Edible

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In a most elemental sense, food nourishes the body while buildings shelter it. Settlement planning, natural resource management practices, as well as various rituals of consumption and socialization inextricably link food, buildings, and people. Contemporary architecture's engagement with food is multifaceted and not only reflective of such foundational synergies, but also reveals a spectrum of aspirations toward further design innovation. Building-integrated agriculture and Edible Estates, for example, inventively reintroduce food production as a vital part of manmade environments, while even in mainstream urban design farming is increasingly reaching the status of an indispensable program. How we consume food traditionally as well as under the influence of shifting cultural values shapes the design of everything from utensils, packaging, and furniture to domestic environments, commercial establishments, and public spaces. Culinary techniques have even inspired how architects describe design processes, a well-known example of which is Greg Lynn's analogy between folding in cooking and folded architecture.

Edible Materials

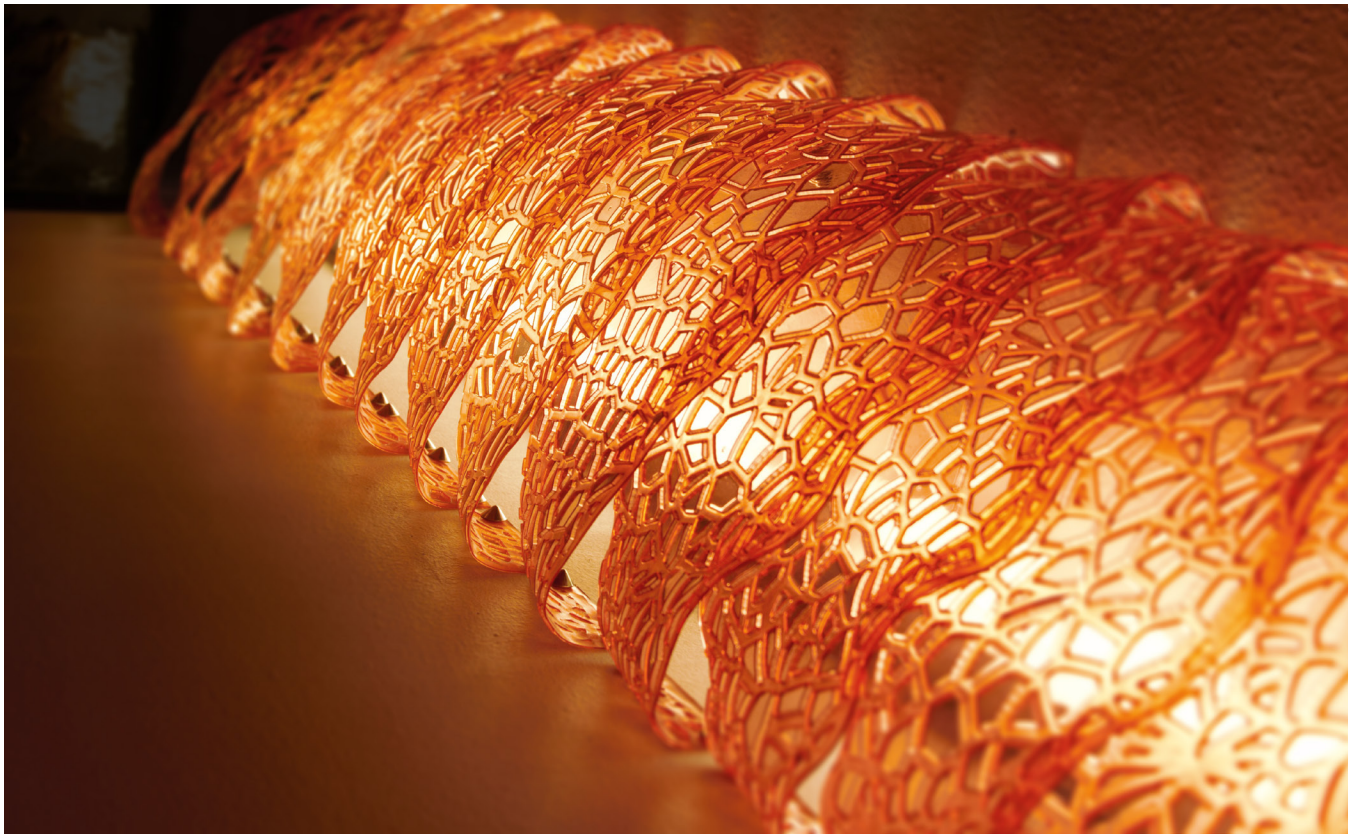
Despite all the affinities, distinctions between cuisine and architecture appear to persist when it comes to questions of materiality. Building construction of course requires materials, while food consists of nutritious ingredients that the body can ingest, digest, absorb, and ultimately eliminate. Construction materials and food ingredients are as such viewed as two distinct sets of substances, often placed in opposition to one another. Food flows through the body, unlike buildings that externally surround it. Building materials seek relative permanence, while good food is fresh and perishable. Fire, the same technology that makes food more digestible, is applied to raw construction materials to improve their resilience and strength. It is perhaps because of the seeming clarity with which edible and building materials are conventionally segregated that transgressions of the boundaries between the two are commonly manifested as fantasy. Edible architectural models plated for consumption appeared in the glutinous feasts of medieval Europe, while the folkloric treatment of buildings as confections has also served as an allegorical device for exploring issues like temptation, desire, and greed. The Brothers Grimm's nineteenth-century "Hansel and Gretel" may have inspired the festive tradition of gingerbread houses, even if in the original fairytale – if interpreted literally – the edible architecture provided a setting for an imminent act of cannibalism. Perhaps not entirely unlike the packaged pairs of edible underwear sold at novelty shops, the notion of architectural materials as food elicits a mixture of curiosity, amusement, and repulsion, with any further consideration likely requiring at least some suspension of disbelief.

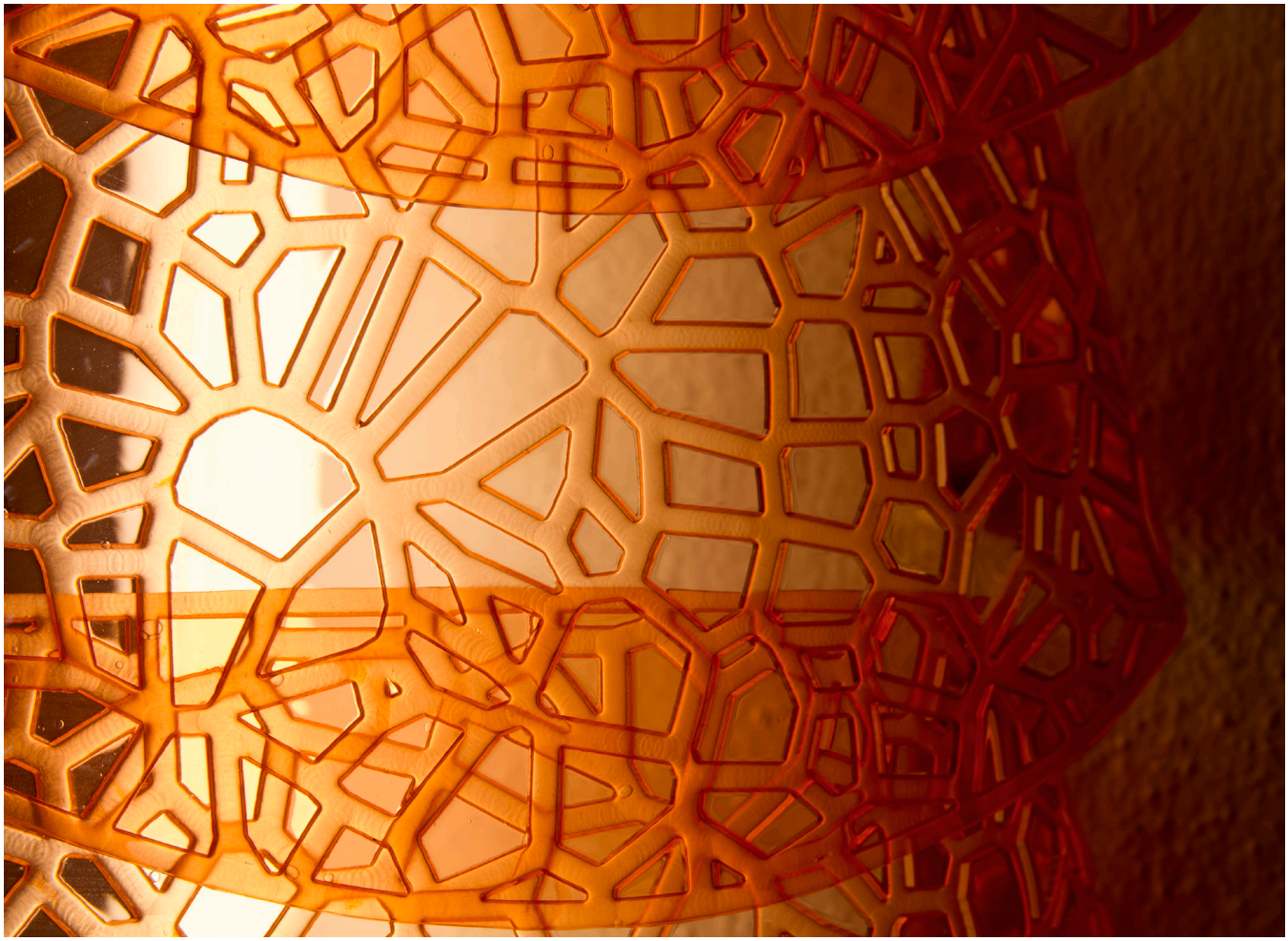
Yet both material palettes and food menus contain a vast array of substances – including plants, and animal products, minerals, metals, and others – whose origins connect them. Cherrywood and cherries, leather and meat, dyes and soy, glue and bones are just a few obvious examples of such connections. Emphasizing their common origins, rather than reiterating distinctions between them, allows one to consider an expanded approach toward further integration of food and material resources as well as their lifecycles. The notion of edibility is in this way less about fantasy, novelty, and wonder than it is about prompting meaningful, creative, and sustainable modes of material innovation. Edible materials are not necessarily delicious or even palatable to humans. What makes them significant is the fact they are renewable in nature, nontoxic, biodegradable, and potentially less resource-intensive. At the forefront of food innovation and advocacy today, nose-to-tail and root-to-fruit have emerged as models of consumption that privilege efficient and effective uses of whole animals and plants. What can designers learn from such models? How might material modes of production in design intersect with expanded applications of such food-based models? And finally, how may such considerations of materiality transform the future of design?

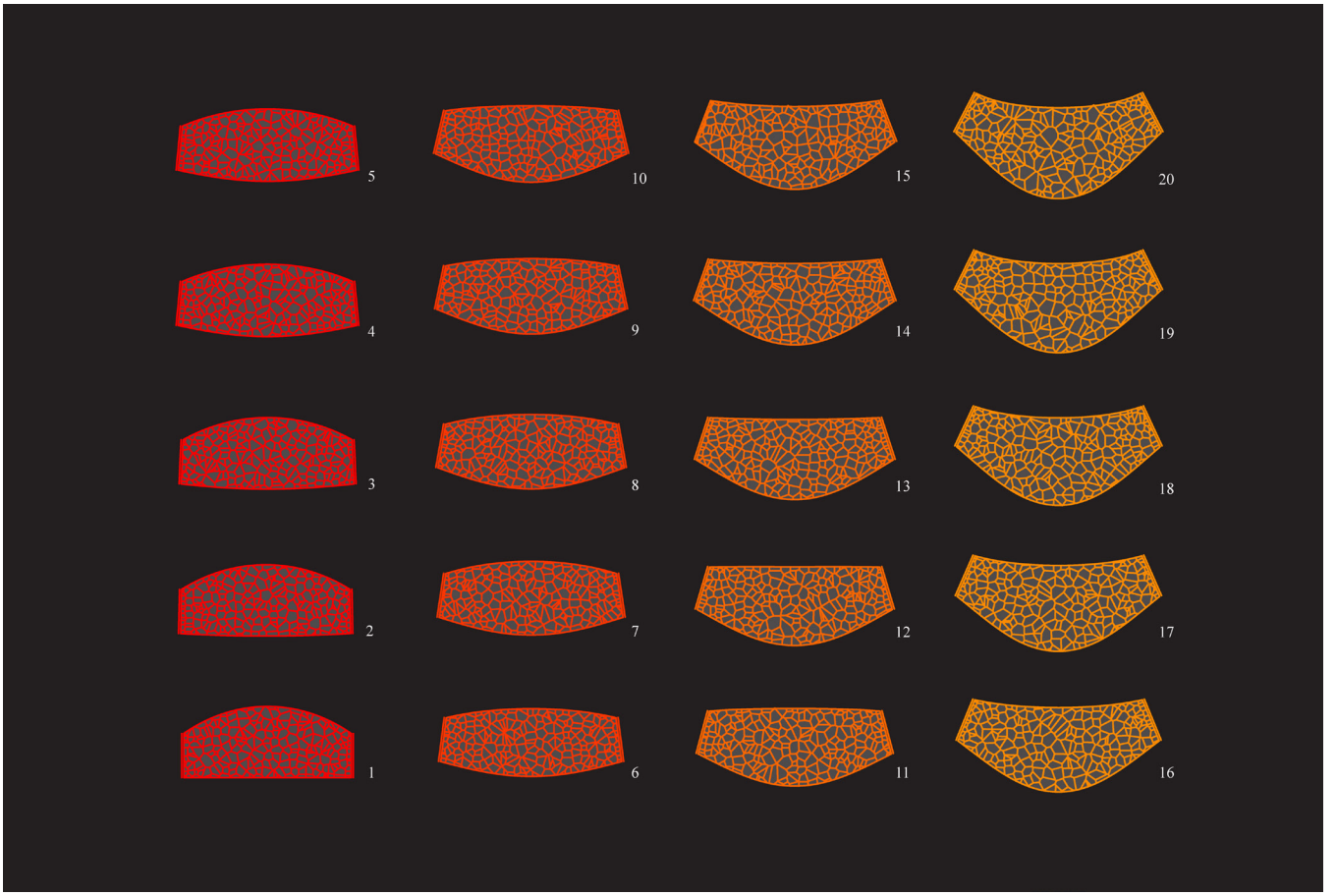
Over just the past few years, a growing number of experimental, research-based designers and architects have worked with such materials in a number of different ways. The most compelling and promising instances of these efforts surpass convention by effectively engaging with emerging technologies, scientific research, and novel modes of design practice. English fashion designer Suzanne Lee's project *BioCouture* (2010), for example, uses custom-grown microbial cellulose to make garments. The edible leather-like material, an outcome of the fermentation process that produces the probiotic drink kombucha, provides an alternative to both animal skin and woven textiles. *Saltygloo* (2013) by the California-based architectural studio Rael San Fratello uses salt as a monolithic material for 3D-printing at full scale. The architects have digitally shaped salt harvested from crystallization ponds in the San Francisco Bay into objects of a range of sizes, from decorative accessories to building components. Also at the scale of buildings, David Benjamin's design practice, The Living, has succeeded in developing prototypes for masonry units made from corn husks and mushrooms. Mycelium, the root-like part of the mushroom, acts as an organic binder resulting in blocks that are essentially grown, rather than cast. Their pavilion *Hy-Fi* (2014), installed at the MoMA PS1 in New York City, showcases the biodegradable blocks as the stereotomic structure's primary construction material. Our own practice, ISSSStudio, has over the past few years been exploring alternatives to petroleum-based plastics by focusing on biodegradable plastics. Through a number of recent projects, including *Protoplastic* (Fig. 1), *40 Blossoms* (Fig. 2), and *Sugarfree*, the studio has devised a method of casting biodegradable thermoplastic mixed from common edible ingredients into highly customizable translucent sheets.

Sugarfree

ISSSStudio's engagement with edible materials, perhaps ironically, stems from our love of plastics. The studio's earlier work, driven by explorations in digital design and fabrication, focused on novel material expressions of surface and pattern. (Fig. 3) Digital technology's capacity to facilitate the customization of form was central to this work; further questions of customization in regards to materials were the logical next step. ISSSStudio's applied



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research in bioplastics emerged at the convergence of the desire to capture and further articulate aesthetic effects of plastics, while searching for more environmentally responsible modes of material production. A core value in this pursuit is the examination of what the designer can prototype on their own, from scratch, and at full scale. Inevitably, this way of designing influences our teaching. *Sugarfree* (2014) is a result of the intersection of ISSStudio's design work and my teaching at The University of Texas at Austin. *Sugarfree* was fabricated and is permanently sited at the University's Materials Lab. (Fig. 4) It is an eight-foot tall lighting installation that occupies an interior corner, floor to ceiling. An assembly of patterned lenses partially conceals conventional fluorescent tubing and transforms its unremarkable light into a warm, amber-colored glow. (Figs. 5 & 6) The twenty lenses form a subtly differentiated series of components, the gradation of which is reinforced by the change of color from top to bottom. (Fig. 7) The material is entirely edible.

Based on a refined version of a basic recipe, the custom-made bioplastic primarily uses gelatin as a natural polymer and vegetable glycerin as plasticizer. The mixture is heated, cast in digitally formed molds, and cured until it is stable enough to release. The process was demonstrated in a public workshop at the Materials Lab which included over twenty students, faculty, professional designers, and artists. The relative simplicity of the process, but also the convincing plastic character of the resulting material, elicited a sense of wonder among the participants. More importantly, the intention is for the experience to expand the range of techniques with which designers and design students are able to construct viable products as well as empower them to experiment with materials within the constraints of available resources and facilities. The act of cooking materials is ultimately not about food or cuisine, but instead points to a set of techniques and ingredients to which everyone has access. The title, *Sugarfree*, refers to the material's edible nature. Though perhaps not entirely delicious, the workshop participants were tempted to sample the produced bioplastic firsthand. While it may seem frivolous, the act of tasting does bring to the foreground the role that different senses play in the design process. Just as importantly, eating plastic questions not only our bodies' relationship to the material world, but also our own sense of agency in its production and consumption.

Conclusion

The intersection of food and design through the framework of materiality provides a vast range of possibilities for innovation. The resulting design thinking has the capacity to influence policy, industrial production, education, artistic practice, patterns of consumption, waste management, and many other facets of contemporary life. At its most robust, the role of experimental design is to generate such thinking through critical, hands-on material practice and to participate in the transfers of knowledge among different industries, disciplines, and scales of practice. The pursuit of edible materialities in architecture and its allied disciplines brings an unorthodox perspective on the use, integration, and experience of material resources.

Images

Listed in order of sequence:
Article cover image_Igor Siddiqui/ ISSSStudio, *Sugarfree* (2014); detail
Figure 1_Igor Siddiqui/ ISSSStudio, *40 Blossoms* (2014); installed at Box 13 ArtSpace, Houston
Figure 2_ISSSStudio + PATH, *Bayou-luminescence* (2011); installed at DesCours, New Orleans
Figure 3_Igor Siddiqui/ ISSSStudio, *Sugarfree* (2014); installed at UT Austin Materials Lab
Figure 4_Igor Siddiqui/ ISSSStudio, *Sugarfree* (2014); installed at UT Austin Materials Lab
Figure 5_Igor Siddiqui/ ISSSStudio, *Sugarfree* (2014); digital drawing
Figure 6_Igor Siddiqui/ ISSSStudio, *Sugarfree* (2014); workshop at UT Austin Materials Lab
Figure 7_Igor Siddiqui/ ISSSStudio, *Sugarfree* (2014); detail