

## THEN &amp; NOW

## Annalen der Physik – a brief history of a living legend

Guido W. Fuchs

Just in time for its 222 anniversary the journal *Annalen der Physik* will experience a metamorphosis – crowned by its relaunch in January 2012. From next year onwards readers can expect a new content, a new look, and a new editorial team. And all this happens for good reasons. Today, the publishing world is under constant pressure to change. This also holds for academic journals and consequently for *Annalen der Physik*, too.

*Annalen der Physik* – AdP<sup>1</sup> appears as a landmark of modern physics, an institution, distinguished by works from Einstein, Planck and other extraordinary talents. But what makes it unique today? The age of print media is said to be over. Our time is dynamic and digital. Nowadays, science articles are delivered electronically, e.g. as pdf or XML documents, right to the researchers office desk or laboratory. Literature search is done via specialized databases or general search engines like Google and the like. In addition, successful journals advertise their content and use the internet for marketing purposes, e.g. utilizing news portals, newsletter, rss-feeds, facebook, twitter, etc. Over the last 200 years the amount of published physics articles has increased exponentially. None of the established and well-recognized journals can deal with the vast flood of information. Filtering out the essence, i.e. information that most likely will advance physics, is the main task of editorial manuscript selection and article compiling. High peer-review quality standards will be more and more important. This especially holds for the general physics journal *Annalen der Physik*, which no longer claims to be a comprehensive manuscript archive, as in the early times, but rather focuses on key aspects of modern physics.



Editors-in-Chief of *Annalen der Physik* from 1790 until 1947  
(top, from left) Friedrich Albert Carl Gren, Ludwig Wilhelm Gilbert,  
Johann Christian Poggendorff, Gustav Heinrich Wiedemann,  
(below, from left) Eilhard Wiedemann, Paul Drude, Wilhelm Wien, Max Planck

This change in scope is good reason to reflect on the past events of this journal.

### Birth of a legend (1790–1824)

The story begins with Friedrich Gren, a natural scientist born in 1760 in Bernburg/Saale, who held a position as professor in Halle, Germany.

The general progress in natural sciences in Europe at the end of the 18th century was remarkable. In comparison to other European countries Germany was only scientific province at this time. Most new findings were published in minutes of society meetings or academy reports,

e.g. in Paris, London or Saint Petersburg, or were propagated by private communications in the form of letters. Thus, ideas could only circulate within small and elitist communities. Gren believed that the lack of a suitable communication and publication medium was jointly responsible for the weak performance of German research. Inspired by the 1778-founded chemical journal of his teacher Lorenz von Crell (“Crell’s *Annalen*”) Gren started his own journal “*Journal der Physik*” in Halle. In the preface of the first issue in June 1790 he wrote: “My purpose of publishing this journal is to make acquainted with the discoveries in mathematics and chemistry of the foreigners and na-

<sup>1</sup> Engl.: Annals of Physics

tives in the field of the natural sciences [...]“. Accordingly, translations of foreign works built an important base for the new journal. With his journal Gren also aimed to give amateurs (“Privatmann”) access to recent research, both as reader as well as author. Important topics were thermodynamics, electricity and magnetism. Gren died in 1798, only 38 years old. His journal marked the beginning of a legend – the home journal of the most distinguished minds in physics.

Ludwig W. Gilbert, born in 1769 in Berlin, was a mathematician and geographer and in 1801 succeeded Gren as university professor in Halle. Already, Gren had worked towards a relaunch of his journal under the new name *Annalen der Physik*. Now in 1799, Gilbert continued his mentor's work and the journal appeared for the first time under the new name. It was denoted as series<sup>1</sup> number one out of eight series until today. Gilbert translated, edited, and enriched many original foreign articles with didactic finesse to the benefit of the German reader. He edited 76 volumes and served *AdP* for a full quarter-century.

During his time physics did not have the rather well-defined topical focus and conformity that it has today. Thus, many articles appeared that nowadays belong to meteorology, climatology, geography, nautical science, or even biology. Still, most publications were in the core area of physics, like the translations of works by David Brewster, Michael Faraday or Joseph Gay-Lussac. Electrochem-

istry was a timely topic as well, with contributions from Johann Wilhelm Ritter, Sir Humphrey Davy and others. *AdP* reported on Ampere's work about magnetic phenomena and their relation to moving electricity. However, the final Ampere's law from 1824 did not appear in the journal. From the first issue of *Annalen der Physik* until volume 30 (1808) the journal appeared at the publisher *Rengersche Buchhandlung* (Renger's Bookstore) in Halle. From volume 31 (1809) onwards, i.e. from series two of the *AdP*, Johann Ambrosius Barth (1760–1813) became the publisher of the journal [1]. As it turns out, the journal was published by the publisher J.A. Barth for more than 180 years until 1992. Originally, Gilbert aimed for physics articles only, but this proved to be difficult and from 1819 to 1824 the name of the journal was extended to *Annalen der Physik und der physikalischen Chemie*<sup>2</sup>.

### The Poggendorff Era (1824–1877)

In 1820 Johann C. Poggendorff (1796–1877) studied natural sciences at the university in Berlin. Already in 1823 the young man was thinking about starting his own chemical-physics journal. After the unexpected death of Gilbert in 1824, Poggendorff realized that there was a chance of becoming the editor of *AdP* and contacted the publisher Verlag J.A. Barth. Poggendorff knew exactly what he wanted: Either become editor of *AdP* or start his own journal that he intended to become the leading journal in physics and chemistry in Germany. He spoke with leading scientists to ensure their willingness to publish with him and used these connections to put pressure on the J.A. Barth publisher. Surprisingly, his plan worked out. Poggendorff, only 28 years old, boldly managed to become editor of *AdP* and published his first issue in

1824 under the name *Annalen der Physik und Chemie*<sup>3</sup>. The new editor arranged for the new name because he thought that both physics and chemistry could not be separated in a meaningful way.

In the second half of the 19th century translations of foreign works lost their importance for the journal to the benefit of original contributions and appeared only infrequently from that time onwards. This development was due to new physics institutes at German universities that were founded in the course of the Prussian university reform. These institutes had an explicit order to promote and perform research, as opposed to the previous “Cabinette”. The first institutes were founded in Leipzig and Göttingen and were inspired by the French *Ecole Polytechnique*. The amount of new findings made Poggendorff publish in total seven supplementary volumes in addition to the regular *AdP* volumes.

In 1874, at the 50th anniversary of “his” *Annalen*, Poggendorff outlined what he considered to be the most important topics: “Electrodynamics, induction, diamagnetism, photomagnetism, thermochrosy, telegraphy, photography, diffusion, fluorescence, spectral analysis, and mechanical theory of thermodynamics”.

From today's point of view not all scientific-editorial decisions from Poggendorff were free of errors. For example, the works by Julius Mayer (1841) and Hermann v. Helmholtz (1847) about the principle of energy conservation were not accepted for publication in *AdP*. Also, Philip Reis's invention of the telephone was not appreciated, neither was Sadi Carnot's work from 1824 about the heat engine. Only nine years later, Benoît Clapeyron's article appeared in *AdP*, where he explained Carnot's thoughts in a more practical way. On the other hand, Rudolf Clausius's concept from 1850 containing the first and second law of thermody-

<sup>1</sup> The term series is a translation of the German ‘Folge’. However, in some cases a ‘Folge’ was subdivided into ‘Serien’, i.e. subseries. In this essay series always refers to ‘Folge’.

<sup>2</sup> Engl.: Annals of Physics and Physical Chemistry

<sup>3</sup> Engl.: Annals of Physics and Chemistry

namics, which basically equals the concepts of Joule and Carnot, was well received and is one of the highlights of *AdP*.

In the area of electricity *AdP* reported about Ohm's current–voltage law, as well as Faraday's numerous experimental investigations that, for instance, contained his discovery of magnetic induction and its visualization through magnetic lines of forces, the behavior of dielectrics, the introduction of electric lines of forces and the discovery of diamagnetism.

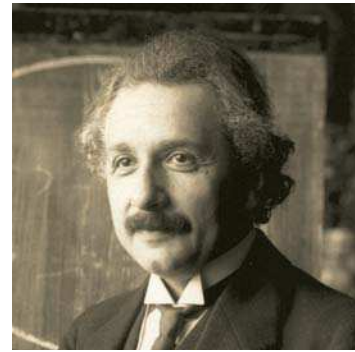
Poggendorff took care of the *AdP* for 53 years. He was the editor of 160 volumes. His *Annalen der Physik und Chemie* were simply called the *Poggendorff Annalen*. The heyday of the journal was between 1850 and 1920. During that time *AdP* developed into one of the leading physics journals in Europe, if not *the* leading journal. With only a few exceptions, reading *AdP* sufficed to keep oneself up-to-date in physics [2]. In addition, *AdP* was very popular and was not only subscribed by university libraries, but also by many secondary<sup>3</sup> and technical schools.

## The Heydays (1877–1914)

After Poggendorff's death in 1877, the publisher Hans Barth appointed the 51-years-old Gustav H. Wiedemann (1826–1899) as the new editor of *AdP*. Right at the beginning, *AdP* cooperated closely with the Physical Society of Berlin (PGzB)<sup>4</sup>, which was realized by appointing Hermann



Hermann Helmholtz



Albert Einstein (Credit: ÖND/Wien, Bildnummer LSCII 0081-C)

Helmholtz as coeditor of the journal. The “extraordinary increase of the material [...] and the fact, that in addition to the *Annalen* also other comprehensive journals have been founded” (Helmholtz 1893), led to fewer and fewer articles being published in *AdP* that belonged to chemistry, mineralogy, metrology and physical chemistry. As a consequence of this ongoing differentiation of the natural sciences into subfields, *AdP* began to focus on publishing articles solely from physics. In addition, it became more difficult for authors to publish in *AdP* due to increased editorial selection criteria, as Helmholtz (1893) states: “The number of German manuscripts has gradually increased over time, so that by now, only a selection of those can be considered.” In 1893, Gustav's son, Eilhard Wiedemann (1852–1928), became Co-Editor-in-Chief of *AdP*. After Helmholtz's death in 1895 Max Planck (1858–1947) took over his role and supported the *AdP* as coeditor on behalf of the PGzB. Only four years later, in 1899, Gustav Wiedemann passed away in Leipzig. His son Eilhard, although himself a professor of physics at the University Erlangen, declined to take over full responsibilities for the journal and finally resigned as editor from *AdP*. Paul Drude (1863–1906), who nowadays is considered as one of the pio-

neers of solid-state physics, became the new Editor-in-Chief of *AdP*. Thirty-six years old, talented, dynamic and already in permanent position as professor, Drude seemed to be an ideal choice. In addition, he resided in Gießen, a medium-sized German town in Hesse, and thus did not belong to the Berlin physicists community that in the rest of the German Reich was often perceived as too dominant. In 1900, with the change of editorship, *Annalen der Physik und Chemie* were renamed to *Annalen der Physik* and the journal has kept that name ever since. It was now the fourth series of *AdP*. One novelty was the introduction of an Advisory Board<sup>5</sup> of five professors, with Max Planck being one of them. Despite Drude's scientific brilliance he seemed to be rather less determined and less critical in editorial matters. Very much to the displeasure of Planck, many manuscripts of low quality passed Drude's judgment. But it was also the time when legendary papers of modern physics were published in *AdP*. For example, Planck's work about the energy density distribution of the black-body radiation<sup>6</sup> was published in *AdP*, where he also introduced the quantum of action  $h$ , the constant now named after him. This work was generally regarded as the beginning of quantum theory. In 1905, Albert Einstein published seminal papers in

<sup>3</sup> Here Secondary School is used as a translation for the German Gymnasium.

<sup>4</sup> Orig.: Physikalische Gesellschaft zu Berlin, PGzB

<sup>5</sup> Orig.: Kuratorium

<sup>6</sup> M. Planck, “Ueber das Gesetz der Energieverteilung im Normalspektrum”, *Ann. Phys. (Berlin)*, 309(3), 553–563 (1901)



Editors-in-Chief of Annalen der Physik from 1947 until today

(top, from left) Eduard Grüneisen, Friedrich Möglich, Hans Kopfermann, Gustav Richter (Photo: Th. Richter),

(below, from left) Hans-Jürgen Treder (Photo: bpk/Gerhard Kiesling), Wilhelm Walcher, Bernhard Mühlischlegel, Ulrich Eckern

*AdP* that built the base for his later fame [3]. At that time, Einstein was mostly unknown to the relevant academic circles and was not working in academia. It is thanks to Drude that Einstein's works were published in *AdP*. However, Planck was one of the first who realized Einstein's genius and the importance of his work. Also, Planck helped this 26-year old patent office clerk to start an academic career and later made great efforts in attracting Einstein to Berlin.

On July 5, 1906 Drude committed suicide. The reasons remain unknown. Planck and Wilhelm Wien (1864–1928) became the new Editors-in-Chief of equal rights. However, Wien was more involved in the day-to-day business of the journal, whereas Planck reserved the right to be consulted in all critical cases like manuscript rejections or revisions. At that time, Planck was already a well-known scientist and an accepted long-standing editor of the *AdP*. Planck appeared as an author of *AdP* already in 1881 and published predominantly in this journal during his whole life. His last article in *AdP* appeared in 1941. In 1947, after the war,

he was involved in the reactivation of the journal [4]. Thus, Planck accompanied *AdP* over 66 years – truly momentous years of the journal.

### Times of crisis (1914–1945)

The political and economic crisis did not go unnoticed by the *Annalen der Physik*. As opposed to 3800 published pages in the year 1914, the number quickly reduced to 2100 pages in 1918 induced by the war – a decrease by 45%. In the following years, this number further decreased reaching a trough of 1800 pages in 1921. Besides the *AdP* and the 1899-founded journal *Physikalische Zeitschrift*, a new journal *Zeitschrift der Physik* came into existence. In 1920, with the acceptance of the German Physical Society (Deutsche Physikalische Gesellschaft, abbrev. DPG), the publisher Vieweg launched the new journal that soon turned out to be a strong competitor for *AdP*. The new journal managed to publish many important works of young researchers in the booming field of quantum physics, like those from Max Born and Werner

Heisenberg. In view of these young scientists *Annalen der Physik* appeared no longer timely, because it was known that Planck and Wien were skeptical towards the new trends in quantum mechanics. Here the young Erwin Schrödinger was an exception. His four ground-breaking articles about the “Quantization as Eigenvalue Problem”, published in 1926, appeared in *AdP*. In these works, Schrödinger outlined his wave-mechanical approach that nowadays is a cornerstone of quantum mechanics. But there were also other examples of important contributions in quantum theory that appeared in *AdP*, like the works from Maria Göppert-Mayer from 1931 “Elementary processes with two quantum transitions”, Max Born and Robert Oppenheimer's 1927 article “About the quantum theory of molecules” or Wolfgang Pauli's 1922 contribution “On the model of the hydrogen molecule ion”. In addition to the domestic competitors, international journals also appeared on the scene, like the *Physical Review* that already used the modern peer-review procedure to quality check its manuscripts.

In 1928 Wien died. His successor Eduard Grüneisen (1877–1949) started to serve the *AdP* in 1929 and this marks the start of a new *AdP* series, the fifth. It was the time of Hitler's rise and with the advent of the Nazis a turning point in German history had been reached, not only for the *Annalen der Physik* but also for German science in general. A flood of German emigrants, persecuted because of their political opinion or their race, left the country, among them many authors of *AdP*. The myriads of personal tragedies that took place was not directly reflected in the *AdP*, however, the absence of many important articles was significant – mostly those from Jewish authors. Accordingly, the decrease in page numbers until 1939, i.e. already in prewar time, was signifi-

cant. Planck and Grüneisen managed to keep the politics out of the *AdP* daily business as much as possible. Thus, even in the late 1930s works from Lise Meitner, Rudolf Ladenburg, Paul Ewald, and Richard Gans appeared in *Annalen der Physik*. But over time, fewer and fewer emigrants published in German and preferred foreign, mostly English language journals. In spring 1938 Debye, together with other guest editors, organized a special issue in honor of Arnold Sommerfeld's 70th birthday. In this context, the publisher approached the organizers with the request to only publish articles from "Arian" authors. This unparalleled case of open racism triggered protests and outrages by many physicists and most prominently by Wolfgang Pauli. But in the end, the special issue appeared as wanted by the publisher.

With the outbreak of the second world war in 1939 the number of contributions again reduced significantly. Shortly after the assassination attempt on Hitler on July 20, 1944 all companies and factories that had no direct war-relevance were closed and large parts of the population were obliged to work in the armaments industry. In the course of these 'total warfare' measures the publishing house J.A. Barth in Leipzig was also closed down and with that *Annalen der Physik* de facto ceased to exist.

## Divided but together (1946–1990)

Germany was broken, the war lost. The severity of destruction, ongoing resentments and loss of manpower made a restart difficult. Grüneisen, who lived in Marburg, which was situated in the Western zone of occupation, had no hope to get permission from the Western allied powers to relaunch the *Annalen der Physik*. After Max von Laue's discharge from

Farm Hall (U.K.), where he had been detained as a prisoner of war, and his return to Germany in 1946, he immediately started with the rebuilding and organization of the German science and physics program. Laue was involved in many projects East and West of the ideological border and independent of the political landscape within Germany. He recommended his former PhD student Friedrich Möglich (1902–1957) as co-Editor-in-Chief of *AdP*. The appointment of a Western and an Eastern Editor-in-Chief of *AdP* remained common practice for the journal until 1992, i.e. until shortly after the German reunification. *Annalen der Physik* adhered to the conviction that both parts of Germany belong together. Only during a short period, between 1950 and 1951, was this new tradition disrupted.

On August 1, 1946 the Soviet military administration granted permission for the restart of *AdP*: "For the benefit of German science and for the benefit of humanity and international understanding". But the license came with some restrictions. *AdP* was not allowed to publish certain branches of physics like nuclear physics, semiconductor physics, high-frequency technology and electronics. It was now series six of the *Annalen der Physik*. Grüneisen and Möglich, as well as Planck who died in 1947 shortly before the first new issue appeared, were the first editors after the war. The journal clearly emerged debilitated from the past crisis and published only 500 pages per year, only occasionally were 1000 pages realized. Though *AdP* still published articles of high quality and long-term importance until the 1940s and 1950s – at least from time to time – the heydays were clearly over. *AdP* lost ground compared to other international journals like *Physical Review* that now took the lead. Relevant nations in the field of physics were the

USA and the Soviet Union. As opposed to the prewar situation there were almost no contributions from non-German authors in *AdP* which, continued to publish in German language.

The successor to Grüneisen, who died in 1949, was Hans Kopfermann (1895–1963) who started to serve *AdP* in 1952 as the West German editor. After Friedrich Möglich's death in 1957 Gustav Richter (1911–1999) became the new East German editor. This marked the beginning of a new series, series seven of *Annalen der Physik*. In East Germany the Socialist Unity Party was worried about its security due to an allegedly ongoing mass migration of its citizens into the Western zones. It was decided to fortify the national borders and the building of the Berlin Wall in August 1961 marked the beginning of a thirty-year physical isolation and separation of West and East Germany. The *AdP* publishing house remained in Leipzig, i.e. in East Germany. Regardless of the new political situation *AdP* followed its policy to appoint two Editors-in-Chief from East and West Germany, respectively. The successor to Kopfermann was Wilhelm Walcher (1910–2005) for the Western Federal Republic of Germany and Hans-Jürgen Treder (1928–2006) for the Eastern German Democratic Republic (GDR).

## Times of reunification (1992–2011)

With the end of the cold war and of communist regimes in the former Eastern Bloc a new era began for *AdP*. The journal was restructured in 1992. The Hüthig GmbH, Heidelberg/Germany took over *AdP* from the former J.A. Barth publishing house. At that time the J.A. Barth publisher was already state property of the GDR since 1988. However, Hüthig published

*AdP* still under the former publisher's trademark 'J.A. Barth Verlag' until 1998. Once again, a new series started: Series No. 8. Bernhard Mühl-schlegel (1925–2007) from Cologne/Germany became the new Editor-in-Chief of the *AdP* in 1992. The Advisory Board was dissolved and replaced by three international co-editors, among them Alexei Abrikosov who later won the 2003 Nobel Prize in Physics. From that time onwards *AdP* published solely in English. The journal intended to be globally more visible, and attractive for young scientists. However, the manuscript submissions fell behind expectations and gave rise to concerns about the future of the journal.

In 1998, Mühl-schlegel was 73 years old and handed over editorship to the theoretical solid state physicists Ulrich Eckern from Augsburg. In the same year, in the course of a restructuring measure Hüthig sold ten of its academic journals to the publisher Wiley-VCH (Weinheim/Berlin). Among these journals was *AdP*. At the same time, the 120-year old cooperation with the DPG (and PGzB) ended. Now, for the first time, and in addition to the print issues, the journal appeared in electronic form. Furthermore, old print issues from 1799 onwards were scanned and refurbished, and have been available in electronic form since 2006. In the year 2005, in honor of Einstein's *annus mirabilis* *AdP* introduced the *Einstein Lectures*. With this distinction contributions from important prize winners, like the Nobel Prize winners Theodor Hänsch (MPQ Garching), Roy J. Glauber (Harvard), or Peter Grünberg (FZ Jülich) were highlighted.

### The new *AdP* (2012)

Ulrich Eckern will end his term as *AdP* Editor-in-Chief at the end of 2011, after 14 years of successful lead-

ership. From January 2012 onwards the journal will be run directly by the publisher with an in-house editorial team with Guido W. Fuchs as the new Editor-in-Chief. The former Editorial Board members Friedrich Hehl, Bernhard Kramer, Gerd Röpke and Andreas Wipf will continue to serve for *AdP* as Honorary Advisory Board members. They will be joined by Ulrich Eckern and Ingo Peschel, who is currently an Advisory Board member. Ingo Peschel, for example, had been crucial and supportive in difficult times, right after the German reunification, during the start of the 8th series in 1992, but also later when Bernhard Mühl-schlegel handed over editorship to Ulrich Eckern in 1998.

The scope of the journal is still to publish *general physics* – in all its aspects. This also includes topics in applied physics. Letter articles will be newly introduced. The *Einstein Lectures* will be revived and continued. The section '100 years ago' will be ceased. Translations of originally German articles into English will not be published as separate articles in current issues but appear as additional material to the original articles. Historical essays *Then & Now* will be introduced with contributions from the Max Planck Institute for the History of Science (Berlin/Germany). In addition, there will be an *Expert Opinion* section where authors can comment on recent or copublished articles in *AdP* in a brief essay form.

In 2012, *AdP* will have changed completely. It is set up to serve an international readership, and although *AdP* has experienced several renamings, it is not considered to change the title into an English one because meanwhile the name *Annalen der Physik* belongs to our international cultural heritage.

To emphasize the continuation of scientific publishing from its first appearance as *Annalen der Physik* in 1799 until today, already in 2009, the

volume counts were officially changed [5]. Previously, volume numbers restarted with the beginning of a new series (Folge), e.g. the latest series No. 8 started with volume 1 in 1992. Now, all volumes are counted from the first one in 1799, so that volume 523 refers to the volume published in 2011. The relaunch of *AdP* in 2012 will not trigger a new series. Instead this concept of series is abandoned. The progress of *AdP* will simply be denoted by its volume number.

Shaping the future of a journal is not completely in the hands of the editor or publisher. The most crucial input has to come from the scientific community. It remains to hope that *AdP* will be well received by the physicists and interested scientists. *Annalen der Physik* has good intentions. It wants to serve the physics community. It has always been a journal acting as a mirror of current research and this is also its guiding theme for the future: Knowing *Annalen der Physik* means knowing physics.

**Acknowledgements.** The author thanks Dieter Hoffmann and Ulrich Eckern for their kind support and suggestions.

### References

- [1] K. Wiecke, 200 Jahre Johann Ambrosius Barth (Verlag Johann Ambrosius Barth, Leipzig, 1980), pp. 17–30.
- [2] F. Hund, Die Annalen im Wandel ihrer Aufgabe, *Ann. Phys. (Berlin)*, **502**(4), 289–295 (1990).
- [3] J. Renn (ed.), *Einstein's Annalen Papers* (Wiley-VCH, Weinheim-Berlin, 2005).
- [4] D. Hoffmann (ed.), *Max Planck: Annalen Papers* (Wiley-VCH, Weinheim-Berlin, 2008).
- [5] G. W. Fuchs and U. Eckern, *Ann. Phys. (Berlin)* **522**(6), 371 (2010).