When Professor Friedrich asked me to give this presentation about a year ago, it was more or less a research project. I had never dealt with this topic before but soon discovered that there are several valuable secondary sources to rely on. I try to mention all these in my following presentation but in case somebody is missing a quotation, I apologize in advance. Then, I had to make some important decisions right at the beginning mainly what to present in only thirty minutes time. There are certainly huge libraries full of textbooks and manuals worldwide and the literature dealing with textbooks and manuals is also filling libraries, somewhat, but not considerably smaller. Going with you through all of this material in chronological order or so would certainly not have been a very good idea. So I decided to give some outstanding examples and to highlight two particular aspects: the ambivalence of pharmacy between science and practice on one hand and international relations on the other.

Silvana Schumacher, Andrea Kanold, Armin Wankmüller, Christoph Friedrich, Wolf-Dieter Müller-Jahncke and others highlight that for centuries, Pharmacopoeias served as main teaching aids in the education of apprentices. Being somewhat like the professional bible of the pharmacist, legally mandatory and the main source of prescriptions, it is totally clear that the main task of the master was to teach his apprentices every single preparation step necessary for the compunding of drugs and dosage forms described therein. As long as more or less mechanically drug compounding dominated pharmacy practice, apprentices will mostly have improved their skills in a learning-by-doing approach supervised by an experienced master relying on the local pharmacopoeia. These books, however, were mere collections of prescriptions,
lacking any comment and theoretical considerations. In the second half of the 18th century, pharmacists began to follow a different, more scientific and theory driven approach and became more and more involved in science themselves. The need for a more theoretical basis of the profession is clearly reflected by a number of innovative and highly successful textbooks edited from the 17780s onwards. Concerning the German situation, most authors consider the first edition of Karl Gottfried Hagens “Lehrbuch der Apothekeerkunst”, which appeared in 1778, as a main corner-stone, although some other volumes preceded this development.

Karl Gottfried Hagen was born in Königsberg in 1749 and started apprenticeship there with his father, owner of the “Hof-Apotheke”. He studied medicine from 1769 to 1771 and nevertheless took over his father’s pharmacy a year later which he continued to operate besides his following academic career which was promoted, among others, by the great German philosopher, Immanuel Kant. In 1788, he was awarded full professor of medicine at Königsberg University. In their “Dictionary of Eighteenth Century German Philosophers”, Manfred Kuehn and Heiner Klemme state that “his ‘Textbook on the Apothecary Art’ helped transform what had been a craft into a true science taught in the university”. It is more than of symbolic value that this landmark publication was edited by a pharmacist who was a medical professor in his second life. Making both perspectives his own, he clearly served as the right author the right time. The work was edited in eight revised editions until 1829. Additionally, several unauthorised reprints, in other words, piratic editions had appeared on the market, in particular those produced by Johann Thomas von Trattner in Vienna who lived from unauthorised publishing almost exclusively.

In the preface Hagen stated that, as the State Pharmacopeia was available in every pharmacy, no prescriptions were listed. Instead, he could concentrate on matters of obviously educational purpose, mainly descriptions of raw materials and methods of their collection, judgement, and storage. This was exactly what
the disciples had to expect from a textbook, and what made Hagens work exceed its predecessors, explanations and background knowledge for daily practice. Therein, one may also see a first step forward from a purely technical viewpoint of the profession to a scientific one. Hagen himself clearly expressed this sensation: Despite using the term “Apothekerkunst”, “Pharmaceutical Art” in the title of his book and largely throughout the text, he discussed in the preface the relationship between “Art” and “Science” in pharmacy and it became totally clear to the reader that he saw an urgent need for a more scientific education of pharmacists: “The art of pharmacy is that kind of applied science that deals with the judgement, collection and storage of raw drugs and the compounding of composite ones.” Scientific or rational pharmacy is distinguished from empirical pharmacy by the ability to give “reasons” for the phenomena empirically observed. Hagen regarded the pharmacist mainly acting empirically as an “artist” while that one who is able to explain what he’s doing, a scientist. The book itself was divided into four different sections, devoted to “The Art of Pharmacy in General”, “Crude Drugs”, “Pharmaceutical Operations”, and “Pharmaceutical Preparations”. Thus, he followed the didactic concept of describing the pharmaceutical work as a natural sequence, starting with crude drugs which were, treated by several mechanical operations, eventually composed to the final preparation. This was, of course, highly innovative as being completely different from any pharmacopeia-focused or enyclopedial literature. According to Silvana Schumacher, who investigated 83 multidisciplinary German pharmacy textbooks edited between 1725 and 1875, Hagen’s approach, which was also followed by several other authors, was only one out of several didactical concepts of that period. Other authors paid special attention to pharmaceutical chemistry, as did Johann Bartholomäus Trommsdorff in his “Systematisches Handbuch der Pharmacie für angehende Aerzte und Apotheker”, firstly edited in 1792. Trommsdorff also discussed the ambivalence of pharmacy between art and science eventually coming to the
conclusion that the profession was something in between, a “systematic art”. Another approach tried to discuss the manufacturing procedures in close context with the basics of natural history or descriptive science. In the mid of the 19th century, some textbooks strictly followed the education course and intended the use of the book as a companion through pharmaceutical education, starting, for example with daily cleaning of working equipment, most probably one of the first duties of a pharmacy apprentice.

Around 1800 the scientific movement in pharmacy continuously intensified and a theoretically based education of pharmacy apprentices became an urgent need, even before university courses were offered in the first decades of the 19th century. Hagen’s publication, which saw eight improved and enlarged editions until 1829, soon faced competitors. So for Germany between 1800 and 1840, Armin Wankmüller could identify approximately 25 different textbook authors and about 50 relevant editions. The strong competition on the textbook market may be one reason for the authors to address a wider audience than the pharmacy apprentice alone. So many publications claimed to be also useful as a manual for pharmacy practice while others aimed at the education of physicians. While Hagens editions kept the term “Lehrbuch” in their title, many other authors prefered the term “Handbuch” to imply their usefulness in daily practice.

Authors additionally had the problem to cope with the tremendously increasing knowledge which made some authors split their contents into several volumes. While Hagen’s textbook was split into two volumes from the fourth edition onwards, other authors followed a multi-volume concept from the very beginning. An outstanding example in this respect is the “Vollständiger Inbegriff der Pharmacie in ihren Grundlehren und praktischen Theilen” by Johann Andreas Buchner, which started with its first volume “Einleitung in die
Pharmacie” in 1821 and ended in 1840 after the edition of four parts and nine volumes in total.

To summarize so far, German textbook literature considerably grew from the end of the 18th century onwards with a great variety of didactical approaches. I am grateful to Olivier Lafont who informed me that the development in France was quite similar to that in Germany. So in 1788, ten years after Hagen’s landmark textbook, Jacques Francois Demachy published its “Manuel de Pharmacien ou instructions sur les différents objets d’Etudes nécessaires aux Elèves en Pharmacie», which was clearly intended for the education of young pharmacists.

In Britain and the US, development started some decades later, so in 1842, the British Society of Apothecaries established its first school of pharmacy in London which brought an urgent need for relevant textbook literature. The curriculum there was dominated by chemistry as well, and many lecturers were educated chemists. Pharmacy in its narrow sense was taught by Theophilus Redwood, a Welsh pharmacist and one of the founding members of the Royal Pharmaceutical Society. Commonly he is regarded as the first Professor of Pharmacy in Britain. As such, he was involved in publishing the professional journal and served as a librarian of the society. So he was certainly aware of the lively publishing activities of his colleagues in Continental Europe. In their “History of Pharmacy”, Edward Kremers and George Urdang stated: “England had never – in literature and elsewhere – hesitated to take the good where she found it, and translations of French and German books were not uncommon” (KU 381). Obviously from a variety of choices, Redwood took the “Lehrbuch der Pharmazeutischen Technik”, written in 1847 by the German Pharmacist Karl Friedrich Mohr who should later become Professor of Pharmacy at the University of Bonn. The time he edited the book, he still practiced pharmacy in
the city of Koblenz. While preceding textbooks usually were scarcely illustrated, the volume contained more than 300 woodcuts of pharmacy equipment and technological instruments. Soon after the original publication, Redwood translated Mohr’s text into English, but soon he learned that the text needed serious changes in order to meet the needs of British pharmacists. As a result, he heavily edited the text and wrote numerous additions: firstly elaborations on methods particular to British pharmacy and secondly extended explanations for the presumably less educated British audience. According to Greg Higby, the final version “was about half Mohr and half Redwood”. The United States opened their first School of Pharmacy, the Philadelphia College of Pharmacy, in 1821 and in 1846, William Procter, known as the “Father of American Pharmacy” became Professor of Pharmacy there. He immediately saw the urgent need for a specific textbook and came across the British Mohr/Redwood edition. He did not spend much effort in adapting the English text to American style and led the British spellings unchanged. However, he added almost 150 pages of his own and added 100 illustrations. He clearly intended to customize the volume, according to its title “Practical Pharmacy” to the specific needs of pharmaceutical practice in the US, but also added scientific information like tables of solubility, temperature conversion and so on which were also borrowed from British sources. Despite all these efforts, however, the book was not really a success – it sold not very well and never saw a second American edition. Nevertheless it will certainly serve as an important example of pharmaceutical knowledge transfer in the mid-19th century.

In the 19th century, many pharmaceutical textbooks were translated from German to French and English and vice versa but, most probably because not being adapted to the specific educational needs, none of those became sustainably successful. The degree of knowledge transfer by these translations certainly needs separate investigations. It should, however, briefly noted here that European textbooks seriously influenced the development of pharmacy in
Japan. So the author of the first Japanese systematic chemistry textbook, Yoan Udagawa, used the “Epitome of chemistry”, originally published by William Henry. According to Wolfgang Götz, the famous German pharmacist Johann Bartholomäus Trommsdorff prepared a German edition in 1803, while a Dutch version was edited by Adolph Ypey the same year. As ties were close between the Netherlands and Japan in the first half of the 19th century, the Ypey edition reached Japan and was adopted by Udagawa, who also referred to another Trommsdorff work, the “Systematisches Handbuch der gesammtten Chemie”.

Coming back to the US, it has to be stated that a publication earned much more success than the Mohr/Redwood/Procter work. This was written by a colleague of Procter in Philadelphia, Edward Parrish, in 1855 and obviously met the needs of American pharmacy students much better than did the German-British-American amalgamation. Parrish called his publication “Introduction to Practical Pharmacy” which still laid the focus on daily professional needs rather than their scientific background. After preliminary remarks, Parrish devoted the first major part to “galenical pharmacy”, the second one to organic, and the third one to inorganic chemical preparations. A last main part was devoted to “extemperaneous pharmacy”. In most cases, particular prescription examples and formulas were the starting point for explanations following. This approach is clearly reflected in the preface to the second edition, where Parrish wrote: “This volume is not the work of a secluded student in his closet, it has been composed by a practical pharmaceutist and druggist, in the midst of the daily routine of his shop.” He, however, did not neglect the advancements, chemical science brought to pharmacy. So he added a “Note on the Progress of Pharmaceutical Chemistry” and stated “that chemistry and pharmacy are so closely allied as that the progress of the former is inseperably connected with the extension and usefulness of the latter.”

The ambivalence between science and practice in pharmacy accompanied textbook literature up to the 21st century. In this respect it is interesting to follow
the titles of the totally 21 editions of the probably most successful American pharmaceutical textbook, initially edited in 1886 by Joseph Price Remington. Remington was also a professor at the Philadelphia College of Pharmacy, and Chairman of the Revision Committee of the United States Pharmacopoeia. Called “Remington’s Practice of Pharmacy” for the first 10 editions, an almost baroque styled subtitle in the 1956 and 1961 issues explained: "a treatise on the manufacturing, standardizing, and dispensing of pharmaceutical products, with biological and chemical properties and tests, assays, uses, and doses; also a guide to the legal obligations of the pharmacist and the professional services rendered in helping to maintain community health; a textbook and reference guide for pharmacists, physicians, and other medical scientists. While pharmacists were clearly addressed as scientists already here, the editions of 1965 and 1970 were renamed as “Remington’s Pharmaceutical Sciences”. A compromise was found later and remained up to the present edition which is called “The Science and Practice of Pharmacy”. Both aspects, however, are clearly separated as two volumes or later as separate parts of one book. The comparably small, last chapter was devoted to “pharmacy practice”.

Undoubtedly a practical issue is reading and interpreting prescriptions. Quite an early edition of Remington’s gives some impressive examples regarding the art of deciphering prescriptions. This picture shows something like the worst case; in Remington’s own words: “The prescription has defied the efforts of all experts in calligraphy up to the present time. The author has shown [it] to more than a hundred skilled pharmacists without receiving a correct solution.” While this has primarily to do with bad handwriting, the next example clearly shows how beneficial some scientific background in interpreting prescriptions may be. We find here potassium permanganate and glycerin in one prescription and I hope that everybody of you is aware that, in case both components will be mixed together, the preparation would have a serious chance to explode.
Almost all over the Western world, prescriptions were written in abbreviated Latin, which must have been a serious challenge for apprentices who were not necessarily familiar with the old language. In this respect it is interesting to see that most textbooks of pharmacy practice did not devote any space to the principles of Latin language. In English speaking countries, there is, however, a wide variety of publications particularly devoted to pharmaceutical and medical terminology. One of the first and most successful volume of this kind was “Selecta e Praescriptis”, published by Jonathan Pereira, Professor of materia medica in London. This work saw 18 editions between 1824 and 1890. Then, it was followed by Joseph Ince’s “Latin Grammar of Pharmacy”, published from 1882 to 1920 in eleven consecutive editions. While Pereira focussed on prescriptions from the very beginning, Ince explained Latin language from the very beginning and discussed pharmaceutical examples in a second part. Besides Pereira and Ince, there are several other examples from Britain and the US, partly comprising up to 500 pages.

In Germany, we do not see a significant amount of latin grammars for professional education of pharmacists. Most probably, this is because one relied on the extended part of practical training as first step into the pharmaceutical profession. Education started with an apprenticeship followed by education at university which lasted not more than two years until 1934, when a three-year university course became mandatory. In Germany, this relict of the traditional master-apprentice system lasted unusually long, in Western Germany until 1971. Before entering university, the student has had two or three year’s of practical experience. During this training on the job, knowledge in pharmaceutical terminology almost necessarily became familiar to the apprentice. Additionally, up to the first decades of the 20th century, basic scientific teaching still took place in the pharmacy. This development is clearly reflected by German textbook literature for pharmacy apprenticeship which was investigated by Andrea Kanold in her PhD thesis. This Genre was dominated by Oscar
Schlickum’s publications and “Der Apothekerpraktikant”, edited by distinguished hospital pharmacy practitioners. Schlickum’s book which was used from 1878 until 1932, was initially called “Die wissenschaftliche Ausbildung des Apothekerlehrlings”. It certainly seems contradictory at first glance that an apprentice should be educated scientifically, but this is typical for pharmacy that time. From the 5th edition onwards, the word “wissenschaftlich” was omitted, but its contents, still dominated by the principles of chemistry and botany, changed only slightly. Schlickum himself gave the rather poor explanation that a new short chapter about furnishings and equipment of pharmacy shops broadened the scope of the book which was thus no longer concentrated on pharmaceutical sciences alone. From 1909, the term “pharmacy apprentice” was changed to “young pharmacist”. Schlickums work was substituted in the 1930s by the “Apothekerpraktikant” which saw several editions from 1936 to 1971, the year German pharmacy education changed again fundamentally. The practical part of pharmacy education now took place after university studies with several challenges for textbook literature. Practice issues could no rely on a sound academic background and theoretical considerations could be taught completely detached from daily pharmaceutical practice. Concerning pharmaceutical language however, one could no longer rely on pharmaceutical training which opened the market for terminology textbooks like those known from the US and Britain since the 19th century. In Western Germany, standards were set by Peter Dilg and Guido Jüttner, probably the most distinguished experts in pharmaceutical language ever. In Eastern Germany, a booklet called “Fachlatein” was common, which is in its 16th edition now. Coming to the end, I would like to go back to the very beginning: When I started to seriously think about what to present today, the last Harry Potter Movie came out. I do not know if everybody is familiar with the Harry Potter saga, but it is interesting that in the world of whichcraft and wizzardry almost every problem can be solved by magic, but obviously not learning. Even the young wizzarding
disciples have to rely on textbooks telling them the secrets of magic. One of them however, is a very aggressive one: It is called the “Monster Book of Monsters” and tends to bite its owner as well as other copies in the bookshelf. So it has always to be secured by a strong leather belt. Booksellers do not like it, but found another one even worse, the “invisible book on invisibilities”, because this is always so hard to find in the stocks. It can also not be shown on the slide. For me, the “monster book” is a wonderful metaphor for teaching aids which are hard to read, didactically insufficient and primarily useful to frighten the student. I am sure everybody has got his monster books in this respect. For example, this is mine and I admit that I have never understood anything presented therein. Today, almost every written volume may appear as a monster to students, grown up in the digital world with all its knowledge readily available via the internet. New media not only made knowledge available, they also enabled students and teachers to communicate with each other in a way hitherto completely unknown. Some distinguished authors of a standard textbook may regret this development, but I feel not many people would care. In this respect, I would like to highlight an Austrian initiative: The former textbook for postgraduate students, called “Aspirantenhandbuch” was recently transformed to an online edition organised like the Wikipedia database. The initiators state that printed editions are hard to organise with a huge amount of experts as authors and will only reflect the state of knowledge in the moment of compilation. Thus, they decided to let everybody discuss relevant topics and so always keep pace with the latest developments. So the so called “Wisdom of the crowds” is going to substitute the distinguished expert’s opinion, and, to stick to the metaphor, the traditional book became invisible. If this will be the future or even the end of the pharmaceutical textbook, I don’t know. But we will have a panel discussion on this topic tomorrow - let’s hope that we will come a step closer to the solution then.

See you there.