**HIGH-TECH IN THE LOW-TECH**
**The work in Unit 20 at the Bartlett School of Architecture UCL**

In a time of increasing demand for sustainable solutions in technology and design, much has been argued for the reintroduction of low-tech procedures in high-tech environments. The main premise has been to reconsider old, vernacular or traditional systems and make them again part of our contemporary life. This has certainly been a hugely significant step towards diminishing the implementation of resource-hungry technologies and materials that have been over-used in the twentieth century. Our contemporary society has acknowledged that long-established techniques have been greatly successful in the past and often simpler, more environmental friendly and 'human' than newly developed, excessively synthetic procedures that were invented from scratch. Vernacular architecture understood quite well how to respond to climatic and geographic extremes by using forms, materiality and nature in an intelligent way: for example by layering snow on a roof as flat as possible to make use of its insulating capacities, or by using the stack effect in ventilation chimneys to cool down spaces in warm climates.

The great advantage we have nowadays is that it is not mandatory to revert to the basics of vernacular architecture. We are currently witnessing the emergence of a new paradigm in which an intensified use of computation allows us to increase the precision of design and manufacturing and customised replication of components, but also helps us embrace a novel sense of materiality in architecture that can be both analogue and digital, conceptual and physical, hard and soft, etc. Advanced tools of modelling and simulating allow designers and engineers to predict form and performance prior to materialisation and at the same time rethink ancient techniques in an entirely new, post-digital way. Besides the great advantages in terms of design control that allows us to invent forms that have a far higher level of complexity and space than before, this insight opens up architecture to a truly multi-disciplinary approach: not only can we now participate in co-authoring novel material-material assemblages, we can also co-author material-nature aggregations and processes of growth, change, mutation.

Our design research in the MArch Unit 20 at the Bartlett School of Architecture UCL has increasingly focused on such explorations. One important area of study is centred on projects that utilise clay as a prime substance or in combination with other cementitious materials. These investigations seem particularly significant considering that around one third of the world's population still inhabits buildings that employ clay, mud, or loam. These are widely available and environmentally friendly in terms of construction and transportation. Many buildings in hot and dry areas employ loam due to its high thermal insulation quality. However, as it is not a standardized building material and it is not water resistant, such 'earth architecture' is highly vulnerable to erosion in time. This has led to its gradual disappearance due to the pervasive use of more durable and common construction methods and materials such as concrete and steel, both imports from developed countries. Our research has therefore shifted to investigate a new sense of materiality, while adopting through new technology towards a more bottom-up, poetic and discursive approach to design.

Wiktor Kidziak's project of a cooperative in Jaipur, Rajasthan reconsiders traditional construction techniques with terracotta and reinvents them via contemporary technology, including digital ceramic slip-casting techniques, terracotta 3D printing, and adaptive manufacturing. The purpose of the project is to support local communities while stimulating knowledge exchange mechanisms about their traditional craft. The first step includes the exploration of different degrees of material porosity in accordance to thermal behaviour, surface finishing and construction

technique. A second step implies the design of earthware systems where architectural spaces can have their own wall-integrated water collection, micro-climatic control and insulation. A third step entails the fabrication through slip-casting of modular and interlocking wall components that create a larger passive evaporative cooling wall and ceiling. The cast's hollow inside generates volumetrically ample, geometrically complex, yet also lightweight components that are permeable or glazed in areas to manage in the building a selective circulation system of water and air.

Another project, Ruby Law's Centre of Dharmic Faiths in Muscat, Oman investigates a new type of concrete and loam composite capable of strengthening thermal and structural performance, while remaining highly mouldable and thus suitable to articulate spaces with great ornamental/atmospheric power. This new material blend involves different degrees of mixture (and therefore variable structural/porous properties) that can be build by the local community, employing both traditional handcrafting and sophisticated pre-casting techniques with the help of CNC milling and robotic extrusions.

A further project, Joanna Pawlas's guesthouse in Hong Kong focuses on reconsidering the role of bricks as a fundamental building block in architecture. It investigates the relationship between geometry and the physical properties of sound, and how parametric systems, computational design and digital fabrication can be used to generate new types of acoustically regulating surfaces. Against the more common idea of acoustic engineering as a means to reduce 'negative' noise levels in spaces, ignoring the potential 'positive' aspects of specific soundscapes, the project makes use of sophisticated sound simulations to produce an acoustic zoning of hollow geometries inside the bricks. These enable trapping or attenuating specific sound frequencies whilst permitting others to pass from outside to the inside of the building. The assembly of the resulting 'audiobricks' produces a porous wall interface to filter or enhance especial soundscapes from the city, generating special sound effects in the building.

In the context of these projects, computation is understood as a fundamental research tool through which the articulation of the building's 'skin', along with augmented spatial and typological conditions can be designed and manufactured in new ways. Such projects rely on the use of complex and hyper-articulated geometries, structures and materials, while at the same time advocating a heightened engagement with the body, society and culture, and our ever-changing environment. Most of all, they are the result of a multi-layered approach to design where a multitude of concepts, methodologies and traditional techniques are embedded in the proposals. Conspicuously expressive and compelling, they derive from programmatic, contextual/climatic and cultural specificities, while at the same time following computational agendas that aim not only at novel technological solutions, but also at aesthetics that push beyond boundaries of the 'conventional' and the 'old'. However, reintroducing the notion of the 'old' implies here reconsidering preconceptions of what we commonly considered 'low-tech', as being conditions that are less advanced and exclusive to underdeveloped societies. What is perhaps happening is that we are paradoxically becoming low-tech again, but greatly empowered by the use of advanced material and technologies. This is why we are arguing for the application of high-tech procedures in low-tech environments as a novel, more sustainable and ultimately highly creative system in contemporary architecture.