Space. Form. Body. Technique
Leicester Engineering Building [1959 – 1963] designed by James Stirling and James Gowan is considered among many buildings that mark a specific response to modernity. Within the "Heroic Period" the structure reflects strongly towards Brutalist ideals. This is achieved through the use of materials common to the Brutalist period including brick, glass and steel. In addition to the materials used, the forms, the angular geometries of the structure and the exposed functions of the building suggest a brutalist ideal. The functionalist strategy used, was applied not only as an aesthetic wallpaper but also through the distribution of spaces and the building’s circulation. With this extreme emphasis on function and circulation, "Stirling aimed to 'allow rooms to become private spaces again...having an ideal shape according to their use and be at their most functional without compromise'" [McKean]. Although functionalism is said to be represented throughout the entire building, some spaces lack a definite function producing free or open spaces. Through a series of processes that included constant redrawing through exploded axonometric drawings, massing, spatial sequencing and material considerations could be fully resolved. While utilizing this process, Stirling and Gowan masterfully produced a structure that not only construct a number of successful spaces and included all of the desired programs, but also experiment with a number of different philosophies of architectural space including Deleuzian smooth space.

The programs involved in Leicester Engineering Building provides an extensive canvas for the creation of a number of different spaces. The creation of these spaces represent a functionalist regime but also formally reflect the specific use of each one. The programs that are included within the building include lecture theatres, workshops, labs, mechanical rooms, a library and staff offices. Each of these spaces required a specific resolution and were placed into the building based on their function and level of use. The progression of the building from the ground level to the upper office levels reduce in size and accommodate for the decrease in population densities [Image 002]. As the programs change from public to private the spaces spin out from a dense gridded core, reducing in size and access [Image 001]. The first and second floors contain spaces meant to be used by all of the participants of the faculty. On these levels, students’, faculty and staff members activate the lecture theatres, workshops, laboratories and open plaza like spaces with educational and social events. This density quickly lessens towards the middle floors of the tower, where the program changes to senior labs and head of department offices. The top five floors of the tower follow this strategy and houses only staff offices, once again decreasing the amount of space required for those floors. This strategy of spatial organization in a tower form also provided adequate height required for the desired water tank. Similar to each space, the circulation through these spaces became a main undertaking for Stirling and Gowan and also reflected a functionalist view.
The circulation of Leicester begins at the exterior Corbusian ramp that scales upwards towards an open plaza. It shifts its angle into the main entrance of the building guiding each participant into a vaulted hall. Here the circulation of stairs and elevator follow the fused together forms and diminishing spaces as if it were an “invisible muscle” [McKeen] restricting specific movements of those within. The advancement into the workshop and laboratory spaces provide a more public like area and reference the larger populations that use the spaces. The lecture theatres similarly reflect more dense populations through larger less restrictive enterances and spaces. The tower’s circulation begins to soften as it progresses up refrencing the smaller populations that use the spaces. Its prism like cladding provide a level of transparency that turns the complex inside out, pushing and pulling each environment into its opposite space and exposing the function. In contrast to the restrictions of the building the interior planning took a more lenient philosophy to architectural space allowing more freedom of exploration and experience.

The interior spaces of Leicester Engineering Building, were designed both functionally as well as phenomenologically. This combination of functional spaces with what Deleuze calls “smooth space” begins to muddle the clarity of Leicester. The interior spaces that were designed to reflect specific functions include the lecture theatres, workshops, laboratories and offices. In contrast, liberty within other spaces is used to contrast the Functionalist technique of architecture in that it allows for spaces to be defined by the requirements and activities of the users. The spaces lack any décor or furniture which Stirling describes as creating “quite separate, independent places”[McKeen]. This notion of place and its phenomenological link relate to the importance and connection that a user has to a specific space. For a space to become an area that allows for a relationship to evolve, the space must be “essentially empty” [Lefebvre] [Image 003]. An empty space vacant of any objects will lack any formal discourse about the activity that should occur within that space. Freedom of space in combination with functionalism within the workshops and laboratories also became a task that Stirling and Gowan had to explore. The request for a freedom within the labs led to a structure that became “an anonymous shed, within which all subdivisions, being non-structural, could be changed without touching the skin” [Lefebvre]. Deleuze and Guattari describe similar strategies of space development in regards to the striated and smooth. Smooth space is defined as a space that lacks any direction or definition. These spaces are open and free, allowing the user to define the space by the social interactions and activities that they desire. Striated on the other hand use strict definition and prescribed space to restrict and control. Within Leicester, freedom of each supplementary space creates smooth individual spaces that could be used for any means. The other spaces that define movement patterns, circulation and perscribe function create a thick striation over the complex.

In addition to the Functionalist strategy that Leicester amplifies it also uses theories including Brutalism, Phenomenology and Modernism to create spaces that are sufficient for an engineering faculty. The confidence that Leicester radiates from its tower to the cascading crystal roof is significantly paralleled in the distribution and creation of the interior spaces and navigation patterns within. The combination of functional and smooth spaces in addition to distinct characteristics, create space that allow experiential freedom and Interest. These formal strategies then create relationships between the user and the spaces that mask the technical lining of the complex, perfectly providing spaces that users can dwell within and activate through social means.
Dissection of Form and Function

The modern phrase “form follows function” has been one of the most debated phrases in architectural history. Modernism produced simple and reduced forms strictly derived from function. Such architecture consisted of primary and geometric forms that were used strategically to amplify the function, and proposed to “embody function more honestly” [Eisenman]. In the so called progression of architecture and architectural thought, Post-modernism inverted modernist techniques, placing a higher value on form rather than function. Post modern has also brought about many questions concerning the progression of architecture since the beginning of time.

One of the defining characteristics of architecture since the beginning of time has been its relationship to man and his most basic needs. This first typology was said “to be found in the model of the primitive hut,” [Vidler] the first function providing for man’s most basic need for shelter. Over time architecture has made changes based on the availability of technologies and the growing complexity of the modern world. Although complexity was an inevitable circumstance, primitive function would still resonate through either obvious or ambiguous techniques. In this sense modernism is only an adaptation of classical functionalism, responding to the contemporary and more complex experience. It is impossible to negate the past when producing architecture of the present. To incorporate any formal, functional or conceptual notion into an architectural project, is to say it is “continuous with the architecture that preceded it” [Eisenman] and has never escaped the classical age. To this extent the phrase “form follows function” is not a paradigm, but a stylistic image for the various adjustments and changes that have been made to architecture in response to the complexity that defines our modern world.

Modern theory attributes function as the guiding principal in architecture. This epoch also uses a high level of reduction of form in order for function to purely exhibit itself. The use of reduced and geometric forms are applied to create a number of different functioning spaces, as well as spaces that do not prescribe any function, but are free and open spaces that provide a base for potential and creative exploration. Post modern theory inverts these notions of modernism, placing a higher importance on form rather than function. Post-modernism responds more successfully to the complexity facing the modern world through complex spaces as well as forms.
The Leicester University Engineering Building [Image 004] was an attempt to reinstate modern traditions using reduced formal techniques as well as strict functionalism. Even though the building is clearly post modern because of its formal and material qualities, its modern critique is also very strong. For example, strict functional consideration is demonstrated in areas such as the north lit workshops, the navigational routes, the office tower and most predominately, the lecture theatres. The workshops were designed as an “anonymous shed” [McKean] referencing a simple form that could be internally manipulated to provide for a number of different functions and experiments. The workshops could also transform for the introduction and use of new technologies and instruments. The main floor and office tower were designed to provide for a decline in users as the building was navigated towards the upper levels. The office tower also projects above the main floor to provide sufficient height for a head of water needed 100 feet above the ground for the workshops and laboratories. In addition to these spaces, modernity was also exercised internally creating vacant “free spaces” that are formally ambiguous and do not prescribe any function. Both of these spaces are produced using simple geometric forms that are specific to the modernist era and exclude any form of complexity or variation. Therefore the question is proposed: Is the modern tactic of utilizing simple and reduced forms essential to achieving both functionalist and free spaces?

Using the post-modern theory - increased value of form rather than function, complexity can be either increased or decreased. In order to prove or disprove that modern formal aspects are required to maintain functional and free spaces, it is necessary to use post modern attributes as well as the lecture theatre as a study model because of its clear manifestation of the concept - “form follows function” [Image 005]. A lecture theatre requires raised seating that projects down towards the speaker. This design decision responds to the function - to accommodate for larger populations in a smaller space as well as to provide for sufficient acoustics and sight lines. The form can be described as a simple rectangular cube with an angle removed to provide for the raised seating and projection. Utilizing the techniques of dissection and addition, complexity through form can be achieved. This process included planes that sequentially intersect and cut, subtract or transform, and add to the previous lecture theatre form.
The first study increased complexity through dissection and subtraction [Image 006]. This Eisenman-like process lends itself to a high degree of complexity in a short amount of applications. The transformations were created through a series of rules that respond to the original form and more specifically to the angled cut. As each plane would intersect and remove a portion of the form, the lecture theatre began to overcome a focus on function and reduced its possible capabilities. In response to reducing the forms' functional capabilities, the complex form began to produce free space that does not have any functional qualities; rather it created an ambiguous space that provided a setting for greater potential. This continual process of subtraction, if repeated, would reduce the form to a point where it no longer supported any function, leaving a useless space.

The second experiment used a similar diagonal cut but was initially transformed into a solid figure [Image 007]. The triangular form was then rotated, flipped, and arranged based on a set of rules formed from the original cut; similar to the surface transformations in the first investigation. The form of the lecture theatre through the process of addition becomes complex while maintaining the internal structure and full functionality. The diagrams show that this process of addition provides a level of complexity as the exterior begins to mask away the function and provide more dynamic and intriguing forms that have the potential to inspire exploration and experience. This post-modern strategy of placing a higher importance on form rather than function does not remove human need from architecture, it only uses that typology as a departure point into the potentials of architecture that result from form and function operating independently.
In contrast to the first two experimentations, the third investigation inadvertently produces complexity of function rather than form [Image 008]. As a result of reduction to the already simple lecture theatre form, all functional qualities are broken and the space becomes an open or “free space” [Woods], similar to the empty spaces in Leicester [Image 003]. Free space is viewed as a space of the in between. The “in-between” as described by Elizabeth Grosz, is “space of movement, of development or becoming...space of a potential that always threatens to disrupt the operations of the identities that constitute it” [Grosz]. The function of an in-between space is always uncertain and cannot be defined by formal qualities. In this sense the function is now infinitely complex. This is a space that is expressed by the second and fourth sets of diagrams. The formal techniques are used to overcomplicate or over simplify to completely obliterate the function and produce a new type of architecture. This design does not prescribe but provide a foundation for potential or creative thought. In contrast, the first and third sets of diagrams exhibit spaces that are functionally produced and maintained. These spaces have a definite function and are expressed through a reduced form or masked through complex form. The analyses of each investigation show a direct relationship to form and function and express a unique balance that must be achieved in order for a space to maintain its function or allow for a space to become functional. Complexity and simplification of form created both functional and free space; therefore it is not imperative to reduce form to a primary representation of the desired function. The experiments tested here are evidently not sufficient to represent the infinite possibilities that could be produced using this approach of dissection, subtraction and addition. They can however, be used as an entry point into a project in which form and function are tested continuously and interdependently. Finally, tests of form and function can also be used to discover a balance between both, to create the most successful space and architecture.
Space. Form. Body. Technique
Architecture and the human body exist as one and the same. As a result of a number of different paradigm shifts, architecture has taken many forms but still references the human body. The incorporation of the complex systems that define our body into architecture is imperative considering our immense interaction with it. Architecture has changed to represent the complexity of our contemporary world. Within this continual change, the role of the human body in architecture has also been questioned. The initial use of the human body in architecture was a direct application of its proportions. The progression of architectural thought from the classical era changed the image of the body and its importance on architectural creation. Modernity began to skew, alter and transform the body into fragmented pieces that did not resemble humanist traditions. These departures from classical thought eventually lead to the combination of both body and technology that was meant to gentrify humanist tradition. The modern body as Merleau-Ponty states “is the locus of all formations about the world; it not only occupies space and time but consists of spatiality and temporality. The body has a dimension. Through motion it polarizes external reality and becomes our instrument of meaning; its experience is therefore “geo-metrical” [Perez-Gomez]. This supports the idea that the human body in architecture relies solely on the body’s registration of information systems embedded into the architecture.

Classical application of the human body into architecture used direct measurements and relationships that exist throughout the human body. As a result, perfect form, function and beauty were strategically achieved. To derive perfect form, function and beauty, the humanist tradition closely followed the image of the Vitruvian Man. The Vitruvian Man was created as a result of mathematics and proportion, applied to early forms of Greek design including sculpture and architecture. Form was then designed from the image of the man inscribed within a circle and square, with his limbs outstretched and his naval at the center. In addition to the application of the exterior qualities of the human body, the internal functions of the building “just like the eyes, ears, nose, mouth, veins and viscera, the organs are arranged in and around the body as a function of it needs and necessities” [Vidler]. This combination of perfect form and function derived from the proportional, symmetrical and internal systems of the human body created a strong unity and became the “authoritative foundation for architecture” [Vidler]. Following this direct application of the human body, architecture started to modify the body and reference different notions including the mind and emotion.
Modern progression profoundly changed the way the body was referenced within architecture. The body was transformed, fragmented and distorted to achieve different levels of representation. Different aspects of the body including the mind and emotion became the leading factors in architectural creation. This change in bodily perspective began to challenge the classical understanding of the human body and started to test its potentials. A number of different stages can be traced to show the evolution of the representation of the human body within architecture. The first change was developed through the notion of the sublime. This architecture invoked emotion through formal and functional techniques such as the use of light. The second change included the fragmentation of the body into individual parts while arranging them to understand other capabilities of the body. This notion was successfully exercised by the cubists, who completely abstracted the figure of the body to understand the body’s potentials as in Duchamp’s Nude Descending a Staircase (1912). The final extension of the human body through the modern movement combined external objects with the body through the projection of a sense of “aliveness” [Vidler] onto the objects. This introduction of life into an object resembled the different senses that a body desired or rejected through the registration of information systems with those objects. Similar to these modernist notions, Leicester Engineering Building incorporates strong functionalism to represent different states of the body both physically and mentally. The continual evolution of architecture represented through Leicester Engineering Building never removed the body completely. However, with the changes to the level of function within architecture, the amount of information that could be translated became limited [Image 5]. In a space that is designed with strict functionalism in mind, there exists a large amount of information that the body can respond to. On the other hand in a space that is “essentially empty” [McKean] the space is rendered useless since the body does not have any information to employ [Image 010]. Therefore, to what extent should function be incorporated into the design of contemporary architecture while maintaining the importance of the body but also producing a level of comfort and potential?
Leicester Engineering Building fuses a modern sensibility of the body with strong functionalism and Brutalist techniques. The overall form of the building employs strong angles and geometries while revealing the buildings functions and direct uses. The forms of the building are strong robust block forms that are noticeably separate from one another that reference the modern rejection of the continuity of the human body. These forms also incorporate Brutalist materials including glass, brick and steel. This application of materials and form allow for the internal functions to be brought to the surface and understood without experiencing the spaces. Leicester encompasses both functional and free spaces that have different levels of information embedded within them. As a result the spaces become useless or productive through possible applications of the human body.

To test this notion, a series of studies were tested and then applied to one another. The first study was an understanding of the various body positions that would be involved in the navigation of Leicester Engineering Building [Image 011]. The body positions were then transferred into individual line segments and placed within each space as a body would navigate through it. Secondly, a general representation of the spaces and their programs lent themselves to diagrams that help support the inclusion of the human body as a direct result of function and information fluctuation [Image 012]. To prove this, the body position segments were accumulated within each space as a body would navigate or utilize the space [Image 13.1]. Smaller amounts of segments would define a decrease in the inclusion of the human body, while more segments would define spaces that utilizes the body and its potentials. For example the progression through Leicester Engineering Building beginning with the Corbusian ramp, shows this relationship of function and information with the engagement of the human body. The angled ramp that guides the participants into the building produces little alteration of the human body and shows that the ramp is only productive through its function. Similarly, the free spaces contain few information systems that are reduced to the interior wall systems and materials that create the space [Images 010]. Although these spaces were designed for unlimited use, they limit the body by reducing the information that can be understood and translated through the body.

In contrast, the functional spaces that include the lecture theatres, workshops, laboratories and offices are all fixed with a number of objects that form complex information systems that define the functions within that space [Image 005]. For example, the lecture theatres contain situations for a number of populations that address several extensions of the human body.
These functional spaces contain information systems that signal applications of the human body in work, rest, and academic situations. The diagrammatic tests therefore conclude that different functions produce fluctuations of information within a space [Image 015]. This change facilitates the body and creates productive or unproductive spaces.

In response to both functional and free spaces, it is clear that the body requires a certain level of function to maintain its participation within architecture. The direct relationship between function and information within a space influences the body and its potentials within that space. By removing all function like that of free space, the body becomes useless in that it does not have any information to respond to. This absence of information places responsibility to the user to fill the space with necessary information in order for it to be activated. In contrast, in a space designed with a function in mind, a sufficient amount of information is embedded within that space and the body can absorb and utilize it. This degree of function and information provides a sufficient base in which the body can adapt to the surrounding or space. This type of space will also allow for the body to expand its potentials through the registration of ambiguous forms and functions. The level of ambiguity in any architecture can persue unexplored areas of the mind and body and can extend their functions through exploration and experience. Therefore, an architecture that can combine new techniques of form and function that do not prescribe or limit the body will be the most successful. Only through this attempt will new bodies of architectural form be created, testing and pushing the body’s inclusion in contemporary architecture.
Architectural technique can be understood either as a tool that is used within architecture to enhance a specific moment or an intimate relationship between the designer and the design process. Each technique that is created depends on the time period, the designer, the project and can fluctuate rapidly based on technology and available resources. Since the beginning of time, architecture has been produced through a limited set of systems and understandings of the world. For example, the creation of the primitive hut [Laugier] used simple understandings of man’s most basic need for shelter in addition to an understanding of natural elements and construction techniques [Image 016]. Since then, the evolution and growing complexity of the world has provided architects with an extensive foundation of tools and economies that can be studied and applied to the design process. Architecture began to move from simple structure that responded to simple sheltering notions to forming relationships with the social, political and historical world. The introduction of technology also simplified a number of processes and allowed for more intricate architecture to be created. The growing complexity of the world in combination with extensive technological growth extended the information pallet that designers could pick from making design concepts and practice exceptionally rich. Architectural technique cannot be defined by a singular static process. Each process is uniquely defined by the project and most importantly the architect.

Architecture starts with an understanding of the project through a collection of project inventory such as program, site, demographic, materials and function. Each of these economies has a level of importance and can help direct the design process. The difference between each process is the designer. Each designer has different understandings and interests regarding the information that forms this world. The designer who chooses the concepts to transform into architecture applies his or her own understanding in addition to a process that is specific to that person. Never will a process or architecture that includes the same economies be the same. This practice of design is a very personal investigation in which the designers thought patterns are both quantitatively and qualitatively expressed through a number of creative means. For example writing, drawing, research, modeling and diagramming are all tools that can be used to discover the fundamental nature embedded within each information system being studied. A very useful method of representation is diagramming. Successful diagramming can have the potential to unveil specific components such as form, space and body. It is the responsibility of the designer to be selective and overlap different economies to produce a level of complexity needed within each project.
The combination of the project requirements and the design process can lead the designer into a very unpredictable exploration of the systems involved. Throughout the design process, the combination of individual economies can have very unpredictable results and produce effects that would never be understood without investigation. This notion of combining different systems together to produce new and innovative qualities is what K Macgregor Wise calls “Assemblage”. In his writing, he describes the unpredicted images that are formed through the accumulation of separate economies. In the example that he provides, a series of elements were described to define an appearance. Within the description, the combination of the described articles, produced qualities and in that specific case an identity [Wise]. This same effect is possible through the combination of diagramming technique. The importance of this example lies in its unpredictable evolutionary characteristics. The combinations of specific elements create an image that can define other qualities. This notion can have very erratic results and can divert a design process in a completely new direction revealing unprecedented systems that are involved but unknown. This notion of unpredictability in fusing of two economies can also be understood as “coevolution”. This term references the mutual relationship that two economies produce from the exchange one another’s embedded information. This application of assemblage and blending of two or more systems is clearly demonstrated through the construction but most importantly the development of Leicester Engineering Building.

James Stirling applied several techniques in the creation of Leicester Engineering Building. Through function, form, materials, and structure the architecture provides an “enormous surplus of information” [Spuybroek] embedded within it. This abundance of information is created through the assemblage of architectural elements and processes that coevolved to form new qualities and an identity specific to Leicester Engineering Building. The initial stride was to understand the several types of program involved in the project. This in combination with the site directly uncovered that the site was too small for its requirements. The initial research immediately directed the process towards a tower design that could achieve the height requirement for the needed water tank as well as fit all required program into the site. Secondly a 6 x 10 square grid was applied to the footprint of the site. This in combination with the requested north lit workshops and laboratories created other sets of diagrams that pressured the process further. This assemblage of site grid with north light direction coevolved into formal qualities that eventually lead to the “crystal waterfall”[McKean] roof design [Image 018]. The spatial process included a series of exploded axonometric diagrams that were massaged into the final result.
This process allowed for a greater understanding of the restrictions of the project and relationships of space, form and material choices. The assemblage of form, structure, materials, and space that create a level of poetics speak heavily to a resolved tectonic expression. This precise combination of material and form in areas that include the spiral staircase, the workshop roof design and the tower clearly represent what Kenneth Frampton described as a “poetic manifestation of structure”. Poesis “as an act of revealing”[Frampton] is utilized to present the personal understanding of modernism and James Gowan’s personal critique of the direction architecture was currently heading. Although this process lead to successful elements combined together to form Leicester Engineering Building, it certainly was not the only possible outcome.

The architectural process is a completely open concept. The information applied to the project does not have any limits. It does however rely on the architect to compose the best possible manifestation for that specific program. The assemblage of all systems involved in a project could have been understood and coevolved into other directions. For example the application of the site grid with the light direction could have been blended to form a different economy that could be applied to space or body as opposed to form [Image 017]. The limitless quality of the design process and more specifically diagramming, can produce a series of unexpected discoveries that enrich a piece of architecture but also reveal new and exciting possibilities. It is the responsibility of the architect to retrieve from the process, small interesting elements that can be translated into architectural devices. Through previously described techniques such as dissection and manipulation of the overlaid grid, the surface becomes a maluable entity in which greater information and as a result more possibilities of form and space arise [Image 019]. This intriguing process and system can have very specific maneuvers and maintain a conceptual quality but can also easily deviate a design, removing its importance.

Leicester Engineering Building is a building that responds to modern architecture through post moder techniques. In that, the building uses a series of processes that are specific to both James Stirling and James Gowan. The overall complexity of Leicester encompasses a large range of classical, modern, post modern and contemporary theories. Such theories include the incorporation of the human body, phenomenological space design, post modern form and drawing and diagramming process that have the potential to produce new contemporary bodies of architecture. This building’s complexity will continue to be stretched and applied to innovative and critical advances and continue to be one of the great examples of progressive architecture.
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