The Katholieke Universiteit Leuven (K.U.Leuven) is the Dutch speaking part of the old university that was founded in 1425. In 1968 it was officially divided in two parts, and the French speaking part then moved out to new premises in Louvain-la-Neuve. The K.U.Leuven, which remained in the old town of Leuven, is now with 28,000 students the largest university of Belgium.

In the late 1990s, as a response to a number of emerging challenges and needs, K.U.Leuven decided to merge its different (smaller) library units related to science and engineering into one single, state-of-the-art new campus library (“CBA – Campusbibliotheek Arenberg”) on its campus in Heverlee, a suburb of the historical town of Leuven. The new building, one of the most advanced of its kind, opened in October 2002.

1. The Situation of the Past

Partly due to its long—and sometimes rather turbulent—history, the university library of K.U.Leuven was organized in a rather hybrid way. The Central Library plays a key role with its majestic facade on one of the most important town squares. The collections in this Central Library consist of general reference publications in all academic fields and of the works related to the cultural heritage of the university and the region; it also acts as depository library for the humanities. Here you will also find the general library administration, where care is taken of general matters important for all library branches (the common catalogue, external relations, etc.).

More specialized faculty libraries are divided over four campuses, each with its own campus library service (Humanities, Behavioral Sciences, Biomedical Sciences and Science & Engineering; Table 1). Each campus furthermore had (has) several sectional libraries which are based in individual faculties or departments. These are quite independent in as far as budget, acquisition policy and opening hours are concerned.

<table>
<thead>
<tr>
<th>Structure of the University Library in Leuven</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Central library (local deposit library, general reference works, historical &amp; cultural heritage)</td>
</tr>
<tr>
<td>2. 4 Campus library services (Humanities, Behavioral Sciences, Biomedical, and Sciences &amp; Engineering)</td>
</tr>
<tr>
<td>3. Each campus has several sectional libraries (in faculties or departments)</td>
</tr>
</tbody>
</table>

The Science & Engineering campus has three official faculties: Sciences, Engineering (or Applied Sciences) and Agricultural and Applied Biological Sciences (or Agronomy), each of them consisting of several departments. Up till the 1960s, all these units were supported by a whole set of small laboratory libraries and a few small faculty libraries. Around 1970 the university got more structured into departments (many in new buildings) and most of them started with a departmental library. Simultaneously the campus library service was founded, making, e.g., deals for avoiding overlapping journal subscriptions. In many places, however, important book collections remained in individual laboratories, most often without adequate access for the broader university public. Over the years a few concentrations took place. First there was a merger between the libraries of Mathematics (Faculty of Sciences) and of Computer Sciences (Faculty of Engineering). Next came a merger between the already unified library of the Faculty of Agronomy with the library of Botany (a part of the Department of Biology in the Faculty of Sciences). By the end of the 1990s, this left us with the following important library units:

- Mathematics and Computer Sciences
- Physics
- Chemistry
- Botany and Agronomy
- Zoology
- Geo-sciences (part of Physical Geography and Geology)
- Social and Economical Geography
- Chemical Engineering
- Civil Engineering (Architecture, Urban Planning, Construction)
- Electrical and Electronical Engineering
- Materials Science Engineering
- Mechanical Engineering

These were only the official library units, most of them only staffed by a single librarian. In addition, there were still many unofficial laboratory libraries without library staff (at best the collections were supervised by a secretary). All these libraries (in total almost 18 units) were coordinated by a dynamic Campus Library Service, which took care of the acquisition administration (the selection was still done by the individual units!), of the cataloguing and of the Interlibrary Loan (ILL) service. It disposed also over a couple of extra people that could be sent to the smaller units in case of illness or vacation of the regular staff. Most of these libraries were situated on the Heverlee subcampus of the university, within a 1 km distance of each other (Figure 1), with exception of the libraries of zoology and of the geosciences: these were a few kilometres away within the old historical city centre.

![Figure 1: Physical layout of Heverlee campus (i.e. K.U.Leuven Science & Engineering campus), with indication of main departmental or faculty library units (situation until 2002). Between buildings 5 and 8 one sees the ruins of the Celestine convent, site of the new library (in red).]

A few numbers may give a better idea of the total size of these libraries:
- close to 1,000,000 volumes (incl. Campus Library Service collection)
- 3,050 printed journal subscriptions
- 7,500 incoming ILL-requests/year
- 13,000 outgoing ILL-requests/year
- >20 km stacks
- ca. 500 seats
- 3,670 m² surface area
- ca. 8,000 students
- ca. 2,000 academic staff

2. Towards Centralization

Within the academic campus library commission (composed mostly of professors, acting as representatives of their departments) a discussion started in the beginning of the 1990s about the desirability of a more centralized library. A special commission was created in 1995 with the task to investigate all arguments against and in favour of a possible centralization.

The arguments that were still heard in favour of a continuation of the decentralized situation were mainly the following (Table 2):
• *The short walking distance between library and office.* In the existing situation almost each researcher can find most of his documentation in his own building. They were afraid that a central library would automatically mean larger walking distances.

• *Personal engagement for the acquisition budget.* The financial policy of the university is very decentralized. Most research groups have furthermore considerable additional and more personalized income, from scientific research grants or from industrial collaborations. The rising subscription prices for scientific journals have led to a strong dependency of the libraries on these decentralized budgets. It was a natural reaction from these research groups to keep a strong hold and close control of their own library. They are much less inclined to subsidize a centralized faraway library.

• *Familiarity of the librarian with his/her customers.* Close contacts grew in each department between the librarian and his customers. He/she knows the professors and senior researchers, and is aware of their personal interests in matters of documentation. These people are afraid that the service will be much more impersonal—and therefore less efficient—in a centralized situation.

• *Facilities for access.* In order to alleviate the restrictions coming from the limited opening hours of a small library staffed by a single person, special facilities (like private keys to the library door for the academic staff) were unofficially introduced in many places. It is obvious that these people were not looking forward to the cancellation of their privileges.

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### Arguments for continuation of old situation

- Short walking distance between library and office
- Local commitment towards acquisition budget
- Familiarity of librarian with his/her customers
- Facilities for access (private keys to library door!)

Table 2: People’s main arguments for keeping the old decentralized structure of individual departmental libraries.

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#### Arguments in favour of centralization

In spite of the above considerations, it was nevertheless felt that there were so many more arguments in favour of a centralized campus library (Table 3):

• The interdisciplinarity of sciences makes it necessary for many people to go up and down between several libraries. Since interdisciplinary research is encouraged, it would be much more efficient if all scientific literature could be put together within the same premises.

• Up till now, all existing libraries within the Science & Engineering departments were strictly research libraries. This is strongly reflected in the collections, where very little material is present that can be of interest to the undergraduate students. Rising journal subscription prices led often to a neglect of book material or modern multimedia instruction tools. The libraries forgot their didactic mission and undergraduate students seldom visited the library. This problem was explicitly noted by the so-called “visitation commissions”, which evaluate the different departments on a national level.

• The fact that all these small libraries were understaffed had the following disadvantages:
  - limited opening hours;
  - often closed due to absence of the staff (meetings, illness, extra holidays,…);
  - no specialized services (i.e. limited informatics support; cf. infra): the single person staffing each library had to be an all-round man/woman.

• Centralization would enable better services towards the community at large (alumni, industry, general audience, …)

• Centralization would allow more smooth implementation of modern media and information infrastructure. For an individual librarian, it is much harder to follow-up on the fast evolution in ICT-technology than for a specialized team.
• The larger walking distances between research buildings and central library would in the future be compensated by a decentralized electronic information delivery. Setting up such a service, however, requires a specialized staff, which could not be realized by an individual department.

• More possibilities for expansion. At that time, most departmental libraries were filled to the brim, with no prospect for expansion. Construction of a new building would, if large enough, allow for some expansion for all branches.

• Improved "visibility" of the campus. This is a local problem: the collection of new buildings that were erected at the Science & Engineering campus in the 1960s forms a rather anonymous group of grey blocks without a face. A new library building, if well conceived, may play the role of a meeting place and become the heart of the campus.

### Arguments for centralization

- Multidisciplinarity of sciences
- Individual research libraries forget their didactical mission
- Small understaffed libraries have resulted in:
  - limited opening hours
  - often closed for holidays
  - no specialized services
- Centralization may lead to:
  - Better (external) services
  - Smooth implementation of modern IT
  - Larger distances will be compensated by decentralized electronic information delivery
  - More possibilities for expansion & Improved “visibility” of the campus

### Why do we still need a (physical) library?

- In spite of modern digital information technology, we still need space for books
- University concept is moving towards more “guided self-study” by the students;
  → We have to offer them the necessary infrastructure!
- The intermediation of electronic information requires a centralized management structure

A discussion of a more fundamental nature was about the continued necessity to invest in a physical building for a ‘centralized library’ concept: “do we still need to invest in bricks in this age of electronic information transfer and virtual networks of almost everything?”. Some of the main arguments to go on with the project as conceived are summarized in Table 4.

### A concept for the new library

Apart from summing up all arguments in favour of this new building the commission also set up some guidelines for its construction.

- The concept of ‘Clusters’. In order to prevent the anonymity of a very large library, the new building had to be divided in a number of large clusters. Each cluster consists of a number of related subjects and a specialized librarian should preferentially staff it. The following clusters were considered:
  - a didactical cluster with books for undergraduates and general reference works;
  - bio- and life-sciences (biotechnology, agronomy, botany and zoology);
• mathematics, computer sciences, electrical and electronic engineering, mechanical engineering, safety science;
• chemistry, physics, astronomy, materials science, geology, chemical engineering;
• architecture, urban planning, civil engineering, social and economical geography.
• *Disposition of the collection:* Since the total budget for the construction would certainly be limited, the idea was raised to divide the collection in layers with decreasing accessibility. The most recent works should be accessible in open stacks. Less recent books and journals should be stored in a compact system (*‘compactus’*). Even older documents (i.e. old journal literature) could be stored in a deposit library, installed in the stacks of a former library of a now almost deserted Jesuit convent, about 1 km from the science & engineering campus. The latter could contain approximately 400.000 volumes. The idea was to work with a continuous flow system: when more new books are bought, this should be compensated by a shift of some older works from open stacks to the compact system, and from the compact to the deposit. The total net surface area required for the library (without deposit) was estimated around 7.000 m² (ultimately, due to the selection of the special location and with the implementation of various seminar and study facilities, it grew to over 10.000 m²).
• Further requirements for the building and its operation were expressed:
  o An extension of the total number of seats (with the undergraduate students in mind!);
  o An instruction room with multimedia applications (cf. supra);
  o Differentiation and specialization of staff;
  o Late opening hours and weekend service.

3. **Location: The Old Celestine Monastery**

Most of the science and engineering buildings of the K.U.Leuven are situated south of the city centre, in the so-called Arenberg campus (cf. Figure 1). The name is derived from the dukes of Arenberg, who possessed a large domain around the Arenberg castle of Heverlee. Guillaume (or Willem) de Croÿ – an ancestor of the Arenberg family -- built the castle in the beginning of the 16th Century (1521-1526). The whole domain was transferred to the university after the First World War. Today the castle houses the administration of the Faculty of Engineering and the Department of Architecture. To the domain of this castle belonged also a monastery of the austere French ‘Celestine’ order (founded by Pope Celestine V).

![Figure 2: Historical representations of the ancient ‘Celestine Monastery’, current home of the modern Campusbibliotheek Arenberg (CBA).](image-url)
There are many historical documents that represent this monastery with its 72 m long church and square courtyard, although they differ substantially in the form and relative size of the buildings. We see them, e.g., in an etching by Joost Vander Baren from a book by Justus Lipsius from 1610, which also includes the castle and a view of the neighbourhood (Figure 2.a). The convent can be seen as a building with two floors in a painting from around 1600 (attributed to the same Joost Vander Baren, and being on display today in the Arenberg castle; Figure 2.b), with a single floor in an engraving from a book written around 1610 by J.Debye (Figure 2.c), and again with two floors in a wooden model made in 1782 for the blind duke Engelbert of Arenberg. The most detailed view was given by Lucas Vorstermans in his engraving from 1727 (from a book written by A.Sanderus; Figure 2.d). We clearly see that the three wings of the convent have two floors, and a gallery with a lower roof surrounds the square inner courtyard. The northern side of this gallery flanks the church.

The monastery was suspended in 1783 by the emperor Joseph II, and the buildings were sold to the duke of Arenberg in 1786. In 1796 the church was severely plundered. What remained was in such a deplorable state that the duke of Arenberg decided in 1816 to completely break down the church building, together with a part of the western wing. Around 1900 the whole complex was even used as a stable for horses (Figure 3.a). At the time of planning of the new campus library, only the remaining part of the west wing and the east wing were standing up (although not in a good shape; Figure 3.b), but three sides of the courtyard gallery with very nice vaults were almost intact. The south wing of the courtyard has completely disappeared. To the north, instead of the church there is just a large red brick wall. The most impressive remaining building was the eastern wing (the so-called refectorium), which over the centuries clearly underwent many restorations.

Since many years, the university was looking for an occasion to restore the old Celestine buildings and to give the site a new destination. The search for a site for the new science and engineering library (further indicated as “CBA” – Campusbibliotheek Arenberg), offered an excellent opportunity to fulfil this old dream. An international architectural competition was organized in two phases. In a first phase, architects were invited to declare their interest in the project. On the basis of their engagement with respect to several criteria, a small number of architects were selected to work out (for a fee) a detailed proposal for the construction of the new library, incorporating the restored remains of the Celestine monastery. We have seen a variety of interesting ideas: some tried to reconstruct the old church by way of a massive entrance building, others concentrated more on the well preserved courtyard and gallery. An international jury finally selected the proposal by the renowned Spanish architect Jose Rafael Moneo, on the basis of its simplicity and respect for the original buildings. His emphasis lies entirely on the courtyard, where he substitutes the missing fourth side of the gallery by a modern two-level construction (Figure 4). In order to accommodate the need for additional surface space without hindering the view upon the existing buildings, he constructs a large but low annex with two floors, one of them underground.
Rafael Moneo (born in 1937) received in 1993 a doctorate honoris causa at the Leuven university, but he also built himself a solid international reputation through a variety of important buildings (museums in Madrid, Merida, Palma, Stockholm and Wellesley Mass., a train station in Madrid and an airport building in Sevilla, a renowned hotel in Berlin and a Cathedral in Los Angeles, …). He received several important international prizes rewarding his achievements.

4. The New Building

Preliminary investigations

The whole project was prepared through a couple of preceding investigations. An historical investigation of the original design of the buildings was performed in preparation for the restoration. A technical company performed a series of restoration-technical measurements. Archaeological excavations discovered – as expected – the foundations of the previous southern courtyard gallery. A part of the foundations of the southern wing was also exposed, and this undertaking exposed an intact old brick well, flanked with two arched constructions, exactly at the site where the architect had planned the information desk! This gave rise to some haggling with the service for the preservation of monuments, which finally allowed removing these archaeological remains, after a careful measurement and description.

From the beginning, the University also made contact with the official organization for "Monuments and Landscape". They had a strong impact on the evolution of the project. They requested, e.g., that the old dilapidated wall at the side of the street be conserved in its present state. They also put severe restrictions on the accessibility to the domain for cars and trucks.

An overview of the floor plans and CBA lay-out

When the competition was finished, detailed discussions were organized between on the one side the architect and on the other side the library staff and the technical services of the university, but also with the safety and fire-brigade services. This has led to numerous alterations of the original design.

In the plan of the ground floor, we remark that the whole library complex has been conceived around the impressive old inner courtyard (see highlight in Figure 5). The CBA entrance is at the southern side of the complex (left in Figure 5), where one walks onto the building entrance while passing another pleasant (outer) courtyard with some well preserved old trees (bottom left of Figure 5). Immediately to the right hand side of the CBA entrance hall is a small self-catering cafeteria facility (with cloak-room and sanitary facilities), and to the left is room for a bookshop. We further remark an open space for temporary exhibitions. The large information desk has one side open to this entrance space, whereas the other side opens towards the controlled interior of the library. Left of this information desk is a space for a return robot for borrowed documents.

Figure 5 : Floor plan of CBA ground level, basement (lower floor) and first floor.

The registered customer, who enters past this information desk, automatically walks into the eastern vaulted gallery. The three remaining galleries surrounding the inner courtyard have indeed been fully renovated and decorated with some carefully selected pieces of art, but they may also be used as an exhibition space within the controlled zone. A modern walking gallery in the didactical wing completes the original square of the courtyard. Through the restored windows, this gallery gives a view upon the courtyard with a preserved ancient tree, but a part of this courtyard will also be available for outside reading in the summertime. The architect saw a symbolic
library-related value in the contrast between the austerity of the convent gallery and the playfulness of the modern glass wall of the didactical wing.

The ground floor of the eastern wing of the old monastery serves as a large reading room with the most recent issues of all the printed journals (electronic journal –some 8,000 to 9,000 in total– are offered through the K.U.Leuven intranet). Towards the southern end of this wing, an elevator makes a connection with the other floors of the library. The southern tip of this wing contains a small seminar room, which can also be made accessible from the non-controlled entrance area.

Between the old east wing and the street, a new low annex building has been constructed, containing the open stacks for the clusters, spread over two floors. At the ground level we see the stacks, reading places and booths for the reference librarians and for copying machines. A special room is reserved for an important slide collection from the department of Architecture. Natural lighting comes through pyramid-shaped cupolas in the ceiling and through an open shaft near the refectory it also streams into the basement floor. In the basement we find a set of group carrels, where small groups of up to 4 or 6 people can discuss in relative acoustical isolation.

The basement also contains some rooms with special drawers for the storage of large maps and a room for consulting those maps. A large part of the basement is reserved for closed compact stacks (Figure 6), directly connected by means of a book elevator to the information desk at the ground floor.

Let us however come back to the didactical cluster, mainly located on the first floor (Figure 7). It is connected with the ground floor space behind the information desk in the entrance hall through an impressive winding staircase which connects both floors. Apart from reading places and stacks, it also contains facilities for the consultation of classical video or DVD film material. Extra reading space is available both in the west wing (where access for wheel-chaired persons is assured by means of a moving platform), and in the east wing where a series of dedicated work desks with various multimedia facilities, as well as a small multimedia studio with state-of-the-art video-conferencing and distance-learning facilities, are available.

Also the west wing of the old buildings has been completely renovated, and is mainly assigned to administrative functions. On the ground floor its southern section contains several offices for the library staff. Here it was impossible to keep the present partitioning of the existing buildings, but the architect reorganized the spaces,
taking into account as much as possible the most important elements of the construction. The northern part of the wing here contains an instruction room for PC-applications. At the first floor of the west wing is more office space for the staff, together with a multi-purpose seminar room or reading room for the didactical cluster. At the basement level is a small stack space for precious volumes; access to this room is restricted.

In order to be complete, the second floor of the east wing should also be mentioned. This existing space is mainly seen as a possibility for future expansion. Initially, it will only be rudimentary equipped.

Technical concept – civil engineering and construction aspects

The new annex with the open stacks has been constructed on a supporting concrete floor with round columns. A fixed partitioning of the stacks according to the clusters was rejected, in order to increase the flexibility of the building. For the compact stacks a similar construction is used, although the top floor of the didactical cluster has been built as a light metallic structure. All new buildings received a flat roof. In contrast to the historical buildings, the new ones received large glass panels, some of them curved. The foundations of the historical walls have been reinforced with supporting masonry, and some sections of the old buildings needed to receive additional reinforcements.

The building has been equipped with most of the standard installations for a modern library: fire detection, intercom system, 2 elevators and a book elevator, automatic lending system and return robot, theft detection, a combination of floor- and convector-heating, air-treatment system (but no cooling). In the floor and walls of the open stacks and reading rooms there is a system of cable channels for data connections; the other spaces only have wall connections.

Some numerical data about the new building:

<table>
<thead>
<tr>
<th>Total net surface area</th>
<th>10,350 m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity open stacks</td>
<td>280,000 vols.</td>
</tr>
<tr>
<td>main building</td>
<td>212,415</td>
</tr>
<tr>
<td>preciosa</td>
<td>9,000</td>
</tr>
<tr>
<td>general reading room</td>
<td>9,180</td>
</tr>
<tr>
<td>didactical cluster</td>
<td>16,575</td>
</tr>
<tr>
<td>Capacity closed stacks (compactus)</td>
<td>600,000 vols.</td>
</tr>
<tr>
<td>Capacity remote closed stacks (depot)</td>
<td>400,000 vols.</td>
</tr>
<tr>
<td>Seats</td>
<td>662</td>
</tr>
<tr>
<td>reading rooms and stacks</td>
<td>494</td>
</tr>
<tr>
<td>seminar rooms</td>
<td>152</td>
</tr>
<tr>
<td>carrels</td>
<td>16</td>
</tr>
</tbody>
</table>

Access

The entrance to the library has for architectural reasons been placed at the south side of the complex (Figure 8), whereas the north side faces more directly the centre of gravity of the campus, with the Celestijnenlaan as its main artery. A natural entrance can be found in the gate of the wall in the de Croïlaan. However, due to the heavy traffic in this street, the city does not permit cars to enter through this gate; it has thus been restricted to pedestrians and to the numerous students on bicycles.

Figure 8: CBA entrance, with outside view of didactical cluster (upper floor); situation at date of opening on 1st of October 2002.
A special bicycle parking has been constructed. Furthermore, for esthetical reasons, the landscape commission does not allow a large car parking space in the immediate neighbourhood of the library. The main access for cars is farther along the Celestijnenlaan, at the entrance to the present institute for Mechanical Engineering. Only staff members, frequent users, handicapped persons and delivery cars will be allowed to come closer to the library up to its small parking lot.

**Technical concept – information technology and managerial aspects**

The whole CBA library (1,000,000 printed volumes, plus electronic and multimedia facilities; some 10,000 potential customers) is operated by less than 20 full-time staff equivalents. Opening hours are 9 a.m. till 10 p.m. Mondays through Fridays, and 9 a.m. till 1 p.m. on Saturdays. Assistance is obtained from a series of job students, especially for routine tasks and help during the evening opening hours.

Nevertheless, this represents an extremely low number of available staff; certainly in view of the aim to deliver a number of personalized services in the different ‘clusters’ and – of course – at the central information desk.

Hence, as many routine tasks as possible have been automated and modern IT technologies have been implemented wherever feasible. All books in the open stacks have RFID identification, which is used for a variety of purposes such as identification, protection, automated check-out, … (automated return may be implemented in the future); the whole complex is surveyed by video control and electronic detection; a dedicated software tool (called the CBA “Locator”) has been implemented to guide the users in physically locating a specific book or journal in the CBA complex (total surface area > 10,000 m²); etc …

Also the CBA internal computer network (between 100 and 150 workstations) is quite special. In cooperation with SUN Microsystems a dedicated fully ‘thin-client’ network, with state-of-the art ‘hot desking’ facilities, has been installed throughout the library complex. This makes up most of the publicly accessible computer equipment. It only requires an extremely low amount of maintenance work and software specialists within the library can concentrate on new applications or development tasks.

5. **Collection optimization and organizational issues**

The logistics of merging some 18 different libraries or smaller information collections have been quite a challenging task. Nevertheless, some 70% of the library collection has been moved and merged during the academic holiday season July-September 2002.

The library management also took the opportunity of this new CBA project to investigate and review the total collection of purchased journal subscriptions. Based on a citation analysis of all master and Ph.D. theses of the past 10 year period (i.e. analysis of all journals effectively cited and used), a “recommended” purchase list has been transferred to the different representative from the participating departments and faculties. This list included both new subscriptions and identification of redundant or ill-used journals or magazines. At the discretion of the different representatives and the chairmen of the individual CBA clusters (cf. above), this list is now used as an efficient steering and management tool for future acquisitions.

6. **Conclusion**

Actual work on the CBA construction site began in April 2000, and all was finished by the official opening date of October 1st 2002. In some two years and a half (plus another two to three years of planning), the Katholieke Universiteit Leuven has constructed a beautiful and efficient modern library, prepared to make the bridge from an old university to the new information technology age. At the same time, with the restoration of the Celestine monastery, an important piece of its historical heritage has resurrected.