of the Paleozoic basins could now be used to describe processes in the late Quaternary to recent marine basins.

It was especially interdisciplinary research issues concerning coastal processes at the intersection of basic and applied science that held a special appeal for me. I particularly feel this allure directly during coastal excursions, and I have specifically used it to introduce students to our subject, the marine geosciences, as part of my teaching career as a professor at the University of Greifswald.

deposits. In this respect, the "prospectivity", that is, the expectation of finding deposits, was of great importance for economic and thus political reasons in the GDR.

Angelika and Jan Harff in front of the Reichstag in Berlin on the Day of German Unity, October 3, 1990

Jan Harff with geology BSc students from the University of Greifswald during a coastal excursion along the Baltic Sea beach near Kühlungsborn, summer semester 2007

My position at the Institute for Baltic Sea Research in Warnemünde provided me with all the freedom in research and teaching that I had been waiting for all those years. I could utilize my connections in eastern and northern Europe that I had fostered even before unification for common research projects as well as for academic teaching throughout the Baltic Sea region.

Soon came the collaborations and guest professorships in the United States, later in Vietnam and then especially in China.

European unification brought us entirely new possibilities for international cooperation. Therefore, after my retirement in Germany in 2008, I was able to easily accept an invitation to Szczecin in Poland, where I am still a professor of marine geology at the university's Institute of Marine and Coastal Sciences. More about that later.

Studying geology wasn't your first wish back in the sixties. How did this come about and how did your interest in marine geology materialize, even if it only occurred after unification?

In Berlin-Tiergarten as a school student, before the construction of the Berlin Wall in 1961, I had seen the structures at the International Building Exhibition (IBA 1957), in which almost all prominent architects at that time were represented with their works. I was fascinated by the Brazilian architect Oscar Niemeyer's structure – a residential building based on a very modern design at that time, using innovative concrete construction and functional structure – I fell under his spell and decided I wanted to become an architect. What attracted me to this field was the intersection of building technology, design, economics and sociology. The border between East and West was still open back then, so for my education I chose the Technical University in Berlin-Charlottenburg and applied for admission to an educational institution where the building-related faculty could be traced back to Schinkel's Bauakademie in Berlin. But nothing came of this plan because on August 13, 1961, shortly after my high school graduation, a special building—the Berlin Wall—was erected. Because I came from the East, this construction blocked my path to the Technical University Berlin-Charlottenburg. I had to change my plans and began a concrete construction apprenticeship in the hope that I could gain admission to a university in the GDR via this practical route. Through my work in construction, I became closely acquainted with the realities of the architectural profession in the GDR, recognizing that the professional intersections, mainly with economics and politics, were too great to allow for free and creative work here. The creative part of the architectural field in the GDR played rather a subordinate role, while mass production of schematic residential and industrial structures was placed in the foreground.

I began to set my professional aspirations on the sciences and found them in geology, a subject that allowed—indeed required—a high degree of intuition due to the particularities of its reductive approach[3]. This decision was prompted by a charismatic geologist and science journalist: Harro Hess. He understood how to describe the geological profession as a new attractive career option for me. Deciding on geology was initially based on rational reasons. Of course, I was enthusiastic about the subject out in the field, but especially when reading *Conversations with the Earth* by Hans Cloos, in which he poetically describes his own geological explorative journey around the world. With impressive drawings, it primarily reflects the kinematics of geological structure formation and defines geological issues as challenges. I owe my enthusiasm for geological theory and for gaining new insights to Serge von Bubnoff, who last taught at Humboldt University's Geological Institute in Berlin. I never got to know him personally. It is his writing that still impresses me today. I virtually slept with

[3] Reductive inferences in geology are all conclusions that lead from the characteristics of a rock or a large portion of the Earth's crust (the facies) to the corresponding condition of formation (the milieu, v. Bubnoff 1954, Chrobok et al. 1979). Because the formation process in question is not observable due to its temporal dimension, this inference presupposes a model – for example, an acute geological approach that states that the laws that govern the formation of the Earth's crust are based on constants that have not changed over the course of the planet's history. These assumptions are connected to various uncertainties so that the inference is always associated with a – usually qualitatively expressed – probability. This inference chain, by relying on geophysics, can be considered a solution for the inverse problem of geology.

Basic Problems of Geology under my pillow. The book provides a universal definition of goals, special characteristics and opportunities for acquiring geological knowledge. It still guides my work as a geologist even today.

It was another geologist who aroused my enthusiasm for marine geology was Eugen Seibold. At the time, still a professor in Kiel, he held a colloquium at our institute in Berlin in 1965 on marine geological work in the North Sea. This lecture triggered the initial burning desire in me that never died out: to become a marine geologist. Eugen Seibold described in his lecture how he had determined the age of the marine sediment from coal nuggets in sediment cores, which—with the (relatively precise dateable) beginning of the age of steamships—wound up in the atmosphere from ship chimneys and then in seabed deposits.

Prof. Eugen Seibold (1918 – 2013)

What fascinated me was this connection between a marine environment as a working region, a complex scientific issue – the dating of sediments – which could be solved by reductive inference, taking into account the relation to the socio-economic development of the studied environment – that is, the industrialization of Europe. Indeed, it was enthusiasm that made me decide, with little chance of my hopes becoming reality. Everything initially spoke against this decision: employment opportunities for marine researchers in the small GDR were limited. In addition, the Berlin Wall had just been built with the aim of making it difficult for people to leave the GDR, and business travel approval, especially for trips at sea, were reserved only for select "cadres". Nevertheless, I managed to obtain a PhD program offer from Otto Kolp, then head of the Seabed Department at the IfM in Warnemünde. I had already made contact with him as an undergraduate student and had worked for him as an intern. I was, however, unable to take this position due to "cadre politics", as mentioned earlier. Despite the barriers that initially blocked my way in the GDR, I did not give up my career dreams, but rather chose a detour via mathematical geology. I figured there was an opportunity for scientific development through this theoretical field even without business travel approval. All I needed were good libraries and computing technology. It was also clear to me that I would need special modeling expertise in all geoscience disciplines anyway. In addition, I had a scientific interest in this subject because, during my studies, I believed I had identified quantification as a necessary process for the development of geology. Of course, you also need data and this data was sufficiently available through the GDR's crude oil and natural gas exploration program. I merely needed to seize the opportunity, never losing sight of marine research during my work, waiting for my chance.

This chance materialized after German unification in Warnemünde at the IOW, when "my" position was advertised. I applied as a lateral hire and was accepted although I had no work experience at sea aside from sailing practice. I was later able to gain this experience during many routine expeditions, mainly on the research ship *Professor Albrecht Penck* in Warnemünde.

Ottfried Albrecht, the captain at the time, is someone I hold in high regard. He taught me through a "hands-on" approach so that it was not difficult for me later, even on larger research vessels, such as the *Poseidon*, *Heincke*, *Petr Kottsov* and *Maria S. Merian,* to sail as an expedition leader. The crowning "moment" of my professional career in Germany was a trip on the *Merian* to West Greenland with Captain Friedhelm von Staa in 2007.

Research ship Professor Albrecht Penck from the Leibniz of institute for Baltic Sea Research Warnemünde

You have told us here about modeling in Geology. Behind the term "model" hide entirely different concepts in various disciplines. Would you like to explain what a model is for you, how it is created, how its capabilities can be demonstrated and how it can be of value?

The term "model" is one we indeed understand in a very general sense. For example, the first seemingly trivial assumption that, in an (undisturbed) sediment sequence, the layered sediment reflects a temporal succession is to be understood as a model. We refer to this "model" as the "Stratigraphic Law". Nicolaus Steno (1638 – 1686) first needed to recognize that sediments form according to the principle of falling leaves for it to gain general acceptance. There are naturally more complicated processes that have meanwhile been represented with models—mathematically as well. The practical successes of mathematical models encountered their breakthrough in the seventies, especially in crude oil and natural gas exploration. In the planning of exploration and production wells, exploration today basically uses basin formation models, accumulation of source rocks as well as reservoir rocks, and hydrocarbon generation from the sediment's organic constituents. The success of this model is primarily derived from the fact that sediment basins can be understood as closed systems to a certain extent, which makes determining the boundary conditions easier. In addition, there are proven physical approaches for scaling, sediment accumulation, the thermal stress-induced transformation of organic matter and the migration of liquid and gaseous hydrocarbons, which can be represented relatively easily by mathematical formalisms and converted

into computer programs. With the help of such models adapted to geological spatial and temporal dimensions, scenarios can be generated on the emergence, migration and storage of hydrocarbons, which assist geologists in calculating the raw material potential (“prospectivity”) and in their decision on how to approach drilling with extreme efficiency. Compared to the high costs of drilling, which run into millions of dollars, evaluating data that is already available using mathematical models is economical, so companies propose “extracting” information from existing data pools when they sink drills. The model’s "suitability” is easily measured: in barrels of extracted oil. This last quality check for the models developed at the Central Institute for Earth Physics in Potsdam was not done, however. In 1990 (in unpublished reports to date), we identified areas of northwestern Mecklenburg and the adjacent Mecklenburg Bay in the Baltic Sea as "prospective" areas for natural gas. The collapse of the GDR changed the concession claims so that no petroleum companies have yet been able to drill exploration wells in the areas we found favorable.

Can you tell us more about the computing technology that was available to you back then? That was during the time of mainframe computers. When were you offered desktop terminals and/or personal computers?

We began our work in batch processing. In particular, we had at our disposal a large Soviet BESM 6 computer system at the GDR’s Academy of Science – a device the size of a small supermarket and with the computing power of one of today’s better PCs. Operating it was time consuming and even required night shifts. We were given the first PCs toward the end of the GDR period. They were likely devices on COCOM lists. I do not know how they wound up in our laboratories. (One of these first PCs is pictured in the photo. The poster on the wall already points to a greater freedom of movement in the professional world at the end of the eighties in the GDR.) We nevertheless were still selling our software to western petroleum companies in 1990. This provided us with foreign currency – for example, for travel – and we saw a great deal of recognition from the academy's leadership.

Jan Harff with geologist Dr. Peer Hoth and mathematician Dr. Jörn Springer (from right to left) from the Mathematical Geology Department at the Institute of Earth Physics of the GDR's Academy of Science: taken around 1990 during software development

Back to studying in the GDR: studying for young people in the GDR with, let us say, a middle-class background wasn't self-evident. How did you avoid this pitfall?

You are addressing a complex problem. On the one hand, there were admissions quotas for students from different social classes, as the background of the students was meant to relatively reflect the social strata of the population. That meant that children of academics, artisans and entrepreneurs (who also existed in the GDR) had a more difficult time gaining admission than members of the "working classes". On the other hand, children of academics with what were known as "individual contracts" were given priority before the Wall was erected to prevent the parents from fleeing to the West.

When I applied to study geology at the university, I entered as a cement worker or geological collector—that is, someone belonging to the "working class"—and I was mostly likely judged primarily on my professional qualifications and was then ultimately admitted. Things, however, became more difficult during my studies and then later. There was an active opposition to the state amongst the student body and, though not organized, was rather spontaneous. Together with other fellow students, I attracted the attention of the security apparatus for openly speaking out against the Wall when still at the University of Berlin and later in Greifswald for opposing the 1968 Warsaw

Pact invasion in Prague. The consequences for me were grave: as I mentioned before, my seaman's passport was rejected, which I would have needed for doctoral studies at the Institute for Marine Research.

As I stated earlier, this initially derailed my career plan and I needed to set a new course. By earning my doctorate and later, when I took up scientific work in mathematical geology, I could navigate in politically calmer waters. In an academy institute like the ZIPE, they usually had our backs and the way things were run was determined predominantly according to scientific criteria. I formed the group consisting of petroleum geologists, mathematicians and IT specialists, with whom we developed models and software initially for the domestic hydrocarbon industry. Collaborating with partners from the former Soviet Union, publications and conference attendance in Eastern Bloc countries were not a problem. During my study visits, I was a guest of leading scientists in the Soviet Union, such as Dimitrij Alekseevich Rodionov and Andrej Borisovich Vistelius. There I also met with the "western elites" of mathematical geology: John Harbaugh, John Davis, Dan Merriam and Fritz Agterberg. An invitation in 1985 from John Davis to visit the United States was actually approved by the Academy of Science in 1989 after a processing period of four years. That same year I traveled for the first time to the US on a work visit to the University of Kansas in Lawrence. The travel approval was probably granted as part of the general liberalization in the Eastern Bloc, but also reflects the success of our working team in international comparison.

I left the GDR in April of 1989 and returned in autumn the same year to a system that had fundamentally changed: Hungary's western border was basically open and the GDR's protest movement was in full swing. I brought valuable scientific contacts with me from the United States, wrote publications and was well-connected on all sides—that is, not only to the East, but also to the West.

In July of 1990, just when the monetary union occurred, we held our first truly international conference in the GDR on mathematical geology, titled "Computerized Basin Analysis". Things were pretty chaotic during that time in East Germany. I decided then to hold the conference in the Renaissance castle in Güstrow, my hometown. I knew the infrastructure there and I could therefore compensate for the lack of professional conference services by improvising with representatives I knew in the city administration and at what was then the Pedagogical University. And so we hosted the big stars in our field for a few days, from the East and from the West. The conference host was the Academy of Science's Central Institute for Earth Physics in Potsdam. The co-organizers were VE Kombinat Petroleum and Natural Gas Gommern as well as the International Association for Mathematical Geology (IAMG). A lovely book arose from this meeting (Harff and Merriam, 1993).

All these undertakings helped us then to successfully navigate through the difficult evaluation phase carried out by the Science Council in the context of reunification and to secure the professional restart in a reunited Germany. For me, this new start meant the realization of my professional dream with a delay of twenty-three years.

Participants at the "Computerized Basin Analysis" conference on the steps of Güstrow Castle in July 1990. (Angelika and Jan Harff, front center. Their daughter Ann, second from the left)

Would you like to tell us about the "Mr. Vetter" episode?

That was during Helmut Schmidt's visit to Güstrow in 1981. It is actually a marginal note, but it fatally demonstrates where a system with excessive security needs can lead. Along the route within the town of Güstrow, which had been sealed off on the day when Erich Honecker was hosting a visit by Helmut Schmidt, checks were carried out on the residents months beforehand. This included my family as well. This check obviously included phone tapping. We guessed as much from the following incident: just for fun, my cousins and I addressed each other as "Mr. Vetter" on the phone. This caused the GDR security service, who had obviously tapped our phones, to go on the hunt for a gentleman with that name. You could dismiss this episode as evidence of an aberrant system at the end of the Cold War period if, for entirely different reasons, the issues concerning capabilities and limitations of surveillance of the private sphere were not on the international agenda again today.

In this context, it would also be interesting to hear what significance the Party played in the process of gaining knowledge. Marxism-Leninism – was that a concept that had practical effects on research and publishing?

Naturally the Socialist Unity Party of Germany (SED), known as "the Party", dominated all aspects of life in the GDR and therefore science as well. The Party set the programmatic and ideological framework through Marxism-Leninism ("ML" – a branch of socialist concepts) and determined the practical implementation of the program though the "socialist planned economy". The program was taught to the GDR's citizens via paradigms from school education to what were known as the "party training years" within the "socialist" enterprises but also in the research institutions and state administration.

This of course included doctoral education. As PhD students we were required to take courses in the social sciences, in which the humanities and social studies were combined, and in which we were also required to attend and complete lectures in seminar groups and write theses. The subject could be selected with a relative degree of freedom, and I personally used this flexibility to expand my knowledge in philosophy. This applies both to my work at the University of Greifswald, where I earned my PhD in 1974 ("Dr. rer. nat", doctor of a branch of science) as well as at the GDR's Academy of Sciences, where I earned my second PhD (Dr. sc. nat. title, "doctor of sciences", comparable to the West German "Habilitation"). Naturally the interpretation of any written and spoken word lay with the ML authorities, which made leaving the given framework nearly impossible.

I was involved with questions of developing mathematical classification methods for geological research methodology during this time. This led me directly to problems of epistemology—that is, basic philosophical questions to which both idealistic as well as materialistic philosophers were, and are still now, devoted. My ML professor in Greifswald accepted my topic suggestion for the required work, which I undertook enthusiastically. In doing so, I succeeded in formally describing the role of classification in geological knowledge acquisition to the extent that I could model it in a software system, which was part of my dissertation. With this software system, I later identified petroleum storage horizons in oil wells based on geophysical measurement data. My work in the social sciences was very fruitful for me. In order to achieve my concrete goal, I read Aristotle, Kant, Hegel, Schopenhauer, Nietzsche, Marx, Engels and Lenin and compared their statements on epistemology to the works of geologists such as Werner, Lyell, Walther, Sander, von Bubnoff and others until I understood in the end how abstraction in geology is algorithmically practicable and how data analysis can lead to synthesis. In doing so, I did not need to worry about the given control framework. In my studies, I had left its restrictions behind.

Naturally the Party also controlled the planned economy, part of the complex political program, which also included science (represented by the compass in the GDR's national emblem), essentially fulfilling two functions. On the one hand, international esteem was to be solidified through so-called "outstanding achievements", while on the other hand, science was to be intertwined with the economy to increase its efficiency through "scientific penetration". In concrete terms, this meant that research found support among state institutions through forming

interdisciplinary working groups, which spanned social work structures. Thus we had developed a very effective network in basin modeling, into which the academy and university institutes, the geological survey in the GDR (ZGI), as well as geological exploration companies were embedded. The system's absurdly excessive security needs, however, hindered publication efforts. The data with which we operated were mainly designated as highly confidential due to reasons of economic strategy (it concerned vital raw materials that were important to the nation's economic success). Publishing the data required a high degree of tempered generalization and needed to be cleared on several levels, which involved a great deal of bureaucracy. Publications were nevertheless possible, and our group exploited these opportunities.

How did what we today call the "peer review process" function in the GDR? How was scientific success determined in the GDR?

The review process functioned differently in the GDR than it generally did internationally. In the geosciences, the author first needed to convince his "state leaders"—that is, the author's superiors—as to the purpose and intent of the publication. That was relatively simple at the Academy of Sciences. With the authorities, such as with the virtually almighty ZGI, the hurdles were far greater and had caused my colleagues a great deal of problems there. The industrial sector was somewhat more flexible, and, coming from the Academy, I had strong cooperation ties with colleagues from VE Kombinat Petroleum and Natural Gas in matters of publication.

The next step was the security check. This involved checking a manuscript in a black-box method that lay outside the author's control. There was a great deal of absurdity involved as well as personal suffering on the part of the geoscientists who, for example, had collaborated with colleagues across the East-West border for the sake of shared publications, but did so without official clearance and who were even sometimes made to answer in a court of law.

The actual scientific evaluation of the manuscripts was carried out by the editors of the journals and their scientific advisory boards. The success of the scientific work was primarily seen as the implementation of ideas and concepts in practice—that is, in the industrial sector. Patents were likewise desirable or the interest coming from the West on the GDR's "know how", which could be exploited to improve the foreign exchange situation in what were known as "immaterial exports" (IMEX) to the West.

But back to Jan Harff, the scientist: you achieved your first great scientific successes when you started working on geological models at the GDR Academy. Can you tell us more about that?

This question is connected to the particular cognitive situation in geology. The spatial and temporal dimension of the geological object under investigation, the Earth's crust, prevents direct observation of the formation processes as well as its experimental replication in the laboratory. Comprehensive spatial observation of the structure is also impossible. The latter must be deduced from spatially discrete observations (e.g., drilling) or indirect measurements of geophysical fields. To date, there has been no change in the division of geological research into two parts postulated by Abraham Gottlob Werner more than two hundred years ago: that is, initially to deduct the structure

of the Earth's crust and/or its parts by observing (measuring) the facies of the rock in outcroppings or by drilling, then to reconstruct the formation process by reductive conclusion. We discussed that earlier.

In the history of science, the mathematization of geology has also developed from modeling the structure of the Earth's crust to mapping its formation processes. When I began working in the subject, internationally diverse schools were working on structure modeling—in two directions in fact—that rubbed against each other along the boundary of both systems in East and West. At the time, this border was also simultaneously a language barrier between Russian and English speakers, which made communicating across the border far more difficult.

Both schools represented different points of view, which could be described in very simplified terms as follows: the Russian school led by Dimitrij Rodionov, Robert Kogan, Yuriy Voronin as well as Andrej Vistelius emanated from an existing *discontinuous* investigation area made of homogenous parts, which was first to be broken down into its components, something known as "classification of geological objects". In a subsequent step, regionalization, you turn to the spatial juxtaposition of these components—that is, the structure of the examination area. The result is comparable to the "classical" geological map. On the other hand, the "western" school, traced back to Georges Matheron, Danie Krige, Andre Journel and others, regarded the study area as a *continuum* whose properties can be described by (continuous) functions after interpolating geoscientific measurement data. These functions are determined using geostatistics (kriging), which is based on Matheron's models of regionalized variables. The Russian school's numerical classification procedures and the geostatistical models of the Western world seemed incompatible, but this was actually only the result of a lack of communication.

Due to my knowledge of languages, I could read Russian as well as English and was therefore in the position to build a theoretical bridge between the two schools. I called this bridge "regionalized classification" by interpreting the investigation area as non-steady in a stochastic sense, subdividing it with numerical classification methods into stationary sub-regions and using geostatistical methods for optimal demarcation between these sub-regions. Parallel to structural modeler rivalries, scientists such as Dietrich Welte strove to introduce functional models for describing processes in geology. These models were first mainly concerned with the formation of sedimentary basins as subsidence areas of the Earth's crust, the accumulation of basin sediments and the genesis of hydrocarbons from organic sediment components through geothermal stress. We already discussed that earlier. These efforts were driven by economic pressure from the industrial sector and the demand for optimizing and quantifying petroleum and natural gas exploration.

Our ZIPE group in Potsdam created a software system ("BASIN") as a synthesis of basin formation process models and methods for regionalized classification. The first complex describes the basin subsidence on the geological time scale and uses the results to derive indicators for the formation and accumulation of hydrocarbons. In the second complex, these indicators are assessed simultaneously and sub-regions of the study area with differing prospectivity for the occurrence of

petroleum and natural gas are designated. We successfully utilized this method for the North German-Polish Basin and the Paleozoic shelf basin structures in the American Midwest. Ultimately, these successes also contributed to the ZIPE's positive evaluation by the Science Council and helped to secure positions for the team at the new German Research Centre for Geosciences (GFZ) in Potsdam.

Then when did the change to the Institute in Warnemünde take place? Was the change in topic a challenge? Was there a central topic at this time?

I actually changed to marine research at the height of my group's success in Potsdam. When the decision to dissolve the GDR's academy institutes as laid down in the Unification Treaty became known, Angelika and I were in the United States. My American colleagues saw the immense uncertainties I faced and offered me a position. I, however, did not take up this offer. The reason was that we simply wanted to be part of the historic process of German unification. This decision proved to be the right one: my group in Potsdam was integrated into the GFZ and, in my case, my oldest dream of becoming a marine researcher came true. I did not consider my move to Warnemünde as a break in continuity because the work was similar: forming a team, interdisciplinary life and describing the formation of sedimentary basins using quantitative models. Three issues were of concern:

- Reconstructing the formation conditions of basin sediments
- Describing the coasts as a result of crustal movement, eustatic sea level variations and coastal morphogenesis
- And what was especially new and exciting for me: drafting future scenarios for the coastal region

I brought the methodological tools of the trade with me; only the spatial and temporal dimension of the approach had changed. It was mainly the time scale that had been shortened to the Late Quaternary and the "Anthropocene". The time period was especially interesting for me, when humans began to creatively "interfere" with nature. In order to understand the recent past, we cooperated with archaeologists who helped us identify old coastal subsidence areas that lie under water today, to determine timelines from cultural remnants and to reconstruct environmental features of the Stone Age. These parameters are needed to provide realistic models that then ultimately allow us a glimpse into the future.

Participants on an interdisciplinary expedition on the research vessel Professor Albrecht Penck, Bay of Wismar, 2002. A fossil in the foreground recovered from the seafloor at a depth of seven meters: a tree trunk around eight thousand years old from a former coastal forest, now flooded by sea level rise (Captain Ottfried Albrecht, second from right)

Anyone aware of receding coastlines due to rising sea levels and the effects of flooding can understand how vital this view ahead is. This problem exists worldwide: think of Hurricane Katrina. We, however, do not need to travel far to understand the problem. We have the sea at our doorstep with the Baltic, where we – especially on the southern coasts— can study coastal processes as if the sea were a laboratory. It was direct questions from coastal residents about their future that motivated me to get involved in several research projects in recent years that addressed such processes. Mr. Graf especially comes to mind, a master baker who had asked me about the future of his bakery, which lies directly on the cliff in Rerik.

What did you experience professionally in the GDR during the political unification?

For me, unification allowed me to fulfill my professional dream: I could become a marine researcher. It was primarily the freedom to travel that I needed, as does every other geoscientist, and now I have experienced that. We were euphoric initially when unification began, overlooking the

fact that no switch had been flipped, but rather that we were witnesses to a process that took years and is still continuing.

One important step was the evaluation by the Science Council. I experienced for the first time, in discussion with competent colleagues from the former West Germany, how you had to provide answers to important questions on your own scientific work, such as research concepts, publishing activities, collaborative relationships and imparting knowledge to younger academics. For me, these evaluations were inspiration to scrutinize one's own research approaches and results, and thus contributed to finding your own bearings.

My experience was that this evaluation was fair, open and objective. It's obvious that I am not alone in this assessment, as we've noticed with satisfaction in the former East that the evaluations since German unification have now become the standard for assessing the status quo and the indicator for scientific achievement for all institutes and institutions in the country. One problem was certainly the so-called honor commissions, which were less objective than the scientific commissions, but had to decide on the continued employment of East German staff in federal German institutions due to their conduct during the GDR era.

I also noticed here, from state to state, there were considerable differences in methods. Because I switched from Brandenburg to Mecklenburg-Vorpommern, my assessment rested on a comparison between these two states. I observed very humane decisions here, but I've also seen great hardships resulting from decisions that are incomprehensible to me.

If we look primarily at the positive side of German unification, I experienced something similar later during the expansion of Europe. The admission of the Eastern European countries created an unprecedented cultural space with entirely new opportunities, not the least for scientific collaboration. I myself profit quite directly from this through my activities in Poland.

How did integrating GDR science and scientists into the West German context turn out? Were you all accepted or were there reservations?

That varied a great deal, and I can only talk about my own personal experiences here. I experienced the reunification in Potsdam at the Central Institute for Earth Physics and was surprised at how contacts were established with West Berlin colleagues right after the border opened. They of course saw new possibilities for collaboration and for utilizing our networks in eastern European regions. There were also many offers to explain the West German scientific landscape in discussions, how to navigate it and to help us. I received my first invitations, however, from universities in the Ruhr region, where I could feel equally at home. I got the impression that this was due to the culture developed by mining in a region where underground work requires solidarity regardless of nationality and other divisive external factors. A similar team spirit is also common in work at sea and explains why I especially experienced similar solidarity with my partners in Kiel and Bremen after I moved to Warnemünde. What I remember in particular during the eventful and inspiring days after German unification is also the assistance from the German Research Foundation (DFG) and the Federal Ministry of Education and Research (BMBF), from whom we "Ossies" received quite a bit of

start-up assistance. Of course, we also have the images of the "Wessies" in mind, who stood or sat across from us, looking down at us and finding us incomprehensible. From today's point of view though, I classify these conflicts rather as “social skirmishes” that are lost in the noise of today’s reality.

What would you regard as the most important outcome of your scientific career? Or would we rather call it a series of outcomes? Do you think they have been suitably recognized?

There are three important outcomes arising from my work and from the teams with which I was connected:

- The development of the “Regionalized Classification” concept as a synthesis of the theory of “Regionalized Variables” developed in France and the United States and the “Klassifikacija Geologiczeckich Objektov” developed by the Russian School of Mathematical Geology
- The development of a conceptual model for analyzing sedimentary basins and assessing their petroleum/natural gas prospectivity, implemented in a PC software system (BASIN)
- The implementation of a coastal research concept that includes the physical-oceanographic and geological description of coastal morphogenesis, as well as the socio-economic utilization of coastal zones from the prehistoric to the historical timescale and the projection to future scenarios.

I do not have any reason to complain about lack of recognition. The International Association for Mathematical Geology 1998 (IAMG) awarded my work on mathematical geology with its highest honor – the Krumbein Medal. I received the GDR’s highest scientific award in geology—the Friedrich Stammberger Prize—in 1989 at the Annual Meeting of the GDR's Association for Geological Sciences (GGW) for our work in developing our basin modeling concept. My work on marine and coastal research was awarded the Serge von Bubnoff medal in 2009 by the German Association for Geosciences (DGG). This award is of particular importance to me because von Bubnoff’s scientific work and approaches have influenced and guided me to a certain extent throughout my entire career. I see respective projects promoted both in Germany by the DFG and the BMBF as well as in Poland by the Ministry of Science and Higher Education as a recognition of my coastal research concepts. In a special way, however, I view this concept as well as my work in China and the fact I was awarded a national Chinese prize in 2013, the International Science and Technology Cooperation Award, as a confirmation of this recognition.

Jan Harff delivering the Encyclopedia of Marine Geosciences to the library at the University of Szczecin in January 2016

I also, however, understand it to be the duty of the scientist to classify the obtained results and to synthesize them in a certain manner. Overview studies can hardly be done by a single scientist today however. Scientific knowledge is growing too rapidly and is now more than ever dependent on cooperation. This undertaking became concrete when my good friend, Terry Healy, a coastal researcher from New Zealand, suggested in 2008 to publish an Encyclopedia of Marine Geosciences. The international interest in this subject had grown enormously, and the number of publications had become virtually unmanageable. It was clear to me that I couldn't manage this work by myself, due to the limits of my expertise alone, so I searched for collaborators. I found such collaborators in Martin Meschede from the University of Greifswald, who took over the portion on plate tectonics; Sven Petersen from GEOMAR in Kiel, who oversaw the volcanic activity and marine raw material sections; and Jörn Thiede from Kiel, now at the University of St. Petersburg in Russia, who edited the portions on geology of the deep ocean and paleoceanography. We then published the "Encyclopedia of Marine Geosciences" together at Springer-Nature 2016. Awarding us the *2017 Mary B. Ansari Best Geoscience Research Resource Work Award* by the *Geoscience Information Society* (GSIS) for our encyclopedia is a great tribute for us. Unfortunately, Terry didn't live to see the completed work. The prize, however, showed us that his advice to create such a compendium of marine geosciences had hit at the heart of international scientific interest. We dedicated the book to Terry Healy as well as to Eugen Seibold, who influenced and shaped not only us editors, but also the community of marine geologists after the Second World War. We have, of course, already spoken about his influence on

my career. Together with my co-editors, we hope that the prize will further promote the book's circulation, making it accessible to more students and young scientists in our field.

vom 4. November 2017 Aus der Redaktion des Güstrower Anzeiger

GÜSTROW

Keine Zeit für Tour nach Seattle

Der Güstrower Geowissenschaftler Prof. Jan Harff reist viel um die Welt, forscht und publiziert – wieder einmal preisgekrönt.

Wenn über einen Güstrower mit der Ortsmarke „Stettin" (Szczecin) geschrieben wird, ist das nicht so ganz gewöhnlich. Für Jan Harff schon. Der Geowissenschaftler ist seit fast zehn Jahren an der Universität im benachbarten Polen tätig, hat dort seit 2010 eine Professur. So ist der Arbeitsmittelpunkt für das Güstrower Ehepaar Jan und Angelika Harff Szczecin. Fast nur an Wochenenden kann man den gebürtigen Güstrower in seiner Heimatstadt antreffen. „Aber ich betrachte mich nach wie vor als Sohn dieser Stadt", stellt er gerade.

Mit 74 Lebensjahren ist Jan Harff aber nicht nur zwischen Polen und Güstrow unterwegs, sondern reist immer noch beruflich durch die Welt, mal nach Amerika, mal nach Südafrika, öfter mal nach China. Eine Reise in der vergangenen Woche an die Westküste der USA musste er absagen, weil er in anderen Terminen auf Zypern und in Estland gebunden war. Dabei war die avisierte Reise nach Seattle mit einer hohen Auszeichnung verbunden. So nahm also sein Kollege Martin Meschede von der Universität Greifswald den Mary B. Ansari Forschungspreis des American Geoscience Institute stellvertretend für die vier Herausgeber einer Enzyklopädie entgegen (SVZ berichtete).

„Seattle wäre für mich zu eng geworden", musste Harff sich eingestehen. Seinen Stolz auf das vollbrachte Werk kann das nicht mindern. Ja, das Wort „stolz" erscheint ihm und seinen Kollegen gerechtfertigt angesichts des knapp 1000 Seiten dicken Bandes, der sich speziell an Wissenschaftler und Studenten, Ingenieure, Ökonomen und Politiker wendet. Die „Encyclopedia of Marine Geosciences" (Enzyklopädie der Meeresgeowissenschaften) sei ein konzentrierter Überblick über die Geowissenschaften, der in Bibliotheken von Universitäten ausliegen werde, aber auch online zu studieren sei. Die Würdigung des im Springer-Verlag erschienen Bandes durch die Geoscience Information Society des American Geosciences Institute (AGI) als bestes wissenschaftliches Werk des Jahres, beweise ihm, dass der große Aufwand gerechtfertigt war.

Jan Harff is not only a sought-after international scientist, but also a significant personality in his hometown of Güstrow in Mecklenburg –as can be seen in this newspaper clipping.

An important event was also your expedition on the Maria S. Merian *to Greenland.*

We fought hard for this expedition and we were ultimately able to work with an international team in West Greenland's coastal regions and fjords in the summer of 2007. We had been studying regions on the Baltic Sea coast for many years, which are heavily influenced by the Fennoscandian inland ice sheet's activity at the end of the last ice age. We see, however, in our geological findings only an "echo" of changes in ice cover as a result of a changing climate with effects on sea level and associated coastal variations. In order to study these processes in "real time", you need to visit Greenland and, at the edges of the ice, study the effects of changes on the ice cover at the coasts. Reinhard, you participated and contributed to a better understanding of these processes with your measurements.

Jan Harff during the "chewing test" for assessing the silt content, here with the Holocene sediments from the West Greenland Shelf in June 2007 onboard the RV Maria Sybilla Merian

Another reason for working in Greenland are the sediments on the Greenland shelf. These provide us with a climate archive that enables us to make comparisons with the late glacial to Holocene climate variations in Europe. We know that climate development west and east of Greenland is similar but is in opposite directions. We talk about the "seesaw effects". The best possibility for understanding these effects and therefore the global climate system is through "decoding" regional climate and paleoceanographic signals in sediments and comparing them with other climate archives such as ice cores. During our expedition, we obtained valuable sediment cores

from the West Greenland shelf and from Disko Bay, but also from the ice-free fjords. Evaluating the data is still ongoing, but important results have already been published.

Kamarujuk Fjord in West Greenland, June 2007: Jan Harff in the foreground with the RV Maria S. Marian in the background

You also visited the Kamarujuk Fjord during the Merian *expedition to Greenland.* You landed where *Alfred Wegener began his expedition and you spent some time there in silence. What was going through your head?*

It is moving to reach such a historically significant place for science. Alfred Wegener has decisively shaped our modern geoscientific thought. He is the example of a scientist who unflinchingly pursued his idea and, as a consequence, paid for this consistency with his life. I don‘t want to glorify such a life, but it nevertheless deserves my highest respect. The 1930/31 expedition was dedicated to a meteorological objective: to clarify the role of atmospheric processes over Greenland ice for North Atlantic weather events – an extremely vital issue in seafaring. However, Wegener's paramount importance for science lies in his preparatory work for developing the plate tectonics model, resulting in the victory of mobilism over fixism. We know that it was not the irrefutable available data that inspired Wegener in his continental drift hypothesis, but a conclusion by analogy borne from comparing coastal forms that border the Atlantic to the east and west. This conclusion required a high degree of intuition, something we talked about earlier when discussing my career decision.

There was also an esteemed political visit during the Greenland expedition on the Merian. *What can and should science achieve in connection with the political sphere?*

This visit was impressive because it demonstrates to us, the scientists “at the frontline”, that the political sphere is beginning to understand what role climate and climate change play for human society. Our onboard team was happy to outline the objectives of our work, explaining the results we had already seen and those we expected. We consciously did not interrupt our work for the visit, but had invited the politicians to watch us at our workstations on the ship and to ask us questions. We provided answers to their questions and in doing so got the impression that we honestly aroused their interest.

Chief Scientist Jan Harff (right) greets high-ranking political visitors onboard the RV Maria S. Merian off the coast of Greenland in June 2007: European Commission President Barroso (left) with wife, Danish Prime Minister Rasmussen (center) with his wife, and the Prime Minister Enoksen of Greenland (second from right)

There is of course the question of converting this interest into political action. This conversion certainly depends on the urgency with which we deliver our messages as well. We tested a method in Greenland, which I gladly recommend. We approached the locals and integrated them into our concept. I traveled to Greenland with my wife a year before the expedition and visited the high school in Uummannaq. We thought up a project together with the teachers in which we requested the students to survey their parents, grandparents and older acquaintances about changes they had experienced in climate and what effects they had on their way of life. We asked the students to

document the results. After a year, we stopped in Uummannaq with our ship and the students presented the results of the project to us. The negative effect of global warming on the local population's way of life clearly came to light, especially the shrinking access to the fjord ice for fishing and hunting. We later invited the students, teachers and interested citizens from the city to visit our ship in order to illustrate, on deck and in the laboratories, what we do in our work as well as the results of our research work.

As a result, I can name two goals we achieved: documentation, especially of qualitative data, on experienced climate change in the Uummannaq area and increased environmental awareness in the local population. In doing so, we reached the clientele who will carry our messages to politicians and will favor candidates in democratic elections who best represent their interests in environmental and climate change.

I think we could generalize our Greenland experience and from doing so, we should head in two directions. We as scientists should, on the one hand, seek out direct contact to the political sphere and provide convincing arguments for dealing with climate and the environment in a conscientious manner. The second political direction should be through indirect contact through the voters. We must make our messages generally comprehensible and convincing to the voters and to those who will become voters in the future, namely the youth. In this regard, we have many diverse channels of communication available: open houses at our institute, public presentations and the media.

After your retirement in Warnemünde, another phase of your scientific career opened up, namely in Szczecin – and with regular stays and expeditions in China.

My active period as a scientist in Germany ended with my retirement in 2008. To a certain extent, however, I felt as if I were in full swing and there were too many scientific questions that remained unanswered for me to simply quit working. These questions concerned the Baltic Sea coasts in particular. In previous studies we had concentrated on the southwestern coastal zones. However, since we know that the processes are only to be understood if one grasps the entire southern coastal region as a natural unit and must function across borders, the work now concerned the adjacent eastern areas.

I could turn to addressing these questions when I was invited by Andrzej Witkowski to the University of Szczecin as a Foundation for Polish Science fellow. After two years, in 2010, my fellowship converted to a professorship in marine geology, which I still hold today. My research program, which also involved scientists from Germany, Lithuania and Estonia, was now financed by the Polish Ministry for Science and Higher Education.

At the Pleistocene headlands on Wollin Island: Jan Harff with Ryszard K. Borowka and Krystyna Osadczuk (from left to right), both from the University of Szczecin, August 2008

Jan Harff with Di Zhou (left), South China Institute of Oceanology, Academica Sinica (SCSIO) and Zhichang Zheng (center) of the Guangzhou Marine Geological Survey (GMGS) onboard a fishing boat on the Pearl River estuary, 2004

My connections to China go back to many years of collaborations, which I had formed even from Germany. A colleague from the Chinese Academy of Science's South China Sea Institute of Oceanology (SCSIO), Di Zhou, invited me to China for the first time in 1999. We initially cooperated on the Pearl River estuary and tried to understand how the natural influences and anthropogenic stresses are represented in the sediment facies in the Hong Kong/Guangzhou/Macao triangle. We had a good area to which we could compare it: the Mecklenburg Bay, where the East and West once bordered each other and where heavily contaminated industrial waste had been dumped. Later Chaoyo Wu from Sun Yat-Sen University and Zhichang Zheng with his Environment Department at the Guangzhou Marine Geological Survey (GMGS) joined us as partners. Even though I'd worked at the Chinese Academy of Science's Yantai Institute of Coastal Zone Research to some extent, the institutes in Guangzhou still remain my primary partners in China.

The Chinese Vice Premier Liu Yandong presents the People's Republic of China medal for the International Science and Technology Cooperation Award to Jan Harff: Great Hall of the People, Beijing, January 10th, 2014

After my move to Poland, the German-Chinese projects then became Polish-Chinese projects, with German participation. Our main interest in this collaboration was fluvial-dominated shelf sediments, taking delta formations into special consideration. The working regions were the Pearl

River Delta and estuary, the Yellow River Delta and the Beibu Gulf at the northern shelf of the South China Sea.

This work involved looking at coastal and climate changes during the last ice age at the northern continental margin of the South China Sea. After several years of successful collaboration with the Guangzhou Marine Geological Survey (GMGS), we were able to convince our partners at the GMGS and the Hainan Geological Survey to undertake a project in the Beibu Gulf. In the meantime, an offshore borehole has been sunk on our recommendation there, which is currently under examination by a Chinese-Polish-German team. Altogether I regard the work, which I've been able to carry out since 1999, together with Chinese colleagues, as high recognition. In doing so, we are partially entering new territory in studying the interaction of climate, geological processes and anthropogenic influences in the Chinese marginal seas.

In our contacts with Chinese institutions, we are particularly excited by our relationships with the universities, where we are meeting a younger generation of highly motivated and gifted geoscientists through our courses.

You stress the importance of the interdisciplinarity. How well did this work out for you in physics? Or how did physics work for you?

Physics played a special role for me. Only through Heisenberg's uncertainty principle did I begin to understand the role of classification in geology, which I already needed and wanted to describe in my dissertation. It concerns the transitions between the continua, which the geologist must grasp and describe in the regionalization—that is, a border demarcation. This demarcation is hierarchical in that areas of discontinuities are to be determined that delimit relative homogeneous regions, which in turn are further segmented according to the geological objective. This hierarchical segmentation of the investigation area has, however, an objective lower limit, which is determined by the Sander "geological interim". That is a geological body in which the spatial juxtaposition does not reflect a temporal succession. Sander calls this area "eventless space-time", a definition equivalent to Heisenberg's uncertainty principle. Geological borders can be described stochastically and captured spatially using geostatistical methods – and therefore algorithmically. We translated this theoretical concept into practical procedures for analyzing sedimentary basins. We had two tracks of physics collaborations in geological process research. In estimating hydrocarbon maturation processes, that is, the genesis of petroleum and natural gas, the organic material's thermal stress in the bedrock plays a decisive role. In addition to proxy data from drilling, such as vitrinite reflectance, we used models for heat flux during basin lowering. We looked for physics collaborators at the University of Leipzig for this work. For describing spatially higher-resolution coastal dynamics we use physical concepts from "fluid dynamics". Here, too, research has progressed so much that effective synthesis can only be achieved through collaboration, meaning cooperation between experts in this field. I have implemented this idea in my projects through cooperation with physical oceanographers and by acquiring third-party funds for positions that were filled by physicists.

Interdisciplinarity, however, means a “panoramic view” for geoscientists. It’s not only physics, but also biology in particular, as well as chemistry and increasingly socioeconomics that are to be integrated into geoscience concepts today. We have fostered this type of cooperation primarily in our coastal research projects. The southern Baltic Sea projects concerned not only scientific-ecological understanding of the driving forces and processes in coastal changes, but also the impact on the ecological situation and the socioeconomic effects on residents living in coastal zones, on both the historic and prehistoric timelines. We met primarily during our expeditions on the research vessel *Professor Albrecht Penck*.

What would you like to pass along to young scientists on their career paths?

I think we should provide advice very early on to the younger generation—that is, as early as when they are choosing their professions.

Before making a decision, young individuals should have a realistic job profile that also includes what everyday work entails. Such job profiles are provided by internships or positions as assistants at an institute, engineering office, company or government body. Financial aspects should not be the only criteria in your decision. The career should make you happy and fascinate you as much as possible so that you’re equipped to master difficult phases that might arise. In terms of an emotional connection to a geoscientific career, I continue to recommend the book *Conversations with the Earth* by Hans Cloos, which I mentioned earlier. I would like to tell students and young colleagues: if you're inspired, follow your inner voice and don't lose sight of your goal.

You will achieve your aspirations, but sometimes you’ll need patience. I also recommend that you stay calm in the face of failure. The cause of each project or job application rejection is in part homemade. A cool-headed assessment is therefore vital for making another more successful attempt.

Many years ago, a former teacher of mine introduced me to his grandson who wanted to study geology. My teacher wanted me to give his grandson advice. When speaking to him, I realized that his impressions of the geology profession were idealized and unrealistic. I then also described the downsides of the profession and got the strong impression that this would prevent him from studying the subject. I then met him the same year at the Institute for Geography and Geology at the University of Greifswald: he had enrolled as a geology major. Today he's a professor at an Australian university.

I also recommend you start looking beyond the discipline's horizons as well as beyond national borders early on. The immense scientific tasks of our time that we must address – climate change, shortage of geo-resources (including energy resources), environmental pollution, globalization and digitalization of the working world – are complex and can only be resolved through interdisciplinary and international cooperation. Interdisciplinary and international networking is therefore the best foundation for successful design and implementation of research work.

There is one more criterion that should be given consideration. That is your satisfaction with your career. We don't operate in a vacuum, but are bound by the imperative of fruitful activity[4]. This is why I recommend dialogues with the societal groups that we want to benefit from our work—known as stakeholders—before, during and after undertaking a research project. This requires transparency, honesty and using language that the partners on the other side will understand.

May we ask you another question – what would you recommended to older colleagues whose long-term professional careers are coming to an end?

I have no right to give advice to colleagues at that age. This is something everyone must decide for themselves. I can only say what worked well for me. I am, however, an exception, coming from a transitional period between two political systems. I was only able to enter my chosen profession of marine geology very late. So for me, when I was forced to retire in Germany, there were too many questions left unanswered for me to just quit, and I very happily accepted the invitation to Poland so that I could answer these questions. No one lives alone in the world though and there's usually a family that has a say in matters. I was lucky in that my wife supported my ideas throughout my entire professional life and provided constructive criticism in many discussions. She therefore supported my decision ten years ago to move to Poland. She even accompanies me to Szczecin, so we share many beautiful experiences as well as struggles. For that, I am grateful.

[4] The requirement to work toward beneficial outcomes based on Kant's Categorical Imperative.

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