

## **A SYNCRETIZATION OF ARCHITECTURE, ENGINEERING AND SCIENCE**

The use of CAD technology as a pedagogical tool in the teaching of environmentally sustainable design

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### **1. SYNCRETIC APPROACH TO ARCHITECTURE, ENGINEERING AND SCIENCE IN THE DESIGN PROCESS**

Energy consumption in buildings is responsible for about 40% of Australia's greenhouse gas emissions. It is quite feasible that the energy consumption in buildings can be halved, but energy performance analysis must be integral to the entire design process. This imperative has led the authors to propose that architecture, engineering and science should be syncretized in the design process. This syncretization shares some features of the rhizomatic approach introduced by Deleuze and Guattari (2007). In rhizomatic systems all points can be, and should be connected. A rhizome can be considered as a space that develops, not from a point but from milieu. In the expansion of a rhizome, elements of the system do not follow tracings of other elements but they form a map of new vistas. Likewise, a syncretic approach is oblivious to the traditional boundaries between architecture, engineering and science. Syncretization has the potential to enrich the intellectual lives of architects, scientists and engineers, and it would have profoundly beneficial performative benefits.

Syncretization should occur from the initial stages of architectural design in which criteria such as space requirements and thermal, acoustic and lighting performance criteria are specified. The building geometry is less defined at this early stage and the subsuming of engineering and architecture into a broader rhizomatic entity enables a wide variety of architectural forms to be explored. As the geometry becomes more detailed, designers continue to be

informed by performance analyses, and these provide some discipline to the design.

## **2. SYNCRETIC APPROACH TO ARCHITECTURE, ENGINEERING AND SCIENCE IN EDUCATION**

A successful and enduring syncretic approach to architecture and engineering depends heavily on educating the next generations of practitioners. Some of the principles of this approach have been implemented by Sam Kashuk, an architect from LAB architecture studio and Graham Thorpe, an engineering scientist, from Victoria University. They are developing constructivist approaches to teaching 'Environmentally Sustainable Design 2' which is offered to 3rd year architectural engineering students at Victoria University. By intertwining their different backgrounds and skills they have embarked on developing new perspectives on designing buildings. The students, who tend to have an engineering disposition, begin by developing almost completely unconstrained free-form designs of a simple building based on a specific program.

For this activity the students use several software packages to develop architectural spaces. Simultaneously they formulate mathematical algorithms that capture the deep engineering knowledge required to design energy-efficient buildings. They start with very unconstrained free-forms which gradually evolve based on feedback provided by engineering knowledge. Through this evolutionary process spaces are developed until the buildings satisfy the specific predefined needs such as thermal, acoustic and lighting performance. Using scripting and programming skills students develop a specific platform based on their own project to analyze building performance and iteratively redesign their buildings. In this process they extract the information such as areas, wall thicknesses, materials and building location. This information is rigorously analyzed and regions of their buildings are colour coded to highlight areas which may lead to energy inefficiencies. Defining their own computing platforms improves student-learning in several ways. Firstly, students understand the fundamentals of engineering science by immersing them in the fine detail of problem solving. Secondly, they are involved naturally in the complete design process using a syncretic approach. Thirdly, they develop skills that will enable them to be creative and productive in the workplace.

## **REFERENCES**

Deleuze, G. and Guattari, F., 2007, *A Thousand Plateaus*, University of Minnesota Press, Minneapolis, pp 3-25.