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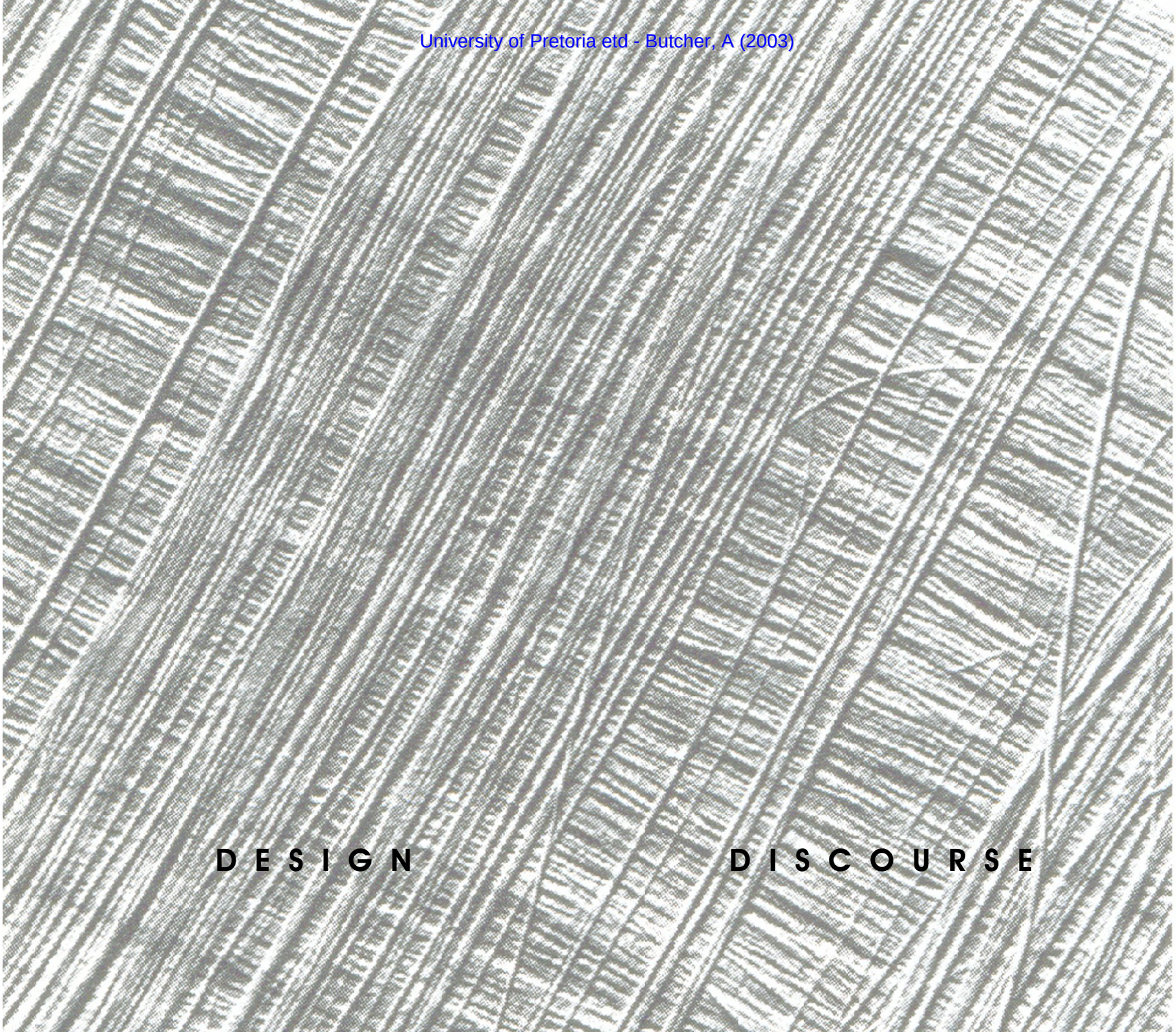

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8. Design Discourse

"Nature has become an appendage of urban civilization whose advantages we use every day, but which we hate. We have to learn how to live with that discrepancy. Palliatives are of no use. The dream of untouched nature is over. We have to accept that it will never again be as it once was. The only thing we can do is to build monuments to the new reality so we can recognize the span of urban reality as that of the future. The city is everywhere." (Coop Himmelblau, 1978, p136)

Pretoria City is made up of a number of layers; these are layers of history, development, buildings, monuments, etc. As each of these layers was laid down, a piece of the biophysical environment was replaced, by built form. This replacement did leave the city with a small number of green spaces, which achieve their task as an urban playground but do very little to contribute to any ecological diversity (Hough, 1984, p16). They do not provide an image of the environment outside of the urban context. One assumes that all green spaces within the city make a positive contribution, but these manicured green spaces often require high-energy inputs (Hough, 1984, p16), inputs such as cutting, trimming, weeding and fertilizing. Many of the plant species within these spaces are also exotics requiring larger amounts of water, while the indigenous plant systems in the biophysical environment require very few energy inputs.

Nohl suggests that nature in urban areas is in a sense a letdown (Nasar, 1988, p81). These areas are artificial and do not fulfil their task as an escape from the city. The idealization of being immersed in nature is not fulfilled. This connection to an un-urbanised nature that we refer to is a concept that Schiller (1759-1805) termed the 'totality of nature' (Nasar, 1988, p79).

Many of these spaces do however have very strong cultural links, which represent a piece of heritage dating back to

8.1 West elevation of 3D model

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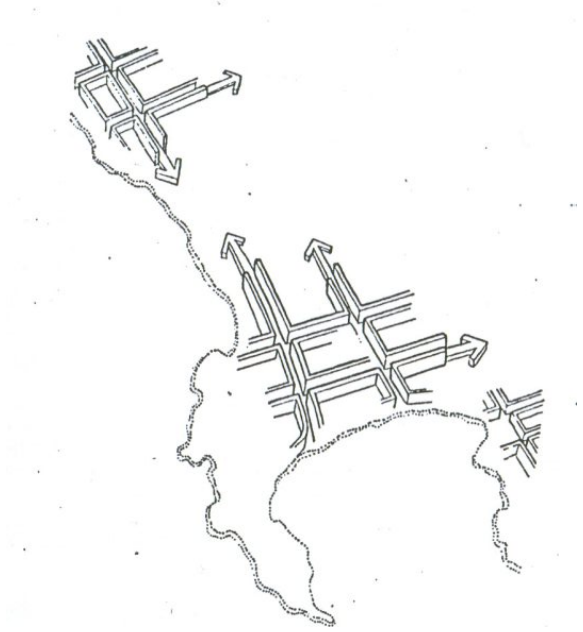
about 1850, but almost all layers before that time are absent. Ethnobotanic links, especially medicinal, are some of the remaining layers from that time and some artefacts do remain on the ridges, but are isolated from the rest of the city and therefore from us. It is important to expose all these layers of history as they form the base for a regional identity (Dewar and Uytenbogaardt, 1991, p39).

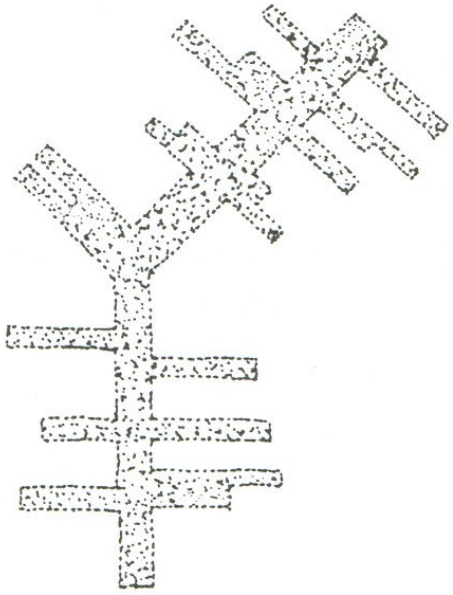
These ridges form what Dewar and Uytenbogaardt (1991, p79) call 'nature rooms'. 'Nature rooms' are natural land parcels that should be maintained so that they are protected from urban development. These 'nature rooms' preserve the urban-rural relationship, and in this case, cultural layers. From these areas, 'nature corridors' need to develop and stretch into the inner city to undefine the boundary between the urban and rural environment. These corridors should coincide with existing cultural installations to form a network of activity systems. As cultural facilities become incorporated into this network, future installations will inevitably tie into it as well. This system will form a mega-structure (Trancik, 1986, p107) creating a synthesis of cultural and physical context. Dewar and Uytenbogaardt, in '*South African Cities: A Manifesto For Change*' (1991, p82), indicate the importance of locating public and social facilities around the nature rooms; the green spaces celebrate these facilities, give them a sense of scale and create a sense of enclosure.

Initial design investigations were based around establishing a continuation of the Zoological Gardens along the river into the city. With the EBRC and its surrounding landscape, this would form a stronger ecological environment that spreads

8.2 Dewar and Uytenbogaardt's concept of 'Nature rooms'



8.3 Maki's 'megaform', an open ended structure whereby linkage is imposed



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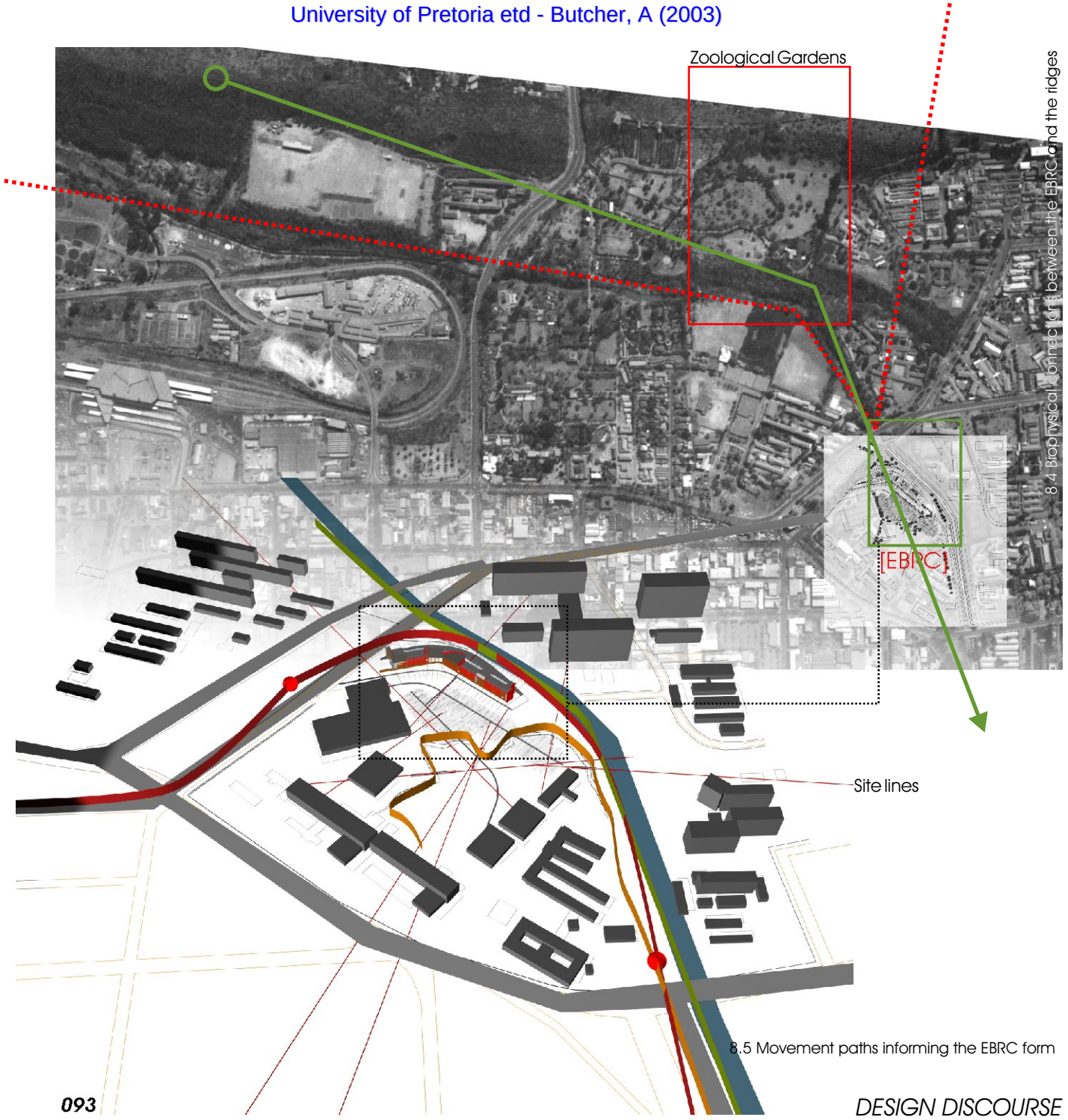

8.4 Biophysical connections between the EBRC and the ridges

8.5 Movement paths informing the EBRC form

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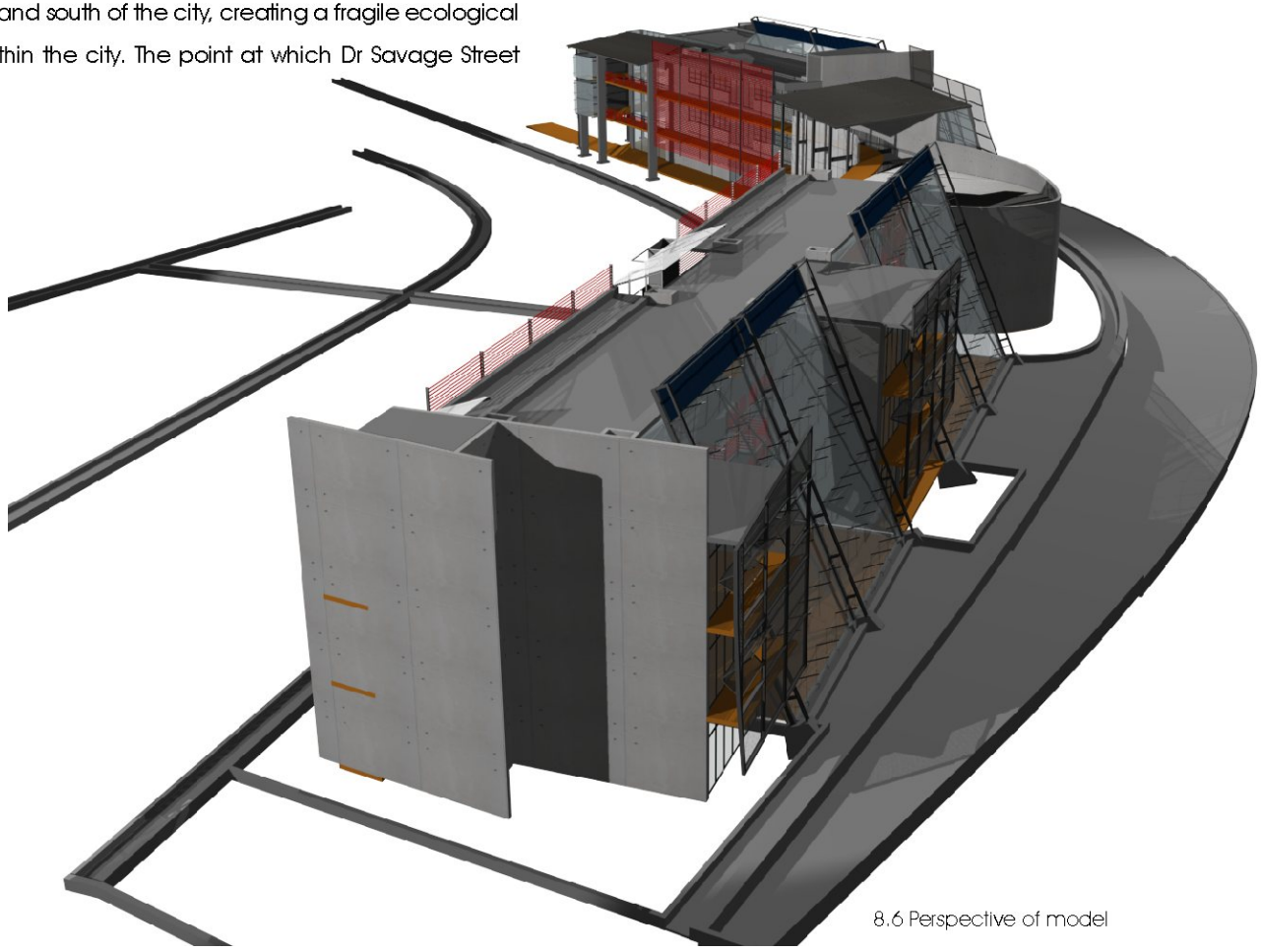
northwards onto the Witwatersberg Ridges and southwards penetrating the CBD. The immediate surroundings of the EBRC are used for cultivated medicinal plants and the land opposite the EBRC on the east bank of the river is used for uncultivated medicinal plants, both of which contributing to the awareness of the greenbelt through appropriation (See fig.8.4).

As identified in the context analysis (see page 004), the Apies River forms a greenbelt through the city that links the ridges to the north and south of the city, creating a fragile ecological thread within the city. The point at which Dr Savage Street crosses the Apies River, is where the river and its surroundings take on a more natural form. The biophysical environment is funnelled into the CBD here and development has encroached northwards. To the northwest, development has been restricted by the Zoo and Zoological Gardens. By establishing a strong identity at this point, there was the possibility of creating an awareness of the 'totality of nature' within the city and making it accessible without encroaching



8.6 Perspective of model

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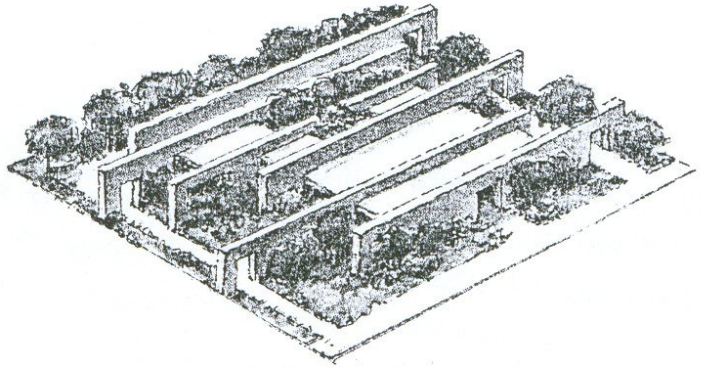
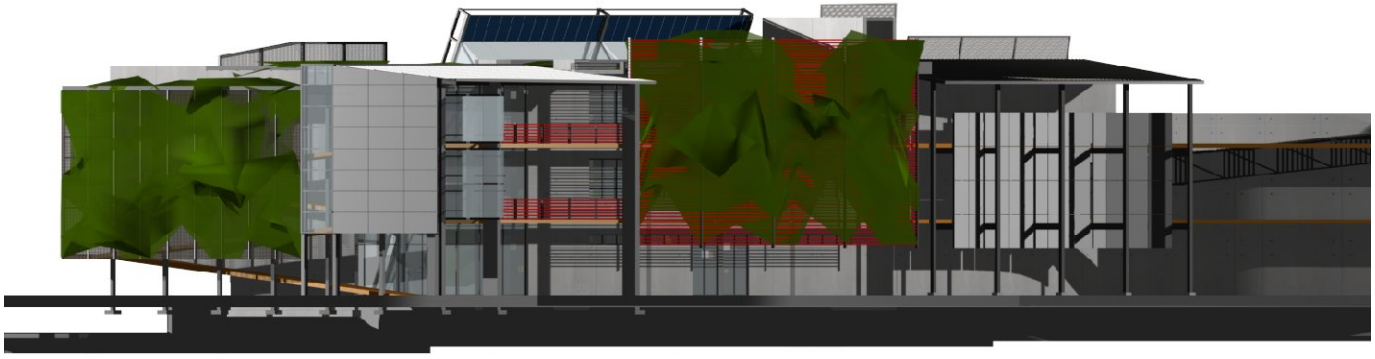
on it. This is demonstrated by Norberg-Schulz's assertion that by 'inhabiting' a landscape, it becomes recognised and understood. People that inhabit the landscape in turn act as the 'guardians' of that space and through interaction reveal the essence of the place (Quantrill and Webb, 1991, p47). This is illustrated by Heidegger's (1889-1976) statement in 'Constancy and Change in Architecture' (Quantrill and Webb, 1991, p47) that: "The bridge…does not just connect banks that are already there. The banks emerge as banks only as the bridge crosses the stream…. With the banks, the bridge brings to the stream the one and the other expanse of the landscape lying behind them. It brings stream and bank and land into each other's neighbourhood. The bridge gathers the earth as landscape around the stream". An analogy to this is that the Apies River greenbelt and the biophysical environment already exist and by means of a number of installations (See fig.3.16) they have been related to human action. At this point along the river, the EBRC is necessary for this relation. How? Norberg-Schulz goes on to say that it is not enough to recognize the landscape but has to be expressed in images that reveal and endure.

The building and the site on which it stands needs to become a landmark to the greenbelt that makes obvious the transition between urban and natural landscapes, but continually attempts to draw the biophysical into the city; in doing so creating a strong dialogue between the architecture and its context. The architecture of the EBRC not only needs to fulfil its functional role of housing a programme

8.7 Wines' concept of 'Passages'



8.8 South elevation of 3D model [with biological envelope]



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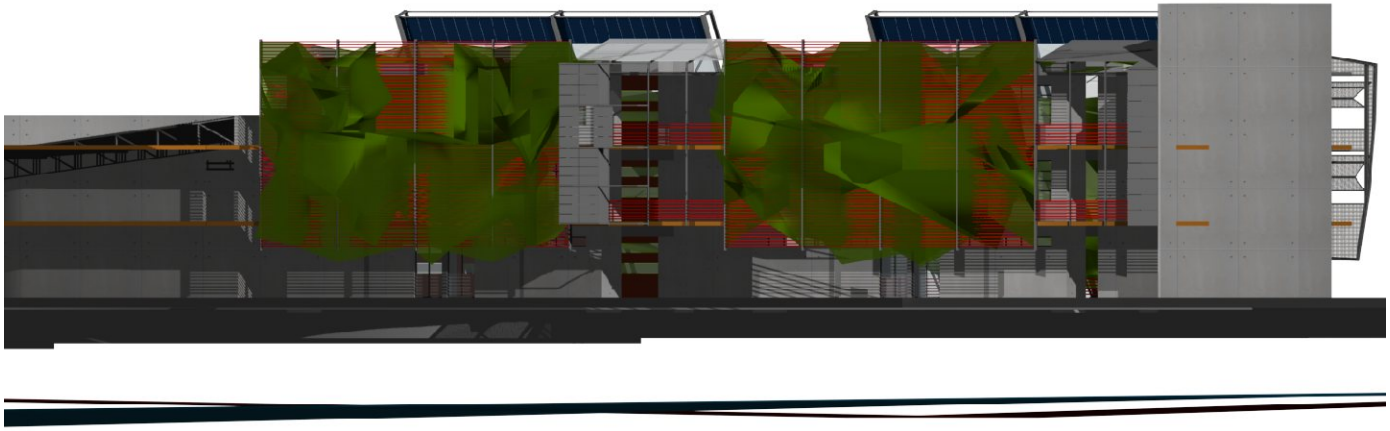
but also needs to communicate this dialogue to the observer, creating an awareness of the immediate and surrounding context. This communication is prevalent in the projects of SITE, as Wines states: "…the practice (SITE) developed the idea that it might be productive as a way of breaking free from the strictly formalist interpretation of architecture to shift the aesthetic focus from shelter to the capacity to absorb and transmit messages. This suggests that walls, instead of being seen mainly as barriers, enclosures or compositional elements, can serve as information-filtering partitions, or points of passage, that fuse and dissolve traditional inside/outside relationships and incorporate narrative commentaries" (Wines, 1993, 32). In relation to this ideal, Wines himself developed the concept of 'Passages'. He defines this concept as a notion intended to describe a mutational, organic and informal set of connections between building and landscape. In doing so the structure should reflect and engage various aspects of landscape, regional identity, topography and cultural references (Wines, 1993, p33). These ideals suggest a fusion between architecture and the landscape. Wines endorses this by stating: "Buildings conceived as integrations of structure and landscape are mutable, metamorphic and evolutionary, constantly conveying new levels of information" (Wines, 1993, p33). This symbiosis will create a strong contrast in the city; this contrast gives richness to the city and pervasive presence to the landscape" (Trancik, 1986, p106).

To emphasise the synthesis between architecture and landscape, there needs to be a strong union with the ground on which it stands. A study of horizontality in architecture, revealed this association with the building and its immediate landscape. Arnheim (1977, p44) emphasises this: "…'belonging to the ground' comes about not by penetration at right angles but by parallelism, which creates an easy harmony. The building hugs the soil and fits easily into the landscape. At the same time, it is rootless like a boat, it tends to float on the surface of the ground because parallels do not interlock. Contact is all the more tenuous



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because the shape of such a building undercuts the vertical dimension of gravitational pull. The building has little weight; it does not press down."

While reposing over the ground does establish a strong connection to the earth, horizontal composition becomes largely affected by visual weight. Visual weight is governed by three factors (Arnheim, 1977, p46), the first being distance. Perceptually, the earth is not the only entity that has a gravitational pull, as any perceived object within a visual field will generate its own gravitational pull. Physically, the gravitational pull from the earth weakens as the distance from it increases. The same is true for the perceptual gravitational pull of an object. For this reason we perceive taller/narrower buildings to be affected less by the pull of gravity, although they do have a larger weight to area ratio than a shorter/wider building.

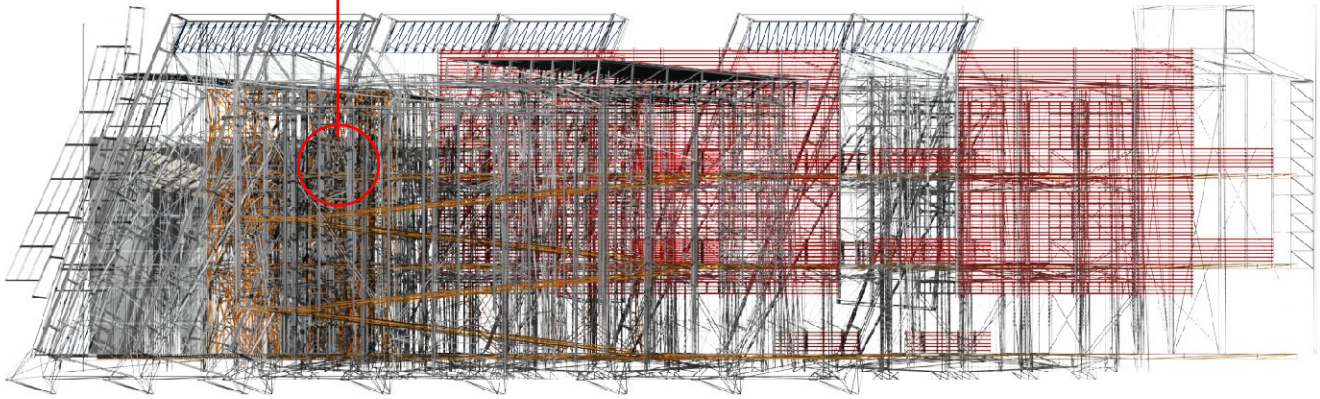
The second factor is load. Physically, the loads on the lower levels in a building are larger than on the higher levels. This is obvious as they support more weight. Because we understand this to be true, we perceive this as visual weight as well; however the lower levels appear physically heavier than those above.

The third factor is potential energy. Physically, the potential energy of an object is amplified with an increase in elevation, and is reflected perceptually. This leads us to believe that an object that is elevated higher than another is heavier than the other.

In the case of a building that is elevated from the ground, it can be said that the interspace (the space beneath the building) affects the visual weight of the building. If the interspace is very large, the structure is perceived to be floating over the ground. If the interspace is small, the building appears to struggle under its own weight to stay elevated.

By reducing the 3D model to its line components, the concept of visual weight is illustrated. With the elements on the ground floor minimized, the building elevates above the ground and a centre of gravity develops where the highest density arises.

8.9 Elevation showing line components



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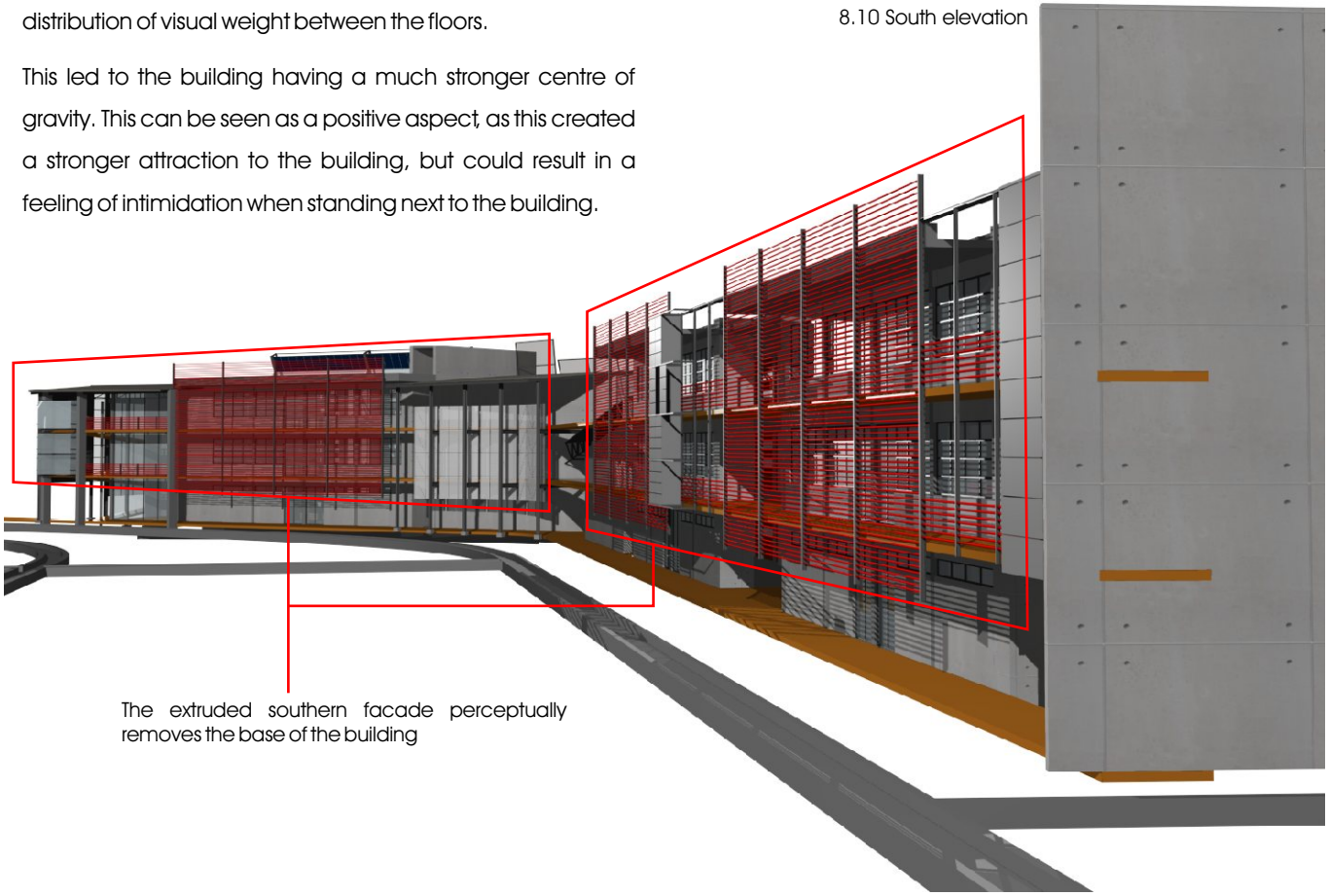
From this, the following deduction was made in the design of the EBRC. To create a strong connection between the building and the ground on which it stands, the EBRC was spread horizontally across the site (see fig.8.7), but remained narrow to limit interference with the flow of the ground water (See appendix C) and for natural ventilation and lighting. This however gave the appearance that the building was applying a great pressure on the ground, therefore the top two floors would be extruded (see fig.8.8), figuratively removing the base, giving the perception that the building was floating above the ground. This also resulted in a better distribution of visual weight between the floors.

This led to the building having a much stronger centre of gravity. This can be seen as a positive aspect, as this created a stronger attraction to the building, but could result in a feeling of intimidation when standing next to the building.

A design approach loosely based on Wines' concept of 'Passages' was adopted. The concept of integrating the landscape and architecture was initially conceived as a purely functional principle of microclimate control and plant propagation. By integrating the landscape and architecture, the building became wrapped in vegetation, a veritable biological envelope. This envelope is in a continual state of growth that constantly morphs and transforms the state of the building.

The envelope is made up of three overall components,

8.10 South elevation



The extruded southern facade perceptually removes the base of the building

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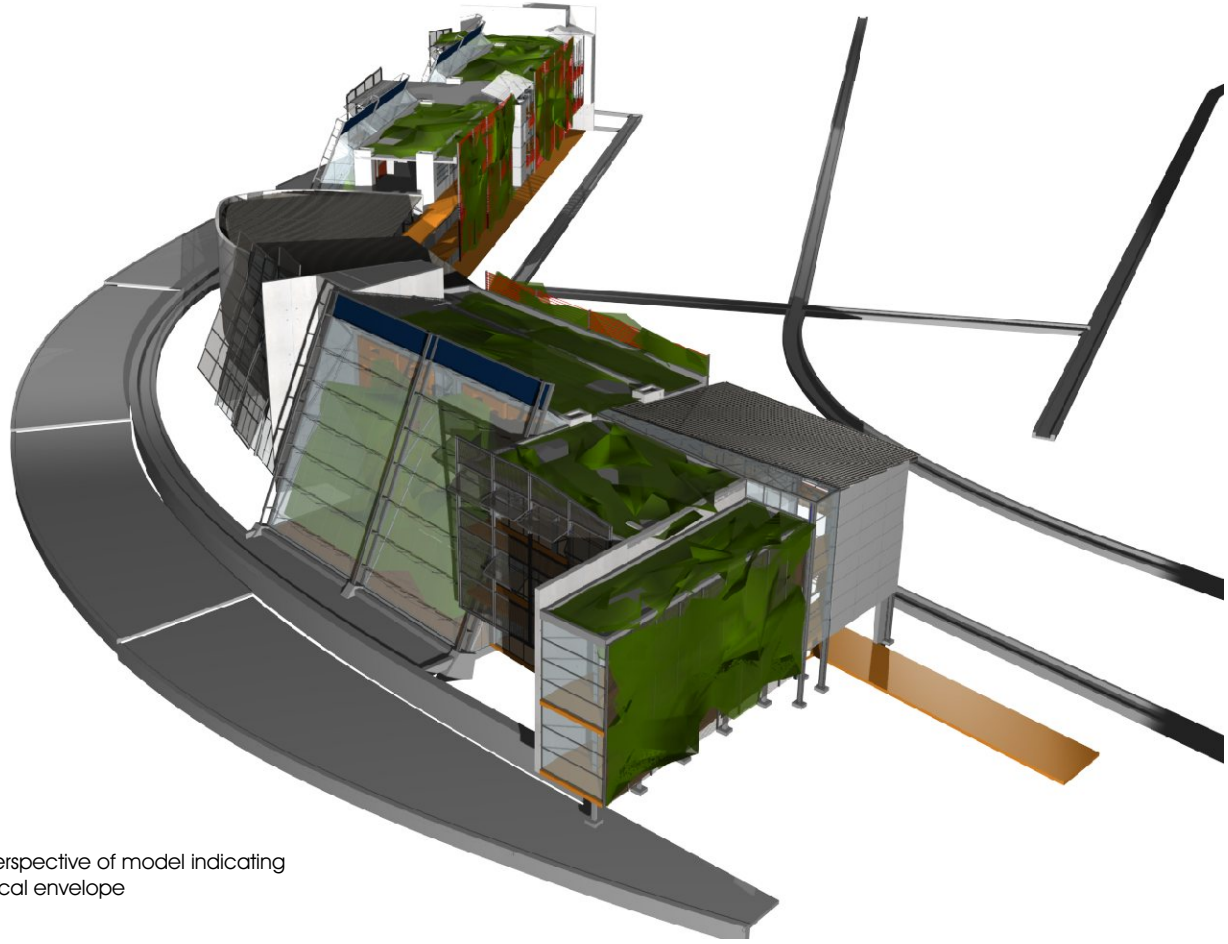
each containing sub-components and sub-functions. The first component is the series of terrariums on the northern side of the building. With each terrarium containing a different climatic zone, the environment therein will evolve differently to the others. As a result of this, the wall in each terrarium will respond according to each habitat. These walls that back the laboratories do not really function as walls, they only function to control temperatures between the two opposite spaces. In essence, the walls function as a response, but the 'wall' in the Mediterranean and garden route terrarium does not even exist. The walls are considered then rather as responsive membranes.

The second component is made up of the roof gardens. These work mutually with the third component, namely the plant screens that enclose the walkways on the southern side of the building. These carry the climbing vegetation down from the roof gardens. All these components are generative responses that have been addressed in greater detail in the technical investigation.

The biological envelope adopts a sub-functional role. It is



8.11 Perspective of model indicating biological envelope

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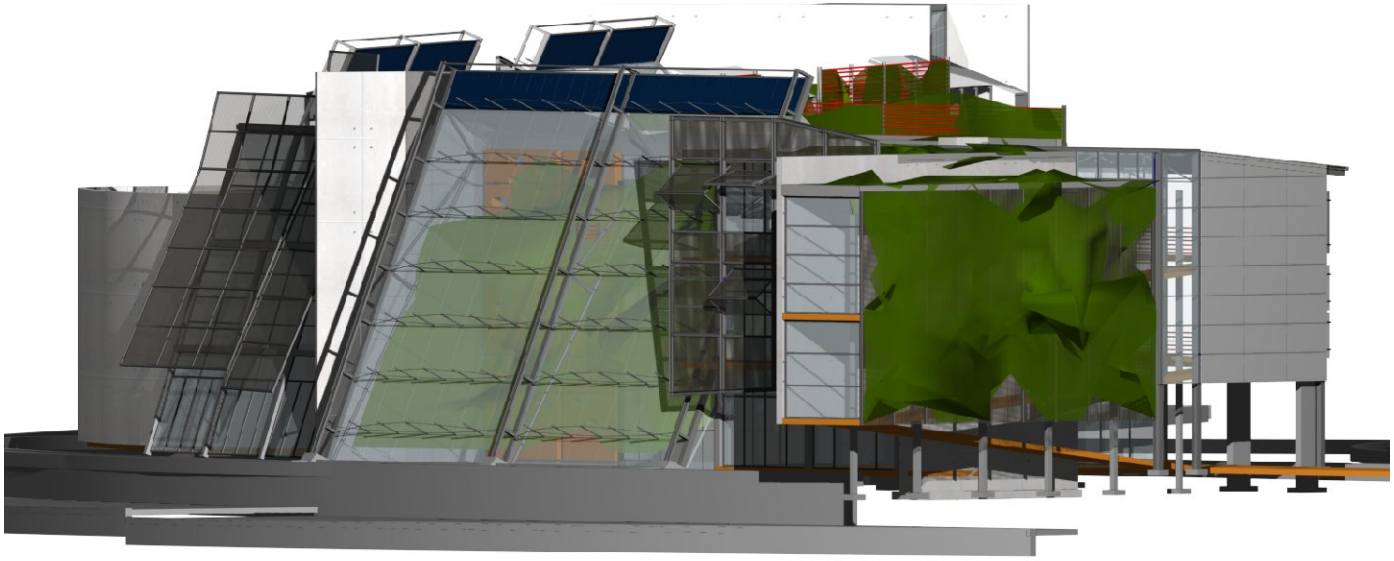
what Wines' refers to as message transmission. Before the design was conceived, it was already determined what the EBRC was to communicate. Beyond its functional role of plant research, the EBRC serves to create an awareness of the greenbelt along the river, an awareness of medicinal plants and the cultures that utilize these ethnobotanic systems.

The biological envelope transmits these messages through symbolic meaning. In terms of semiology, it is determined that the envelope is the signifier of the EBRC and the users and general public are the referent. The envelope does however convey a number of different semiological meanings depending on the three different levels, these being syntactic, semantic and pragmatic (Lang, 1988, p14). Syntactic meaning results from the buildings' location. The referent would probably not understand the generative reasoning behind the biological envelope but would draw parallels with the vegetation on and around the building and surrounding biophysical environment, identifying a superimposed connection and becoming aware of the greenbelt. Referents that participate in the EBRC as occupants or in the collection of medicinal plants will identify the spread of medicinal plants along the river into the Zoological gardens.

The semantic meaning relates to the 'norms' and representation that the envelope signifies. If the referent does not know the function of the EBRC, the semantic meaning would be that the building is attempting to be 'green' or 'sustainable'. As denoted in the technical report, the envelope does contribute to these aspects, but there is not an intention to communicate this message. If the function of the EBRC is known, the semantic meaning

8.12 Entrance and south-east coast &
sub-tropical terrarium



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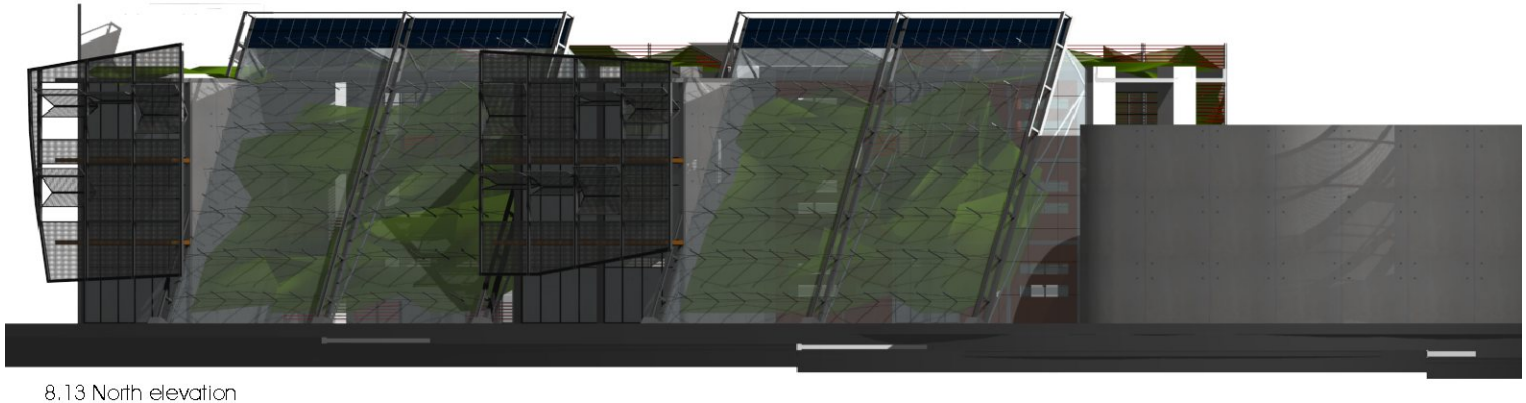
becomes increasingly significant. One would assume that the three terrariums represent different climatic zones and that the plants are grown for cultivation and research. This could be taken further, with the referent questioning the necessity of the cultivation and thus understanding the needs to preserve these plants and their habitats. By observing that the same plants occurring in the envelope occur in greater numbers along the river to the north as apposed to the south, further awareness of the biophysical environment is achieved. The function of the EBRC has to be known before the correct messaging will transpire.

The pragmatic meaning relates the symbol to those who use it. In this case, only the occupants of the EBRC would know for what research purposes the plants are being grown. However this group of referents will experience how the envelope controls the micro-climatic conditions.

The building forms an indirect relationship with the biophysical environment and a direct relationship with the river, in doing so the river becomes animated at this point.

The southern end of the site will be animated with the establishment of the 'Ceremonial Square' at the intersection of Struben Street and the Apies River. The retail and exhibition functions of the EBRC will spread northwards from the 'Ceremonial Square' and will be linked to the main research component through a series of pathways containing ethnobotanic related displays. At the EBRC, this pathway turns towards the sculpture department linking the arts campus to the square. With both gateways to the site being animated, pedestrian activity is drawn through the site without the need for any development between these two points. A series of visual axes linking the two gateways are generated through the landscaping, which guide pedestrian movement along the river. The landscaping extends past the EBRC over Dr Savage Street, indirectly connecting, through a series of visual points, the Zoological Gardens to the 'Ceremonial Square'.

The building lies adjacent to the Apies River, enclosing the pedestrian path. This interface creates an exciting movement passage that is strengthened by drawing the



8.13 North elevation

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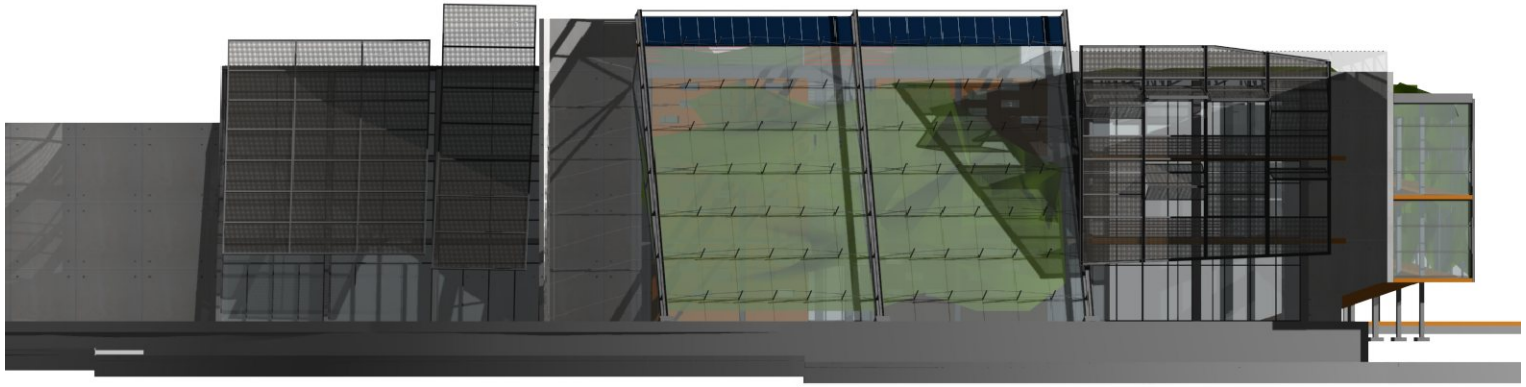
building away from the river in response to the pedestrian line of movement from the new transport terminus. Where the EBRC steps away from the river, an enclosed public space is defined by the road, river and building edge. The upper level of this space allows activity from the EBRC and function from the café to overflow outdoors, while the lower level provides a pause space to the 'nature room' and transport terminus. Now serving as a public space, the bridge at Hove's Drift takes on the function of a gateway. With this recessed, a focal point is allowed to form as an indicator of the EBRC for the fast moving vehicular traffic along Dr Savage Street. This focal point is created through the contrast between the active and inactive planes that first come into view along Dr Savage Street. One's eye is drawn along the façade to where the auditorium curves, directing attention along the river.

The functional areas of the building are organised around two lines of movement. The first being pedestrian movement through the site along the river, the second being the movement through the building. The components of the building are fitted between these two boundaries and respond to the line of movement through the building so that it is not interrupted. The constructed wetland on the northern side of the building curves around the disjointed plan form as a response to a more humanist line of movement.

The steep gradient of the site at the northern edge that used to follow the form of the river now follows the form of the building, creating a less intimidating environment along the river. The gradient is formed with a series of gabions that lead up to the EBRC. The gabions provide seating for the public space adjacent to the river as well as terraces for medicinal plant propagation where disruption will be limited.

Drawing the EBRC away from the river resulted in the building becoming fractured into two segments, forming a tension point where these two pieces converge. The auditorium is placed at this junction as its loose form articulates these two parts. The northern façade of the auditorium is an extension of the southern façade of the adjacent laboratories, forming a directing wall that originates in the entrance foyer. As the



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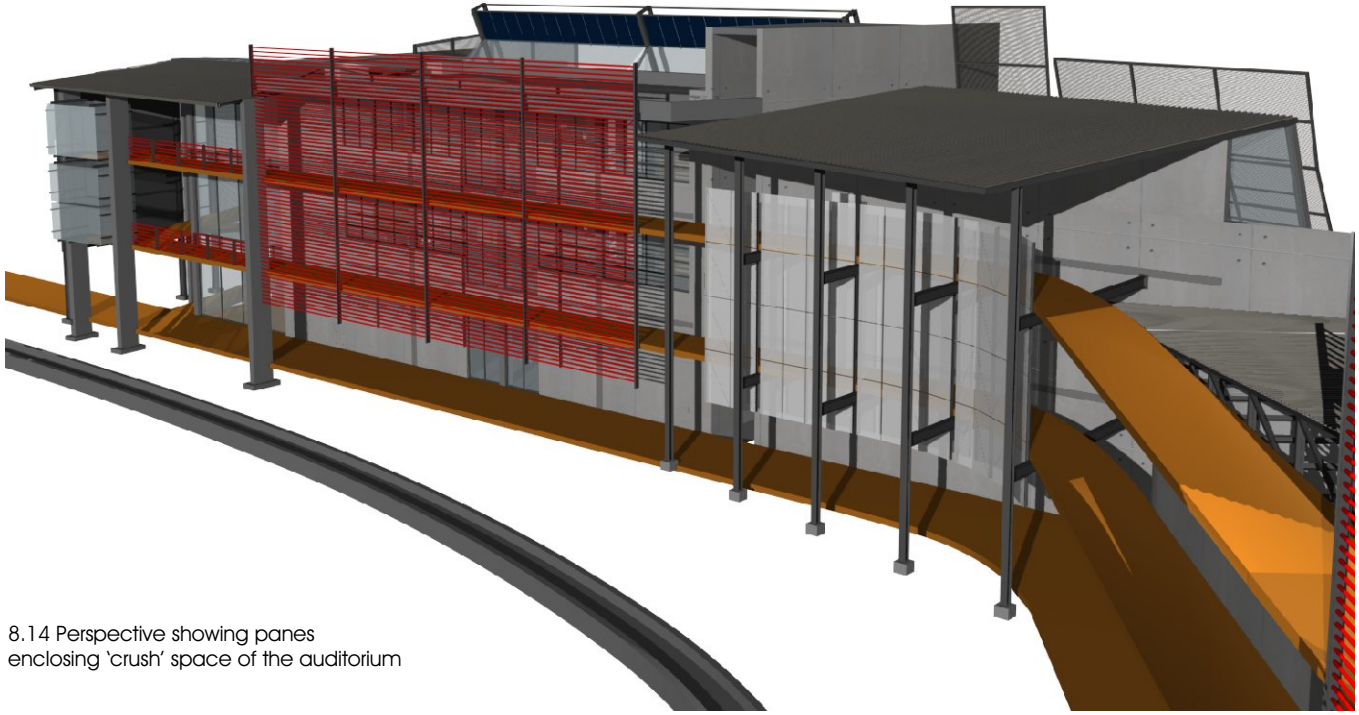
wall turns back on itself, it forms a positive space that encloses the auditorium, while the negative space forms a gathering place for the auditorium. This space is linked to the café. The columns supporting the roof and walkways above define this gathering space, but do not disconnect it from the outside. The panes above however do attempt to enclose this space. At this point the walkway of the first floor turns to follow the building but remains removed from it, emphasising the line of movement from the entrance to the end of the EBRC.

By placing the walkways outside of the main structure, users are directed outdoors as soon as they move around the building. This ensures a constant connection with the landscape, both physically through the vegetation growing adjacent and visually. Similarly, the ramps at the entrance are contained by vegetation growing on a steel mesh screen. The ramps are placed perpendicular to the elongated form of the building and follow a visual axis northward along the river. This ensures an immediate awareness of the greenbelt upon entry into the building. The steel mesh on the ramps is relatively strong, but is not a static element. Vegetation from the roof will penetrate it and disengage its components to pass through it, altering the aesthetic of the building over time.

With the walkways and screens pulled away from the main structure, the EBRC appears to elevate over the ground. This allows for activity from within functional spaces to overflow into the landscape from anywhere within the building. On



8.14 Perspective showing panes enclosing 'crush' space of the auditorium

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the northern side of the building, the same thing occurs except the outdoor spaces are defined by the series of cooling ponds, maintaining these spaces as semi-private spaces for the occupants.

While the design of the EBRC is based on a generative process, true generative design would need to be achieved through the use of computer technologies due to a vast number of factors that affect this process. Much of the building's dynamic form is related to the generative process. The terrariums are angled at 65° to allow for large amounts of solar transmittance into the terrariums. The reality of the situation might however lead to a different formation, as the exact location of the building; the slight east and west orientations of the terrariums and suchlike would affect the solar transmittance. What does become apparent is that the closer the generative process is followed, the more dynamic the architecture becomes.

The dynamic form evolves from the composition of a series of horizontal and vertical planes. These planes are pulled away from and pushed into the overall structure resulting in a succession of protrusions and voids. The envelope of vegetation continually moves over and behind these planes, puncturing and distorting them and disguising their ordered form. This overlay of planar elements creates a juxtaposition of order and disorder that should create a tension. This does not occur due to the organic aesthetic of the vegetation, but does however create an interest through its dynamic form.

Plants are perfectly ordered as individual components of nature. This is due to their genetic template, but as a result of

8.15 Perspective of ramps [without vegetation]

8.16 Perspective of ramps [with vegetation]

8.17 Perspective of entrance

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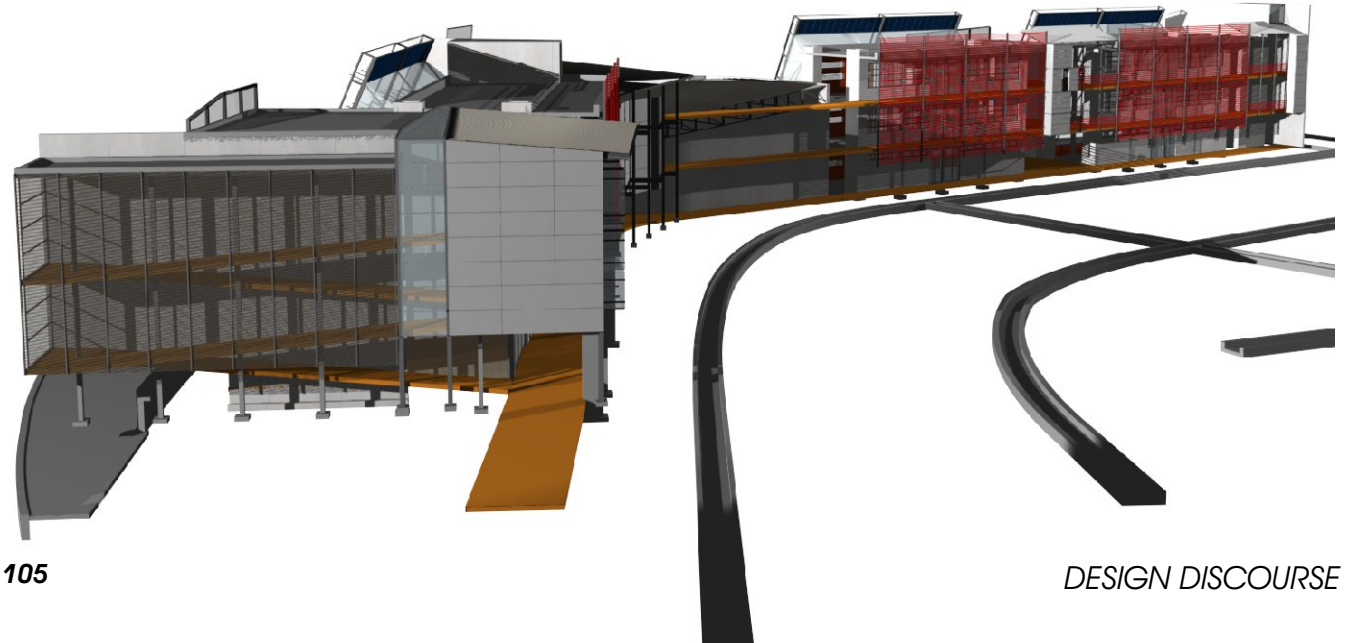
differences in gene expression patterns, characteristic plant growth will vary in different species. This reveals random growth patterns resulting in an overall lack of order. This is true in what Arnheim says: "…the components of a disorderly arrangement must be orderly within themselves, or the lack of controlled relations between them would disrupt nothing, frustrate nobody. You cannot sabotage a melody unless there is one…" (Arnheim, 1977, p170).

On the southern façade, this assimilation of an orderly and disorderly arrangement is illustrated with the plant screens. The repetitive form of the steel screens become disordered as the plants from the roof gardens form an unsystematic layer over the steel screens. This façade is in constant motion as the vegetation proliferates over the screens, becoming overgrown, being seasonally cutback and periodically trimmed for research purposes. This results in a continual shifting of quality of light and climatic conditions within the building and an interaction by the user through appropriation. These screens generate a sense of enclosure, encompassing the walkways as part of the main structure, but are actually pulled away from the building. These screens are paralleled by the terrariums, but separated by the laboratories. The permeability of both the screens and terrariums allow for a strong visual connection between the internal and external environments. The research process is partially revealed to passers-by with the overlaid imagery of the origin of the plant and experimentation, while from the interior, strong associations are created with the external environment. This permeability of the building allows for an interplay between the internal and external environments. The plants within the greenhouses form an external environment enclosed into the internal environment of the EBRC, while all movement within the EBRC takes place in the external environment. When viewing the building perpendicular to its elongated axis, these environments become very blurred each with the

8.18 Perspective of west facade



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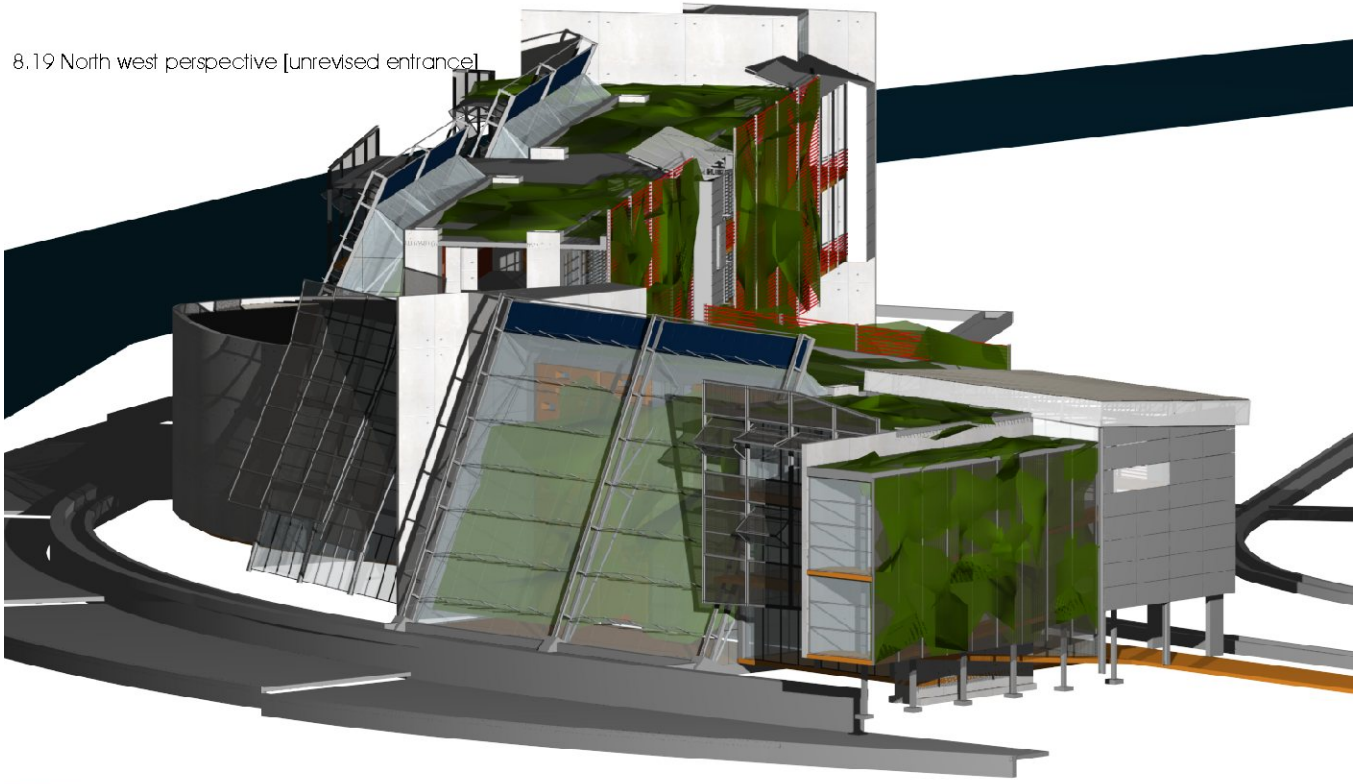
other, and even more so with the backdrop of the CBD to the south and west and the ridges and river to the north and east respectively.

This juxtaposition of layers is repeated on the northern façade in the terrariums with the flat plane of the glass being animated by the continual transformation of the environments behind. The screens over the adjacent offices and library extend past the structure to block morning and afternoon sun, giving the appearance that the terrariums pass entirely behind the screens. Where shadow paths are constant, the screens are chopped and bent. With every bend however, new shadow paths are created so the screens are continually folded and cut. This results in a permanent disordering of elements with no consistency in their form and a more dynamic northern façade that relates to the pedestrian axis. However the rhythm established by the voids and protrusions is maintained.

The building is constructed from simple materials and components. The points at which these components fuse with the landscape, is where the building becomes most exciting. There is a fascination with connectivity of two components that, although are closely associated, are rarely fused. This also generates an interest in the lifespan of the building by observing how the appearance of the building will evolve over time.



8.19 North west perspective [unrevised entrance]

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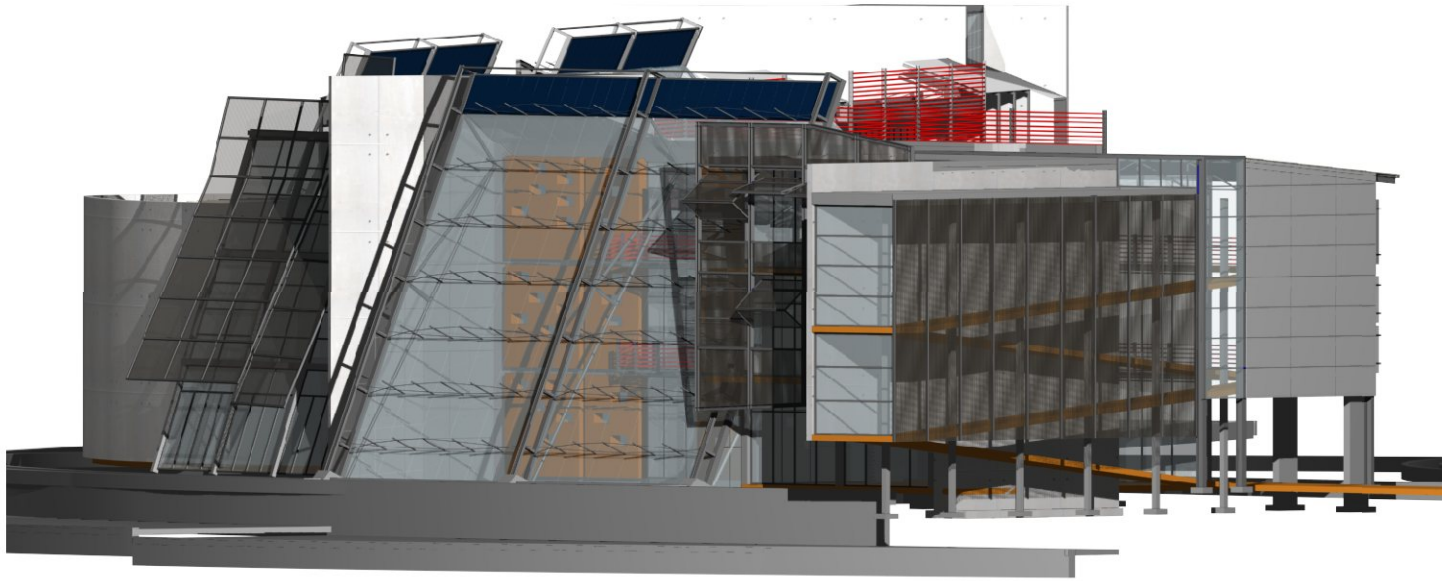
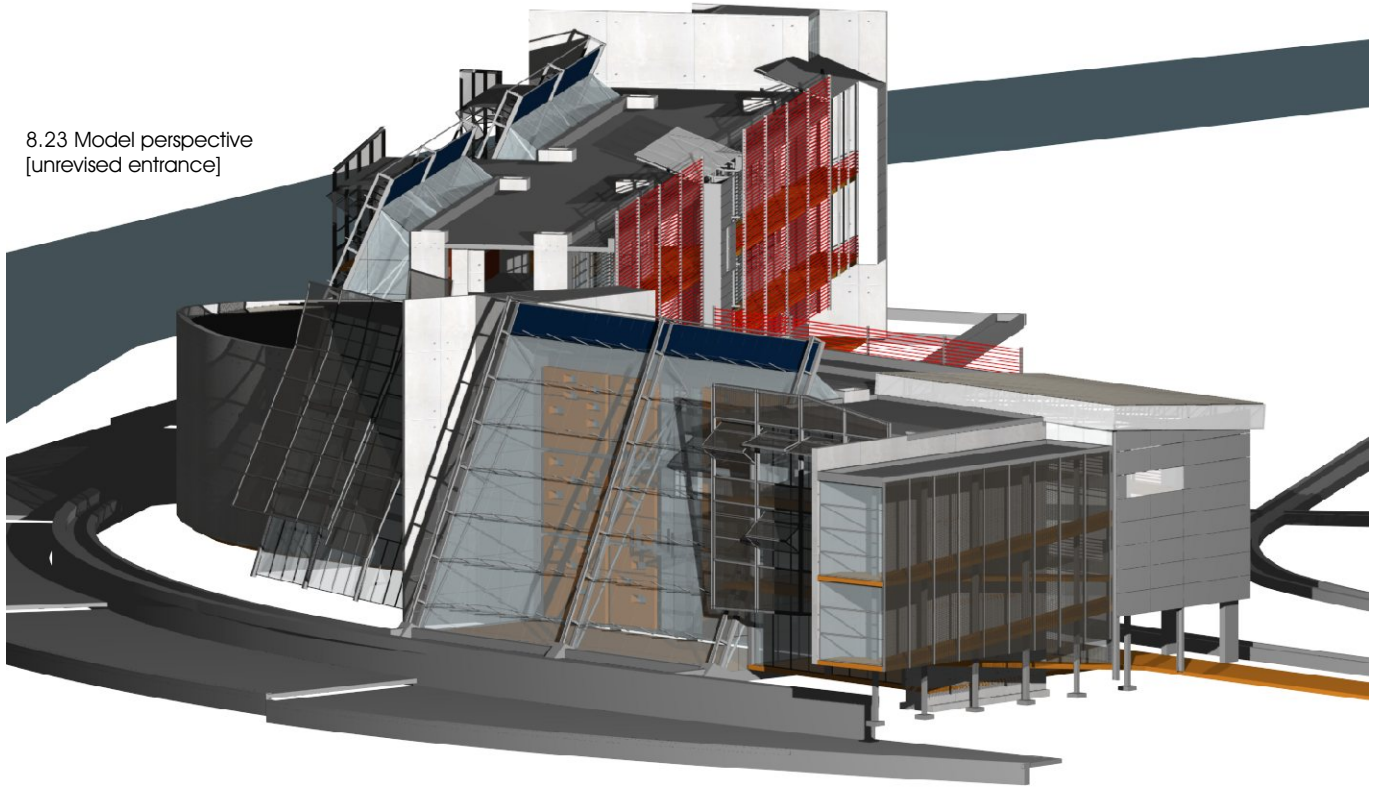


8.20 North west perspective

8.21 Perspective of entrance

University of Pretoria etd - Butcher, A (2003)

8.22 West elevation



8.23 Model perspective
[unrevised entrance]

University of Pretoria etd - Butcher, A (2003)

8.24 South elevation [in context]

University of Pretoria etd - Butcher, A (2003)