

**Abstract :** In this interview with professor Shashank Satish from Wadiyar Centre for Architecture (WCFA) Mysore, we discuss teaching biomimicry in design through a structured, inquiry-driven methodology. He explains the approach taken by students and various resources that help during the process. Students focus on sustainability and functionality with the priority given to these two aspects. He also discusses how it bridges the gap of theoretical and practical knowledge, thus giving students a researched understanding of biomimicry to suit innovative design solutions that counteract ecological principles and contemporary architectural challenges.

This interview with Professor Shashank Satish from Wadiyar Centre For Architecture (WCFA), Mysore highlights his innovative pedagogy in the elective course of bio-inspired design. He elaborates on a structured approach that guides students through the exploration of bio-inspired concepts, emphasizing practical applications and sustainability. The course uses resources like Janine Benyus' works and asknature.org to guide students in exploring natural mechanisms for sustainable design solutions.

Focusing on hands-on learning, students create dynamic prototypes, integrating nature-inspired mechanisms into architectural projects and products. Examples include facades inspired by the Venus flower basket, adaptable designs based on snake skeletons, and air-filtration systems modeled after the Titan Arum. The course fosters experiential learning, aligns with sustainability goals, and inspires both students and faculty to explore the potential of biomimicry in architecture.

**Q1: Reflecting on the structured exercises employed in your elective, could you provide a detailed explanation of your teaching approach and its intended outcomes?**

*The students are given a structured lens through which they explore literature and then use specific keywords to find examples of bio-inspired design from around the world. These examples could be recent or older ideas, but the focus is on viewing them through these lenses. This happens in the first month of the semester. Since this elective is primarily for students in their 7th semester, I provide an option for them to incorporate their own designs into the coursework.*

*At the end of the semester, they are required to design something. This criterion is clearly communicated before they select this elective over others, such as architectural journalism. I emphasize that this elective will have a design component and won't be purely theoretical. Once this expectation*

*component and won't be purely theoretical. Once this expectation is set, during the first week and month, I ask them to identify different questions they're curious about. Until that point, I hold off on introducing them to Janine Benyus' work.*

**Q2: After students identify their questions, how do you guide them in refining and exploring these ideas further within the framework of the elective?**

*Once they come forward with at least three questions, I sit with them to discuss and break down these questions. After this, I introduce them to Janine Benyus' work. They use resources like asknature.org to explore how their questions are addressed in the natural world and develop ideas for their designs. Since this elective is in their 7th semester, they also have the option to align this work with their architectural design projects, which*

often emphasize sustainability.

A significant portion of students—approximately 50–70% each semester—integrate their work in this elective with their architectural design projects. The AD (Architectural Design) faculty have responded positively, noting that the biomimicry details students create align well with sustainability criteria. For students who struggle to identify a passion project, I suggest working with the building's skin as a design problem. They explore mechanisms and processes from nature, using resources like [asknature.org](http://asknature.org) to emulate designs that meet their specific project requirements.

**Q3: Could you elaborate on the progression of the semester and the phases that structure the learning process for students?**

The last three months lead to the final prototype design. By the semester's end, students present dynamic prototypes inspired by natural processes. These prototypes need to demonstrate dynamism and explain the underlying process inspired by nature. Typically, these designs do not mimic nature visually but instead adapt natural mechanisms to specific design challenges, such as facade design, skylights, or biophilic products.

Some students even design products unrelated to their architectural projects, like pavilions or other prototypes. The methodology emphasizes exploring mechanisms rather than visual biomorphism. For example, some students design facades inspired by dynamic natural processes, while others create product designs that function independently of architectural applications.

**Q4: Could you share a few notable student projects or outcomes, highlighting how students applied biomimicry principles to their designs?**

Certainly. Here are a few examples:

**Facade Design Inspired by a Venus Flower Basket:** One student designed a prototype inspired by this underwater organism, which expands, contracts, and purifies water. The facade design aligns with their AD project, and the student also created a video or GIF as part of their final submission.

**Dynamic Facade Using Silver Ant and Mimosa Pudica Mechanisms:** Another student fused mechanisms from the silver ant and *Mimosa Pudica* plant to create a facade that dynamically manages radiation and building cooling.

**Air Filtering Inspired by Titan Arum:** A student explored the air-capturing and filtering capabilities of Titan Arum to create a detailed model for sustainable building design, incorporating layers for glazing and air filtration.

**Origami Facade Design:** Inspired by the interlocking mechanisms of a powerful fish, one student developed a facade with dynamic, expandable, and contractible features.

**Pavilion Design Inspired by a Snake's Spine:** Using the skeletal system of a snake, a student designed a pavilion that adapts and deploys into various forms.

**Q5: Could you tell us about the specific tools, resources, or methodologies that you incorporate into this elective to enhance the students' learning experience and support their design explorations?**

The primary resource I recommend is Janine Benyus' website, [asknature.org](http://asknature.org). While I don't focus heavily on theoretical tools like climate analysis (as students learn these in their AD studio), I complement their existing knowledge. Additionally, we invite experts like Prashant Dhawan, co-founder of Biomimicry India, for guest lectures. He shares insights into biomimicry practices in India, providing valuable exposure.

Each year, I update the resources with relevant readings, such as "Biomimicry in Architecture," and introduce students to works from institutions like MIT Media Lab, Michael Pollan's and Janine Benyus' works remain consistent foundational resources.

**Q6: How does this elective impact students' conceptual understanding and practical approaches to their design processes, particularly in terms of integrating biomimicry principles into their designs?**

The elective aims to instill a hands-on, experiential approach to learning. Students not only conceptualize ideas but also work on physical prototypes, diving into the physics, dynamics, and materiality of their designs. This process encourages

*them to integrate biomimicry principles into their sustainability strategies in AD studio projects. While it's too early to measure real-world applications, the elective sows seeds for a deeper appreciation of nature's mechanisms.*

*In the first class, I challenge students to reflect on questions like, "What do you take for granted?" and "What does nature do best?" This shifts their perspective, encouraging them to observe everyday natural phenomena closely. For instance, an early assignment involves visiting the Mysore zoo to study a species, its behaviors, and environment, fostering a deeper understanding of biomimicry concepts.*

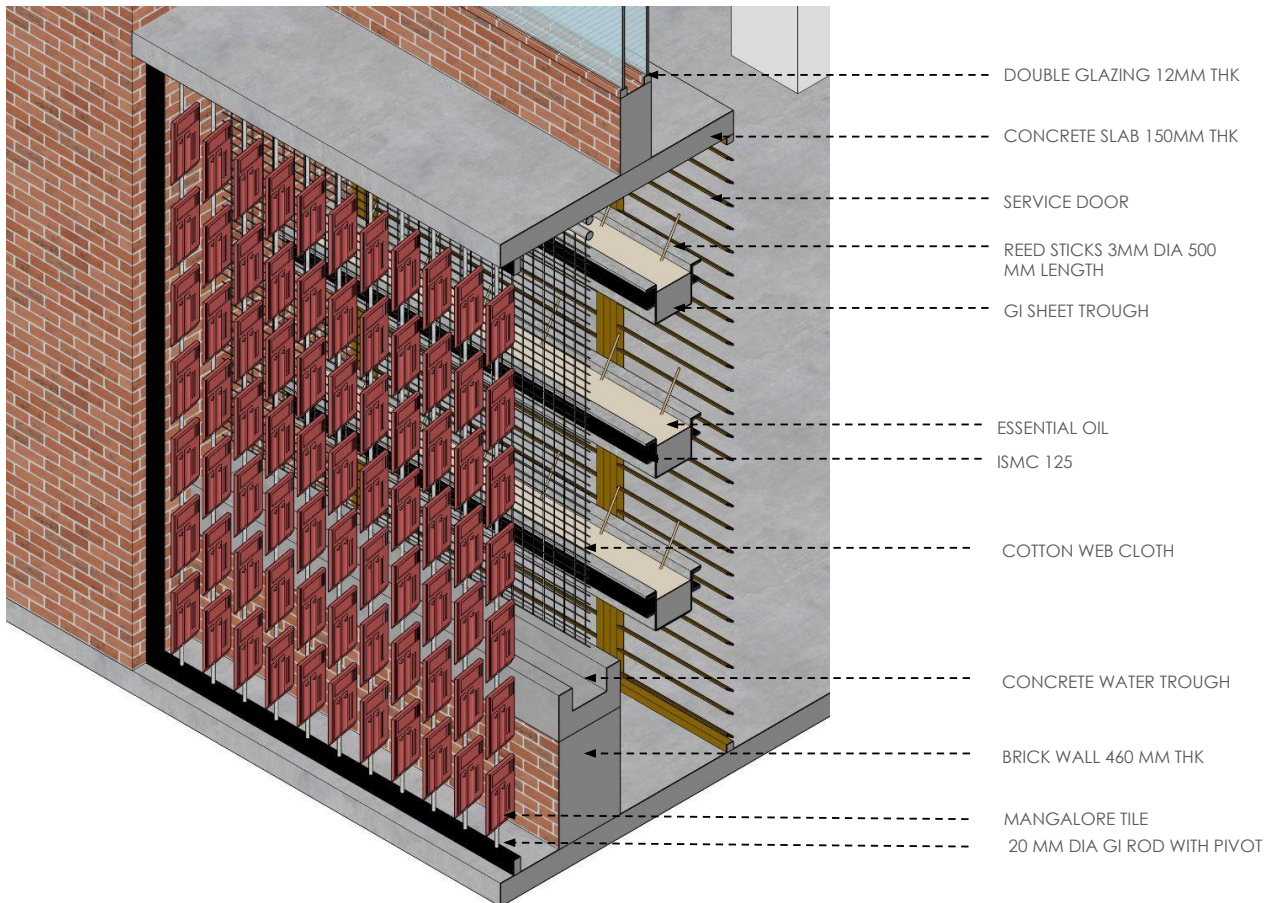
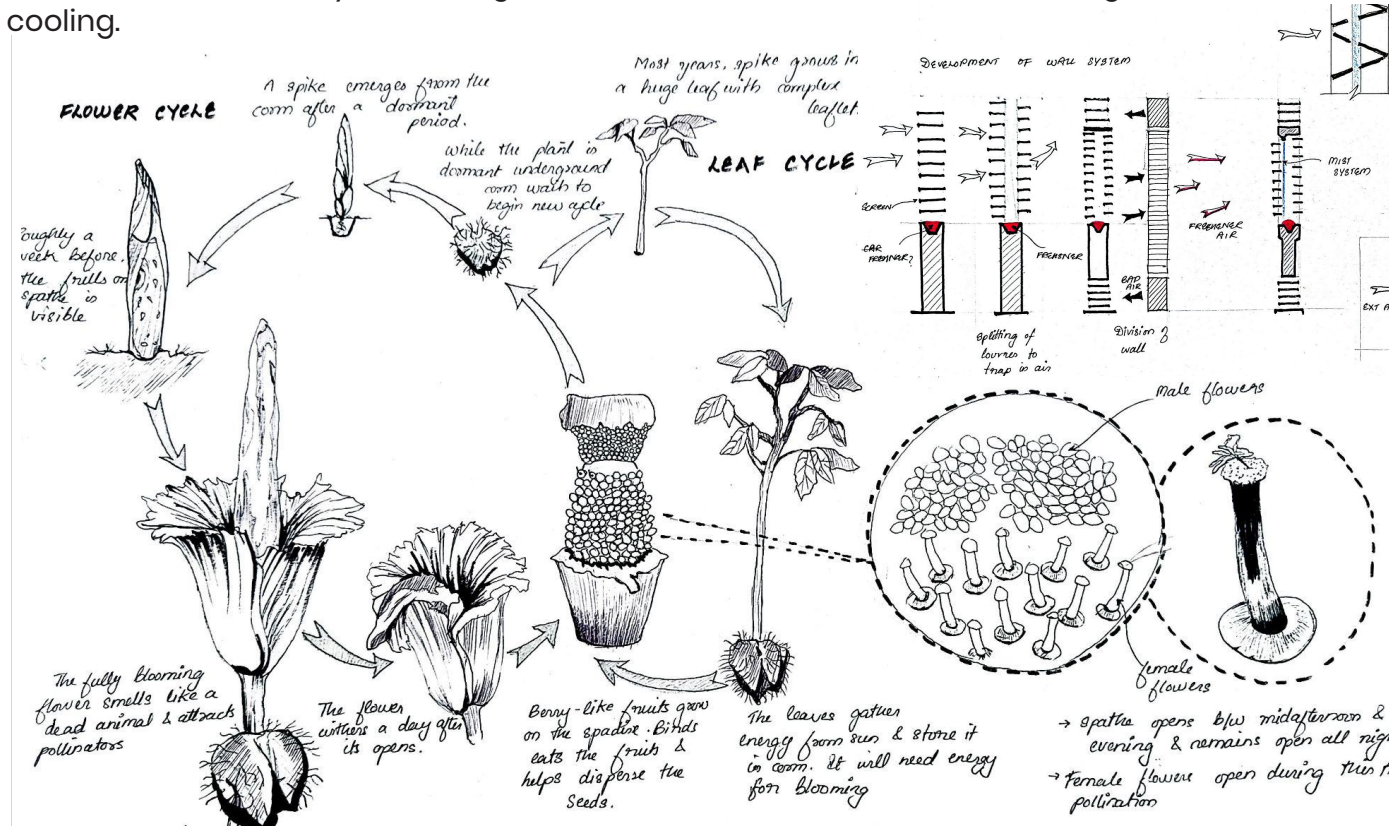
**Q7: How do students respond to the integration of biomimicry principles into their work, and how do they perceive the connection between these ideas and their broader academic endeavors?**

*Absolutely. Many students and faculty in the AD studio are enthusiastic about how this elective complements their sustainability projects. It's rewarding to see students excited about translating these concepts into tangible designs, and it's a testament to the elective's success in bridging theoretical knowledge and practical application.*

# 1. Titan Arum

Student Name: HariPrasad

Titan Arum examines the plant's bloom cycle, odor release, and structure, applying its principles to a breathable facade system using reed sticks, essential oils, and water troughs for ventilation and cooling.

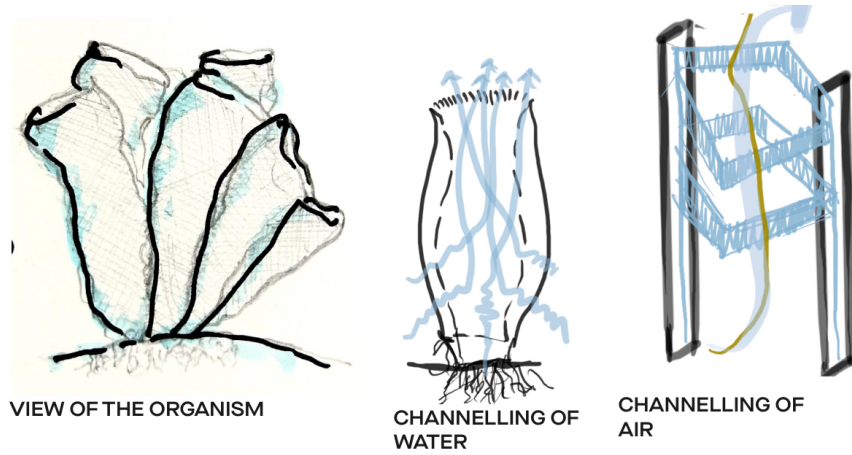


WEST FACADE - PROTOTYPE DETAIL

## 2. Venus Flower Basket

Student Name: Ruchi

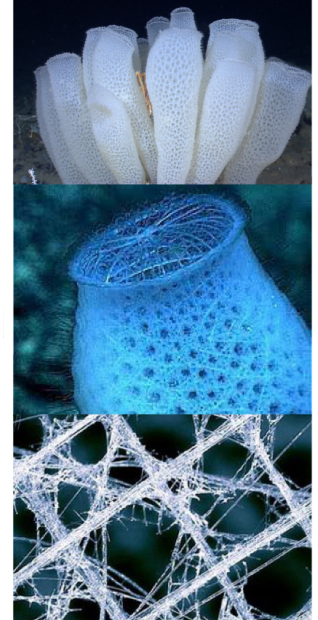
Venus Flower Basket studies the deep-sea sponge's air and water channeling properties, translating them into a dynamic facade system with movable lattices and membranes for controlled light and airflow.



VIEW OF THE ORGANISM

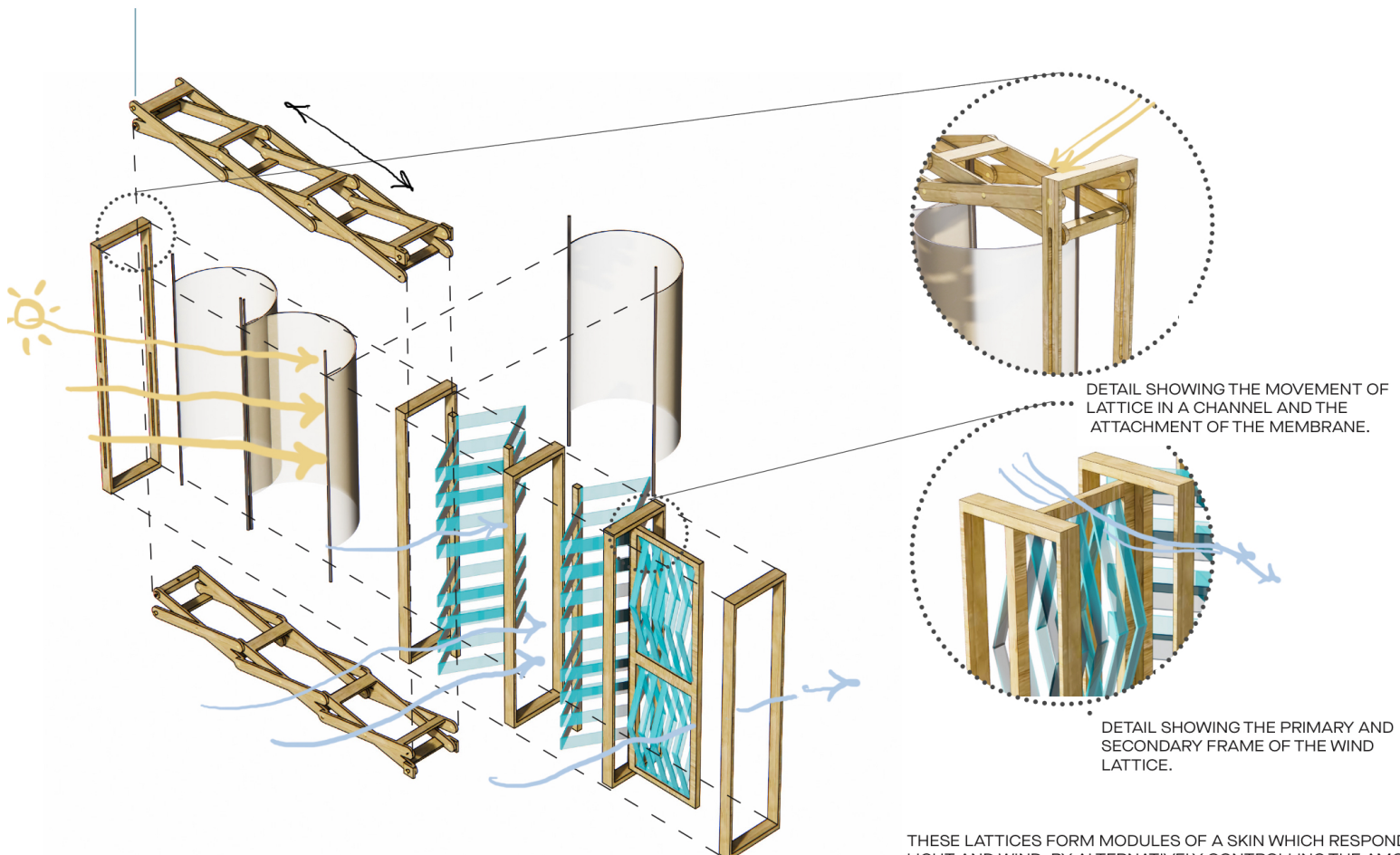
CHANNELLING OF WATER

CHANNELLING OF AIR



CONCEPTUAL SECTION THROUGH THE MEMBRANE.

LATTICE MOVING IN A FRAME ATTACHED WITHA TRANSLUCENT MEMBRANE TO ALLOW LIGHT. AS IT MOVES / EXPANDS, IT ALLOWS MORE LIGHT AND AS IT CLOSES IT OPENS UP THE VENTILATION UNITS WHICH SUCK IN AIR DUE TO THE VOID CREATED. THERE ARE ALSO FIXED UNITS FOR CONSTANT AIR FLOW.



DETAIL SHOWING THE MOVEMENT OF LATTICE IN A CHANNEL AND THE ATTACHMENT OF THE MEMBRANE.

DETAIL SHOWING THE PRIMARY AND SECONDARY FRAME OF THE WIND LATTICE.

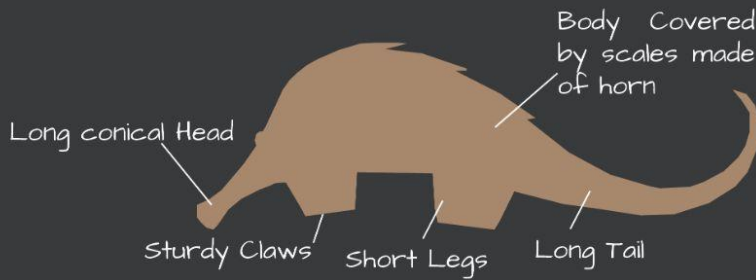
EXPLODED ISOMETRIC VIEW OF THE MODULE

THESE LATTICES FORM MODULES OF A SKIN WHICH RESPONDS LIGHT AND WIND, BY ALTERNATIVELY CONTROLLING THE AMOUNT ENTERING IN.

### 3. Pangolin

Student Name: Ujwal K

This design mimics the pangolin's protective scales, using a gear and lever mechanism to regulate openings for light and ventilation. Inspired by its adaptive behavior, the model adjusts sunlight patterns throughout the day, enhancing sustainability and efficiency in architecture.



Scales

Scales are made of Keratine, used for defence.



Defence

Rolls into ball.



Behavior

Solitary, Nocturn



Diet

Ants And Termites

Closing And Opening

Sunlight Patterns throughout the day with same setting for all Module



Morning



Afternoon



Evening

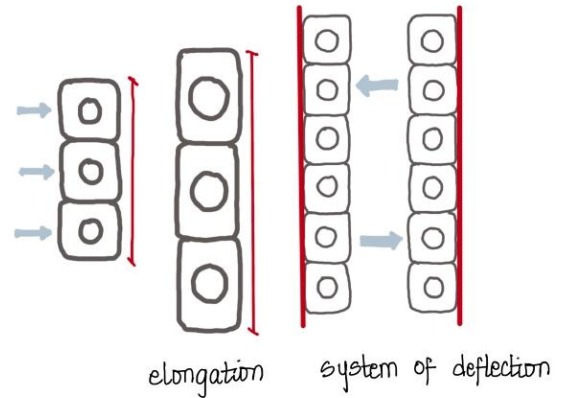
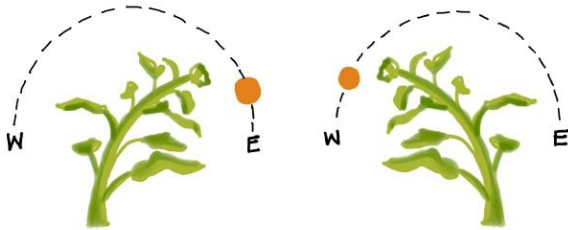
Using Gear Lever Mechanism

Working Model

# 4. Sunflower

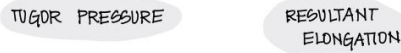
Student Name: Seeka J

Inspired by the sunflower's heliotropism, this modular kinetic facade adjusts sunlight and ventilation using folding aluminum panels. The panels dynamically open and close, enhancing passive cooling and energy efficiency.

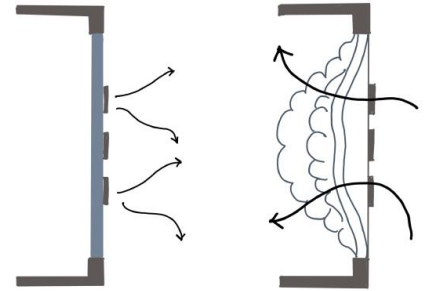
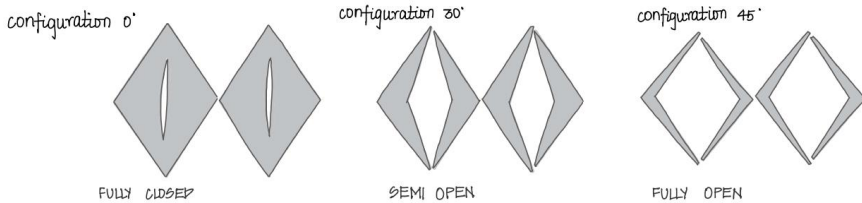


Movement of water reduces turgor pressure

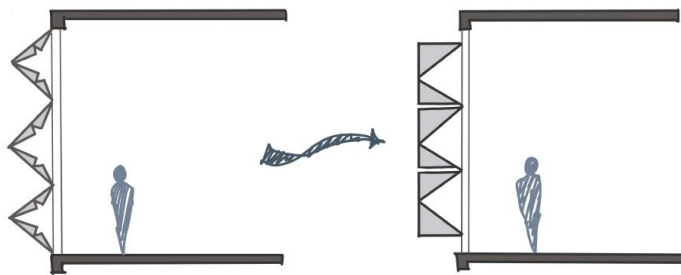
The bending of the stem towards the sun is because of



Applying external pressure to adapt a surface modularity



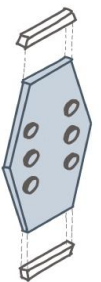
control sunlight and enable natural ventilation



**SCHEMATIC DIAGRAM SHOWING FACADE IN MOTION**

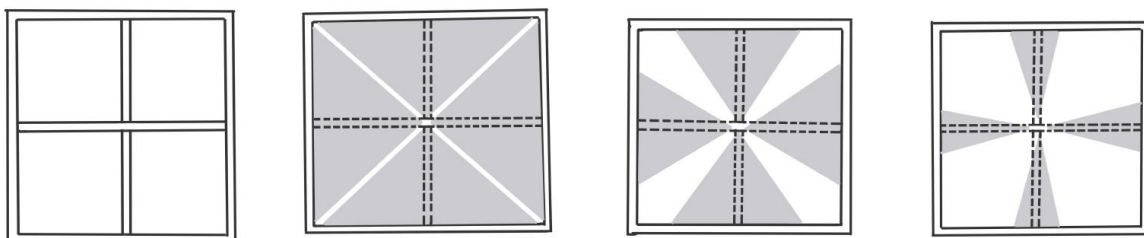
The proposed kinetic facade is a modular system made of pre-fabricated modules with aluminium sheet for base frame.

The mountain fold of the plates cuts direct sunlight



**SINGLE MODULE OF THE FACADE**

## WORKING MECHANISM OF SINGULAR UNIT :



FRAMEWORK

FULLY CLOSED

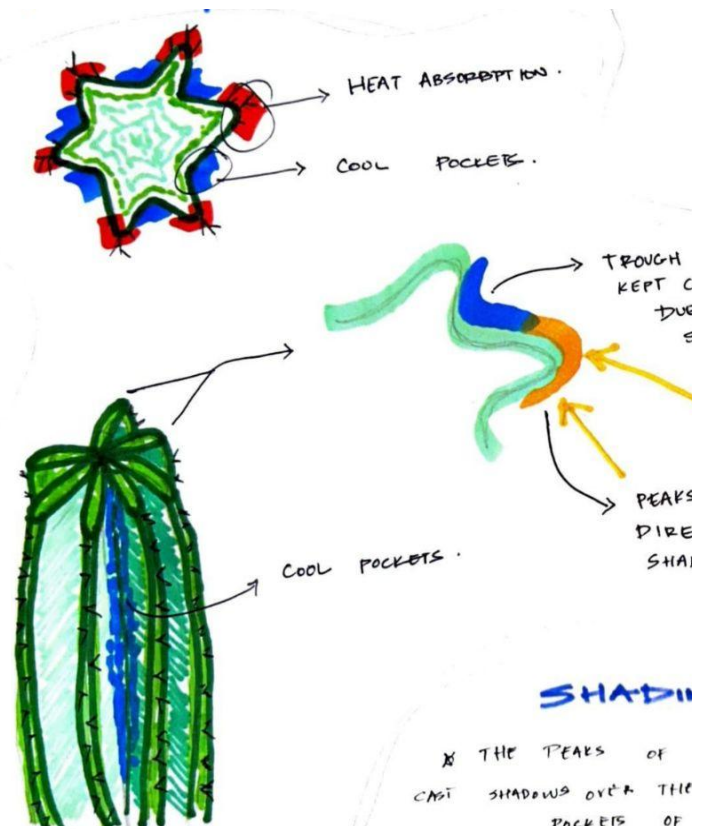
SEMI CLOSED

FULLY OPEN

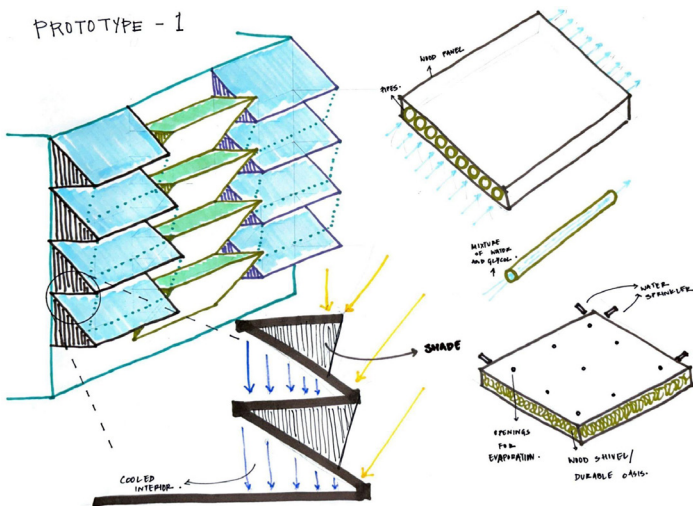
# 5. Cactus

Student Name: Raheesh M

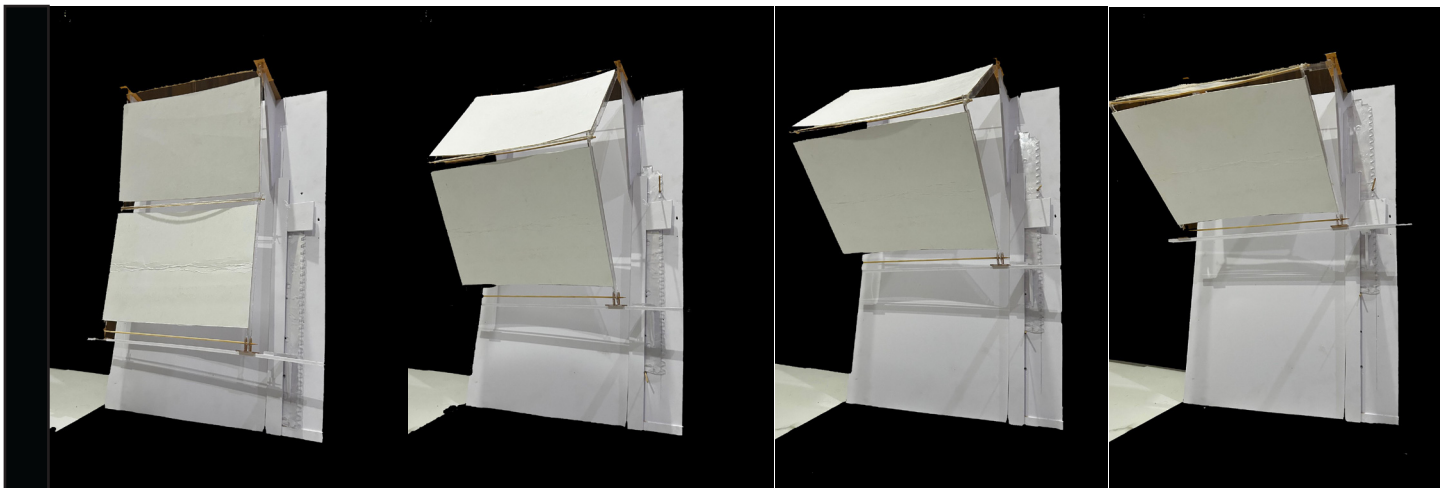
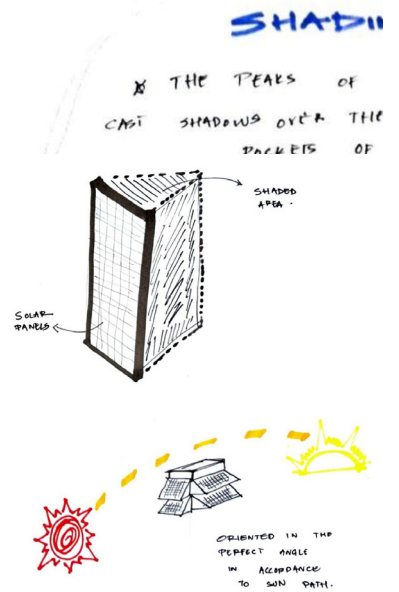
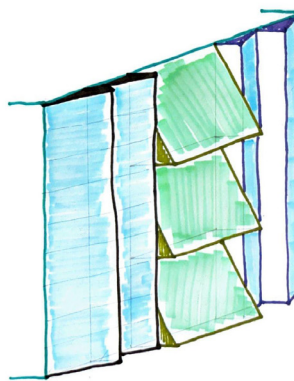
This design takes inspiration from the ribbed structure of cacti, where peaks provide shade to troughs, reducing heat absorption and keeping the plant cooler. The architectural model mimics this by incorporating angled panels or layered facades that create self-



PROTOTYPE - 1



PROTOTYPE - 2







### **Shashank Satish**

Shashank works at the intersection of Art-Science, Phenomenology, and Curation. He founded Holy Cow! Studio in Bangalore, where he engages in diverse graphic design projects, art grants, and creative collaborations. His work has been showcased at notable events such as the India Foundation for the Arts' Project 560 (2015), Serendipity Arts Festival (2016), and Walk-in Studios (2019). Shashank has also curated Indian and international artists and architects in exhibitions including Designuru (2016), Festival of Stories (2016), Rangoli Metro Art Centre (2017), and Chennai Photo Biennale (2019).

As the Principal Investigator of the Experiential Cognition Lab, established in 2017, Shashank explores the human experience between art and cognitive science. In 2019, he collaborated with scientists from the National Centre for Biological Sciences, Bengaluru, producing installations for the 'Lab Cultures' Art-Science exhibition. His podcast, 'Anubhava,' features conversations on Experience and Consciousness with leading thinkers and practitioners. With a background in architecture and a master's in Experimental Media Arts, his transdisciplinary research influences his teaching and artistic practice. He currently serves as a faculty member at the Wadiyar Centre for Architecture in Mysuru