

TRANSFORMATIONAL DESIGN FOR TRANSLATIONAL RESEARCH

Zayed Centre for Research into Rare Disease in Children
Great Ormond Street Hospital

11 June 2018

Ellie Richardson GOSH
Gavin Henderson Stanton Williams

Great Ormond Street
Hospital for Children
NHS Foundation Trust



UCL INSTITUTE OF CHILD HEALTH

What makes a 'Good' Translational Research Facility?

- “The clinic and the lab have to be combined, and the outcome has to be a new medication, a new device, or a new therapy.”
Rui Shi (2016)
- **There's a common theme of 'enabling collaboration'.**
- There are emerging trends in enabling collaboration through building and infrastructure design, but developing an embedded collaborative culture is the 'final frontier'





“Communities are comprised of a diverse mix of people, functions, and uses.

The **built form** that we give to communities helps to **foster connections and communication**: it becomes the stage for our culture”

Toon Dreessen Outgoing president of OAA & Dreessen Cardinal Architects (2015)



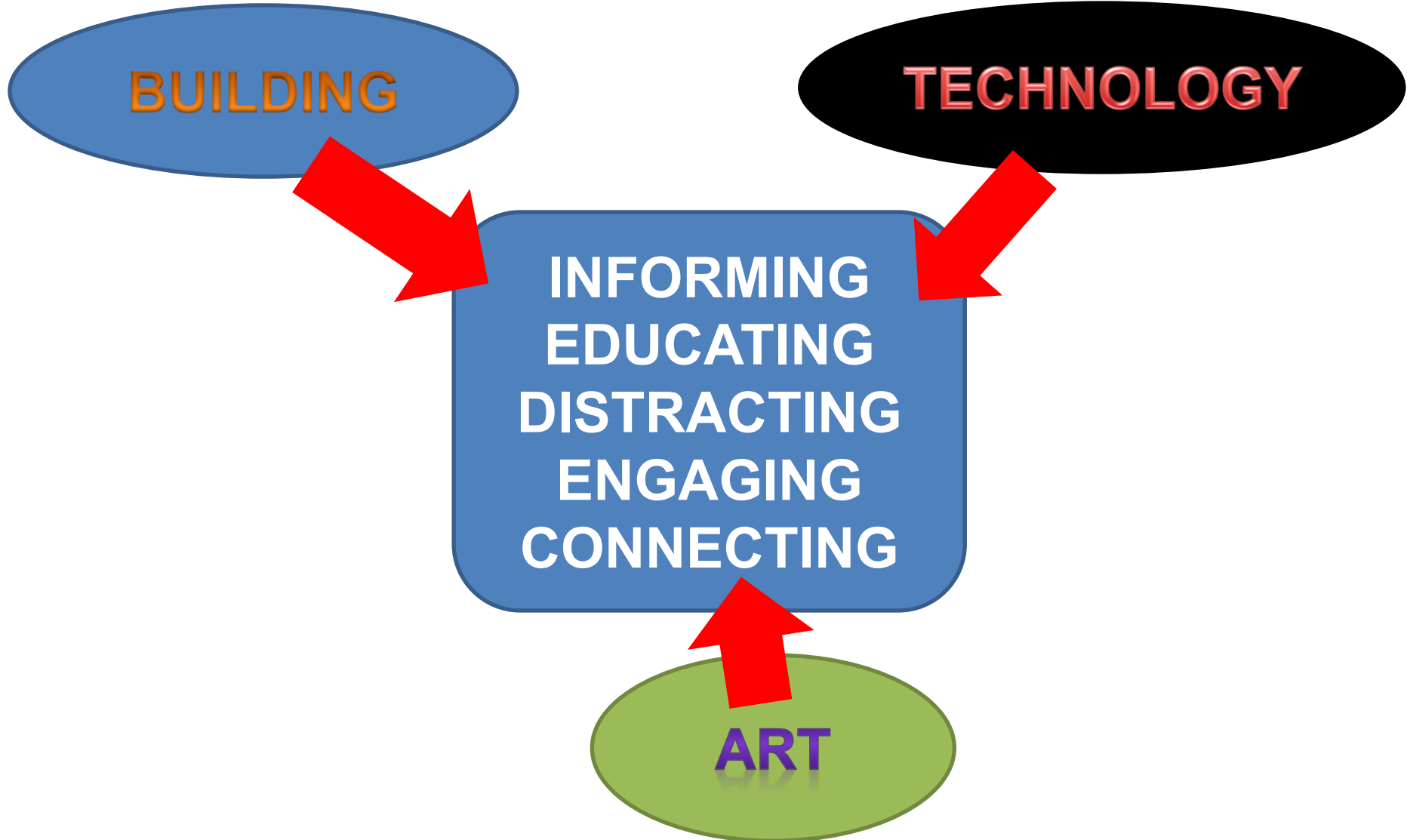
Fostering Connections and Communication

BUILDING

TECHNOLOGY

**INFORMING
EDUCATING
DISTRACTING
ENGAGING
CONNECTING**

ART



What makes a 'Good' Translational Research Facility?: Choosing the Right Architects

- We challenged ourselves to consider a certain design approach and 'look and feel' for the building
- Experienced in designing research facilities
- We were happy to be challenged

Developing the Brief: The Statement of Need

Most rare diseases are caused by a genetic defect, which means that children are born with the condition and will not get better by themselves



Developing the Brief: The Statement of Need



1 in 17 people will suffer from a rare disease at some point in their lives.

In the UK alone that equates to approximately **3.5 million** people.



Only a quarter of rare diseases have had their molecular basis defined, meaning many risk being undiagnosed and therefore untreated.

Developing the Brief: The Statement of Need

THERE ARE AT LEAST
6,000
RARE DISEASES



Seventy-five per cent
of rare diseases affect
children.



Many rare diseases
(approximately 80%)
are of **genetic origin.**

30 % of rare disease
patients die before
their fifth birthday.

Leaders in rare disease research

In this section, we hear from some of the leading profession who will work in the Zayed Centre for Research into Rare Disease in Children about their aspirations for the research and the benefits that the centre will bring



Paolo De Coppi
Regenerative medicine

"The technology we are now using allows us to grow stem cells in the lab and to make them into different tissues. This is helping to understand how some disease genetic variants in the embryo or early during development in the womb. The technology helps us to understand how tissues form and fails in a way important tool. For example, we can now take cells from the skin of a patient and create stem cells to test how an individual will react to different drugs. In the future of personalised medicine and will be further supported with the opening of the Zayed Centre for Research."

Paul Bradley
Genetics

"Through world leading education and partnership we can learn much from our patients that together with their unique genetic information can be used to develop better clinical care. Such approaches from a combination of our patients and world leading research centres will be an integral part of the Zayed Centre for Research."



Faruk A. Ozpolat
Cancer

"The increased severity for the manufacture of cell and gene therapy products in the Zayed Centre for Research will enable us to assess the benefits of these ground-breaking new treatments in many more patients and different diseases."



William Davies
Molecular Immunology

"It is an exciting time for us as we bring the benefits of our work, we know there are improvements to be made and work along them. But there's also an enormous wave of technology and reagents coming down the line and we're going to be leading the Zayed Centre for Research and help us do that."



Julian Thurston
Immunology

"The next frontier in gene therapy is a method to create libraries of new and complex conditions. Dedicated gene therapy facilities. The focus in the Zayed Centre for Research will give us the infrastructure to develop the form of genetic medicine for more patients."



John Anderson
Cancer

"Approaches to cancer's control have changed rapidly over the last 10 years. The tools our most targeted techniques will bring about improvements in cancer care using genetic treatments. Because of the intricate nature of our patients' genomes, it's ability to remember what it has attacked and its capacity to resist chemotherapy has the potential to be a complex, long-lasting infection and cancer care, with the side effects."



Jennifer Williams
Neuroimmunology

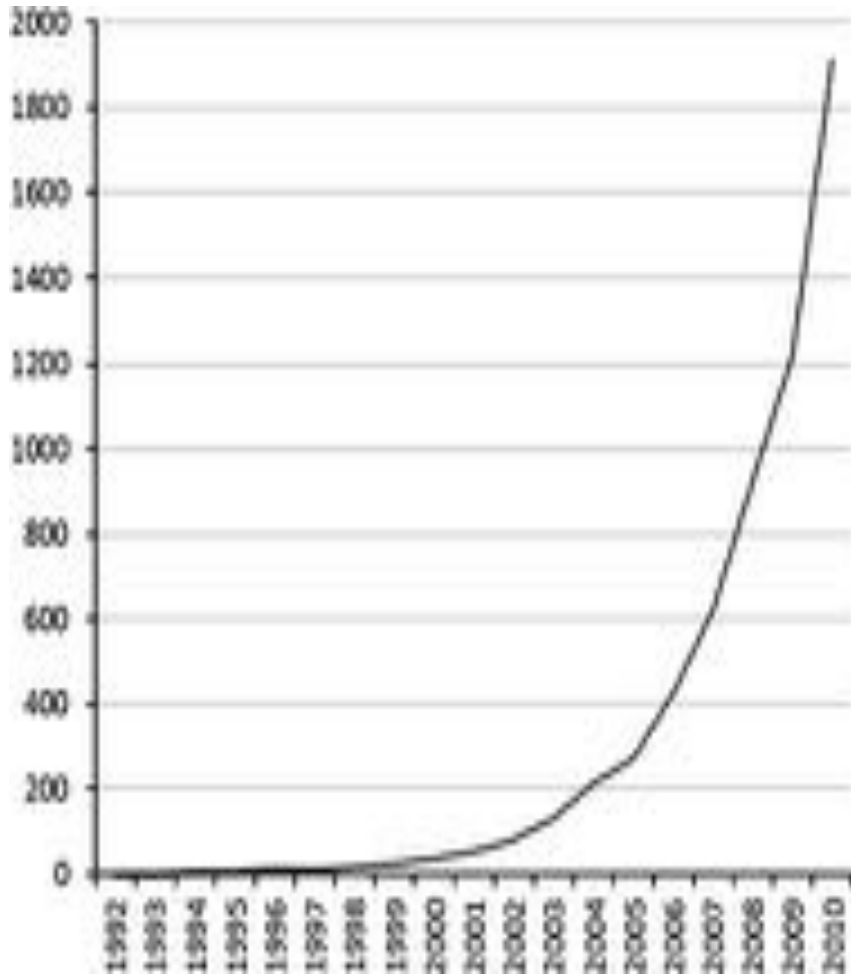
"Research will be crucial to the success of the Zayed Centre for Research. What we need to do is to develop innovative medicine to help children with muscle wasting conditions remain strong and in better health for longer."

Jenny Williams
Neuroimmunology

"Team all research will be an important part of the Zayed Centre for Research. The type of therapy could prevent or reduce the loss of muscle in long with children muscle wasting. Team improvements in the muscles of the family or care could improve the child's quality of life dramatically. Importantly, the more we understand, the more we have the potential to cure the devastating disease and other muscle-wasting disease."



Developing the Brief: The Statement of Need



Number of published articles with the terms “Translational Research”, “Translational Science” or “Translational Medicine” each year, as appeared in a Pubmed search (carried out September 9, 2011)

Developing the Brief: The Vision

Concept of making an *ideas factory* a reality for GOSH

- How to better foster and maintain relationships with other external academic and research partners
- How to encourage
 - Cross fertilisation
 - Spontaneous interaction
 - The development of a research and clinical community
- Access to communal / hot-desk work stations / break-out area / Café for visiting academics, clinicians or researchers from partner organisations visiting the research facility

**A “RESEARCH HOSPITAL”
not a ‘hospital that
does research’.**



A Powerful Partnership: GOSH and UCL Institute of Child Health



Great
Ormond
Street
Hospital

UCL Institute
of Child
Health

Developing the Brief: The Strategy

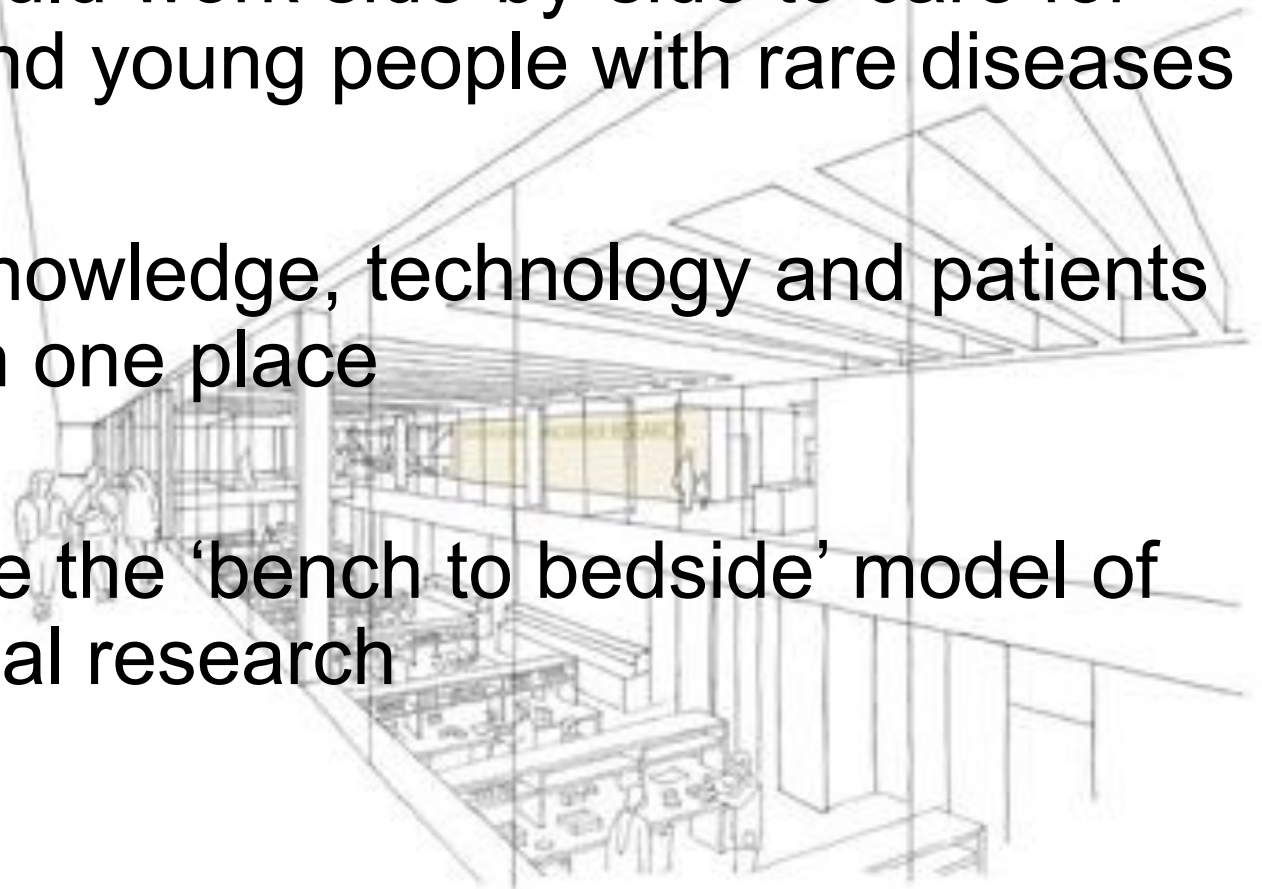
The Rare Diseases Research strategy developed by UCL and GOSH set out three central themes:

- The genetic and molecular basis of disease
- Interventional studies and new therapies
- A better understanding of the outcomes and experience of disease and therapeutic interventions



Developing the Brief: The Vision

- To create a building where scientists and doctors could work side-by-side to care for children and young people with rare diseases
- To bring knowledge, technology and patients together in one place
- To promote the 'bench to bedside' model of translational research



Developing the Brief: The Vision

- To improve the expertise in the diagnosis, understanding, management and care of rare diseases
- To discover new ways to help patients and offer the chance of a longer, fuller life
- To bring breakthroughs and cures for rare diseases closer
- To help children nationally and internationally



Developing the Brief

Site Visits: Invaluable in learning from others

- Institute Imagine, Centre for Scientific Research (Necker Enfants Malades Campus) Paris
- Department of Biochemistry at the University of Oxford
- Oxford Centre for Neural Circuits and Behaviour
- Art Strategy Visits to Science Museum, Natural History, V&A, Museum of London

‘Virtual site Visits’:

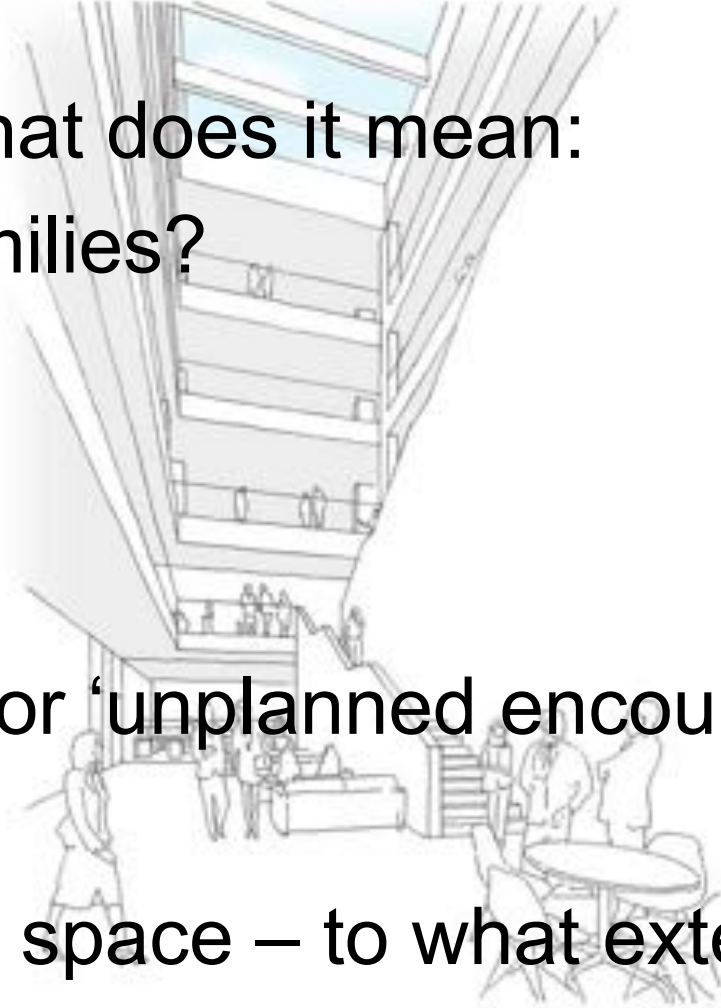
- The Crick Institute
- Sainsbury Laboratory Cambridge
- Fondation Imagine, Université Paris Descartes
- Jamelia Farm Research Campus, Virginia
- Clinical Research Centre, Lund University, Malmo, Sweden
- Stevenage Bioscience Catalyst, Open Innovation Campus
- Leonard and Madlyn Abramson Pediatric Research Center (*The Children’s Hospital of Philadelphia*)
- Children’s Medical Research Institute, Australia
- Bioscience research campuses in British and US universities

The Brief: What's in the Tool Box?

- New Space/Technology Platforms to increase the volume of gene sequencing
- New certified laboratories for manipulating human tissue and gene therapy
- Space for GOSH academics involved in rare disease to be co-located with laboratories
- Outpatient Facility

Developing the Brief

- Translational – what does it mean:
 - To Patients & Families?
 - Clinical Staff?
 - To Researchers?
- Creating spaces for ‘unplanned encounters’
- Sharing the same space – to what extent?



Developing A Culture of Integration

- **The people visiting and working in the building should know what is going on in it!**
- Scientists, Clinicians, Patients, Families: Feeding curiosity, but giving reassurance
- Involvement and education using:
 - Space
 - Art
 - Events
 - Workshops
- Developing a 'social' culture



Sharing the Same Space – to what Extent?

The Debates:

- Two entrances?
- Circulation – shared?
- FM: Security, Waste Streams, Deliveries
- IT – governance/data protection issues
- Seminar Rooms, Offices, Café, Changing Rooms, ‘Staff Rooms’



Outpatients: Practical Applications for Technology

- Involvement of the wider 'family' in consultations ('kitchen table'/'sofa' consulting)
 - Patient engagement – play areas are not enough
 - Information Screens – communication is key
- HBN's haven't kept pace with the changes in technology that deliver today's medicine and patient experience***

Outpatients – Design Innovations (other things not covered by HBN's)

- Consultant Support Space for 'back of house'
 - Touch-down (podium) for 'front of house'
- = No Staff Base!
-
- 'Quiet' Waiting
 - Electronic wayfinding
 - Electronic check-in



Patient Engagement in Waiting Areas



Translating to hardware/software app in consult rooms

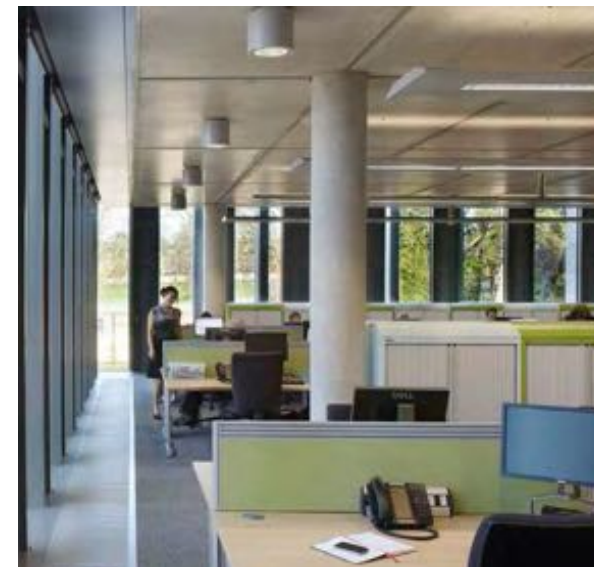
Patient Engagement in Waiting Areas



(Balkwill, Chambers, 2015)

Workspace: Addressing Complexities with Technology

- Joint usage (GOSH & UCL)
- Were faced with separate IT networks (two PC's per desk, copier/printers on different networks within one building)
- Culture of cellular offices as a recruitment and retention tool



GMP: Addressing Complexities by Design



- Ever increasing demand
- Cell Therapy & Gene Therapy sharing facility
- Clean rooms 'packed' with equipment
- Managing EMS & CCTV interfaces (set up IT sub-group)
- Timing of choice and procurement of equipment – circuit boards can be out of date by the time you are operational!

FM: Addressing Complexities with Technology

The partnership between GOSH and UCL brought operational considerations through two partners jointly occupying one building

- Joint FM strategy
- Agreed to share most waste streams
- Joint approach to deliveries
- BMS and EMS system monitoring & response

Barcoding and monitoring systems already in place, just needed to agree venn diagram





MEET LAKE

One year ago, 17-year-old Lake took part in a gene therapy trial at Great Ormond Street Hospital to treat an immune system disorder that has affected him since birth. Now 18 years old, Lake is ready to start a new life in Cornwall





Vision and Aspiration

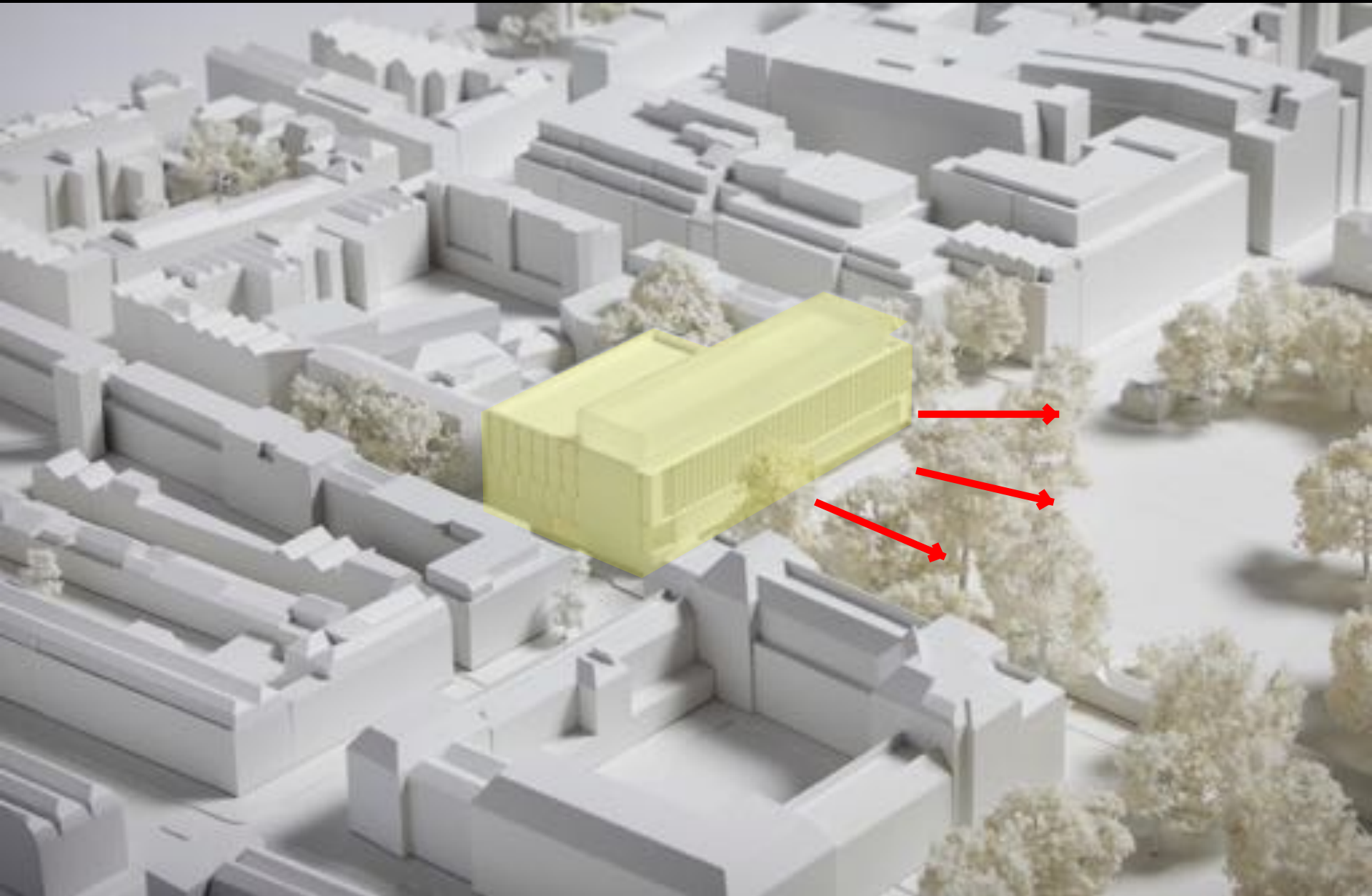
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- To bring knowledge, technology and patients together in one place
- To promote the 'bench to bedside' model of translational research
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A View of the Foundling Hospital.

View of Hospital by EXPANS PROCTER

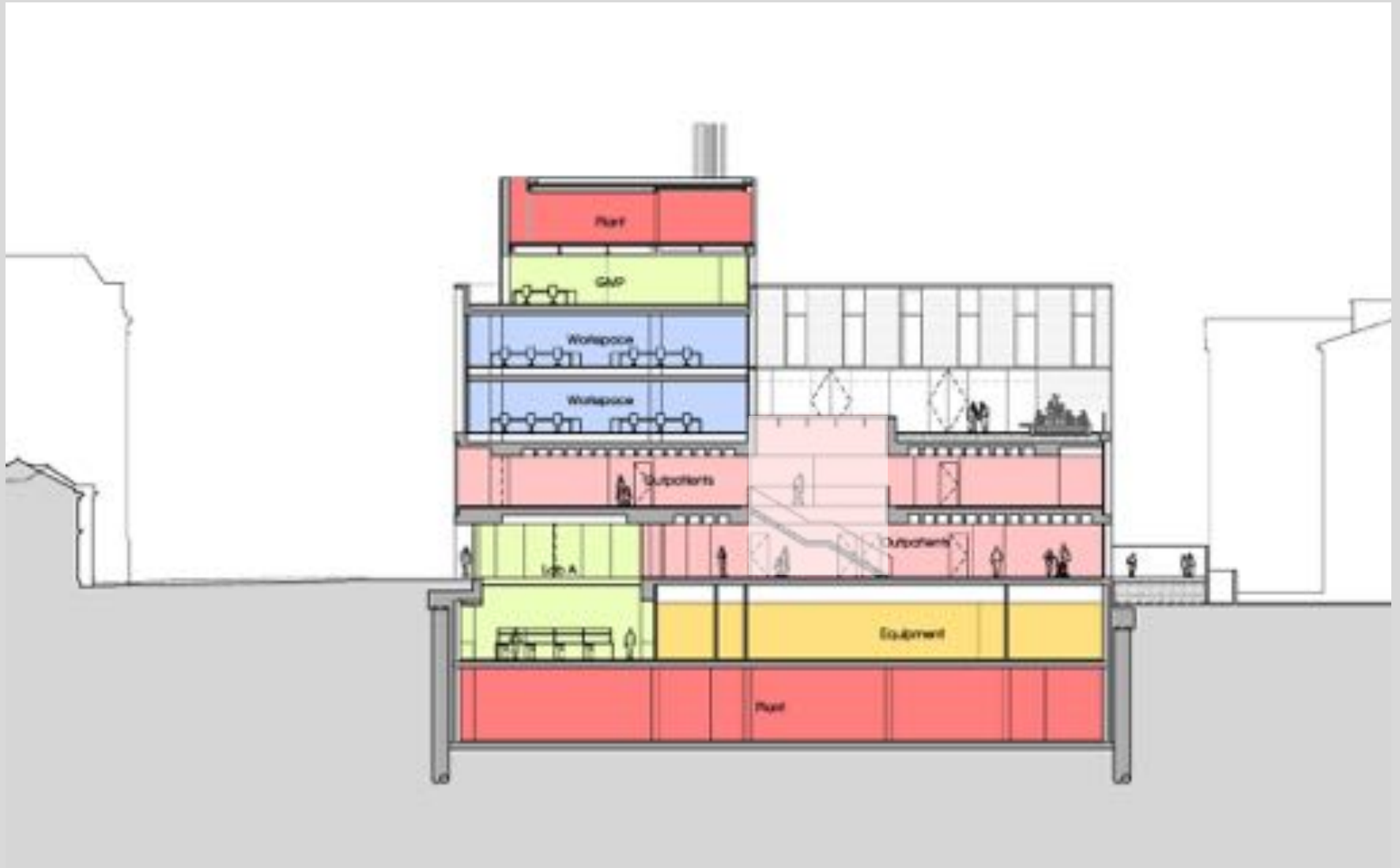




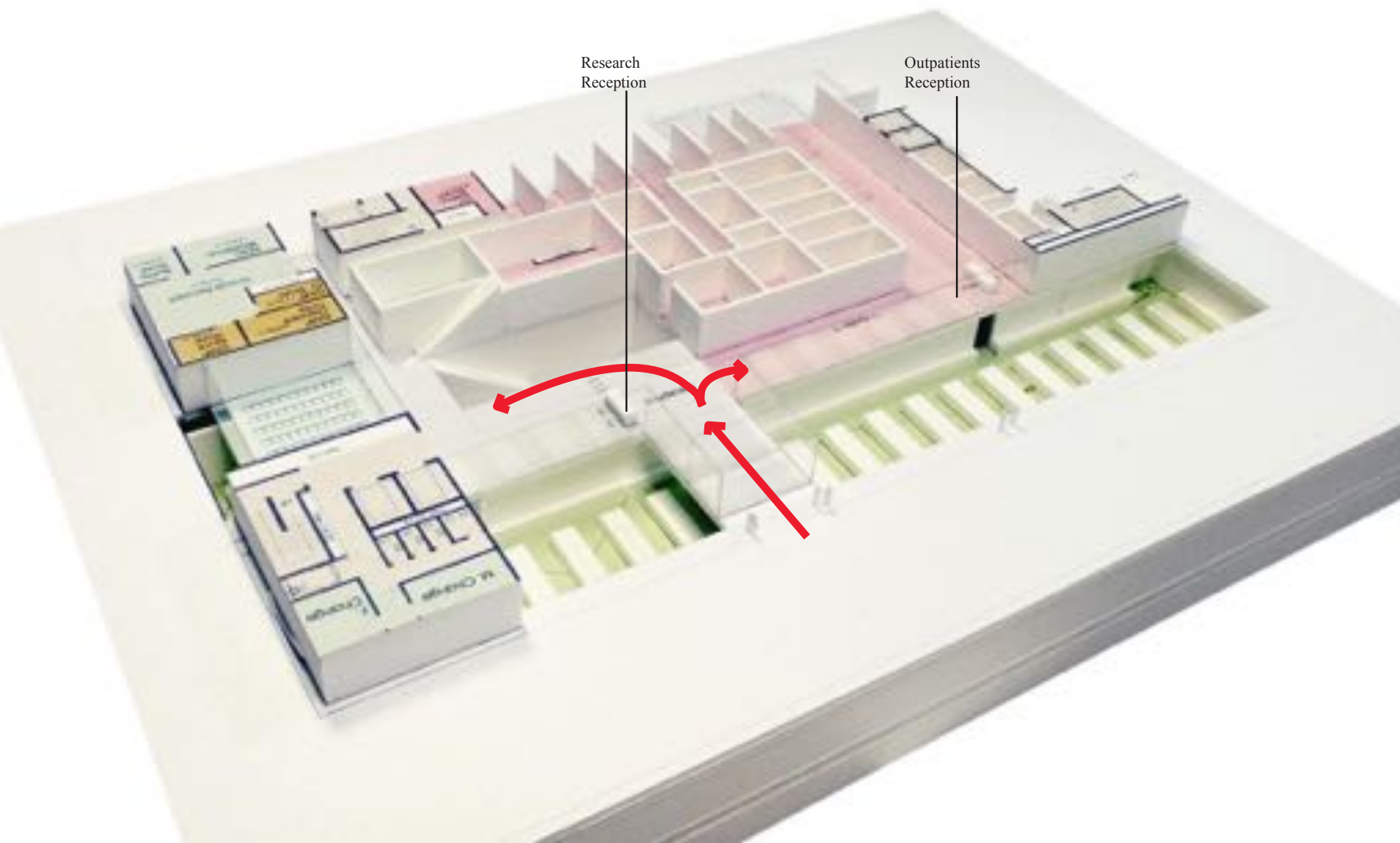
Playground

LEFT

Section Through Main Laboratory / Outpatients Atrium







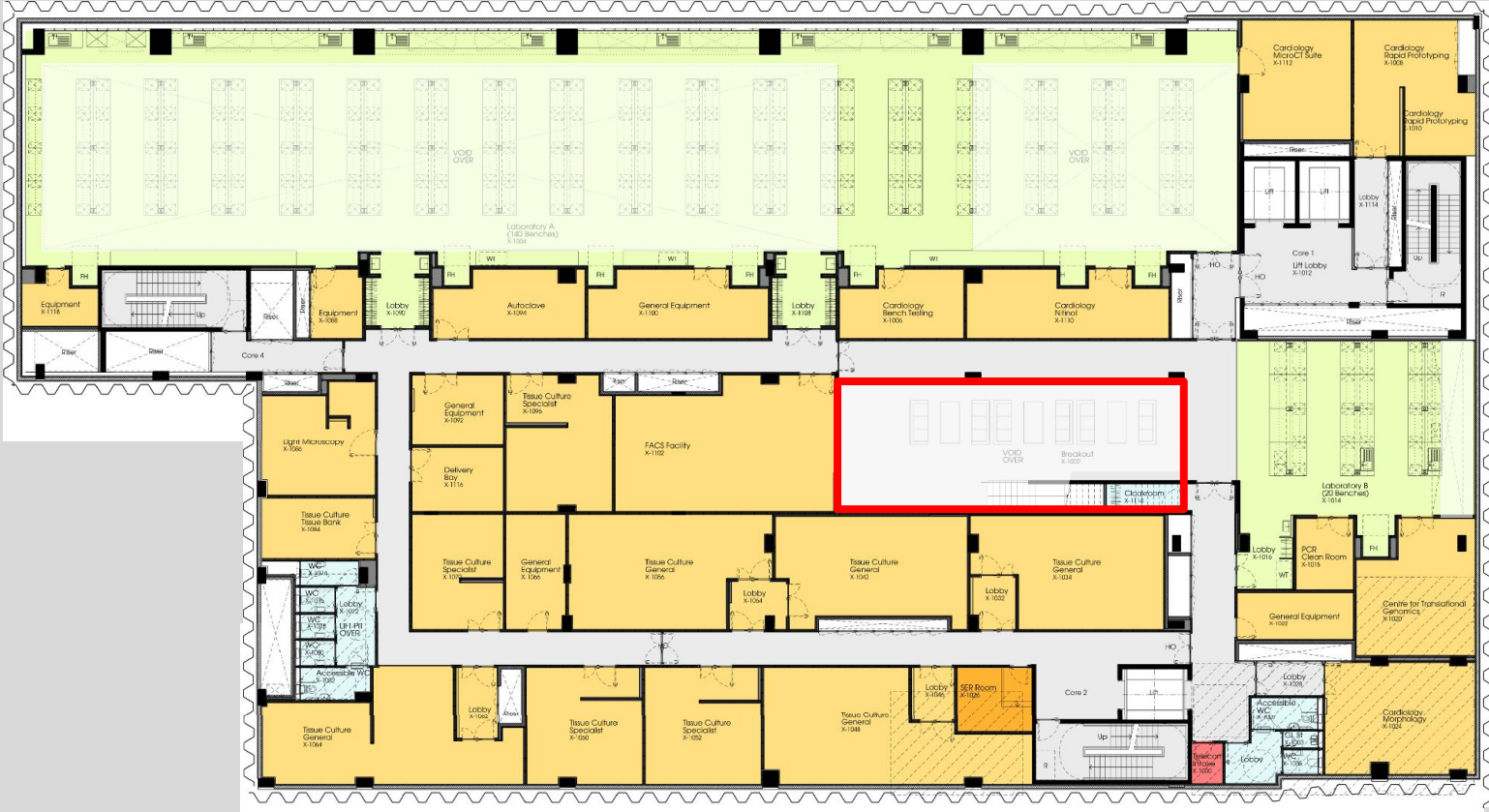
Research
Reception

Outpatients
Reception

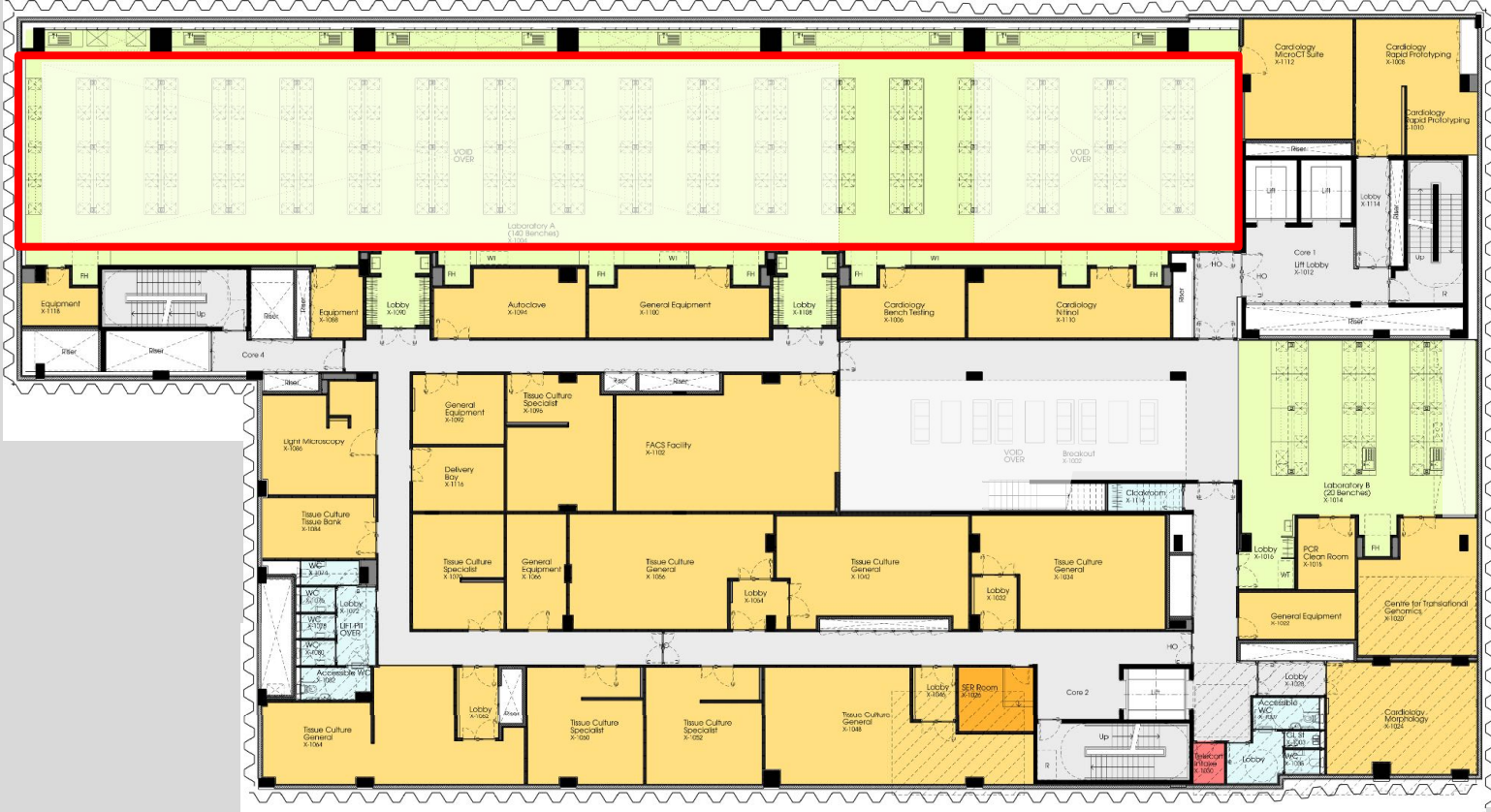




Plan Lower Ground Floor

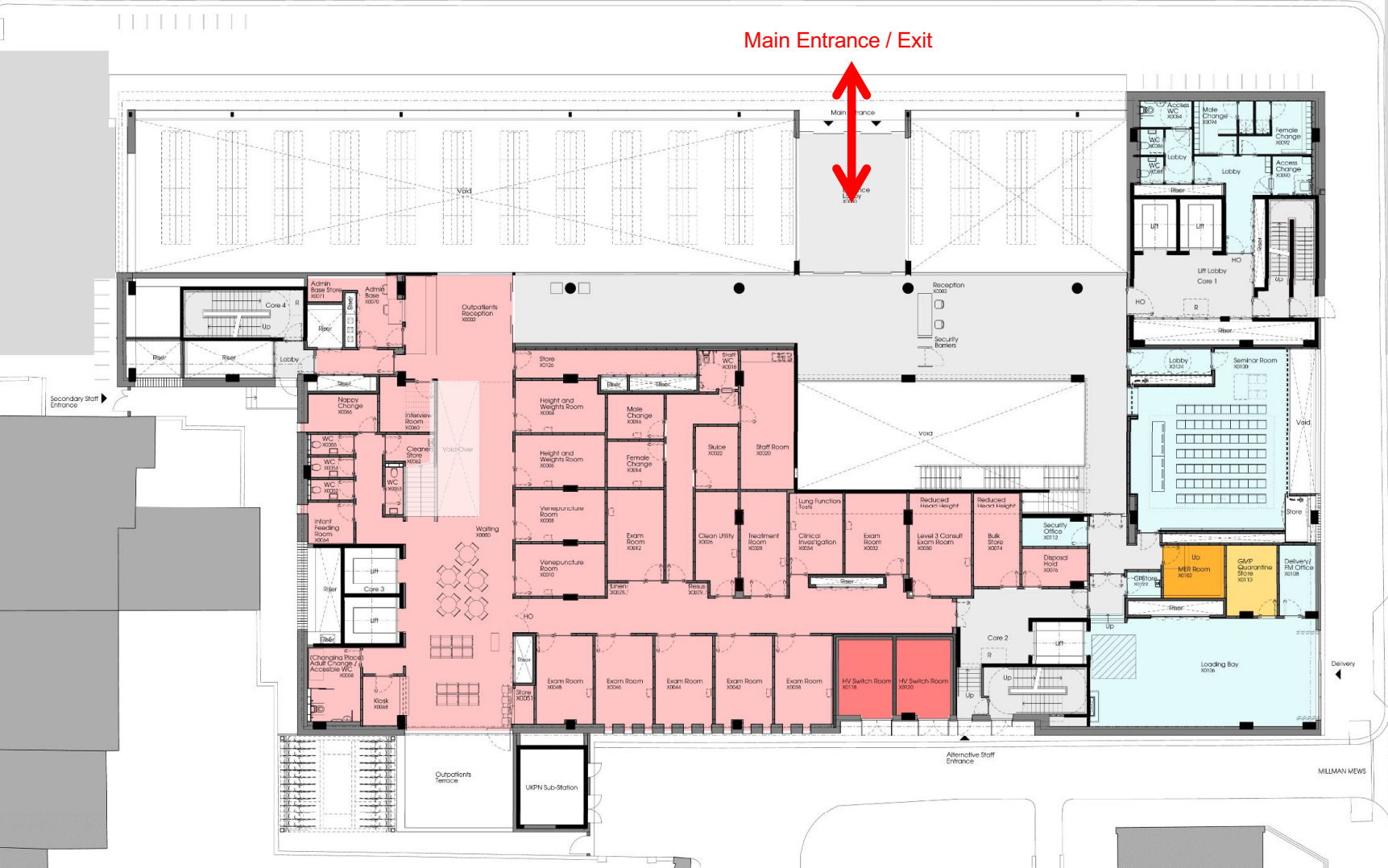


Plan Lower Ground Floor





Plan Ground Floor



Plan First Floor









Phase 3A Art Group

"It's like the future"





WILKINSON HOLDINGS

Key Lessons



- Site visits invaluable
- Funding streams change so does the research going on in the building – needs to be ‘flexible but functional’
- Plan for the tech, but decide detail as late as possible – it will evolve sooner than you think
- Be brave – don’t be constrained by what has gone before, we are in a new era of ‘hybrid’ health and research building design
- Pay great attention to the cultural aspects as well as the building
- Security and ‘open design’ needs careful planning
- Healthcare and laboratory design in one building – accommodating multiple users, standards and systems

REFERENCES

DREESSEN, T. (2015) **How Architecture Can Bring Communities Together**. Huffington Post [Online] Available from: https://www.huffingtonpost.ca/toon-dreessen-/architecture-and-community_b_7236966.html

GOLDBLATT, E & LEE, W-H. (2010) **From bench to bedside: the growing use of translational research in cancer medicine**. American Journal of Translational Research [Online] Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2826819/>

STEEER, M. (2016) **Can Buildings Make You Happy?** CNN [Online] Available from: <http://edition.cnn.com/2008/WORLD/europe/10/16/buildings.happiness/index.html>

VAN DER LAAN, A.L. & BOENINK, M. **Beyond Bench and Bedside: Disentangling the Concept of Translational Research**. Health Care Analysis (2015) Available from: <https://link.springer.com/article/10.1007/s10728-012-0236-x>

WILLIAMS, S. (2016) **Building A Translational Medicine Powerhouse in China**. Science [Online] Available on: <http://www.sciencemag.org/features/2016/06/building-translational-medicine-powerhouse-china>

Picture Credits:

GOSH CHARITY (Winter 2017) **Pioneer Magazine**

GOSH CHARITY (2016) **Zayed Centre for Research into Rare Disease in Children, Annual Report**.

BALKWILL, F & CHAMBERS, K (2015) **Centre of the Cell: Science Comes to Life**. PLoS Biology 13,9 e1002240. doi:10.1371/journal.p.bio.1002240

