

MIMETIC SPINE

A Wearable Mechanical Installation

Water Cooling / Temperature Sensing / Cable-Driven Motion



Exploring the relationship between body temperature and mechanical expression through a wearable cooling circuit and articulated tail.



EXPERIMENTAL WEARABLE / HUMAN-COMPUTER INTERACTION

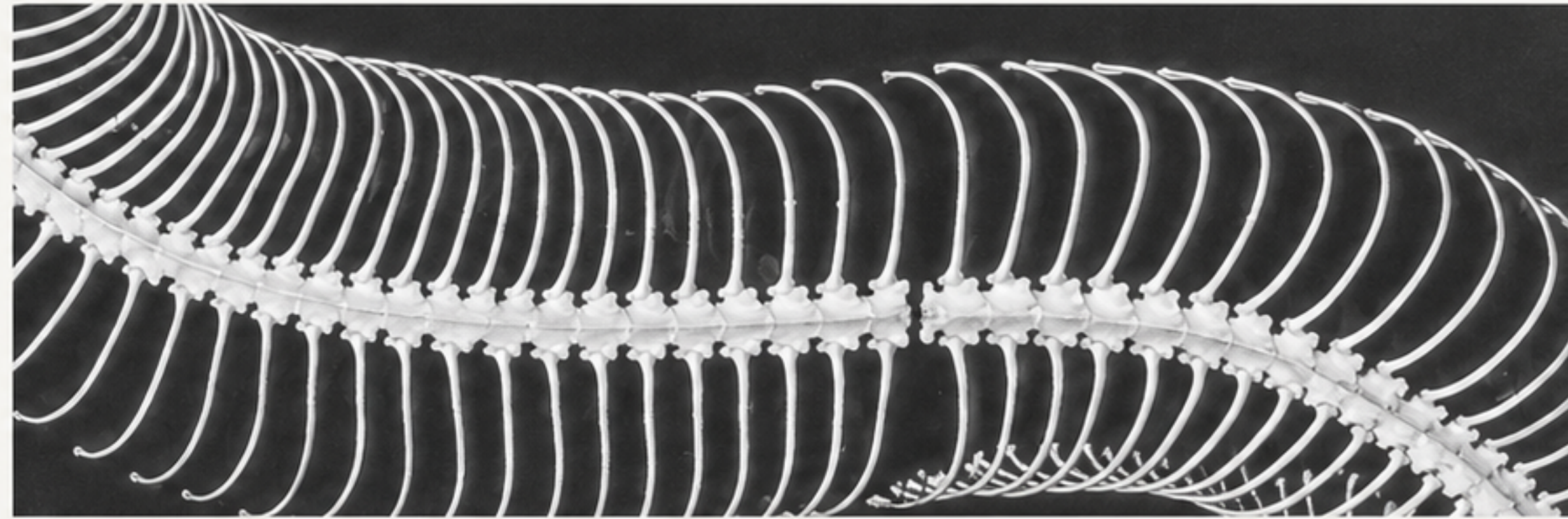
02 / CONCEPT DEVELOPMENT

BODY, INSTINCT
& DESIRE

Translating symbolic narratives into a physical interaction.

Drawing on the Eden narrative and Lacanian ideas of desire, the project places the human body, the snake and the forbidden fruit in a shared interaction.

Body heat becomes an input; cooling and mechanical movement become a physical response. The installation explores the tension between instinct, symbolic meaning and the urge to cross boundaries.



SNAKE
Articulated form
and instinctive
response.



APPLE
Temptation and
symbolic boundaries.



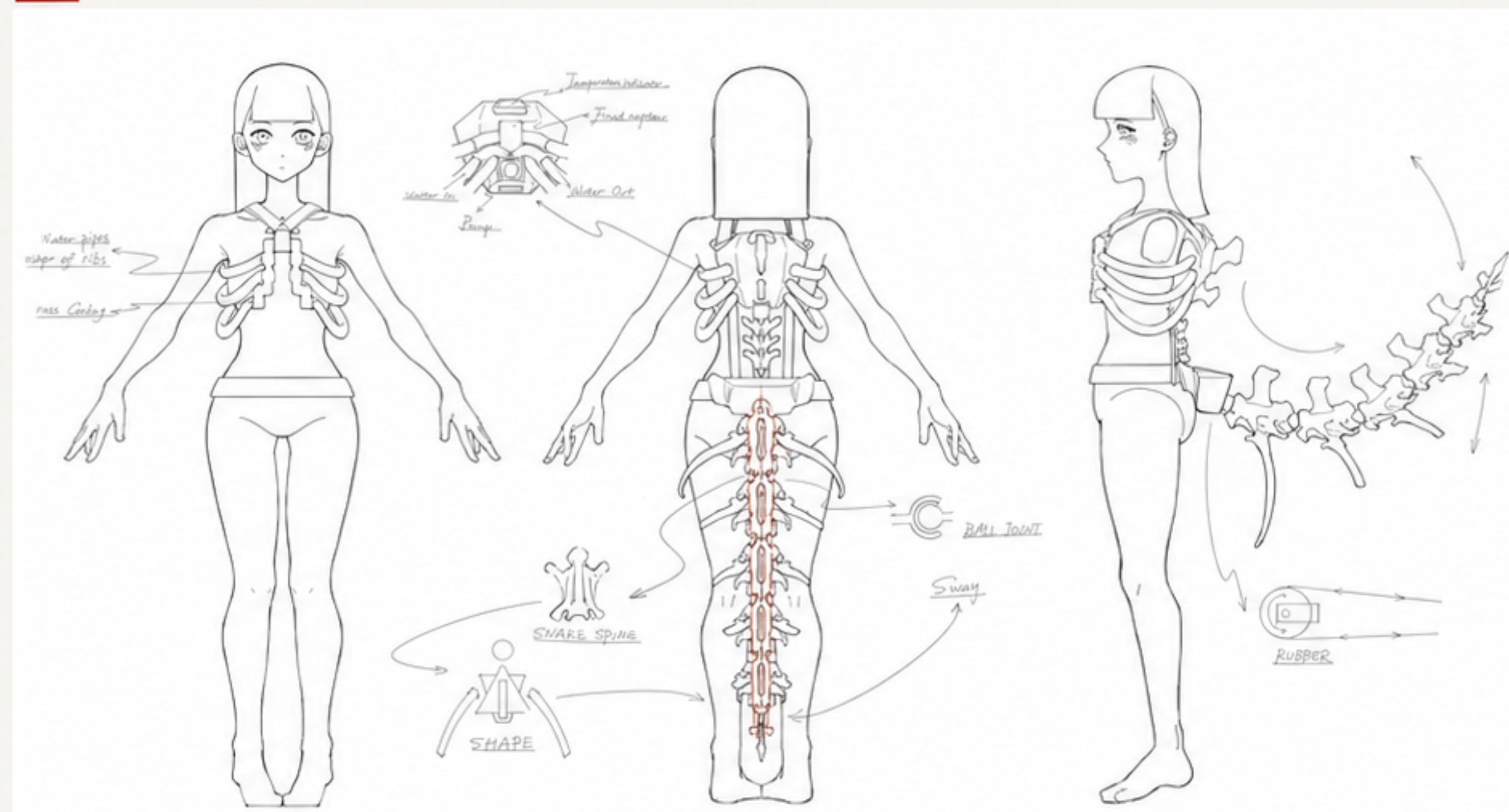
HUMAN
Body heat and
emotional projection.

The snake functions here
as an artistic metaphor.

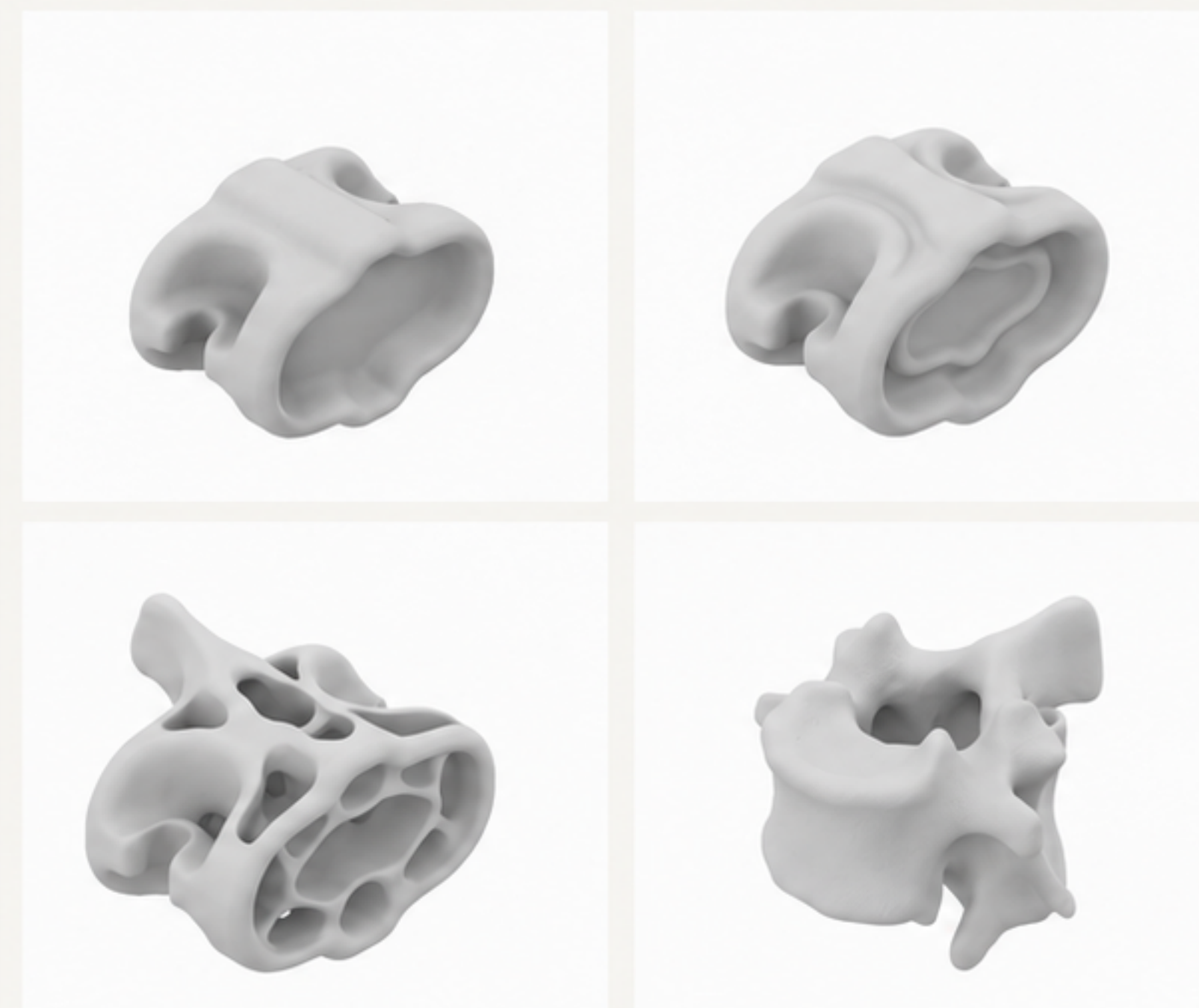
03 / INITIAL IDEATION

FROM BODY TO STRUCTURE

Defining contact, support and motion through form exploration.



The initial sketches map the chest-mounted cooling components, back support and articulated tail onto the body. Vertebral form studies explore how joint geometry can connect the biological reference to a cable-driven structure.



Vertebral form studies

CONTACT / Chest-mounted cooling components

SUPPORT / Back-mounted structure

MOTION / Articulated mechanical tail

04 / MECHANISM RESEARCH

TEMPERATURE
INTO MOTION

Cable-Driven Tail Dynamics

An Arduino reads temperature-sensor input and maps temperature ranges to servo angles. Three steel cables transmit the servo motion to an articulated tail.

The six-segment tail concept uses nested spherical joints to explore bending and posture. ABS 3D printing is the proposed fabrication route; load capacity and motion limitis require further testing.

Temperature input / Servo control /
Cable tension

```
#include <Servo.h>
// 指定温度传感器引脚
const int tempSensorPin = A0;

// 指定伺服电机引脚
Servo servo1;
Servo servo2;
Servo servo3;

// 指定温度范围
const float tempMin = 20; // 温度范围下限
const float tempMax = 30; // 温度范围上限
const float tempStep = 10; // 温度范围步长
const float lengthIn = 50; // 温度范围长度

// 指定角度范围
const int angleMin = 0; // 最小角度
const int angleMax = 360; // 最大角度

void setup() {
  // 初始化串口通信
  Serial.begin(9600);

  // 指定伺服电机引脚
  servo1.attach(9);
  servo2.attach(10);
  servo3.attach(11);

  // 初始化温度传感器
  servo1.write(0);
  servo2.write(0);
  servo3.write(0);
}
```

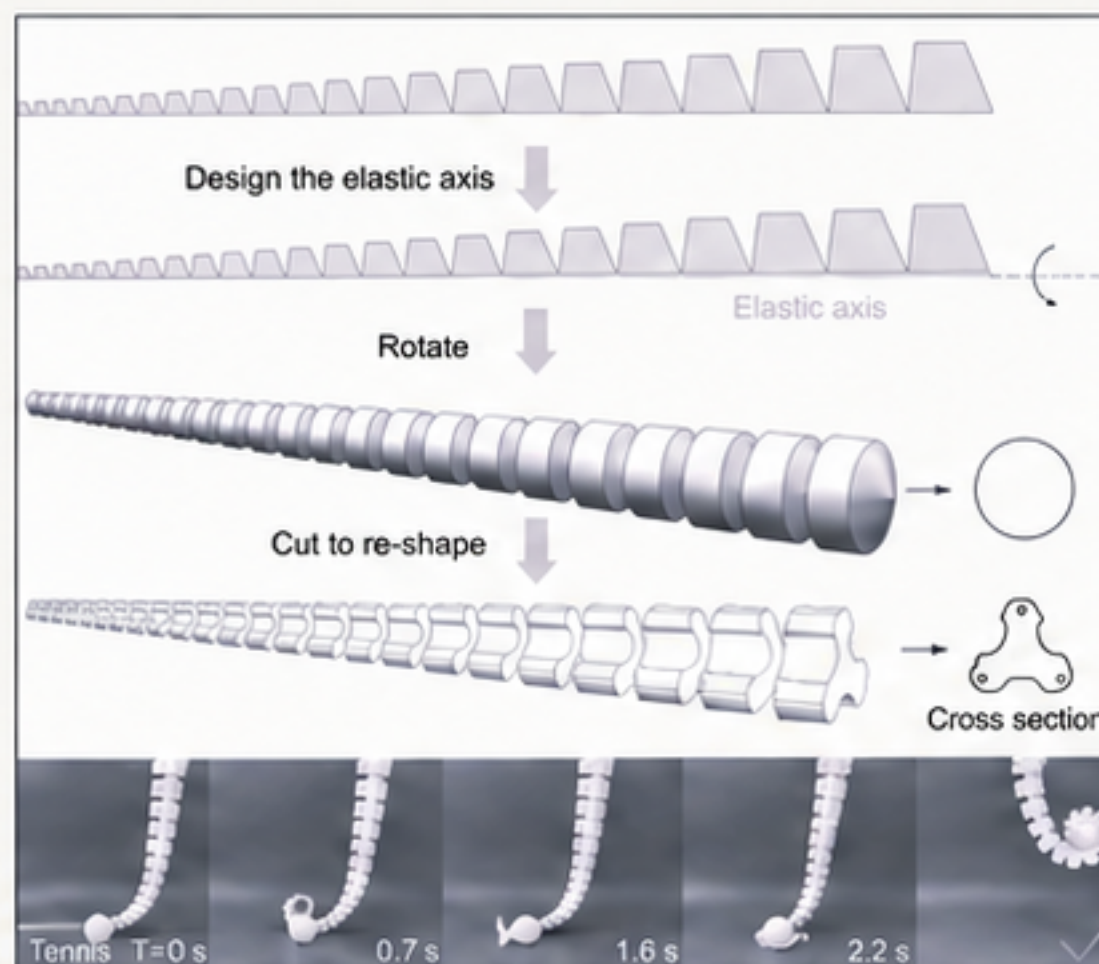
```
void loop() {
  int sensorValue = analogRead(tempSensorPin);
  // 将模拟量转换为电压值
  float voltage = sensorValue * (5.0 / 1023.0);

  float temperature = voltage * 100; // 将电压值转换为温度值
  Serial.print("Temperature: ");
  Serial.print(temperature);
  Serial.println(" C");

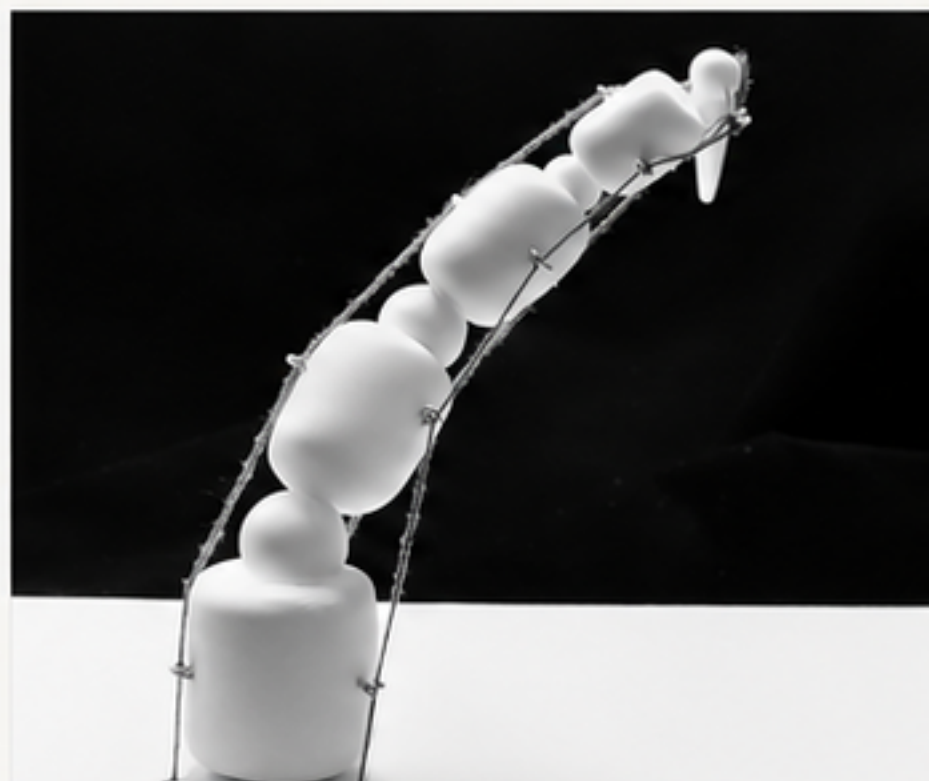
  if (temperature < tempMin) {
    // 温度过低，伺服电机转动
    setServoAngle(servo1, 90);
    setServoAngle(servo2, 90);
    setServoAngle(servo3, 90);
  } else if (temperature > tempMax) {
    // 温度过高，伺服电机转动
    setServoAngle(servo1, 180);
    setServoAngle(servo2, 180);
    setServoAngle(servo3, 180);
  } else {
    // 温度正常，伺服电机不动
    if (temperature < tempMin + tempStep) {
      setServoAngle(servo1, 180);
      setServoAngle(servo2, 180);
      setServoAngle(servo3, 180);
    } else if (temperature > tempMax - tempStep) {
      setServoAngle(servo1, 90);
      setServoAngle(servo2, 90);
      setServoAngle(servo3, 90);
    }
  }
  delay(100);
}

void setServoAngle(Servo servo, int angle) {
  int servoAngle = map(angle, 0, 360, 0, 180);
  servo.write(servoAngle);
}
```

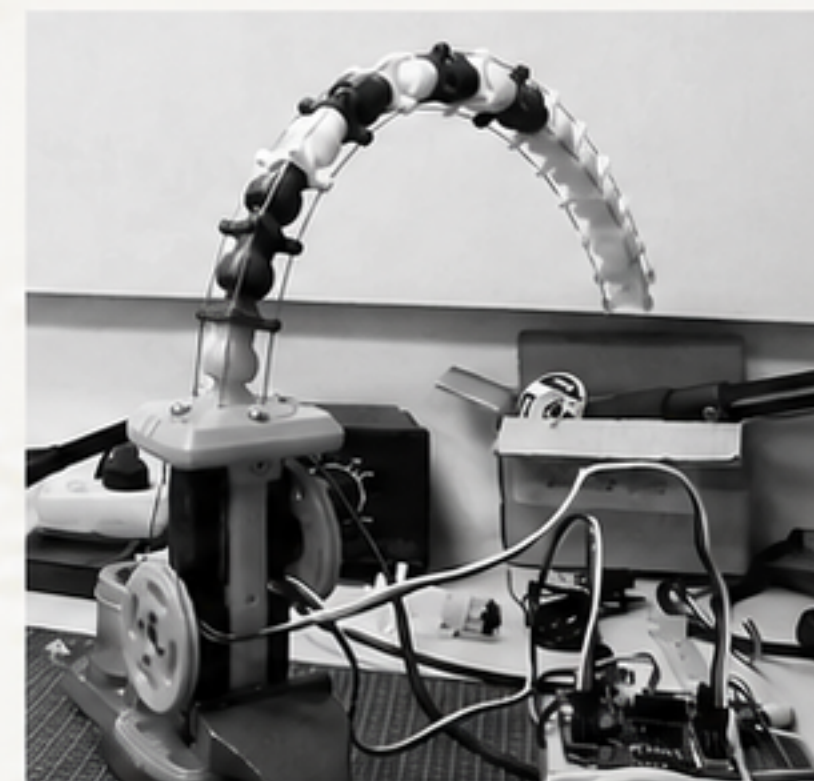
Arduino control logic



Continuum mechanism diagram and motion study



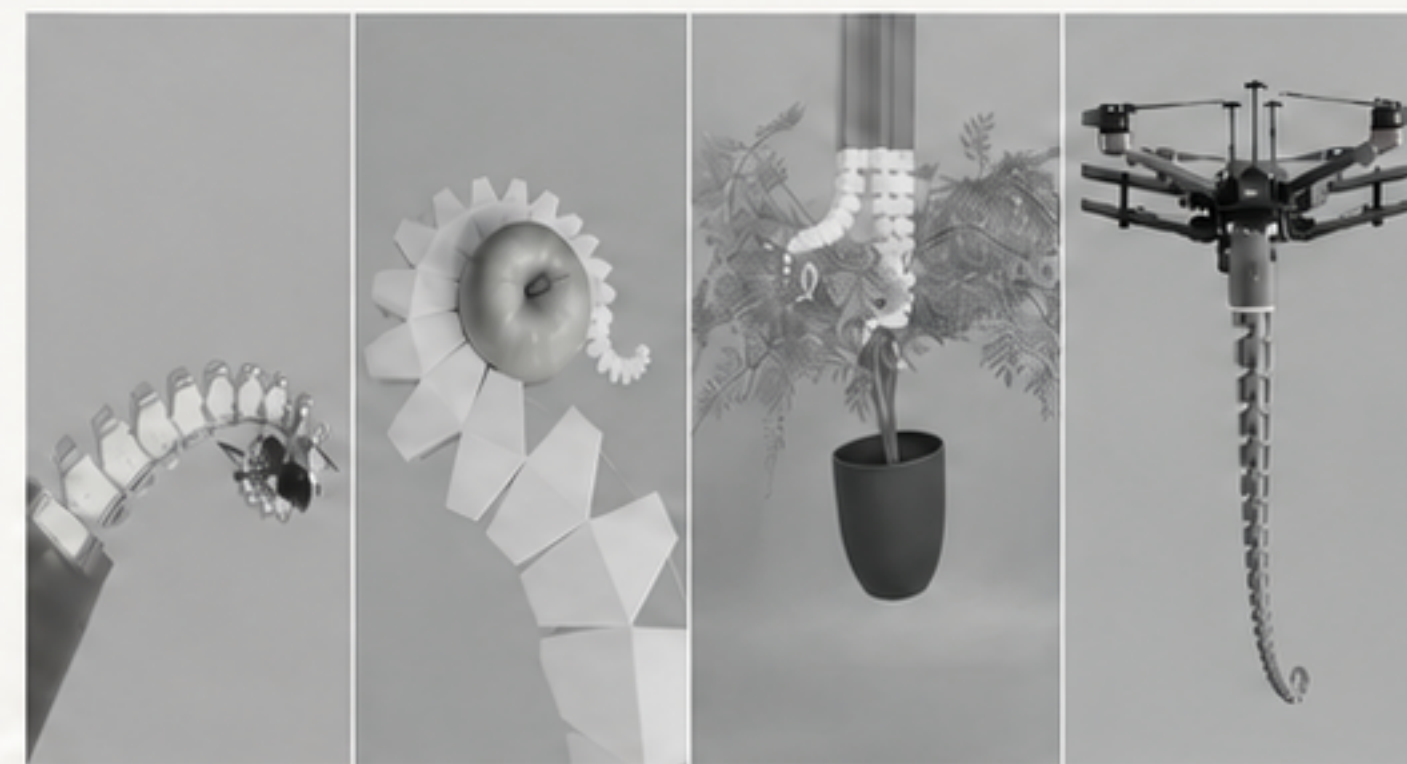
Cable-driven mechanism close-up



Tabletop mechanism reference



Tripod-mounted reference



Spiral and biological mechanism references (SpiRobs)

05 / DESIGN DEVELOPMENT

WATER COOLING
& WEARABLE INTEGRATION

Mannequin layout and contact components

From Functional Circuit
to Wearable Expression

Chest-mounted contact components, transparent tubing and a back-mounted support form a circulation system, translating water cooling into a visible wearable language.

From mannequin studies to the wearable prototype, the design explores tubing routes, component connections and their relationship to body proportions.



Overall wearable configuration



Back support / Tubing connections / Vertebral details



06 / FINAL DISPLAY

MECHANICAL
EXPRESSION

A wearable installation connecting temperature, circulation and motion.

The final prototype brings together a visible cooling circuit, back-mounted support and a vertebra-inspired mechanical tail. Its articulated poses translate the project's body-machine narrative into a physical form.

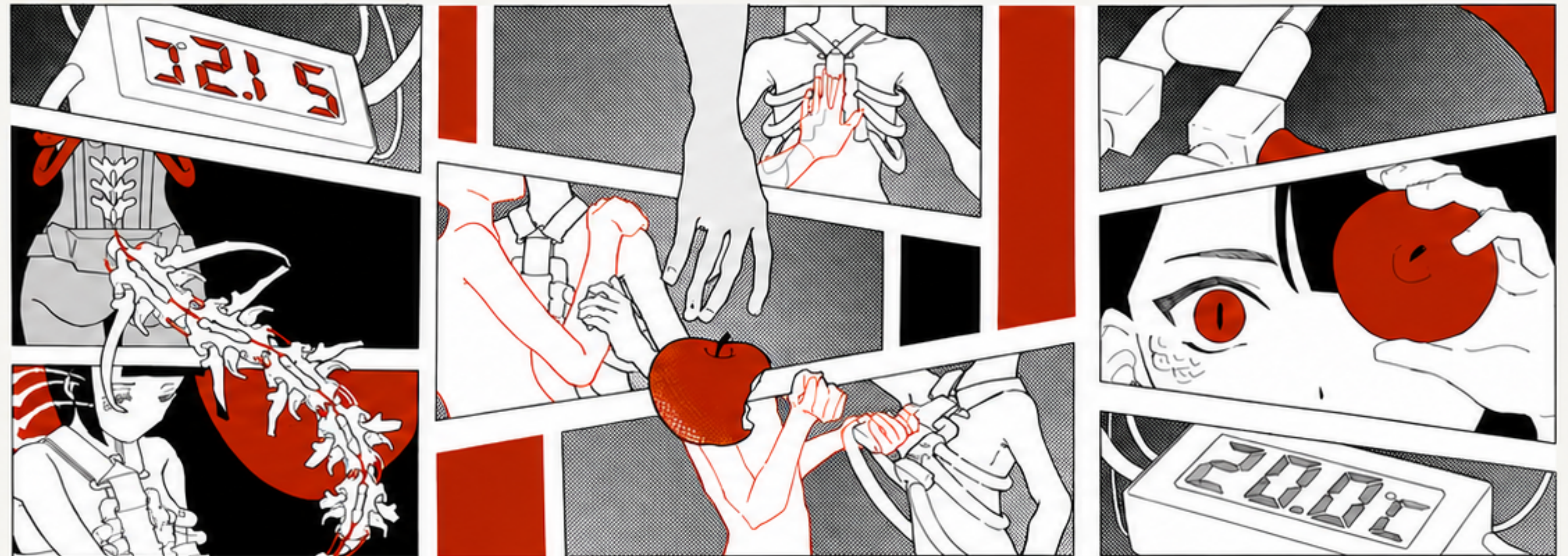
The project film connects thermal contact, circulating red fluid and mechanical movement through a shared visual language.

WATCH THE PROJECT FILM

<https://youtu.be/vfX03bwNbEQ?feature=shared>



Articulated tail / Three demonstrated poses



Project film / Narrative storyboard