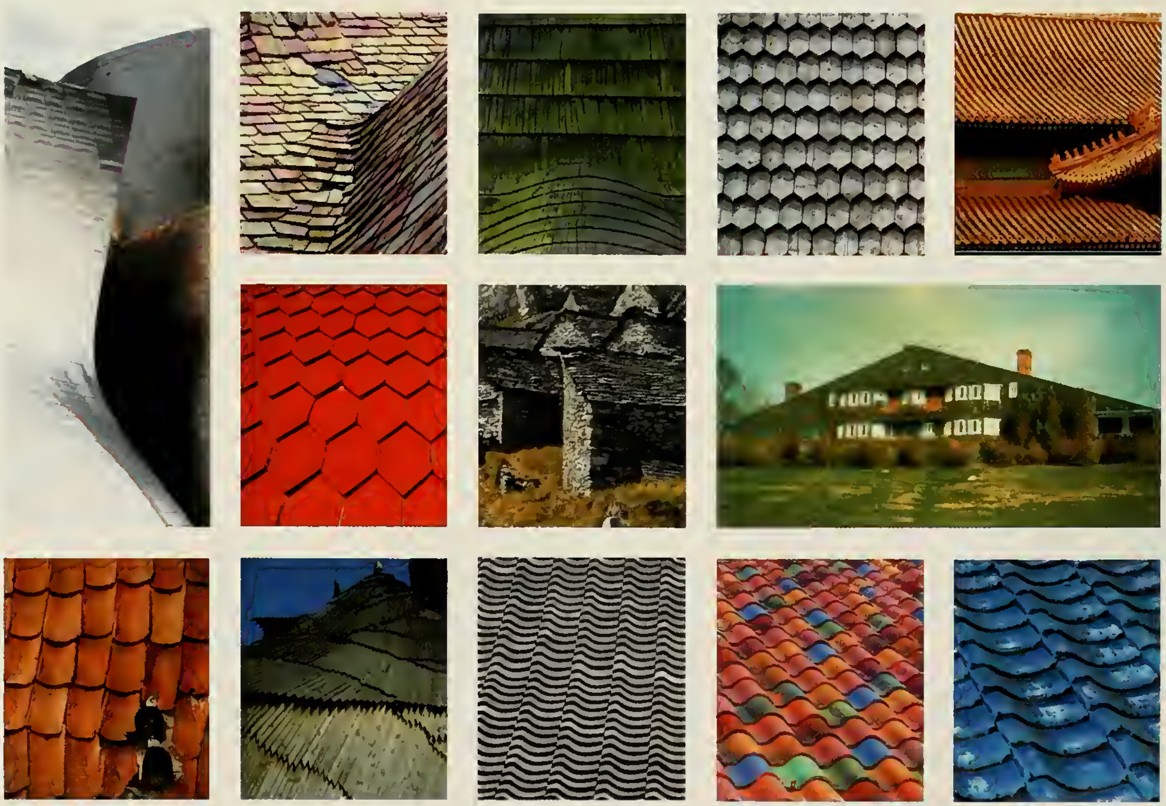
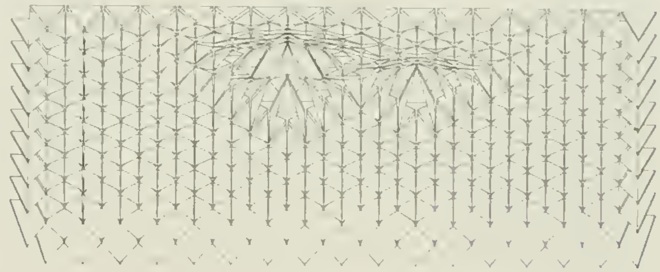
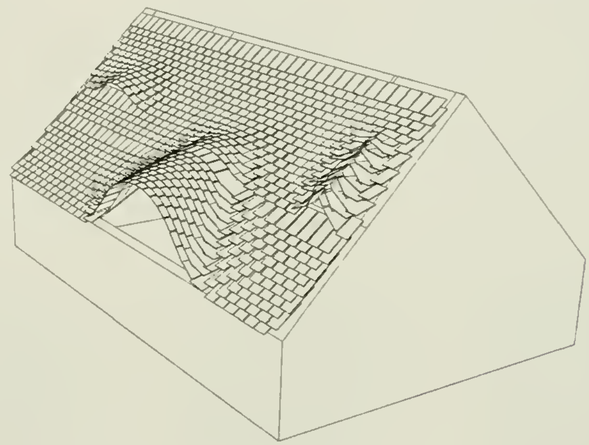
Shingle

Adam Modesitt

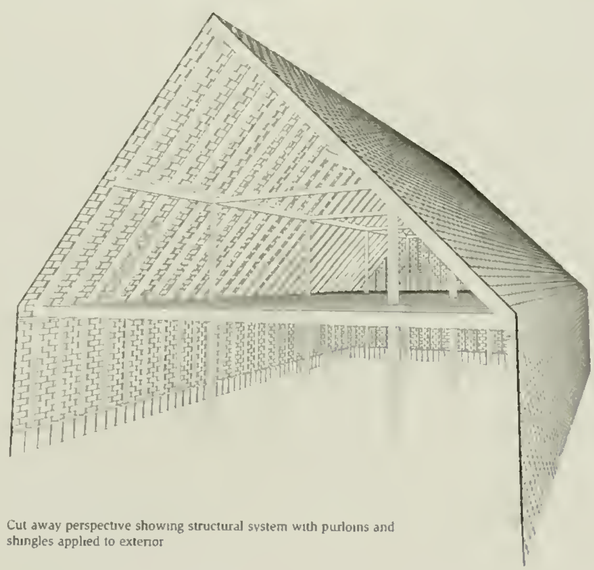




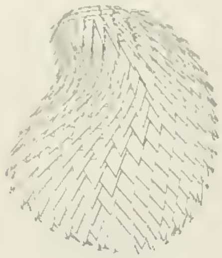


Rectangular shingles applied to a conventional roof dormer arrangement, showing the effects of different scales of distortions

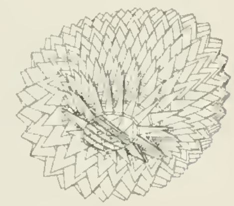
There is a discordance in architectural practice today between the abstract conception of architectural surfaces and the material necessities of construction. Despite the fact that contemporary CAD software has now become synonymous with excessive surface abstraction, ultimately, architectural surfaces require discretization into constructible elements- such as bricks, panels, or tiles. In the regular and rectilinear geometries characteristic of modernism, discretization was a nominal problem. Plaster and paint masked underlying structure, and cast concrete did not suggest the requirements of formwork. Contemporary advances in computer hardware and software, however, are changing the limits of what is constructible. The projects of Frank Gehry, which are shingle-based systems enabled by the use of CATIA and advanced computer hardware, famously transform crumpled paper models into titanium-skinned full-scale buildings. The shapes Gehry conceives of and designs are abstract and composed of continuous surfaces, but their construction requires discretization. The solution employed by Gehry's office is a system of shingling, in which individual shingles are assembled together to compose larger shapes. The construction of the buildings is enabled by software that digitally controls thousands of shingles, and coordinates them to be subservient to the previously designed form.



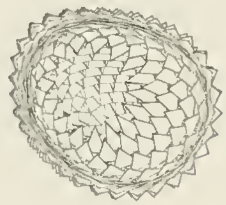
Cut away perspective showing structural system with purloins and shingles applied to exterior



A basic triangular shingle instantiated upon an blob-like shape with varying degrees of convexity and concavity

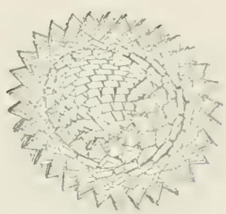


Top view of standard shingled surface

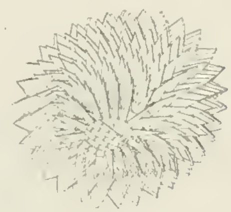


Bottom view of standard shingled surface

The same surface with the same number and spacing of the shingles but several times the thickness of the original

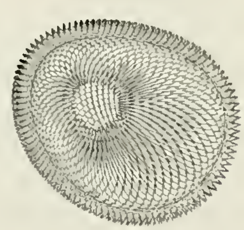


Top view of thickened-shingled surface

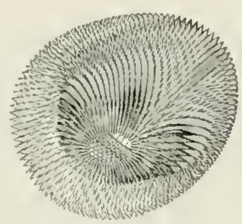


Bottom view of thickened-shingled surface

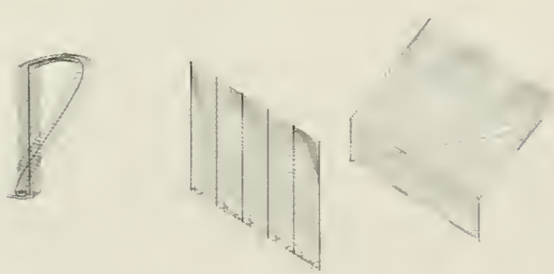
The same surface with a much larger number of basic triangulated shingles



Top view of high density-shingled surface



Bottom view of high density-shingled surface



Two spines, one curved and one linear, are divided into 60 equal segments
The spacing of the segment endpoints is projected onto a series of vertical lines, which then form spline control points.

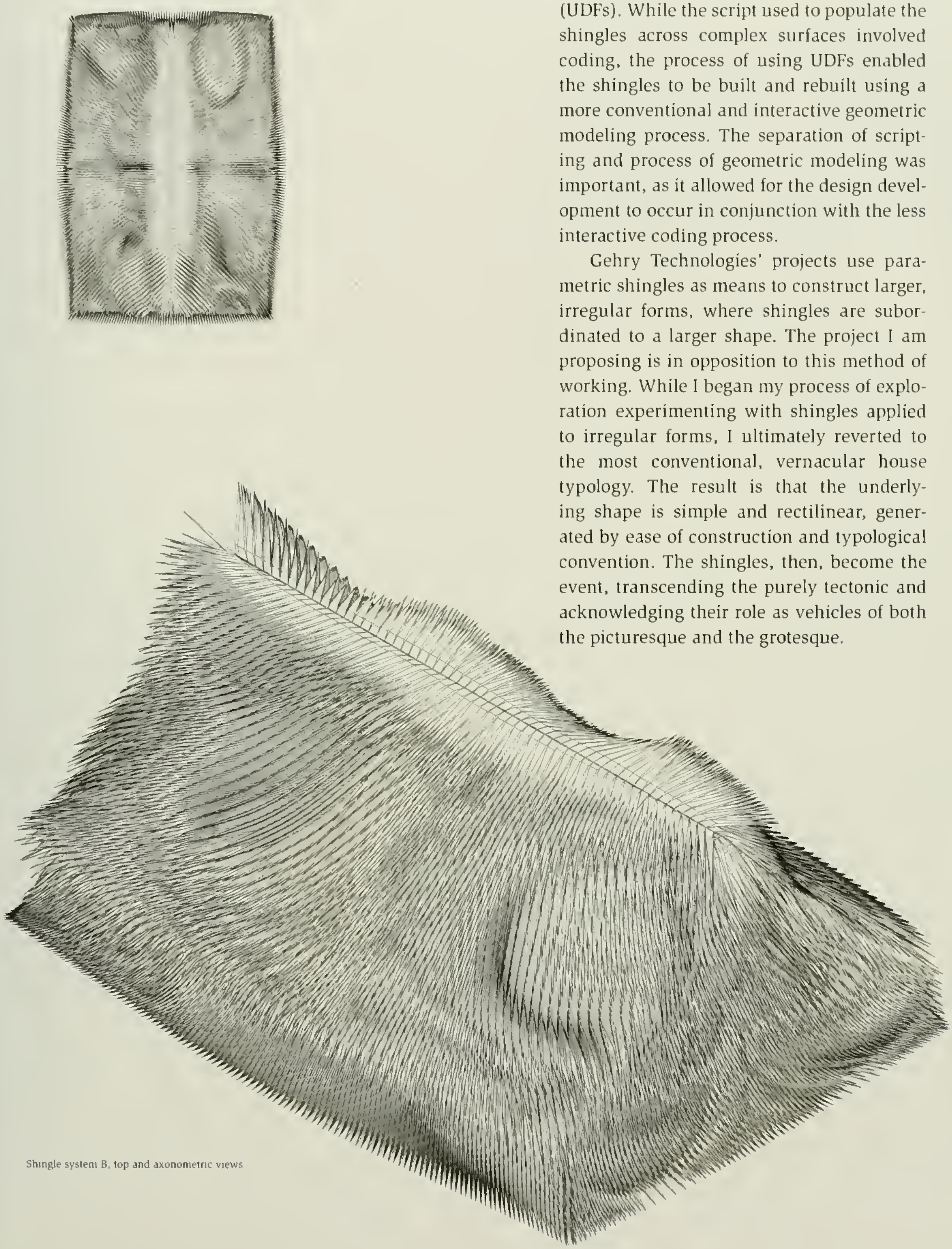
Among the most explicit manifestation of discretization are shingles, essentially defined as overlapping tiles that cover exterior walls and roofs. As a technique, shingles are found in vernacular architecture throughout the world. Their pervasiveness is due in large part to historical tectonic and construction efficiencies: shingles can be made of many materials and systematically applied to a surface with a reasonable threshold of craftsmanship. In contemporary housing, though, wooden shingles are used more as a symbol of domesticity than as tectonic necessity. A pastoral, shingled farm house, for example, is now an image of the picturesque, rather than a model of contemporary construction processes.

This project takes the vernacular definition of the shingle as its starting point, and begins to subvert the picturesque, embed a system of tectonics within shingling, and marry form with the shingle. This is done through an exploration of how computers and software allow for the design of complex systems, in which thousands or tens of thousands of individual shingles are instantiated and controlled through meta-parameters. The ability to control thousands of objects through the computer enables a level of complexity, precision, and predetermination that a conventional process cannot achieve. For example, one of my design prototypes contains nearly 15,000 shingles. The prototype shingle system gives the appearance of being composed of thousands of unique elements, but in actuality there are only 9 unique shingles in the entire system. There are 51 "type A" shingles, 161 "type B" shingles, 218 "type C" shingles, 935 "type D" shingles, and so on. Without the use of computers, such a tightly resolved and predetermined system would be impossible. The shingle systems shown are also universal, insofar as they may be applied to any surface shape or condition.

The shingles in this project were built and populated in CATIA, using a combination of scripting and User-Defined Features

(UDFs). While the script used to populate the shingles across complex surfaces involved coding, the process of using UDFs enabled the shingles to be built and rebuilt using a more conventional and interactive geometric modeling process. The separation of scripting and process of geometric modeling was important, as it allowed for the design development to occur in conjunction with the less interactive coding process.

Gehry Technologies' projects use parametric shingles as means to construct larger, irregular forms, where shingles are subordinated to a larger shape. The project I am proposing is in opposition to this method of working. While I began my process of exploration experimenting with shingles applied to irregular forms, I ultimately reverted to the most conventional, vernacular house typology. The result is that the underlying shape is simple and rectilinear, generated by ease of construction and typological convention. The shingles, then, become the event, transcending the purely tectonic and acknowledging their role as vehicles of both the picturesque and the grotesque.



Shingle system B, top and axonometric views