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Crossroads of Heritage: The material culture of science and technology in universities¹

University paths and heritage paths

Heritage is a contingent concept defined according to identity, power and culture transformations. At the same time, heritage encompasses historical elements that reveal these transformations, whether in an entire society or in a small institution. In every agora, citizens participate in the ‘double construction’ of their heritage and negotiate the narrative of their history². As small but well-structured and heterogeneous societies, universities have their own codes and conflicts to create and to manage their specific heritage³. Furthermore, historically universities are centres for constructing knowledge to produce objects and for constructing objects to (re)produce knowledge. Therefore, the paths of universities and the paths of the material culture of science follow a somehow parallel course and university heritage is a valuable source for understanding the past, present and future of science and technology. Scientific instruments and machines enable historians to study not only academic experimentation and didactics, but also the power-

¹ A former version of this paper was presented at the Universeum Network Meeting 2009 (Toulouse, 11–13 June 2009) with Santiago Vallmitjana (Faculty of Physics, University of Barcelona) *Two interesting university collections in Barcelona: Common projects*. This study has been partially supported by the Spanish *Ministerio de Ciencia e Innovación* (HAR2008-02580-E project). Another version was presented at the International Course on Scientific, Technical, and Industrial Heritage within the Erasmus Mundus Master Course *Techniques, Patrimoines et Territoires de l’Industrie (TPTI)* (Terrassa–Barcelona, 14–24 September 2009).

² Concerning museums, heritage and power negotiation, see for example S. Macdonald, *Exhibitions of power and powers of exhibition: an introduction to the politics of display* [in:] S. Macdonald (ed.), *The politics of display. Museums, science and culture*, Routledge, London, New York 1998, p. 1–24; T.W. Luke, *Museum politics. Power plays at the exhibition*, University of Minnesota Press, Minneapolis 2002; M. Iniesta, *Els gabinets del món. Antropologia, museus i museologies*, Pagès Editors, Lleida 1994.

³ Despite the works of researchers such as Susan DiGiacomo and Eli Thorkelson, the anthropology of universities remains largely an undeveloped field.

ful image of technology, gender construction or international politics. On the other hand, university archives, libraries and spaces are other axes of university heritage and should be considered together as evidence of a same history⁴.

In this sense, universities have shared characteristics with historical industrial landscapes and can be studied as ‘living archaeological sites’ and as interpretation centres for the preservation and construction of their memory, which is embedded in the daily dynamics of science and technology. Following a theoretical framework developed earlier⁵, universities can be regarded as ecomuseums: sites where people and material culture are interpreted in their historical and spatial contexts and where ‘inhabitants’ are active actors in this interpretation; sites where past and present form part of a continuum and where locality is a central item for constructing a shared culture⁶. This paper continues this approach and describes, from this perspective, a case study of heritage management.

The ETSEIB path

The School of Industrial Engineering of Barcelona (ETSEIB) was founded in 1851 as a successor to the Barcelona Board of Commerce Schools (1769–1851). Discontinuities in the preservation of the material heritage have been linked to discontinuities of spaces, namely moves and replacements of historical buildings in 1851, 1874, 1927 and 1964, but also departmental restructuring. In 1964, the ETSEIB Museum (created in 1851) disappeared officially and its materials were dispersed through the School departments (called *cátedras*). Other material discontinuities have resulted from reforms in academic plans, research challenges or economic limitations, as well as from the dynamic nature of the concepts of ‘museological piece’ and ‘obsolete item’, the evolution of professional identities and changes in scientific and institutional legitimisation mechanisms.

In Catalonia, a few scientific and industrial heritage initiatives were developed following the political and social transformations Spain has faced since the implementation of democracy in 1975⁷. In 1976, the ETSEIB library initiated the catalogue of its bibliographical heritage, later supported by the Catalan government. For the past two decades, the library inventory and restoration were ETSEIB’s heritage priorities. Today, the library section on history of technology is one of the most relevant in Spain.

⁴ The same point can be made about the historical heritage of secondary schools, although that discussion is beyond the scope of this article.

⁵ The concept of ‘university ecomuseology’ was developed in J. Valentines, *Arqueologia industrial a la Universitat: el cas de la ETSEIB*, “Quaderns d’Història de l’Enginyeria”, VI, 2004, p. 127–160 (available online). For an interesting study on polytechnic university spaces as memory sites, dynamic research and teaching centres, see: F. Drugman (ed.), *I luoghi del sapere scientifico e tecnologico*, Rosenberg & Sellier, Torino, 1994.

⁶ To learn more about ecomuseums, see: G.-H. Rivière *et al.*, *La Muséologie selon Georges Henri Rivière: cours de muséologie-textes et témoignages*, Dunod, Paris, 1989; L. Bergeron, *The new generation of museums: technical, industrial and ‘ecomuseums’* [in:] B. Schroeder-Gudehus (ed.), *Industrial Society and its Museums. Social Aspirations and Cultural Politics: 1890–1990*, Harwood Academic Publishers, Chur, 1993, p. 91–95; M. Iniesta, 1994, p. 76–85.

⁷ For technical museums, industrial heritage and political identity in Catalonia, see: A. Roca-Rosell, *Musées, technique et identité culturelle. L'exemple Catalan*, “Alliage. Culture-Science-Technique”, 50–51, 2003, p. 151–164; J. Valentines, 2004, p. 130–134.

In 2002, the planned relocation of ETSEIB to a campus near the Besòs River in Barcelona led the Centre of Research for the History of Technology (CRHT) to initiate an inventory of ETSEIB's historical heritage. Since then, the Centre has been documenting the instrumental, archival and spatial heritage of the School. These projects were implemented separately. Subsequently, however, the material cultures of science and technology have converged into a common point⁸.

Heritage axes

The School of Industrial Engineering of Barcelona is engaged in four areas aiming at the preservation of historical heritage: one for collections, another for archives, another for bibliographical material and a fourth for spaces. A brief description of these heritage axes is provided below.

a) *The ETSEIB Historical Collections* (ChEIB). At the moment, there are more than 1,000 catalogued items in the inventory of movable heritage. These items comprise not only obsolete instruments, but also instruments in current scientific use. There are objects for research, teaching, skills training, management and popularization (i.e., models, engines, measurement instruments, machine tools, furniture). Items catalogued so far are representative of the wide spectrum of chronologies, geographies and topics commonly found in university heritage. For example, the first catalogued item – a pile engine from a Catalan ironworks – contains elements from both the eighteenth and the nineteenth centuries. The second catalogued item – the laptop initially used for the inventory – was made in Southwest Asia in the twenty-first century.

b) *The ETSEIB Historical Archive* (AhEIB). This archive is an integral part of the main ETSEIB Archive. It comprises c. 150 linear metres of documents related to the historical development of the School and technical education in Catalonia⁹. Many documents also provide information about the instruments collection, such as receipts, bills, patrimony inventories, school reports, minute books and records of research projects.

c) *The Science and Technology Historical Section* (FHCT) of the ETSEIB Library. Historical manuals, industrial leaflets, handbooks, technical reviews, academic memorandums and projects complement the archaeological and archivist documentation. Moreover, this heritage axis shows the historical aims of the School and the development of scientific topics, pedagogic issues and debates on technology in Spain. The FHCT is divided into three sections: i) Monographs: especially from the nineteenth and the twentieth centuries; ii) Reviews: currently c. 5,000 volumes covering 450 titles published

⁸ To learn more about past experiences in heritage management at the ETSEIB, see: M. Ramon, M. Codina (ed.), *Catàleg del Fons històric de Ciència i Tecnologia*, UPC, Barcelona 2001 (bibliographical heritage); J. Valentines, *El Patrimoni Històric de l'Escola Tècnica d'Enginyeria Industrial de Barcelona*, CRHT-ETSEIB, Barcelona 2004b, p. 3–13 (instrument collections); J. Valentines, *Projecte de Gestió Integral de l'Arxiu Històric de l'ETSEIB. Memòria i Trajectòria*, ETSEIB, Barcelona 2006, p. 5–11 (historical archives). These works are accessible at the CRHT website, <http://www.upc.edu/cut>.

⁹ Guillermo Lusa has written a compelling history of the School, positioning it in the national and international spheres. It was mainly based on this archive. See G. Lusa (ed.), *Documentos de la Escuela de Ingenieros Industriales de Barcelona*, ETSEIB, Barcelona, vol. 1–19, 1991–2009 (collection). See also Robert Fox's review on these volumes in "The British Journal for the History of Science", 38(1), 2005, p. 116–117.

before 1950; and iii) Industrial catalogues: several thousands of catalogues of national and international companies.

d) *The School of Industrial Engineering Spaces* (sETSEIB). Spaces in current use, past spaces and lost spaces (e.g., workshops, classrooms, laboratories or departmental layouts) provide relevant information about the practices of science and the daily life of university collections. Spaces and structures hosting the ETSEIB nuclear reactor (1962–2005) were destroyed. Nevertheless, the containment building of the nuclear reactor was catalogued in the Inventory of the Industrial Heritage of Catalonia, which is in charge of the mNACTEC (Catalan Science and Technical Museum) and some of its instruments have been preserved (e.g., the main switchboard).

Other areas could be considered within the whole heritage project of the School of Engineering. These are:

e) *The immaterial heritage: oral sources*. The establishment of an Oral Archive of Engineering consisting of personal testimonies of active and retired professors, laboratory technicians and assistants is a future aim. The connection between material and immaterial culture might be an appropriate approach to understand the past and present of universities from non-hierarchical perspectives. Moreover, oral sources are often the best, if not the only way to contextualize instruments, spaces and people.

f) *Dispersed or lost objects and collections*. Other types of cultural items associated with the history of the School could be treated. These include lost objects and objects preserved in other institutions (e.g. museums, teaching centres, private entities). The identification, location, inventory and study of dispersed and lost material will enable a more comprehensive picture of heritage and a better understanding of the reasons for its preservation or destruction throughout history. Fieldwork and archival work are needed for this purpose.

Interface of university heritage axes

As seen above, heritage interface areas provide a multiplicity of opportunities for documentation and analysis. An integrated approach also improves efficiency and quality in exhibition, dissemination, preservation and storage. Furthermore, integral heritage management should optimize spatial, economic and human resources in a university. The lack of such resources presents a real challenge for long-term sustained heritage preservation programmes in universities¹⁰.

¹⁰ Resource problems and institutionalization challenges are shared by most universities and cultural entities to different degrees. In this sense, some universities have chosen to strengthen the network of their museums and to participate in regional and national scientific heritage platforms (i.e., University Louis Pasteur of Strasbourg, University of Gottingen or University of Valencia). The case of the University of Strasbourg and France is discussed in S. Soubiran, *University heritage and scientific mediation*, “La lettre de l’OCIM”, May (special issue), 2009, p. 9–17. For the Spanish case, see the monographic issue of *Revista de Museología* on Spanish university museums (vol. 43, 2008). See a discussion of the University of Gottingen case in this volume, p. 9–16.

As can be seen in Fig. 1, coordinated or common management between instrumental, documental and bibliographic collections enables sharing cultural initiatives, computer and conservation expertise, digital equipment and display spaces. In the case of ETSEIB, common management enables the School to provide space (conservation and exhibition rooms, seminar and lecture rooms, coffee bar, welcome area) to the heritage project, as well as tools (publication centre, electronic website, restoration and conservation tools) and personnel (maintenance technicians, administrative and computer assistants, security staff).

The heritage project also prompts resource collaboration within the whole Polytechnic University of Catalonia (UPC), of which ETSEIB is one among several institutions. One example is the de-acidification project of the collection of nineteenth century books (ETSEIB Library). This project has been outsourced to a private company but equipment used belongs to the Polytechnic Institute (Terrassa Campus, UPC).

Another example of shared resources is provided by the use of preservation space. Presently lacking a central storage, each ETSEIB department preserves its historical scientific instruments in more or less accessible and visible ways. The lack of an appropriate central storage is due to space constraints and infrastructural limitations of the ETSEIB building. Nevertheless, departmental management has become a good way of implementing a decentralised heritage project. At the same time, the School provides common spaces (such as storage rooms, corridors and halls) to keep a few items that departments have no conditions to preserve. The amalgamation of departmental and central heritage policies, of individual and collective work, of individual and collective interests, of non-professional and expert points of view, must be the key to creating a solid structure for heritage.

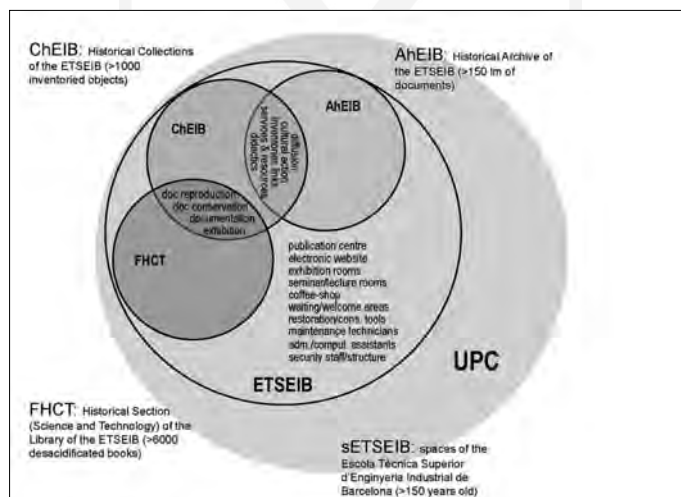


Fig. 1. Heritage axes and internal interfaces

Virtual heritage crossroads

How can all these heritage lines be connected? Undoubtedly, axes can be linked through a specific integrated heritage programme under a structure representing the microsocial cosmos of universities (among others, academic personnel, service and administration staff, students, board). This structure, however, depends on heritage awareness and political will that does not yet exist at the ETSEIB. Nevertheless, a common heritage project via the internet aimed at increasing visibility, credibility and relevance to our work is currently being developed. To this end, for example, the Historical Archive website offers not only archive catalogues and guides, audiovisual broadcasts and resources to direct access, but also e-links to the other axes of university heritage¹¹.

Although important, this is however not enough. In a way similar to our university history, ETSEIB's material culture should circulate and made relevant beyond the School (Fig. 2). First, as a way of standardizing and normalizing historical bibliography access, ETSEIB's historical library has been catalogued in the Collective Catalogue of Universities of Catalonia¹². Secondly, archival treatment tools and data have been shared with other institutions, such as the Science Archive Service (SAC, at the Catalan and Spanish levels) and the European archive network CASE (Cooperation on Archives of Science in Europe). The SAC site is developed by the Centre for the History of Science (CEHIC, Autonomous University of Barcelona) and seeks to be an archive without documents, in other words a platform for the dissemination of science and technology archives, and for the promotion of access and cataloguing projects¹³. CASE is a European group of archivists dedicated to the promotion of contemporary scientific archives. Its website is aimed at developing links with other European archive sites and at providing a gateway to historical scientific sources in Europe.

Finally, data, resources and software of the School's historical collections will be shared with COMIC's (Scientific Instruments Commission, Catalan Countries, with future participation of Spanish and Portuguese projects). COMIC's main objectives are to report and coordinate initiatives of research and conservation of scientific collections; to offer consulting and advisory services for new projects; to promote the interchange of information and experiences; to create a collective catalogue of scientific instruments, and to provide electronic resources for the study of the material culture of science. The implementation of a broad online database will improve the establishment of relations between instruments and associated archival, iconographic and bibliographic data. Thus, in a way similar to the ETSEIB project, COMIC encourages the relationship

¹¹ The heritage websites of the ETSEIB are: a) Historical Archive e-Site, <http://www.upc.edu/cutc/AhEIB/patrimoni.htm>; b) Historical Collections of the ETSEIB, http://www.upc.edu/cutc/colleccions_historiques/patrimoni.htm; and c) Historical Library of Science and Technology, <http://biblioteca.upc.es/bib240/serveis/fhct/info.asp>. In these websites, it is possible to access all inventories and catalogues. Most publications about ETSEIB heritage are accessible online too.

¹² The CCUC is accessible at <http://ccuc.cbuc.cat>. To learn more about the de-acidification project: "Desacidificació de part dels materials bibliogràfics del Fons Històric de Ciència i Tècnica de la Biblioteca de l'Escola Tècnica Superior d'Enginyeria Industrial de Barcelona (Universitat Politècnica de Catalunya)". ETSEIB Library.

¹³ The SAC website is at <http://www.sac.cat>. The ETSEIB is included due to its important scientific archive. The page offers links to ETSEIB's documental collections. The CASE website is at <http://www.bath.ac.uk/ncuacs/case.htm>, with links to the SAC.

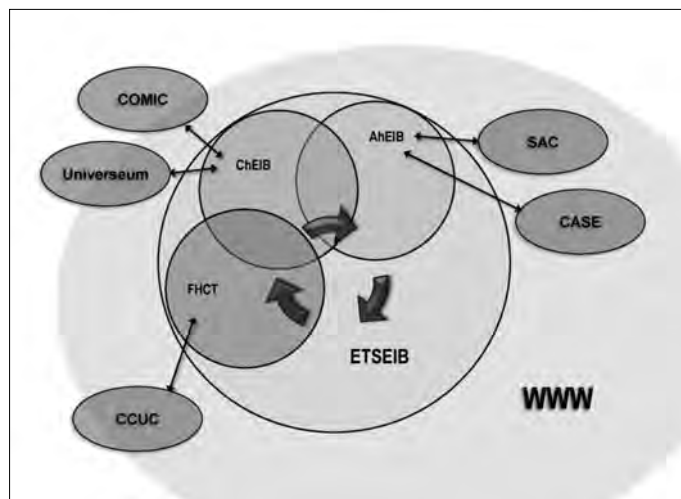


Fig. 2. Virtual heritage crossroads

between different kinds of material culture by means of bibliographical links, cross-tables and image files¹⁴.

Microsociety of the university at the next crossroad

In universities, active participation of each social group is essential for the development of heritage projects. People managing heritage sections obviously need to be involved. On the other hand, and no less relevant, are the skills and effort of workers and students who live daily in a continuous and dynamic relation with university material culture and spaces. Below, I enumerate present or potential main actors at the ETSEIB and some of their abilities and tasks regarding heritage.

a) Administrative Staff and Services

Workshops and laboratory technicians can assist in the identification of instruments and add data to the inventory (e.g. chronology, acquisition, associated projects). Technicians can also participate in the conservation and even the restoration of historical instruments for reuse in scientific and teaching practices and for exhibition in departmental display cases¹⁵.

¹⁴ COMIC's website can be accessed at <http://webonet.no-ip.com/comic>. For more on COMIC, see: "Els instruments científics dels Països Catalans. Un catàleg col·lectiu del patrimoni científic català. Memòria orientativa del programa de recerca". Convocatòria de programes de recerca, 2008–2010, Institut d'Estudis Catalans (main researcher: José Ramón Bertomeu Sánchez). Presently, COMIC has finished the first stage of its heritage project – the online database. In 2010, COMIC will complete website design and implement the decentralized data entering system.

¹⁵ This is the case of Kim Albó, a technician from the Department of Materials Science and Metallurgical Engineering of the ETSEIB. At the ETSEIB, mid-twentieth century restored polishing machines are being

Furthermore, in ETSEIB other services have assumed some degrees of responsibility for heritage. First, central maintenance services have improved space and environmental conditions of conservation and have collaborated in the setting up of exhibitions (i.e., museography infrastructures, light design, display panels). Secondly, the cleaning staff has also participated in the heritage conservation and maintenance of storerooms, archive boxes and scientific instruments. Thirdly, computer technicians have collaborated in the implementation of heritage websites and description software tools. Finally, protection and security of the material culture in exhibition rooms and storerooms have been assigned to the security staff (Fig. 3).

Departmental and central administrative staff also plays an important role in the ETSEIB heritage project. For example, administrative staff is able to carry out heritage coordination and control tasks (i.e. heritage movements, entries, documentation, assignment, disposal).

b) Academic Staff

Working together with administrative and service personnel, academic staff can contribute to the design of departmental heritage policies, the inventory and strategies of preserving and exhibiting new elements of the material culture of engineering. Furthermore, professors can introduce historical technologies into the academic curriculum and into student practices, with the aim of clearly showing concepts, applications and contexts of scientific principles¹⁶.

c) Graduate and postgraduate students

Students are an essential part of the university community and can actively collaborate in heritage projects through university associations, academic work or specific short-term grants. In fact, the involvement of graduate and post-graduate students in university heritage preservation, access and study projects has been increasing in European universities¹⁷.

At the ETSEIB, students have inventoried archival material and instruments. They have also developed monographs on historical machines and university museums for

reused for research. They have replaced more recent ones due to their better stability. Technical staff has also restored a few historical objects for exhibition in departmental areas.

¹⁶ Joaquim Agulló, from the Department of Mechanical Engineering, has taught physical principles of kinematics and dynamics using instruments designed by a former professor and director of the ETSEIB, Paulí Castells. One of these instruments is the algebraic pulley-block to solve linear equations by means of a mechanical system (dated 1932; ETSEIB heritage inventory, object num. 00474, accessible at http://www.upc.edu/cutc/colleccions_historiques/Patrimoni/inventari_patrimoni.pdf).

¹⁷ For example, during the Universeum Network Meeting in 2009 (Toulouse), a few communications showed the potential of the student community in university heritage management. The Transylvania University of Brasov has been able to include graduate students in the Forestry project. In exchange for their work, this ‘non-professional staff’ can obtain academic credits (E. Helerea *et al.*, *Forestry: A Project to Increase Access to University Heritage*). At Leeds University, the university heritage project is coordinated by post-graduate students. Normally, tasks are non-remunerated and developed for the benefit of students themselves, namely experience and skills acquisition in museography and heritage (M. Steadman, *Progressions towards establishing a Museum of the History of Science, Technology and Medicine at the University of Leeds*).

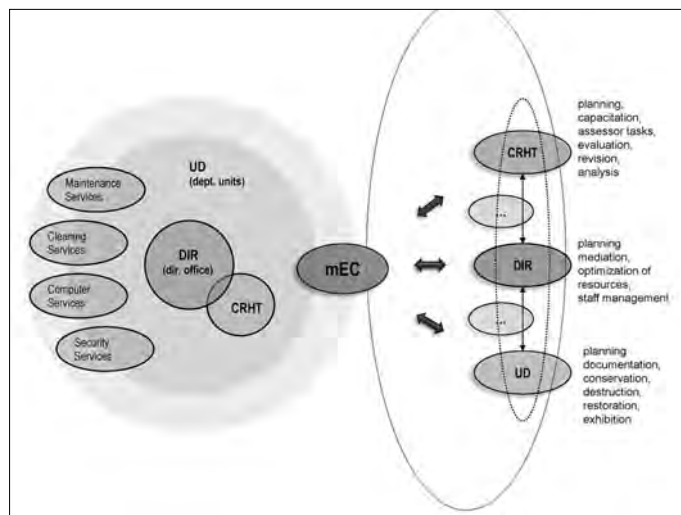


Fig. 3. University structures and heritage management

their courses on the history of technology (or even, for final projects of university studies). Postgraduate students in the history of science, medicine and technology should also be taken into consideration. In this sense, ETSEIB is seeking collaborative mechanisms with other universities in Catalonia (Autonomous University of Barcelona, University of Barcelona) which provide master courses in the history of science.

Traffic lights at the crossroads

Until today, and as far as historical heritage management is concerned, relations between academic structures at the ETSEIB (direction, management and secretarial offices, research and teaching centres and support services) have been discontinuous and partial. Overall responsibility has gone back and forth to the Centre of Research for the History of Technology (CRHT), with the intervention of departmental and direction units through short-term programs, linked to annual or biannual projects. This situation has raised challenges regarding preservation, conservation, documentation and diffusion, and, most importantly, a lack of visibility and awareness towards historical heritage. History of science departments have the appropriate knowledge, tools and trained personnel to take good care of heritage, but they need the active engagement of other university sections to develop efficient heritage programmes. As I have argued, heritage management should be a collective goal¹⁸.

¹⁸ There are, however, scientific heritage and university museums under the direct jurisdiction of history of science research centres and departments. This is the case of the Whipple Museum at Cambridge University or the Museo Historicomédico at the University of Valencia. The potential of these museums as laboratories for the history of science were debated in a “Publics of Science” Seminar organized by CEHIC

A new management model based on interrelations and collaborative work is proposed. A formal Board representing ETSEIB units and staff sections is required. This board would eventually be established at the Museum of Engineering of Catalonia (mEC), the future museum of the school¹⁹. As can be seen in Figure 3, heritage planning would be carried out by all the ETSEIB units. The Board's main activities would be the coordination and optimization of resources. Departmental units would manage heritage documentation and conservation. Finally, the Centre of Research for the History of Technology would undertake tasks of heritage consulting, museographic training, inventory review and historical analysis. Bibliographic and archival materials would be coordinated by the Library and the Secretarial Office, respectively. Furthermore, the integration of ETSEIB heritage project at other crossroads, namely similar projects in Catalan Countries, Spain, Portugal or Europe, will stabilize long-term projects and share information, computer resources and preservation and diffusion strategies. Local, national and international networks are strong platforms to consolidate these aims.

Epilogue: Ecomuseologies in universities

The different heritage axes of the School of Industrial Engineering of Barcelona – technical instruments, archival documents, historical bibliography and spaces of science, immaterial and lost heritage – should converge at real and virtual points for integral and efficient management. To achieve this end, it is necessary to coordinate people and sections across the ETSEIB. This coordination brings the added-value of optimising university resources (e.g. spaces and facilities, instruments, skills, budgets) and improving historical understanding, as well as reinforcing the collective nature of such project.

Following and re-creating the concept of ecomuseology, university spaces can be simultaneously regarded as a cultural laboratory, a research and training centre and a living museum. All university individuals (academic, administrative and service staff and students) can shape the university 'ecomuseum', where the 'eco' prefix has a genuine etymological meaning. At the same time, university landscapes or indoor sites can become spaces open to society, in other words spaces for meeting, thinking, raising questions and debating science and technology in non-presentist and non-dominant perspectives.

(Autonomous University of Barcelona, 04/12/2009, with the participation of Josh Nall, from the Whipple Museum and Marta C. Lourenço, from the Museum of Science, University of Lisbon).

¹⁹ For the project of the Museum of Engineering of Catalonia, see: J. Valentines, *El Museu de l'Enginyeria de Catalunya: bases conceptuals per a la creació d'un museu universitari*, UPC, Barcelona, 2002 (final project of engineering studies; director: Antoni Roca Rosell).

STRESZCZENIE

Rozdroża dziedzictwa naukowego: kultura materialna i technologia na uniwersytetach

Historia uniwersytetów (tak jak historia społeczeństw) oraz ich spuścizna podążają podobnymi ścieżkami. Artykuł ten dotyczy redukcji przedmiotów kultury materialnej w Szkole Inżynierii Przemysłowej w Barcelonie – instrumentów technicznych, dokumentów archiwalnych, bibliografii historycznej, niematerialnej przestrzeni naukowej, a w związku z tym zagubienia dziedzictwa materialnego uczelni. Występuje tutaj pewna sprzeczność z zasadami efektywnego zarządzania. Członkowie mikrospołeczności Szkoły (profesorowie, administracja i studenci) powinni zbliżyć się do siebie, spotkać się na tymże rozdrożu. Jednakże bez długoterminowych projektów, koordynowanych przez powołane do tego celu struktury, ruch na tym skrzyżowaniu może być bardzo trudny. W tym sensie szkoły techniczne oraz uniwersytety mogą być postrzegane jako wewnętrzne ekomuzea, których „mieszkańcy” nieustannie tworzą własny kulturowy krajobraz.

