The Sainsbury Wellcome Centre for Neural Circuits and Behaviour is a unique, world-class, state of the art neuroscience research institute at University College London (UCL) designed by Ian Ritchie Architects with Arup engineers. Neuroscience is the study of the nervous system, which includes the brain. There are many fields of neuroscience and they are interrelated. For example:

Computational neuroscience (also called theoretical neuroscience) studies the information processing properties of the biological structures that make up the nervous system: how our brains and nervous systems gather, manipulate, classify, store, and retrieve the information we get through our senses. Computational neuroscientists use advanced computing capabilities to understand and solve complex problems.

Systems neuroscience (an experimental neuroscience) studies the structure and function of the networks formed by connected groups of nerve cells in the brain. These networks (also called neural circuits) give rise to our sensory systems, control movements, store information, and make decisions, and are the most complex structures mankind has ever studied. Making progress in systems neuroscience will require new technology to measure the structure and function of these networks, and scientists in this building are currently designing some of the most advanced tools in the world.

It is often difficult for scientists working in specialised fields to find time and opportunity to regularly meet with colleagues working in the same or related fields. However, most scientific innovations or discoveries happen when creative people work together and exchange new ideas and ways of looking at problems. The SWC was specifically designed to give the scientists a chance to meet more easily, every day, and encourage conversations and collaborations. This was done by using the results of neuroscientific research that investigates how people interact with the space around them. The SWC is one of the first buildings in the world which was designed to take into account what has been learned so far about how the spaces in which we live and work affect our moods and the ways we behave.

It is also unique as a research institute because it was designed ‘from the inside out’: the architects visited neuroscientists worldwide to understand the state of their art and what they could envisage their laboratories requiring in the future before even beginning the design!

Client: University College London
Funders: Gatsby Charitable Foundation and Wellcome Trust
Architect: Ian Ritchie Architects
Engineers: Arup
Internal area: 13,805m²
Construction cost: £55m, £3,980 /m²

To learn more, and about why the building looks as it does, continue reading...
Collaborating with individuals from different disciplines enables creative people to approach questions from new perspectives, and most scientific innovations emerge from joint thinking. The funders wanted a building which would encourage theoretical and experimental scientists from many countries and with a wide range of expertise to interact and collaborate to create breakthroughs in neuroscience. The building had to be capable of attracting the world’s best science research teams and deliver a working environment adaptable and flexible enough to accommodate the rapidly evolving demands of scientific research for the next 60+ years.

The building was designed ‘from the inside out’, beginning with the needs of the scientists who would work there. The design team, client and funders visited neuroscience laboratories throughout Europe and the U.S., and studied UCL’s existing research operations. The design team then collaborated with the client and neuroscientists to develop and refine design proposals for the laboratories. These are innovative, and optimise the opportunity for scientists to interact and maximum adaptability so the research can flourish.

The interior of the building has also been organised to reflect the latest neuroscientific and biological research into how people interact with the spaces that surround them. Definitive empirical studies need to be done, but indications are that building design has a real biological and neurological impact. This is not unexpected!

Human beings seem to prefer designed spaces in which we can see a long way and feel connected to others. We like multiple vantage points and varied visual spaces - some intimate and some more open. This multi-scale spatial approach is similar to the ‘scale-free’ biological networks in cells, our brains, and online social networks: dynamic, flexible systems with major and minor ‘hubs’ of activity with many connections between them.

The three-storey computational neuroscience labs are located in the middle of the building. Although the computational neuroscientists have different spatial needs to the experimental neuroscientists, their spaces are directly connected to two storeys of double-height experimental laboratory spaces on either side. This is to encourage interaction. The experimental laboratories are designed with visual connections between floors and between laboratory and write-up areas. They are also high enough to allow space for large vertical spatial experiments.

The laboratories and other areas of the building are uniquely adaptable. Single and double floor height spaces can be reconfigured, and the many services the scientists use are designed to be ‘plug and play’ for maximum ease and flexibility when experiments are set up.

The main circulation routes on each floor encourage people to stop and exchange ideas without obstructing others. They are designed with sightlines through the entire building, so wherever one is, one has a sense of connection to everywhere else. But because people’s needs change throughout the day, the building contains calm private areas as well as many social interaction spaces, flexible lecture and seminar facilities.

Research shows that people who have views of the outside and access to outdoor spaces tend to be less stressed, and otherwise mentally and physically healthier. So there are roof terraces as well as a ‘brasserie’ opening onto a wild flower garden which provides a social focus for everyone in the building.
Neuroscientists have also learned that people feel better and stay healthier when they are exposed to natural levels and cycles of daylight. Normally, our architecture seldom allows enough of that kind of light into buildings, although it is particularly important for people who spend most of their time inside. The architect addressed this issue by making the entire north wall of the SWC out of translucent, finely ribbed cast glass. This allows diffused ‘white’ natural light into the building and also allows the soft change from day to night to register on the inside walls.

The scientists wanted to be able to write anywhere and everywhere as ideas come to them, so the entire inside face of the building’s cast glass envelope and all the internal glass partitions can be - and are - used as writing surfaces. And in circulation areas and spaces where there are no glass walls to write on, glass whiteboards are deliberately provided to encourage the immediate exchange of ideas. The concrete soffits everywhere inside the building are painted with a blue of 480nm spectral wavelength; it is the colour our eyes and brain react to most strongly and which makes us feel especially alert and awake when we are exposed to it.

Although the scientists did not want people in offices opposite to be able to look in, they did want windows that opened, so the building has narrow, triple-glazed windows set flush with the façade. These have mechanically operated and adjustable cast glass louvers which can be rotated to suit individual requirements for privacy or clear views, or to reflect afternoon sunlight deeper into the building.

For this project the architects worked with a glass manufacturer and installer to develop a unique kind of structural cast glass assembly which was prefabricated in large modules. This meant that although the installation was faster than ever previously achieved, which reduced disruption to neighbouring buildings and traffic, a high quality of workmanship was maintained.

The glass envelope of the building has a high thermal performance and the SWC is designed to be impressively energy-efficient, especially for an inner-city, highly serviced research building with three separate environmentally controlled zones. The SWC is the first new-build installation in the UK using a demand-control ventilation system. This system samples air for volatile organic compounds, solvents and other particles and gases, and adjusts its action accordingly. This reduces typical lab air change rates from 10-12 air changes per hour to 4. The building achieves an EPC rating of 28 and a BREEAM Excellent rating.

Because the building’s whole reason for existence is to encourage communication, the architect wanted to ensure that the SWC’s exterior is also about interaction with the public.

In the words of Pasqual Maragall i Mira, the Mayor of Barcelona during that city’s development for the 1992 Olympics: “The exteriors of your buildings are the walls of our public rooms, so we will have a say about what they look like because we have to live with them.”

Local interest groups and statutory authorities were consulted early and extensively during the design process to make sure the way the building ‘speaks’ with its neighbours and the public is appropriate.

During the day the white glass raises the quality of light in the street without causing any disturbing reflections. Seen from outside, the building glows softly at night without any glare. Before the design of the façade began, as a metaphor for the building, Ian Ritchie thought of an iceberg: it expresses the melting of barriers between theoretical and behavioural scientists that the client wanted to achieve, as well as the climate change the earth is undergoing. At each end of the north façade, as it comes around the corner, the translucent cast glass becomes clear, as if ice were melting into water.
The south façade of the building, which can’t be seen from the street, is covered with a ‘veil’ of suspended, thin white rectangles - like a field of abstracted ice floes - which provide shade and move gently in the breeze. They hide pipe-work and utilities and form the backdrop to a landscaped courtyard at ground level which can be seen from the rear of the neighbouring buildings.

Why did the architect put waves in the façade of the building? The waves echo the vertical rhythms and proportions of the Georgian architecture in the neighbourhood - affirming our culturally defined notion of beauty. The curvy façade also reflects Ian Ritchie’s sense of humour: they refer to ‘brain waves’ both as a clever idea and an electrical impulse in the brain. And partly as a playful reference to the specially rapidly firing neurons of the computational neuroscientists and partly to give their labs a distinct identity from the outside, he increased the frequency of the waves across the central block of the building.

The art on the outside of the building is intended to make the centre less anonymous and engage passers-by through communicating something about what is happening inside. The five curated vitrines punctuate the translucent wall in the colonnade with neuro-related artwork which will change over time. They currently explain some visual phenomena and the ways our brain can be confused in its attempt to represent the visual world: distortion, deception, inversion, illusion and perception.

A new ‘pocket’ park on the west side of the building provides seating and a gathering area next to a landscaped wall. A neuroscience image is projected onto the building’s west wall at night. The 100m long public colonnade on Howland Street more than doubles the width of the pedestrian realm and extends a hand to the past: since ancient times colonnades have been used to mediate between the private interior and the public exterior of buildings. During the Renaissance the ceilings of colonnades were often ornamented and, carrying that architectural tradition forward into the present day, the SWC’s colonnade is animated with an art installation of one thousand fluttering ‘pixels’ suspended from the colonnade soffit. From one end of the colonnade, you can see portraits of UCL’s Nobel Laureates in physiology or medicine which come into focus as you approach them, and from the other end you see Johann Sebastian Bach’s entire ‘Musical Offering’ - regarded as one of the world’s most extraordinary expressions of musical creativity.

Bach music pixels close up

“The distillation of three perfectly interweaving lines, of shared melody in perfect form and harmony, reflects the ultimate in unveiling the mysteries of the musical mind. Bach’s famous visit to Potsdam to visit Frederick the Great on May 7th in 1747 inspired a theme in his ‘Musical Offering’ which conflates the Renaissance knotty-ness of the old Ricercar with the staged luminosity of the fashionable Enlightenment. As artists so often do, the return to first principles at the end of a creative life leads to works where not a note, a word or a figure could be removed without reigning incoherence. Bach’s raw scientific data absorbed and lost into the realms of the ear, heart and mind is just the start of a 40-minute work which hurrs the 16th-century towards the late-19th in a single arc of creative genius.”
Jonathan Freeman- Attwood, Principal of the Royal Academy of Music.

“The design team worked directly with neuroscientists for over 4 years. We have been learning from each other, architects from scientists and scientists from architects, we have all become neural architects so to speak.”
Professor John O’Keefe - SWC Inaugural Director and 2014 Nobel Prize laureate for Medicine or Physiology.