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New Territories: Materiality and Craft from Natural Systems to Digital Experiments

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Abstract : Digital fabrication, between advancements in software and machinery, is pushing practice today towards more complexity in design, allowing for unparalleled explorations. It is giving designers the immediate capacity to apply their imagined objects into physical results. Yet at no time have questions of material knowledge become more relevant and crucial, as technological advancements approach a radical re-invention of the design process. As more and more designers look towards tactile crafts for material know-how, an interest in natural behaviors has also emerged trying to embed intelligence from nature into the designed objects. Concerned with enhancing their immediate environment, designers today are pushing the boundaries of design by bringing in natural systems, materiality, and advanced fabrication as essential processes to produce active designs. New Territories, a yearly architecture and design course on digital design and materiality, allows students to explore processes of digital fabrication in intersection with natural systems and hands-on experiments. This paper will highlight the importance of learning from nature and from physical materiality in a digital design process, and how the simultaneous move between the digital and physical realms has become an essential design method. It will detail the work done over the course of three years, on themes of natural systems, crafts, concrete plasticity, and active composite materials. The aim throughout the course is to explore the design of products and active systems, be it modular facades, intelligent cladding, or adaptable seating, by embedding current digital technologies with an understanding of natural systems and a physical know-how of material behavior. From this aim, three main themes of inquiry have emerged through the varied explorations across the three years, each one approaching materiality and digital technologies through a different lens. The first theme involves crossing the study of naturals systems as precedents for intelligent formal assemblies with traditional crafts methods. The students worked on designing performative facade systems, starting from the study of relevant natural systems and a specific craft, and then using parametric modeling to develop their modular facades. The second theme looks at the cross of craft and digital technologies through form-finding techniques and elastic material properties, bringing in flexible formwork into the digital fabrication process. Students explored concrete plasticity and behaviors with natural references, as they worked on the design of an exterior seating installation using lightweight concrete composites and complex casting methods. The third theme brings in bio-composite material properties with additive fabrication and environmental concerns to create performative cladding systems. Students experimented in concrete composites materials, biomaterials and clay 3D printing to produce different cladding and tiling prototypes that actively enhance their immediate environment. This paper thus will detail the work process done by the students under these three themes of inquiry, describing their material experimentation, digital and analog design methodologies, and their final results. It aims to shed light on the persisting importance of material knowledge as it intersects with advanced digital fabrication and the significance of learning from natural systems and biological properties to embed an active performance in today's design process.

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