HISTORY RECYCLED
A TOWN LANDMARK FOR GALT

ERIC J. SIMARD
20089818

WATERLOO ARCHITECTURE CAMBRIDGE
COMPETITIONS ELECTIVE – AUG. 12, 2005

The community of Galt, once referred to as the “Manchester of Canada,” follows a historical trajectory common to many cities of the Industrial Age. In the post World War II era the development of subsidized highway systems and suburban tract housing efficiently siphoned off large portions of small “Main Street” style cities’ population. Effectively rendering them and the remainder of their population obsolete. Asked to consider the design of a town landmark pertinent to the twenty-first century for a town such as Galt, one is forced to confront and ultimately re-appropriate the most salient historical threads that help to form the physical, sociological and technological fabric of the region. The most important and literally deeply carved trait in the region is undoubtedly the Grand River. An embodiment of time itself, it informs all other aspects of Galt’s history and subsequently its collective consciousness. It is from this point that a more in-depth investigation of the towns development; its forms and material presence, its relationships and ultimate understanding of itself as well as its technological progression can begin to inform the decisions made in the design of a prominent identifying and symbolic object in its landscape.

The Grand River perambulates from its source at Georgian Bay 290 kilometers to its mouth at Lake Eerie providing, since its discovery, a source of water, transportation and most importantly energy in the holistic sense of the word. The Grand is a source of life. As such it is of no surprise that its banks became increasingly populated by human settlement early in the 19th century. Land owned by William Dickson, totaling approximately 90,000 acres along the central portion of the Grand, was parceled and sold primarily to Scottish settlers.[i] In 1816, Mr. Dickson enlisted a young American carpenter and entrepreneur, Absolom Shade (fig. 1), to help develop a small parcel of land on the river’s banks first named Shade’s Mills after the Sawmill

Figure 1: Absolom Shade

and Grist Mill built by the latter. The first built forms of the settlement later to become known as Galt were inextricably linked to the river through orientation, siting and function. This would have the inevitable consequence of setting the precedent for development along the river's edge. By 1836, Galt had developed a strong industrial base characterized mainly by textile factories located along the river. This had the effect of placing Galt at the center of a robust regional economy and spurred a hitherto unseen climb in population.[ii] Consequently, a boom in building was experienced wherein a large number of institutional buildings such as several banks and churches, a post office and Carnegie library were prominent features (fig. 2). A further result of the growth in population figures was an increased concern for the potentially disastrous effects of flooding. The answer to which was the construction of a deep concrete levee system having the general effect of dislocation from the river. Creating a large and unusable concrete gash effectively eclipsing the presence of the river, which would later be exacerbated by the growing obsolescence of the city's industries. Another notable feature of Galt's physical landscape is that which characterizes its skyline, namely the numerous steeples belonging to the churches that populate the area. The latter are also a result of Shade's influence, responsible for petitioning the Anglican Society for the Propagation of the Gospel to send missionaries to the town in the 1830's.[iii] The steeples, reaching for the heavens, create a link between the man-made realm and the natural or infinite; a similar connection concerning the river was obscured by its encasement in a mostly inaccessible and unwelcoming concrete channel.

Figure 2: Soaring steeples of the many churches and strong stone façades of the banks with concrete levee and river between. Intersection of Water and Main Streets.

The relationships between social consciousness and place relative to time are mirrored by the physical history outlined above. In the earliest days of Shade's Mills and prior to its settlement, life played itself out at the pace of the natural environment. Food was as bountiful as the sources, namely the rivers and fields. Transportation accelerated and decelerated relative to the speed of the current. The mills produced so much as the river could flow steadily. Nature, mainly represented by the river in Galt's case not only supported life, it dictated life; the river was life. With the progression of new fuel systems came the Industrial Age and the machine age wherein society's gaze turned inward toward the whirring factory mechanics and the dials, knobs and pedals of automobiles, radios and eventually televisions. The river was outpaced by the man-made world, unhinged from society it no longer played an important role. Subjugated to the characteristic of barely picturesque, life went on above it and even despite it in a sense. The earliest mills are an expression of a different understanding of the relationships between man and nature. One where knowledge was gleaned from the landscape and as such nature was sacred. With the results of nature's profaned commodification now made painfully clear by modern science, we begin to see a resurgence of traditional forms of knowledge under the pseudonym of "green" or "sustainable" technologies.

Figure 3: West wall of the levee

The historical progression of technologies related to urban settlement is now beginning to show signs of its cyclical nature. In Galt, the first large-scale manifestations of technological ingenuity were undoubtedly the mills. Sited on the banks of the Grand River to exploit the natural energy flows provided by its movement, their technology was of a purely mechanical nature. The waterwheel,

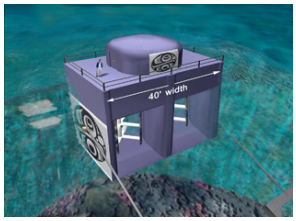
ranging from anywhere between 3m to 10m in diameter, was the device responsible for the capture and transfer of kinetic energy. This "borrowed" energy could be transferred to a multitude of productive tasks via a main shaft and system of gears snaking throughout the various levels of the building. Often the water was channeled in order to achieve the required force to turn the large wheel by which it is stripped of a portion of its energy. The water quickly regains what it lost by being returned to the flow of the river. The energy source is not altered in a manner that would threaten the possibility of continued extraction. Thus, making it a sustainable practice. Unfortunately, however, the latter notion was not at all understood as such at the time. Technology is today, as it was then, primarily understood as the application of science to commercial and industrial ends.[iv] It is with this understanding that we have evolved our technology to conquer the problems of mass production and seeming economic prosperity. Best exemplified in the energy sector nationally and internationally by the unconscionable volumes of hydrocarbon-based fuels burned daily, the ethically questionable methods of nuclear production and the damming of rivers. All of which incur severe environmental issues; the forgotten factor in the technology equation. These basic technological practices, supplying "the heat, power and mobility that animate modern civilization"[v], are inherently unsustainable. Consequent societal tensions, the beginnings of which are being asserted today, force modern technology along with society through a bottleneck. Wherein, an increase in efficiency informed by scientific progress and social awareness are needed in order to pass through. The first examples of sustainable solutions ventured are windmills, solar panels and water current turbines among others, often deployed *en masse* referred to somewhat ironically as "farms". The latter are all reiterations of traditional technological knowledge; five centuries-old windmills feature prominently throughout Europe, North

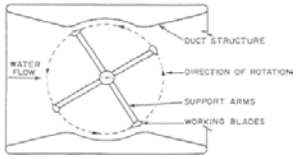
Figures 4 & 5: Gears and water inlet/outlets in Galt

American riverbanks feature two to three centuries-old waterwheels and turbines, among these solar energy is the oldest source of energy production on the planet. History has proven that shifts in energy production technologies such as wind and water to wood, wood to coal and coal to oil have been the driving forces behind the most fundamental changes in society and consequently its built form.

* * *

A town landmark by definition must, through its physical and representational languages, not only create a dialogue between place, object and observer, but also embody those already contextually established and perhaps even those to come. The landmark for Galt, herein proposed, accomplishes this through a synthesis of the above outlined existing historical discourses. The most fundamental of which is the technology necessary to sustain modern urban settlement. The modern progeny of the early waterwheels that powered Shade's Mills are water current turbines of various scales and applications. The Darrieus Water Current Turbine, although gathering energy from the same source as a waterwheel, makes use of technology derived from vertical axis wind turbines named after their French inventor Georges J. M. Darrieus.[vi] This smaller version of a water current turbine is used primarily for domestic applications in small streams and creeks and is rated at between 1.5 and 2.5 kilowatts (kW). The large scale Blue Energy Ocean Turbine makes use of tidal currents at the mouth of ocean estuaries or inlets. Its mechanical and energy production/capture principles are essentially identical to the Darrieus': fixed hydrofoil blades connected to a rotor that drive an integrated gearbox and electrical generator assembly. The model pictured at right (fig.7) is rated at 250kW, but due to their modular design several can be





Figures 6, 7 & 8: Darrieus Turbine, Bleu Energy Ocean Turbine and its plan

installed in series' capable of producing several thousand megawatts of energy.[vii] The proposed design (fig.9) adopts this technology while making certain alterations to account for the subtleties of site context. First, the system uses a perpendicular configuration similar to that of an undershot waterwheel, as opposed to Darrieus' vertical axis system. The turbine proposed uses eight fixed hydrofoil blades in order to provide better lift in slower current speeds. The blades are attached to a buoyant central rotor. The latter drives the gearbox and electrical generator via a flexible coupling, which allows for the vertical movement associated with seasonal and day-to-day changes in river levels. According to the Grand River Conservation Authority (GRCA) website, the average river velocity in Galt can be estimated at 13m^3/s during the summer months.[viii] Using this data and a general water current turbine power generation formula[ix] the energy rating of the proposed system can be approximated:

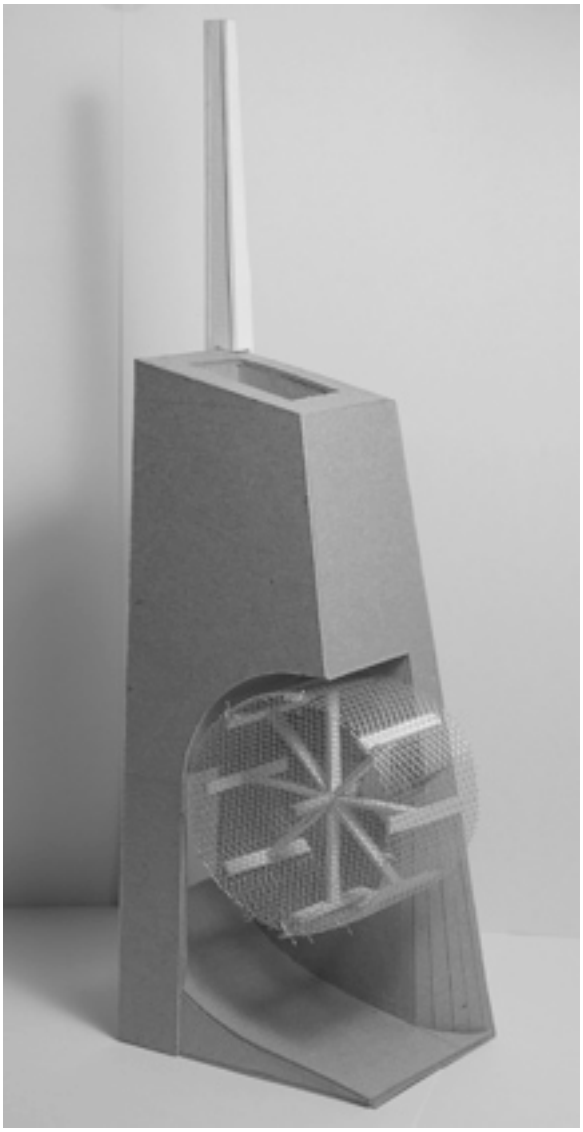


Figure 9: 1:50 scale model of proposed water current turbine

$$P = (k / 2) \bullet \rho \bullet A \bullet V^3$$

where:
P: power produced [watts]
k: performance coefficient [0.17]
ρ: density of water [1000kg/m^3]
A: swept area of rotor (d • h) [m^2]
V: velocity of water [m/s]

$$P = 125(6)(13)$$
$$P = 9{,}750\ W$$

The design proposes to install twelve such water current turbines. Thus, the total energy production can be rated at

117kW. It would follow that if 5kW are required to power the average household in an industrialized nation,[x] this system could hypothetically provide power for approximately 23 households. By contrast, the system could otherwise power 1,160 street lamps at 1000W each. The GRCA river data tables demonstrate the inherent inconsistencies when dealing with natural sources of energy. This can prove problematic for the direct use of renewably sourced power. Including a small-scale energy storage facility would allow for a steady link between the river and the various possible uses of its energy. The latter include street lighting, subsidizing main street business facilities to encourage economic development or simply for use in times of peak energy demand. Most significantly, these uses establish a mental and visual link with the community the turbines serve, which can help to promote a stronger sense of place.

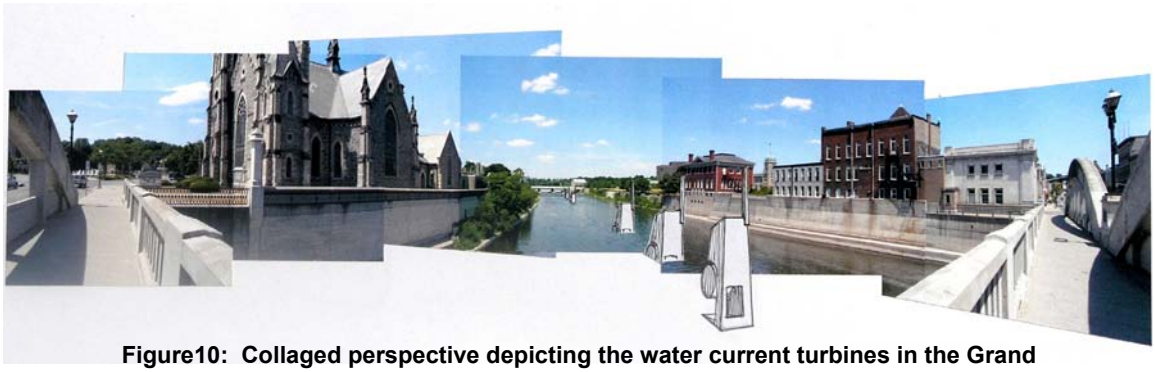


Figure10: Collaged perspective depicting the water current turbines in the Grand

Changes in the dynamics of energy production provide significant opportunities for the rethinking of communities and their conceptions of place. Currently, the overwhelming majority of a community's electricity is provided by power generation stations, such as coal, oil and natural gas fired plants or hydroelectric dams in Galt's case. These facilities are kept out of sight and, as the saying goes, therefore out of mind as well. This centralized condition nullifies or at the very least dulls significantly the most fundamental connection to place: the explicit ability to sustain life. This trend is also apparent in agriculture, with a majority of production taking place at great distances from communities in centralized regions of ever-decreasing size. Fortunately, however, we are beginning to see the consequences of these trends today in forward-looking communities through an increase in local production methods. The erection of

highly visible or landmark energy producing devices, such as Toronto's wind turbine and the proposed water current turbines, can dramatically affect community awareness. In so doing, a community gains a new understanding of its relationship to its surroundings. In Galt's case, the realization that the Grand River is a source of local renewable energy significantly alters the way in which the community sees the river and consequently Galt as a place. The latter forges a new connection between individuals and their reliance on their location along the river for sustainability as a community. Further aided by informational placards and possible development of the river's edge as a community space through the design of boardwalks. The essential aspirations of the proposed design in this context are to reanimate the Grand River in Galt and in so doing to revive a conception of place that once prevailed and has once again become appropriate; that of investment in local resources for community viability. In concrete terms these concepts are achieved by physical means.

The siting and material language of the water current turbines are derived from the contextual dialogues at play. The materiality of the turbines assures a seamless integration of the objects within the deep concrete levee. In avoiding ostentation, the use of concrete for the body of the turbines becomes an evident choice. The rotor, arms and blades are coated in white to evoke wind turbines and by association sustainable technologies in general. The form of the device is derived in part from the iconic forms of the region's mills and waterwheels. This can be seen in the vertical orientation of the rotor assembly, evoking undershot waterwheels. This is further enhanced by its encasement in a galvanized metal protection screen, which in an abstract sense gives the assembly the more solid look of the waterwheel. Also, the concrete arc that follows a portion

Figures 11 & 12: Concrete levee detail and church steeple at north-east corner of Queen's Square

of the wheel's circumference is an abstraction of the former mills' water inlets or outlets that puncture the levee wall at various locations along its length (fig.5). The form is also partially derived from the area's church steeples. The latter, in stretching towards the heavens, establish a link between the man-made world and the natural world as previously mentioned. By adopting this stance the turbines open a similar dialogue between the street level and the level of the river. In the evening this is exacerbated by the white illuminated spires that extend above pedestrian eye level, drawing the eye along the course of the river. This reconnection of river and community is aided by the siting of the turbines. Situated in rows and clustered in three turbines on either side of the Main Street bridge as well as on the south side of the Park Hill Road bridge and the north side of the Concession Street bridge. The turbine clusters are situated so as to take advantage of the main points of contact between the community and the river. Allowing for the greatest generation of awareness possible.

The proposed design of a "Town Landmark" for the community of Galt draws on all pertinent regional and certain global historical discourses in order to achieve its goal as an identifying symbol in its landscape. The deep concrete levee provides an excellent starting point in terms of materiality. While, the function of church steeples is translated to the use of community awareness. In the decades to come local governments and economies will become increasingly important as a struggle to pass through an impending social and technological bottleneck takes place. Municipalities can help to generate a more decentralized community by instating their own independent means of energy production by using the land that they directly inhabit. In Galt's case, its history is the evolution of human settlement relative to the Grand River. The river was the settlements source for all life in the holistic sense of the word. Best exemplified in concrete terms by the Sawmill and Grist Mill built almost two hundred years ago by the community founder Absolom Shade. The inherently sustainable means by which these buildings' waterwheels borrowed their energy from the flow of the river was, over time, obscured by more economically efficient yet more environmentally unstable means of production. Consequently, today, we are

beginning to see a resurgence of what can be termed traditional knowledge gleaned from a close relationship to the land one subsided upon. Modern technology, however, has allowed for significant improvements in the efficiency of these traditional mill systems. Leading to today's elegant wind turbines and the lesser-known water current turbines. Deployed in sufficient numbers these sustainable turbines can produce enough energy to power entire communities and there is no doubt that they can only improve in efficiency. The proposed design for a landmark in Galt, through its variegated historical considerations, commemorates the role of the river as a source of life and the early sustainable industries that arose while simultaneously opening a new and hopeful dialogue between the man-made and the natural.

Endnotes:

[i] Cambridge History: Brief History of the Community of Galt
http://cambridgeweb.net/historical/galt.html
[ii] Ibid
[iii] City Archives: Hall of Fame Member Absolom Shade
http://www.city.cambridge.on.ca/cs_pubaccess/hall_of_fame.php?aid=44
[iv] Dictionary.com: Definition of technology
http://dictionary.reference.com/search?q=technology
[v] Roberts, Paul. "The End of Oil: On the Edge a Perilous New World." New York: Houghton Mifflin Company, 2004. p. 3
[vi] Alternative Hydro Solutions: Development of Darrieus Turbines
http://www.althydrosolutions.com/background.html#development
[vii] Blue Energy: Technology
http://www.bluenergy.com/technology.html
[viii] GRCA River Data: River Levels Central & Lower Grand
http://www.grandriver.ca/index/document.cfm?Sec=2&Sub1=6&Sub2=4
[ixix] Alternative Hydro Solutions: Turbine Theory
http://www.althydrosolutions.com/background.html#theory
[x] Roberts, Paul. "The End of Oil: On the Edge a Perilous New World." New York: Houghton Mifflin Company, 2004. p. 76

Image Acknowledgements:

fig.1: City Archives: Hall of Fame Member Absolom Shade
http://www.city.cambridge.on.ca/cs_pubaccess/hall_of_fame.php?aid=44
fig.2: Cambridge History: Old Postcards
http://cambridgeweb.net/historical/oldpostcards.html
fig.3: Author's own
fig.4: Ohio's Old Mills Today: Isaac Ludwig Mill
http://fpw.isoc.net/KREK/Lucas_Ludwig_Mill_Page.htm
fig.5: Author's own
fig.6: [x] Alternative Hydro Solutions: The Darrieus Turbine
http://www.althydrosolutions.com/background.html#sites
fig.7: Blue Energy: Technology
http://www.bluenergy.com/technology.html
fig.8: Blue Energy: Technology
http://www.bluenergy.com/technology.html
figs.9,10,11,12: Author's own