Andrew Bayley
Arch497
Professor John Ronan
05.06.2011

Material selection for the cladding of rain screen facades;
mining the properties of materials for performance and meaning

“A cladding has no limits, it demands nothing but a surface to clad.”

-David Chipperfield

A new dilemma has arisen in architecture in recent decades, namely what does a building get covered with and why. Whereas there was once a time when buildings were simple, and a single material performed structural, insulative and moisture blocking functions in a monolithic stack, a contemporary building often times will have each of these functions performed by a discreet material or set of materials. This paper aims to explore material choice for the cladding layer of facades that are composed of layers of materials, each performing a highly specific function in the assembly of the building envelope. How does an architect justify a material for a cladding when it no longer has the responsibility to hold the roof up, keep the rain out, or make sure that building occupants remain comfortable? One must exploit the inherent properties of a material in the cladding of a building to avoid superficiality. All materials have properties and qualities that lead architects to specify a particular one for a specific function. Structural members are often made from materials with high compressive strength, such

as steel and concrete. Insulation and vapor blocking layers likewise will be created with materials chosen for their performative characteristics. Once we get to the outside of this assembly, the criteria for deciding what material to clad the structure with becomes somewhat less straightforward. This paper will argue that a guideline can be drawn for this decision making process, one that begins with the inherent properties of a material, whether they be emotional or physical. For a cladding material to avoid being a superficial skin simply wrapping a structure, an architect must exploit one or both sides of its inherent properties.

To understand this discussion it is important to define the dual nature of a material's properties. The physical properties are defined by nature and can be manipulated only so much by mechanical and chemical processes. The emotional qualities are less concrete, and can be different in different parts of the world. These qualities are defined by cultural and social norms and traditions, and have little direct association with how a material may function. By examining selected projects by three architecture practices that employ a layered envelope system, this paper will show that often a cladding material's emotional, or associative, properties are often times as important as its physical properties. David Chipperfield works both sides of the equation, both with wood, in the River and Rowing Museum and glass, in the Figge Art Museum. Herzog and deMeuron are able to elicit associative qualities from the inherent physical properties of metal panels in two museums, the New deYoung and the addition to the Walker Art Center. The work of Kieran Timberlake Architects focuses initially on the physical aspects of the wood that is employed as a cladding on two of their projects, The Loblolly House and the Yale School of Art Gallery, before creating an associative meaning with the cladding. By analyzing the approach to cladding of these three architectural practices at the vanguard of building and technology, we will better understand the decision making process behind cladding materials, and the ramifications of those decisions.

Oak cladding and a pitched roof alude to traditional building methods and materials in the River and Rowing Museum

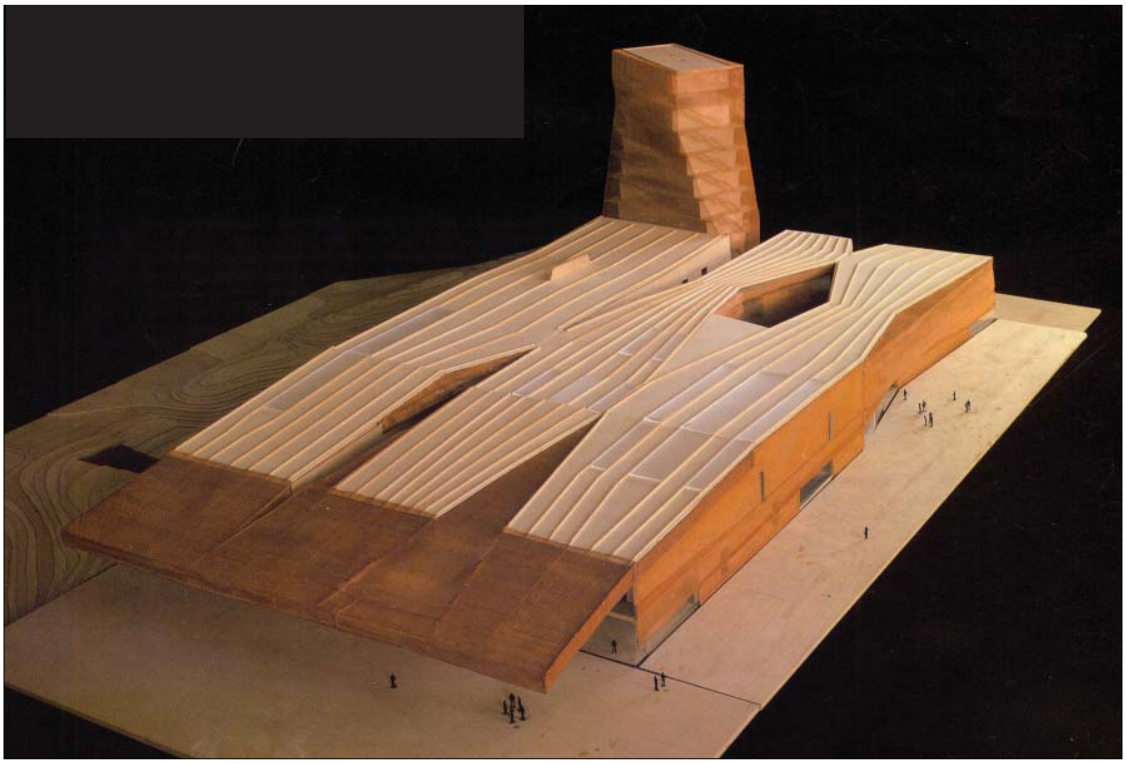
Early in David Chipperfield's career, he received the commission to design the River and Rowing Museum on the river Thames at Henley just west of London. By Chipperfield's own estimation "the mid 80s...was a very difficult time to make a modern building in England". He found that the local community was somewhat hostile to the idea of modern architecture. Instead of battling with them, he chose to explore this community's opposition to modern architecture through formal and material choices. Formally, the two story building has been capped with a pitched roof, a traditional move to be certain. Additionally, the upper story housing the boating artifacts is clad in an oak paneling. Oak has several inherent qualities that lead architects to include it in a project. It is a durable hardwood that will withstand years of exposure to the elements and can be used as both siding material and decking. Chipperfield takes advantage

of these qualities by deploying the oak universally across the project's walls and exterior decks, but the main driving force behind the decision seems to be oak's emotional quality, its historic associations within the community that the museum is being built. For this building to be accepted by the locals, Chipperfield argues that continuity between the past and the present must exist. "Sometimes [this continuity] can be expressed through the wood we use on the outside of the building...I have found that if people recognize things, then they form a relationship with that thing, they enjoy it." In this instance, Chipperfield is expressly exploiting using the emotional, associative qualities of the oak cladding to connect the building to the community in which it is being constructed, as well as taking advantage of its physical properties.

Different treatment of glass creates different readings of the Figge Art Museum depending on lighting conditions and view point

Chipperfield exploits glass's variable transparency at the Figge Art Museum in Davenport, Iowa. Conceived of as a catalyst for reinvestment in a faded downtown riverfront area, the museum is designed to assert itself on the urban fabric. This takes the form of a monolithic glass box that forms a rain screen cladding system surrounding the museum structure. Depending upon the condition of the building envelope directly behind the rain screen, the glass is either transparent, translucent, or opaque. By baking on a ceramic fritting, Chipperfield manipulates this primary physical prop-

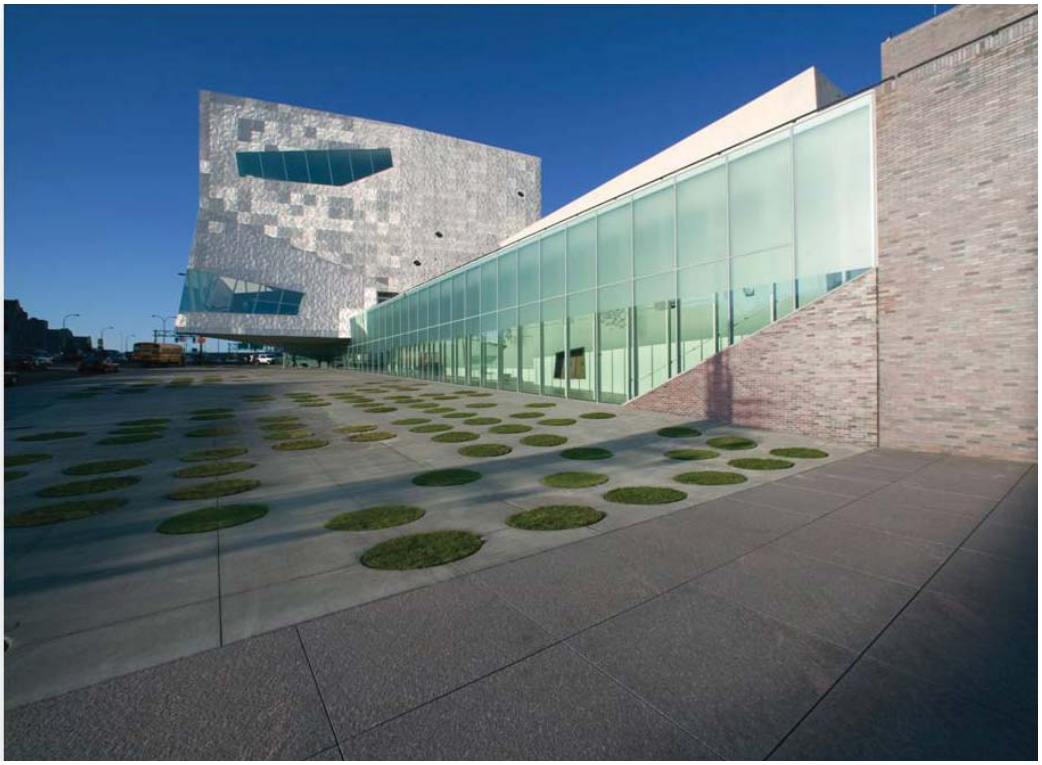
erty of glass, and begins to create pattern on the broad flat surfaces of the museum volume. Allowing light to pass from within the museum through the rain screen creates a lantern effect that draws attention to the building, and downtown Davenport as a whole, one of the primary goals of the project. In this building, Chipperfield manipulates glass's transparency, one of the material's physical properties, to create an emotional response in those who experience the building.



The massing of the deYoung suggests a material that can hold deformations

Herzog and deMeuron, the Swiss architect firm, seem to take a more sculptural and emotional approach to the cladding of their projects. The New deYoung Museum of Art in San Francisco's Golden Gate Park is completely wrapped in stamped and perforated copper panels. Two of copper's main material properties are its malleability and its propensity to patina over time when exposed to the elements. The architects play on both of these physical characteristics, but in an emotional or associative manner. The deYoung Museum has a widely varied collection of art and artifacts, ranging "from the present day all the way back to the beginnings of human history." Originally, H&dM "came up with the idea of separate buildings...each housing a different collection and giving expression to the diversity of cultures." This idea lost favor to creating a single building that is pulled apart in places, allowing both each collection to have its own discreet area and for the park to penetrate the museum structure itself. Seen from above, in the observation deck of the "education tower", one looks down upon a rectilinear structure that has been pried apart in places to create courtyards and light wells. This effect is heightened by the ribs that run the length of the roof. The programmatic and curatorial decision to spread apart spaces in the museum led to the formal gesture of a rectangle that has been split in places and held open. It is as if a sheet of copper has been slit and pried apart, holding its new, deformed shape. The organization of programmed space suggests a malleable material, and copper fits that description. The architects even demonstrate this quality of the cladding to the building user by stamping patterns into it, giving each panel a depth much greater than the material's thickness. As the museum has aged, the panels have lost their original luster and will continue to patina until they are a dull green. This should fit into the created nature that is Golden Gate Park. Over time, the structure's appearance will become more natural and blend in with the recreated natural surroundings. Here H&dM are exploiting specific physical characteristics of the copper to heighten the emotional impact of

An image from 2009, showing a new copper panel adjacent to original panels from 2005



The Walker Art Center addition, with its floating volume clad in crumpled aluminum panels

Paneling continues into lobby of performing arts space on interior of museum

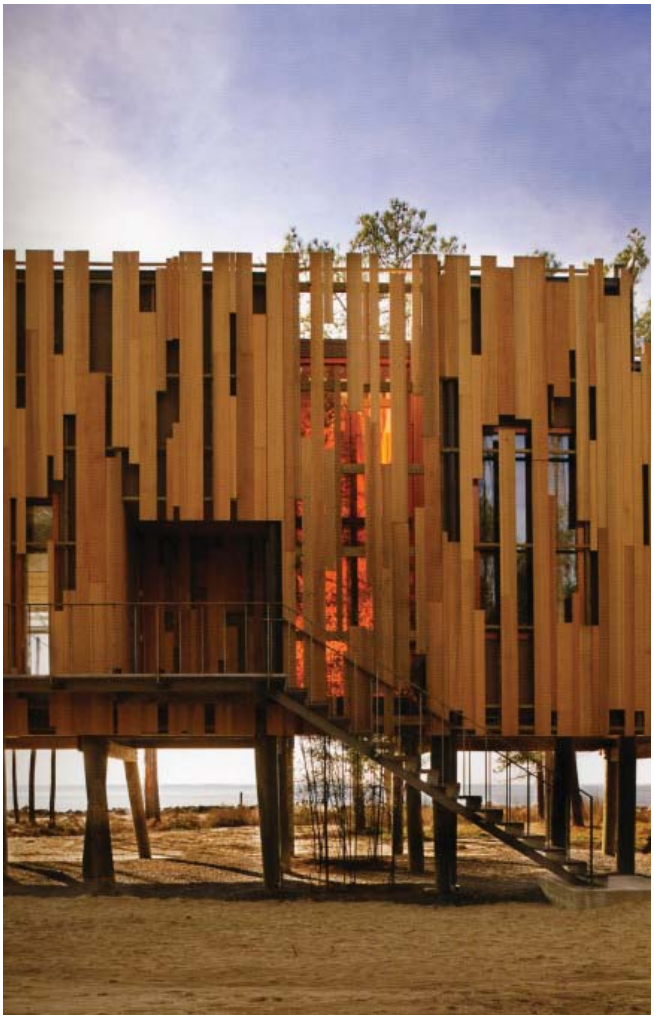
the façade.

The Walker Art Center Expansion in Minneapolis, also by Herzog and deMeuron, has an aluminum rain screen panel system as its external cladding. In both placement on the site and massing, a large volume containing a performing arts theater is juxtaposed against the existing gallery tower designed by Edward Barnes, and completed in 1971. The theater is set above the entrance, both inside and outside of the building, so as one walks up to, in and through the structure, the same aluminum panel is always present. By mechanically crumpling the aluminum panels, they create a form that is stands in stark contrast to the flat, rectilinear grounded form of the original tower. Not only are the surfaces that make up the new volume articulated much like crumpled and then flattened aluminum foil, but this volume appears to not even touch the ground, unlike the solid brick tower of the Barnes building. Regardless of this volume's interior or exterior condition, it is covered with the same panels, suggesting that the texture of the surface is more important to the architects than the performative aspects of the material choice. "The papery appearance of the facade consists of panels which can simply be folded up along the slanted edges of the openings," according to the architects. This is an important quality of the material, for the facade is littered with irregularly shaped and sized punched window openings. The aluminum panel used for the rain screen both gives the building its unique crumpled appearance and allows for simple resolution at the points where openings are to be placed. Again, Herzog and deMeuron exploit the physical properties of this cladding material to evoke emotional associations within building users.

Kieran Timberlake Architects are known as a firm that places building performance and construction technology high among design priorities. It there-

The corner entrance of the Yale School of Art Gallery building

Cedar rainscreen on the Loblolly House, mimicking the "solids and voids" of the wooded lot it occupies



fore stands to reason that a cladding material in their projects would be chosen on the basis of its physical properties, but that does not preclude them from using associative terms to justify their decisions. In the recently completed Yale School of Art Gallery, a 3,000 square foot stand alone exhibition space, "the exterior wall is a ventilated rain screen made of horizontal strips of reclaimed western red cedar." Cedar has several physical qualities that make it an ideal cladding material. First, cedar is naturally rot resistant, and therefore able to be used in exterior conditions with little or no addition of sealants. Second, it is very light for a cladding material, adding a minimal amount of load to the assembly as a whole. KTA exploits both of these qualities, while also creating moments that employ evocative or associative notions of space making with the cedar. By stopping every other cedar plank short of the corner, "this layered wall construction creates a lattice-like scrim at the entry and a pattern of parted planes at the corners of the building."

Another project in which KTA uses western red cedar as a cladding material is the Loblolly House, a single family residence on Chesapeake Bay in Maryland. This building "represents a novel approach to pre-fabricated and modular housing concepts." With the goal of reducing the building's ecological impact as much as possible, among other measures, the architects chose cedar as a cladding material because it has a negative carbon footprint. The product absorbs carbon in production, which is then stored on the building. By KTA's own estimate, the cedar cladding is sequestering over 3,300 pounds of CO2. Another physical quality of cedar is that, much like copper, it ages over time when exposed to the elements. The rain screen on the Loblolly House "now in its third season, is beginning to weather to a beautiful silver-gray." Again, KTA not only understands thoroughly the physical properties of the material which they use, but they also begin to use it in ways that create associations with the building's surroundings. By staggering the irregularly sized vertical planks of cedar "sometimes

positioned over solid wall and sometimes lapping over glazing," the architects attempt "to evoke the solids and voids of the forest." The Loblolly House is an example where both sides of a material's dual nature are exploited in the cladding of a building. KTA's ability to pull this off stems from a deep understanding of cedar's unique properties.

To avoid capricious and superficial material choices for a cladding system, it is imperative that architects fully understand the inherent physical properties of the materials they use, and also have the ability to imbue the same material with emotional and associative meaning. David Chipperfield demonstrates his knowledge of the community in which he built the River and Rowing Museum, and the associative power of an oak cladding system. In Davenport, he exploits the varying transparency of glass to create a monolithic block that can still give different readings and act as a beacon on the banks of the Mississippi River. Herzog and deMeuron are adept at deriving associative meanings from a materials physical properties, as seen at the deYoung Museum and the Walker Art Center. In the Loblolly House and the Yale School of Art Gallery, Kieran Timberlake Architects base their cladding material choice firmly on physical, performative qualities of the cedar planks, and only then begin to explore ideas of the emotional and associative properties that they can then elicit through strategic application on the facade. The examples described in the present paper demonstrate the deep physical and emotional understanding of materiality that these three architectural practices employ in choosing and deploying a cladding system.

Works Cited:

el Croquis 109/110- Herzog and deMeuron 1998-2002, The Nature of Artifice. Madrid, 2002.

el Croquis 129/130- Herzog and deMeuron 2002-2006, The Monumental and the Intimate. Madrid, 2006.

el Croquis 120- David Chipperfield 1998-2004, Dense Minimalism. Madrid, 2004.

el Croquis- David Chipperfield, 1991-2006. Madrid, 2006.

http://kierantimberlake.com/home/index.html