Report Summary: Designing for Science: Building, user and adaptation in the Cavendish II Laboratory

Charlotte Airey, October 2015 – April 2016

Overview: This study was an investigation of the advantages and disadvantages of design requirements in the Cavendish II in relation to adaptability and user requirements. Built in 1974 to last 25 years, it has supported innovation in science well beyond 41 years. It is worth investigating what has contributed to the longevity and success of the Cavendish II, and whether it is indeed the fabric of the building which allows for adaptability via user creativity.

Aims: The study sought to uncover how initial design decisions and user interference have contributed to the longevity and eventual demolition of the Cavendish II in 2020, which may inform the concerns in the design of the Cavendish III, and perhaps other laboratories in Cambridge.

Process/methodology: A qualitative study of the Cavendish Laboratory was deemed appropriate in order to interpret key themes in the design and use of the building over its lifetime. This involved drawing upon multiple source types: archives, review of literature and, most importantly, semi-structured interviews with users and other stakeholders. Regular visits to the Cavendish Laboratory over the course of six months also allowed some observation of the use of spaces over time.

Results: It was found that the drivers for change over the lifetime of the Cavendish II were related to pressures from growth in staff numbers, organisational changes of research groups, and increasingly highly-controlled, high-precision experimental environments and contemporary requirements to collaborate with industry.

The modular steel frame structure of the building was crucial in allowing for maximum flexibility in plan and section. Moreover, though the facilities are considered overcrowded today, these pressures have been alleviated by allowing plant to overflow outdoors and into circulation spaces, and densifying occupation has encroached into stairwells and within the plan.

The combination of little building agency with high user ingenuity is therefore another reason for the lasting success of the Cavendish and its ability to accommodate unforeseeable changes in science. The examples of clean rooms and other projects engineered by building managers show that the problem-solving attitude and funds to enable these projects allow for cutting-edge facilities to be introduced.

Adaptations in the Cavendish II are driven by internal and external processes which are cumulative and fragmenting. The iterative nature of space allocation to research groups through funding means that space is occupied in a piecemeal way, leading to long-term fragmentation.

The superimposition over time of building works, both scientific and building-related, creates a build-up of archaeology in spaces which become expensive and time-consuming to remove.

The analysis of four user interviews in Chapter 5 revealed that although the building is appreciated in its malleability, it should not be designed at the expense of user comfort. A user-centric approach should dictate that certain, less-adapted areas of the building such as social spaces may be more humane. It follows that 'total flexibility' is not favourable; where any space can change to any function. Though this is a design feature demanded for the Cavendish III, it is a case where genericness trumps functionality. The services required to run a laboratory are different from that of an office space, and allowing for conversion from one to another is both expensive and impractical. This feature in the Cavendish II has contributed to the increasing fragmentation of building organisation as well as producing land-locked office spaces which are unappreciated by users.

Recommendations: A long-term management strategy for adaptation might therefore help prevent deterioration of group cohesion and convenient proximity between working areas, as well as the degeneration of quality of the physical environment.

A design for the Cavendish III which envisages heavy alteration and interference on the part of researchers and staff will help maintain the culture of innovation, though care must be taken to prevent user interference with spaces designated for activities other than experimental work. As such, a more distinct zoning of areas for more and less changeable areas may allow for a building which both allows for science practice to evolve and also maintains beautiful and pleasant working and teaching environments. BDP has already suggested this approach in their Stage I Briefing Report for Cavendish III.

Conclusions: The authority of the architect remains in this middle ground between high-specificity and total flexibility. In the move from the Old Cavendish to the Cavendish II, and the discussions for the plans for the Cavendish III, some parallels emerge: both relocations were made on the basis of overcrowding, cluttering of circulation spaces with equipment, services and plant, disturbances due to an increasingly dense site, and contamination from years of experimental activity. While the Old Cavendish continues to be in use by other departments such as Sociology and Anthropology, the Cavendish II is to be demolished in 2020.

The question remains whether cutting-edge science inevitably must keep moving to highly-specified, new-build facilities. Perhaps the Cavendish II would be preserved if it were architecturally more significant. In today's context of Cambridge Science, such a malleable, 'low-road' building for a world-renowned institution such as the Cavendish Laboratory would be unacceptable, for it must attract top specialists from industry and academia around the world. In Cambridge's legacy of such science buildings, such as the Stirling Prize-winning Sainsbury Laboratory, architectural expression must symbolise the integrity, class and excellence of the institution within.

Next steps: A more quantitative study might follow up on remaining questions relating to energy use: the adaptation of laboratories and allocation of experiments involves a certain amount of waste in the demolition of wall partitions and other building fabrics. The increasing fragmentation of research groups may also mean that duplicates in plant may also increase energy use of the building beyond what is necessary.

Further information: A pdf copy of the full study may be acquired through Living Labs or the Department of Architecture, since this study was made as part of a Third Year Undergraduate Dissertation.

About you: *Charlotte Airey, Architecture Undergraduate.*

Photo: 

Motivation: *Having a background in physics, buildings for science have always intrigued me, as they are often left out of the architectural discourse, though they present some of the most burning questions about longevity in buildings and the paradox between human comfort and experimental conditions.*

Personal outcomes from project: *Qualitative analysis and interview techniques, a better understanding of how science buildings are managed.*

Vision: *The University continues to undertake many built projects, where architectural value has a place beyond iconicity. As an institution which by its very nature operates on time scales of centuries rather than decades, the enduring use of buildings beyond their original purpose must be envisaged, particularly in the view of user comfort.*

What's next?: *I plan to take my year out as a Part I architecture student in a private practice in the UK, before I begin to apply for Masters degrees in Europe or Australasia.*