

Medieval Stars in Melk Abbey

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Summary

Melk Abbey, a marvel of European high baroque architecture, is one of the most frequently visited tourist attractions in Austria, attracting 450 000 visitors each year. The monastery's museum presents selected aspects of Benedictine life in Melk since the monastery's foundation in 1089. After the church, the library is the second-most important room in a Benedictine monastery. Due to the wide scientific interests and contacts of the medieval monks, these libraries also contain manuscripts on mathematics, physics and astronomy. In 2009, the International Year of Astronomy (IYA2009), the annual library exhibition was fully dedicated to astronomical manuscripts and early prints from the past 1000 years. Following earlier research work on astronomical manuscripts in Melk's library, we were invited to organise the exhibition. In addition, we also presented a lecture series and provided more background in an accompanying book. Because of positive feedback from the visitors, the exhibition was extended until March 2011. In the two years of its duration, the exhibition was seen by more than 900 000 visitors. In this article, we describe the background to the scientific project, how the exhibition was organised and lessons learned from this project.

Elements of a unique exhibition project

Historical context of the project

One might think of monastic libraries as book collections that only contain theological paperwork. However, after the Council of Nicaea (325) decided on the criteria for the Easter date, astronomy became an important tool in the Middle Ages for computing Easter Sunday and the corresponding feast days. Therefore, some of the oldest books in monastic book collections contain manuals on the so-called *computus ecclesiasticus* (Figure 1).

In the early 15th century, an inner-monastic reform movement, known as the Melk Reform (Bruck-Niederhorn, 1994), was initiated by the Council of Constance (1414–1418) and spread from this abbey to over 40 Benedictine monasteries throughout central Europe. Besides the restoration of monastic values and the economic system, the education of the monks was also a main concern of the reformers. The reform therefore initiated an extension of the spectrum of scientific interest in education and monastery libraries towards the *artes liberales*.



Figure 1. The first display of the exhibition contained about 3500 years of accumulated history: The books in the lower row are about 550 years old, while the two large-format books were written in the 11th and early 9th centuries. Except for the book in the centre, all deal with variations of the *Computus Ecclesiasticus*, the calculation of the date of Easter Sunday. Credit: G. Zotti.

These seven subjects, including astronomy and mathematics, were considered to be the general education of a free man, hence the Latin word *liber* for liberal or free. The general level of education in the convent was improved, and gifted novices were sent to study at the University of Vienna. On the other hand, young *Magistri* who had finished their studies of the liberal arts in Vienna were contracted to Melk to teach at

the abbey's school. Consequently, the abbey's school, first mentioned in 1140 (and still in existence today), reached its first academic peak in the 15th century. In the reform's new philosophy, the influence of the academic tradition of Nikolaus Seyringer (~1360–1425), who was the reforming abbot of Melk and the former rector of the University of Vienna, is clearly visible. This epoch overlaps with the early phase of the

University of Vienna (founded in 1365), when astronomers such as Johannes von Gmunden (ca. 1380/84–1442), Georg von Peurbach (1423–1461) and Johann Müller, better known as Regiomontanus (1436–1476), worked. An intensive academic and scientific collaboration between Vienna University and Melk Abbey was established on multiple levels. As a result of these developments, the monks of Melk Abbey collected, among other things, several hundreds of pages of astronomical manuscripts by copying, exchanging duplicates with other monastic libraries or by purchasing. As we will show later, several rare manuscripts were thus preserved from loss throughout the centuries.

Modular project concept

From the very beginning of our work in the library of Melk, our main concern was not to stack dates and facts onto each other. We saw the exhibition items as witnesses to an evolution of scientific focus and knowledge, thus using them to illustrate this increase in knowledge. Therefore, we conceived the IYA2009 project as time travel through more than 1000 years of history and developments in astronomy, told by documents and items from the library, including the instrument and mineral collections of the Abbey. We offered several ways of exploring the rich historic documents on astronomy at Melk.

A. Exhibition: Historic Astronomy and Austrian Astronomy in 2009

The exhibition was divided into two sections, which formed a continuous timeline from the earliest astronomical manuscripts, dating from as early as the 9th century, focusing on the work of astronomers at the young University of Vienna and observations obtained in Melk Abbey over the centuries into the age of modern astronomy. The end of the journey showed the contemporary international astronomical research in 2009 in which Austria is involved, such as that carried out at the European Southern Observatory (ESO).

B. Lecture series: Astronomical Colloquium 2009

For advanced visitors, talks on historical and modern astronomy were given. The topics were related to those addressed in the exhibition, but which could not be followed through there to the fullest extent. Before every lecture, we gave a special guided tour through the exhibition. One



Figure 2. Melk Abbey viewed in the evening sun from a hot-air balloon. Below, the historic city centre of the town of Melk can be seen. Melk is the starting point of the Danube landscape known as the Wachau. Credit: M. Rotheneder OSB.

lecture evening was dedicated to astronomical observations in collaboration with the Lower Austrian Amateur Astronomers, which had to be cancelled due to bad weather. However, it is worth noting that for this evening the complete outdoor illumination of Melk abbey (usually a brightly-lit tourist landmark) was switched off to expose the dark skies over Melk.

Also workshops with students in the high achievers programme were held and will now continue on a yearly basis.

C. Publication of exhibition proceedings

Edited by the librarian, Father Professor Dr Gottfried Glaßner OSB, the first volume of the new publication series *Thesaurus Mellicensis* was dedicated to the scientific results discovered by the members of the project team. The contributions have been reviewed by members of the medieval book commission of the Austrian Academy of Sciences.

Selected highlights of the exhibition

The oldest item of this exhibition was written before the year 825 and contains a copy of *De Temporibus*, the standard book on the calculation of the Easter date by the Venerable Bede (Codex 412)¹. It is one of the oldest books in an Austrian book collection. (Figure 1, top right).

A central point of the exhibition was based on notes, manuscripts and *incunabula* of the early phase of the University of Vienna, when an intensive collaboration between the two institutions was established (see section 3). As a place of spiritual and political influence, Melk also had contact with the imperial family of the Habsburgs. Two groups of items were displayed, firstly, a

pair of globes, one of the Earth and the other celestial, manufactured by Vincenzo Coronelli in the late 17th century, and secondly, meteorites, which were donated by the Habsburg family to the Melk Abbey school.

A showcase was dedicated to pre-telescopic instrument reconstructions and a 19th-century telescope from the monastery's school reminded visitors of the 400th anniversary of Galileo's discoveries.

In the second module of the exhibition, we presented two international research projects that include Austrian participation. Austria's new ESO membership was brought to the attention of visitors by hosting ESO's photo-panel exhibition. Furthermore, Austria's first satellite project, BRITE–Constellation (Weiss, 2008) was represented by a true-scale model.

Concept implementation and lessons learned

Early experiences in the design phase

First discussed in late 2007, the basic concept for this project grew in our minds for about a year and condensed towards a consistent proposal in 2008. For the title of this project we have chosen the German translation of Psalm 192, "The heavens declare the glory of God...", which was quoted in a sophisticated Latin manuscript on the construction and usage of astrolabes (Cod. 511). At the first work meeting with the cultural administration of Melk Abbey in December 2008, we soon learned to understand the basic concept of the abbey's museum: Everything has to fit into the architectural atmosphere of the rooms. This is especially important for projects in the

library, as its main room is itself a significant piece of art, including the uniform leather-bound book covers, which match the wooden baroque bookshelves. The allegorical figures in the area of the architectural painting surrounding the ceiling fresco are dedicated to the research topics covered by the books in the library including astronomy.

To accommodate this we had to revise the arrangements of the external items slightly, but the science was untouched. Once the ESO exhibition was moved to the next event location in Innsbruck, this philosophy even allowed us to place the shiny gold BRITE satellite model in the baroque library's main hall, as it fits with its colour concept perfectly.

Preparing the displays

The museum and the church of Melk Abbey are open for visitors throughout the year. The main season starts traditionally with the Easter week, which was in early April in 2009. Aside from a few details, the showcases and the explanation cards for each item were finished in mid-March so as to be able to present the exhibition at the celebration for the proclamation of the Wachau region and Melk Abbey as the Best Historic Site by the *National Geographic Traveler* magazine.

From our work in the library, we knew of several important books in the collection, which formed a firm basis for the exhibition. Around Christmas 2008, we spent several days in the library halls screen-

ing all catalogue entries which could contain astronomical content for interesting items. Our search was based on authors and titles of the books and also on catalogues of incipient words, i.e. the first few words of the opening line of a text. Cross-references in the scientific literature were also used. However, we did not restrict ourselves to modern, electronically available catalogues, but we also investigated older compilations of book catalogues, which gave valuable information on the historic book inventory. We will discuss the findings in the next section.

During our work, we were supported by the abbey's librarian, Father Glaßner, OSB, and his assistants, Mag. Christine Preiner and Mag. Bernadette Kalteis. Additionally involved in the investigations and publication on specific topics were Mag. Nora Pär (Univ. Vienna), Dr Vittoria Feola (Univ. London), Giles Davison (London), Karl Heinz Keller (Bavarian State Library) and others. Dr Christine Glaßner from the Commission of Palaeography and Codicology of Medieval Manuscripts of the Austrian Academy of Sciences also contributed her expertise. As each of the team members has a different core competence, many fruitful discussions were held, where scientists from one discipline had to explain their approach using non-expert words. In the preface of the accompanying book, *Thesaurus Mellicensis Vol.1*, Father Gottfried Glaßner addressed this by stating that the key to the success of this project was the willingness of everybody to listen and join in the discussion.

Once the museum was closed to the public in the evening, we tested potential configurations of the presentation by placing the books on top of the showcases and documented the options photographically. We used these sketches at our meetings in Vienna to visualise the current layout and discuss further improvements. Finally, in February, we placed the books in the showcases according to our final concept. Special care had to be taken for conservation reasons. Again, the librarians guided us with their expertise. To protect the displayed pages from ultraviolet light, the glass was covered with an ultraviolet-reflecting foil. Also the windows were permanently covered with curtains to reduce the incoming light, and flash photography of the manuscripts was forbidden.

To be able to show selected pages of the books, we had to prepare the books in a certain way so as to avoid further damage. The pages were fixed with strips of the same foil that was used to cover the glass of the showcases and acid-free paper. Due to the old wooden and leather bindings, the books had to be supported with little wooden book stands. If several, non-adjacent pages contained details that we wanted to show, we included a photographic reproduction on the relevant explanatory card.

Although working with white gloves when handling the pages inside the books, when working on the final placement blackened fingers and hands were unavoidable while carrying books around or aligning them. Being in such an environment, browsing through thousands of pages of ancient knowledge and having the plot of Umberto Eco's (1986) bestselling book, *The Name of the Rose*, in mind, we could not resist referring to certain passages of the story when we saw our black fingers. However, we survived.

Other items were placed between the books. Meteorites from the abbey's mineral collection (founded in 1767) and several historic instruments from the physics department of the abbey's school were displayed between the books. The exhibition also included the excellent pair of Coronelli globes, a celestial and an Earth globe, which form a permanent part of the library exhibition, as well as several details of the fresco, showing astronomical allegories or instruments.

Optimising a scientific exhibition for a high throughput of international tourists

The main goal of this exhibition was then put into an overall context: the evolution of research interests in astronomy. During our work on the showcases, we developed a first impression of how much time an average guided tour takes for the library module. At peak times, the tour guide has about five to ten minutes to explain the rich library and its long history to the group before the next tour approaches the displays. Although in certain cases little radio headsets are handed to the tour participants, which give a bit of extra time because they avoid confusion between different guided groups, we still had to condense the concept of the exhibition to a few basic lines.



Figure 3. The exhibition authors Paul Beck and Georg Zotti with the true-scale model of the BRITE satellite in front of Melk Abbey's church. The model "hovered" in Melk above visitors' heads until the end of the exhibition. Credit: G. Zotti.

Each tour is different and every tour guide has his own style and area of expertise. Therefore, we were requested by Melk Abbey authorities to prepare educational material, which was handed to the guides in advance of a special training session in the library. In this written summary, we drew attention to and gave detailed information on a few selected books, which we thought of as cornerstones of astronomical history (see the next section), and also provided information on each item. Over the two years, the authors also did some “sneak touring” for quality control by listening anonymously to tours passing through the library. A more extensive guided tour was given by the authors on every lecture night.

In the peak season (April to October), tourists are not obliged to follow a guided tour, but can visit the museum independently. So, to convey the essence of this exhibition to international and individual tourists, an exhibition sign welcomed them with the exhibition prologue not only in German, but also in English, French and Italian.

Connections to the First Viennese School of Astronomy and Melk Abbey during the 15th century

As the first peak of astronomical research in Vienna coincided with a phase of strong interest in astronomy in Melk, we found many documents on interactions. A very interesting document for astronomical research is one of the only four existing copies of the Latin *Iudicium super Comete* 1456 (Cod.

1605, fol. 162rv). The early Habsburgs assigned Peurbach to present an expert view of the great comet of 1456, which is nowadays better known as 1P/Halley. While the original manuscript is lost, this excerpt has survived for more than 550 years in the library of Melk. This shows the importance of monastic libraries for preserving scientific treasures over centuries.

Although Peurbach was paid as a court astrologer, he minimised the astrological interpretation of the comet. In fact, this work represents one of the first empirical approaches to the phenomenon of a comet and is structured in a similar way to a modern publication. To give readers the opportunity to discover the text of this important document on their own, the Latin transcript (Ferri, 1961) and a translation were published in the exhibition book (Beck & Zotti, 2009a). A more extensive, critical discussion on astrology by Georg von Peurbach was found in a unique manuscript which is described in the same book in more detail by Gläßner & Keller (2009).

As mentioned earlier, we also investigated older book catalogues, which gave valuable information on the historic book inventory. The most impressive direct evidence that the keepers of the library did not simply collect material blindly, but also evaluated its quality was found in the oldest library catalogues written in 1483 (Cod. 874, fol. 50v) and in an edited copy that was written around 1495 (Cod. 1075, fol. 31r). In the register of authors, we found not only the name of the astronomer Johannes de Monte Regio (Regiomontanus), but also a statement underlining the respect that the monks of Melk had for him and his place in his science: “rightfully the king of the Viennese astronomers”.

Another interesting note on the interaction between the astronomers of the University of Vienna and Melk Abbey was found in a baroque book of colloquium abstracts. In this publication, Georg Matthias Bose, a mathematician and astronomer at the University of Wittenberg, invited readers to celebrate the 300th anniversary of the observation of the lunar eclipse of September 1457 by Peurbach and his young student, now known as Regiomontanus (Bose, 1757). From Bose’s point of view, this observation marks the restoration of astronomy, as it appears to be the first one after antiquity where European astronomers

recorded exact stellar altitude data to derive the local timestamps of the contacts. According to Regiomontanus’s journal of observations, which is quoted by Bose, the astronomers observed in Melk. We therefore were initially surprised that there was no note concerning the stay of both astronomers in Melk, although about 25 years later one of them is highly glorified in the library catalogue. However, we found indications that King Ladislaus [Postumus] (1440–1457), whom Peurbach served as royal astrologer, stayed for some time as a guest in Melk Abbey in September on the way to his planned wedding in Prague, where he instead found an untimely death. Also, the measured timestamps perfectly fit with an observation made in Melk, and the fit is definitely much better than for Vienna as an observation location.

Among many other documents, we also want to highlight Fragment 229, which was also published as the APOD for 17 April 2009 (Beck & Zotti, 2009b). The (assumed) author (cf. Bruckmüller, 1989), Magister Wolfgang de Styria (1402–1491 or 1498), was a student of the liberal arts at the University of Vienna before 1423, at a time when Johannes von Gmunden was dean of this faculty and also gave lectures. After Wolfgang had completed his studies in Vienna, he was contracted to teach at the abbey school. A year after he arrived in Melk, he also joined the monastery. However, the latest research suggests that this fragment was already written in the 14th century², which would show another fascinating example of the tradition of astronomical knowledge. This fragment was probably written for teaching basic astronomy in the abbey’s school. It explains the Ptolemaic, geocentric system and how in this geometry a lunar and solar eclipse can be explained. Finally, the circular table in the lower right of the page gives an algorithm to calculate the date of the Easter full Moon (cf. Beck & Zotti, 2009a).

Press work and media feedback

In 2009, the project was advertised nation-wide by Melk Abbey and excursion web pages as a special project for the International Year of Astronomy 2009. Klösterreich, an Austrian collaboration of monasteries with a combined marketing concept, proclaimed 2009 as the year of monastic libraries and also advertised this exhibition as one of their highlights.



Figure 4. Impression from one of the numerous guided tours through the library exhibition: A tour guide explains the concept of the exhibition to an international group of tourists. Credit: P. Beck.

For the domestic press release, several photos of the displayed items were provided. The picture that was chosen most often by the media is shown in Figure 3. The original intention for this picture was that this façade is generally recognised by Austrians as part of Melk Abbey, and we assumed that Austria's first satellite would catch people's attention. Obviously, we were right. The catchiest headline found with this picture was "Scotty, beam me into Melk Abbey".

To draw international attention, a photograph of Fragment 229 was submitted to APOD and this was published on the opening day of the exhibition. The mainstream coverage of the project concentrated around the opening of the exhibition in spring 2009. More sophisticated reports followed during the year. Also, the project was reviewed in annual reports such as the Austrian commission for UNESCO (2009 Annual report, p. 29):

"Throughout the year, numerous activities took place in all of Austria, which are described in more detail under www.astronomie2009.at. Special highlights were an exhibition 'The heavens declare the glory of God' at Melk Abbey, and 'Travelling to the stars' at Rein Abbey near Graz, both of which centred around historically valuable books from six³ centuries of astronomy."

Conclusions

Having the chance to work on such a large collection of astronomical manuscripts and prints was a very interesting experience. During the last 50 years, several individual manuscripts, such as the *Iudicium*, have been analysed in detail or from the viewpoint of the University of Vienna and its famous astronomers. In the course of this project, however, we have analysed the scientific interest and usage of astronomy in a monastic, medieval environment. In addition to the central role of the *Computus*, we were able to show that the Benedictines did not defend old views, but were interested in ongoing astronomical research and were able to discuss the arguments for all proposed theories.

The project definitely benefited from the fact that we could utilise the complete infrastructure of a location used to working with hundreds of thousands of tourists per

year. This was very helpful from an organisational and marketing perspective, as we only had to provide the text for the flyers and a press release, while the layout, production and distribution in the printed and electronic formats were done by the Cultural Office. Also, the press release received a wider response as it was sent out via Melk Abbey's network. Only the explanatory cards in the displays were laid out by us. By following this strategy of work distribution we could optimise the workflow and outcome.

The feedback we received from visitors and audiences following the guided tours and the lecture nights was very positive. In general, people were impressed by the astronomical work contained in monastic libraries. Also, the open way in which we presented the history of astronomy was appreciated.

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Notes

- ¹ Codex numbers refer to the inventory of the library of Melk Abbey.
- ² Priv. Com. Dr. Christine Glaßner, Austrian Academy of Sciences, Commission of Paleography and Codicology of Medieval Manuscripts.
- ³ Note that for the exhibition in Melk this number is too small by a factor of two.

Biography

Paul Beck, graduated as a master in astronomy from the University of Vienna, Austria. Now working as a PhD student at the Katholiek Universiteit Leuven, Belgium, on the asteroseismology of red giant stars with photometry from the Kepler satellite, funded through an Advanced Grant from the European Research Council under the European Community's Seventh Framework Programme (FP7/2007–2013)/ERC grant agreement n°227224 (PROSPERITY).

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