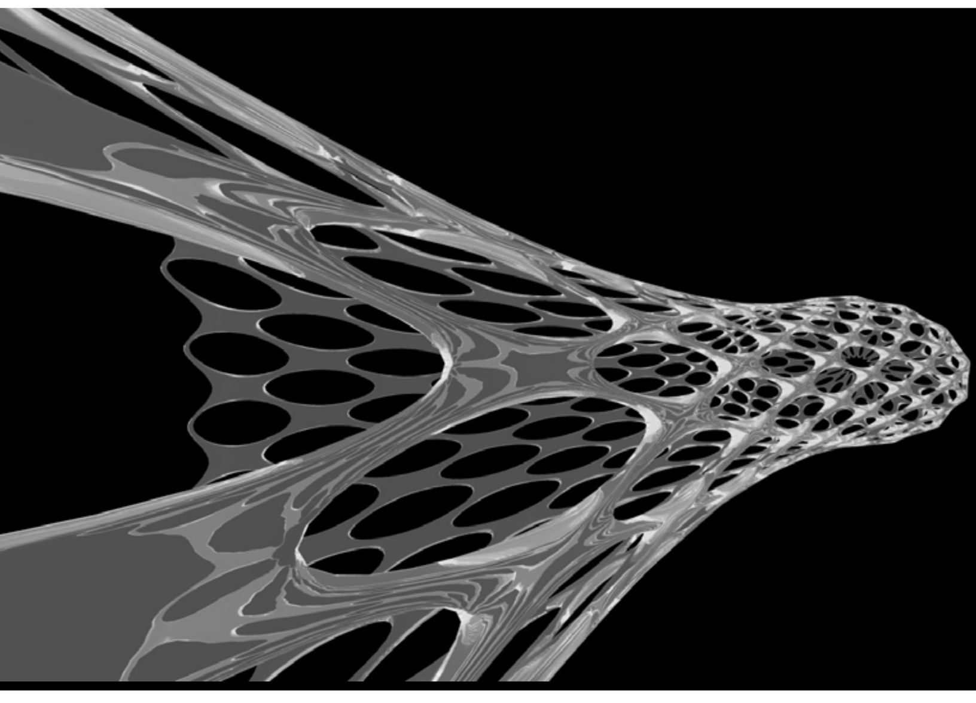

Digital Architectonics Program
University of Bath

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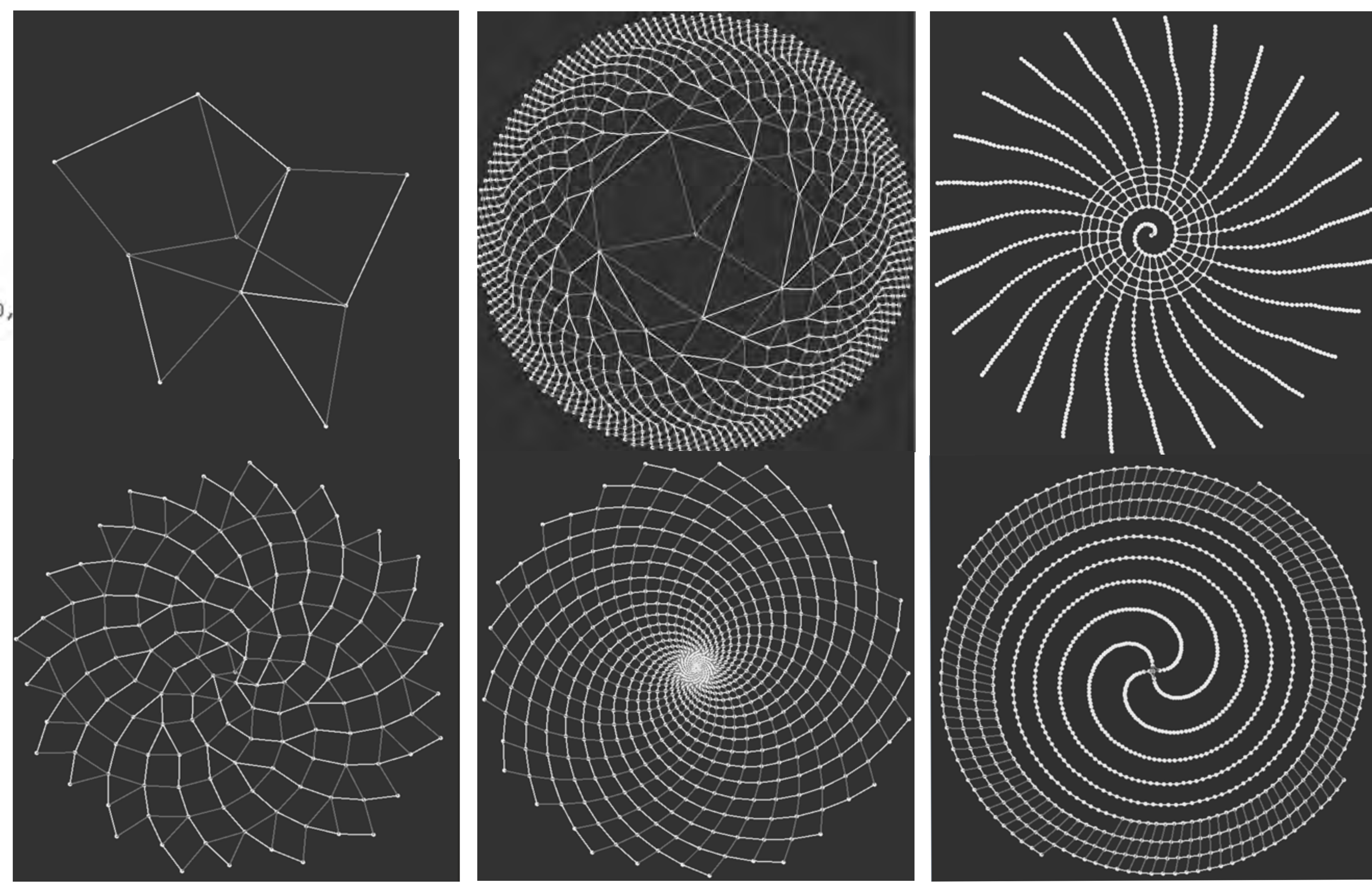
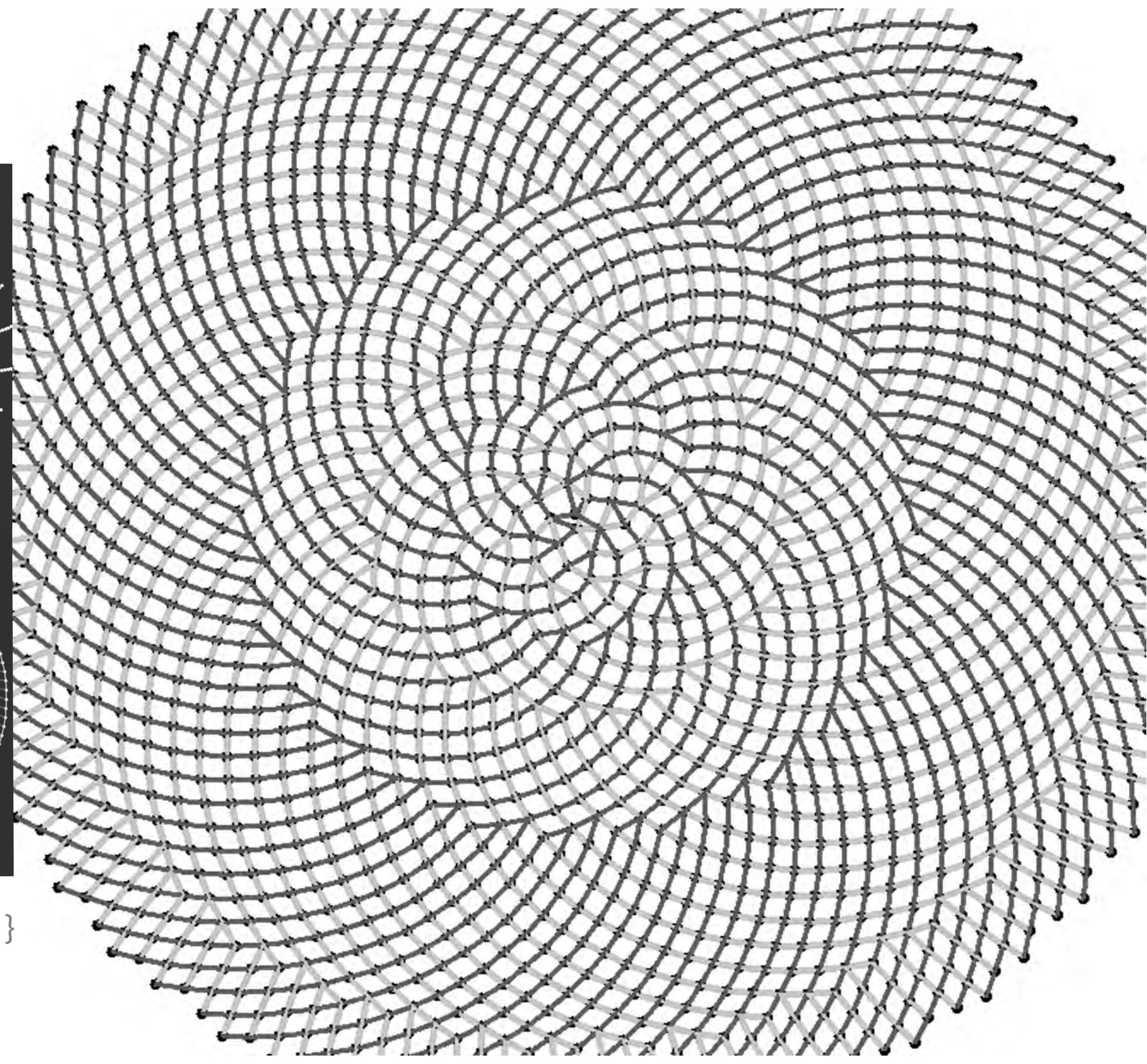
e x p l o r i n g   p h i l l o t a x i s
[processing applet]

```
import controlP5.*;
ControlP5 controlP5;


public float delta_angulo=1.0;
public float exponent=0.6;
public int number_of_seeds=1000;
int max_number_of_seeds=2000;
PVector [] puntos = new PVector[max_number_of_seeds];
float centre_x=350.0, centre_y=350.0;


void setup ()
{
  size (700,700);
  controlP5 = new ControlP5(this);
  controlP5.addSlider("number_of_seeds",10,max_number_of_seeds,1000,20,50,150,
  controlP5.addSlider("exponent",0.1,3,0.6,20,80,150,14);
  controlP5.addSlider("delta_angulo",0.05,2.0,1.0,20,110,150,14);
}

void draw ()
{
  background (20);
  stroke (244);
  strokeWeight (8);
  float radio, angulo, x, y;

  angulo=0;
  for (int i=0; i<number_of_seeds; i++)
  {
    angulo= angulo+delta_angulo*2*PI*((sqrt(5)-1)/2);
    radio=(pow(i,exponent)/ pow(number_of_seeds,exponent))*0.5*width;
    x=radio*cos (angulo);
    y=radio*sin (angulo);

    puntos[i]=new PVector (x,y);
    point (puntos[i].x+centre_x, puntos[i].y+centre_y);
  }
  strokeWeight (2);
  nearest();

}


void nearest()
{
int i,j;
float min_dist;
float min_dist2;
int minP=0;
int minP2=0;
float aux;

for(i=2;i<number_of_seeds;i++)
    {
    min_dist=10000;
    min_dist2=10000;
    for(j=0;j<i;j++)
       {
        aux=puntos[i].dist(puntos[j]);
        if(aux<min_dist)
           {
           minP2=minP;
           min_dist2=min_dist;
           minP=j;
           min_dist=aux;
           }
           else {
                if (aux<min_dist2){
                 minP2=j;
                 min_dist2=aux;
                }

           }
       }
     float dir= puntos[i].cross(puntos[minP]).z;
     if (dir >0) {
     stroke (180,0,150);

     }
     else {
     stroke (0,150,180);
     }


    line(puntos[i].x+centre_x,puntos[i].y+centre_y,puntos[


     dir= puntos[i].cross(puntos[minP2]).z;
     if (dir >0) {
     str    0,150);


     else {
     stroke (0,1


    lin  ntos[i].x+          e_y,puntos[    ].x+centre_x,puntos[minP2].y+centre_y);
    }

}
```

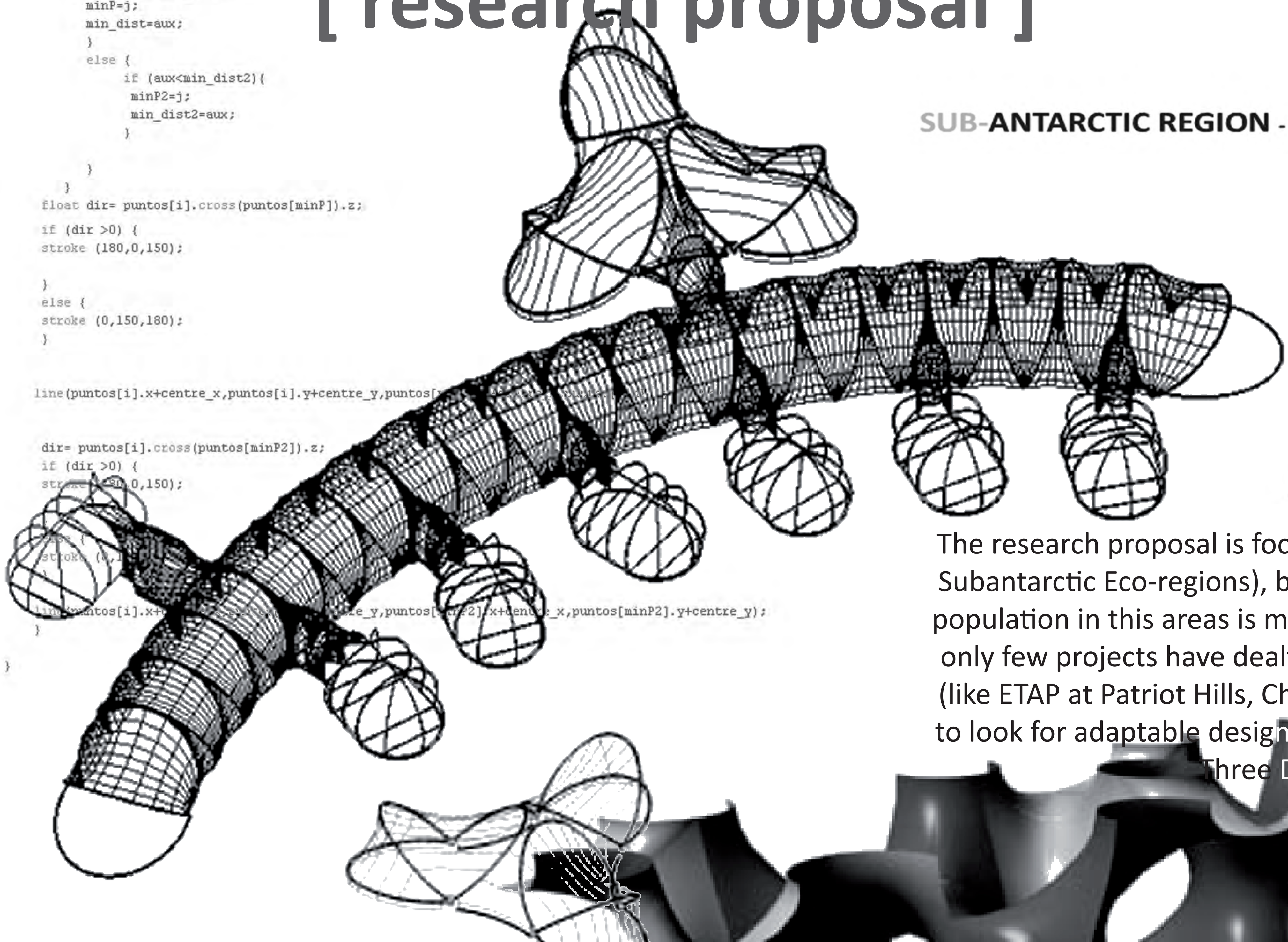


{ Variations of Number of Components, Radius, Angle }

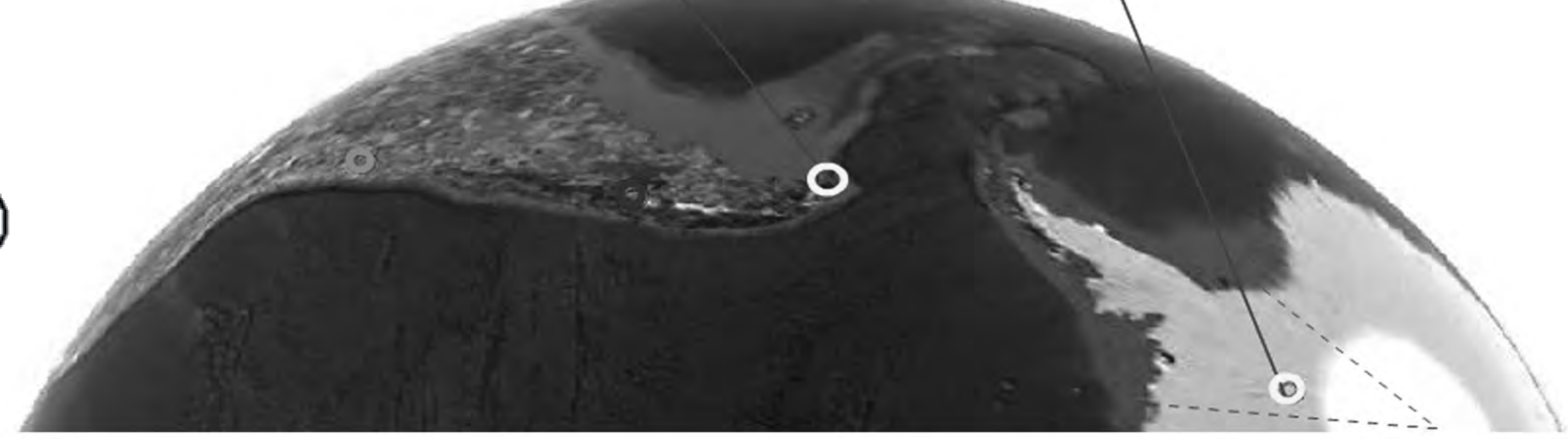


The program explores Phillotaxis, or the subtle arrangement of leaves and petals in plants, which obeys some mathematical relationships. The model is composed of a generative spiral of "seeds". Initially each seed is positioned at a specific angle from the previous one (the golden angle). The radius, or Plastochrone ratio, for each seed is also increased in proportion to the square root of each seed number. The two groups of helixes, or Parastichies, are drawn by joining each seed to the closest and second closest previous seeds. The applet allows these three core parameters to be changed by using slider bars: the number of seeds, the way the radius increases and the angle between seeds.

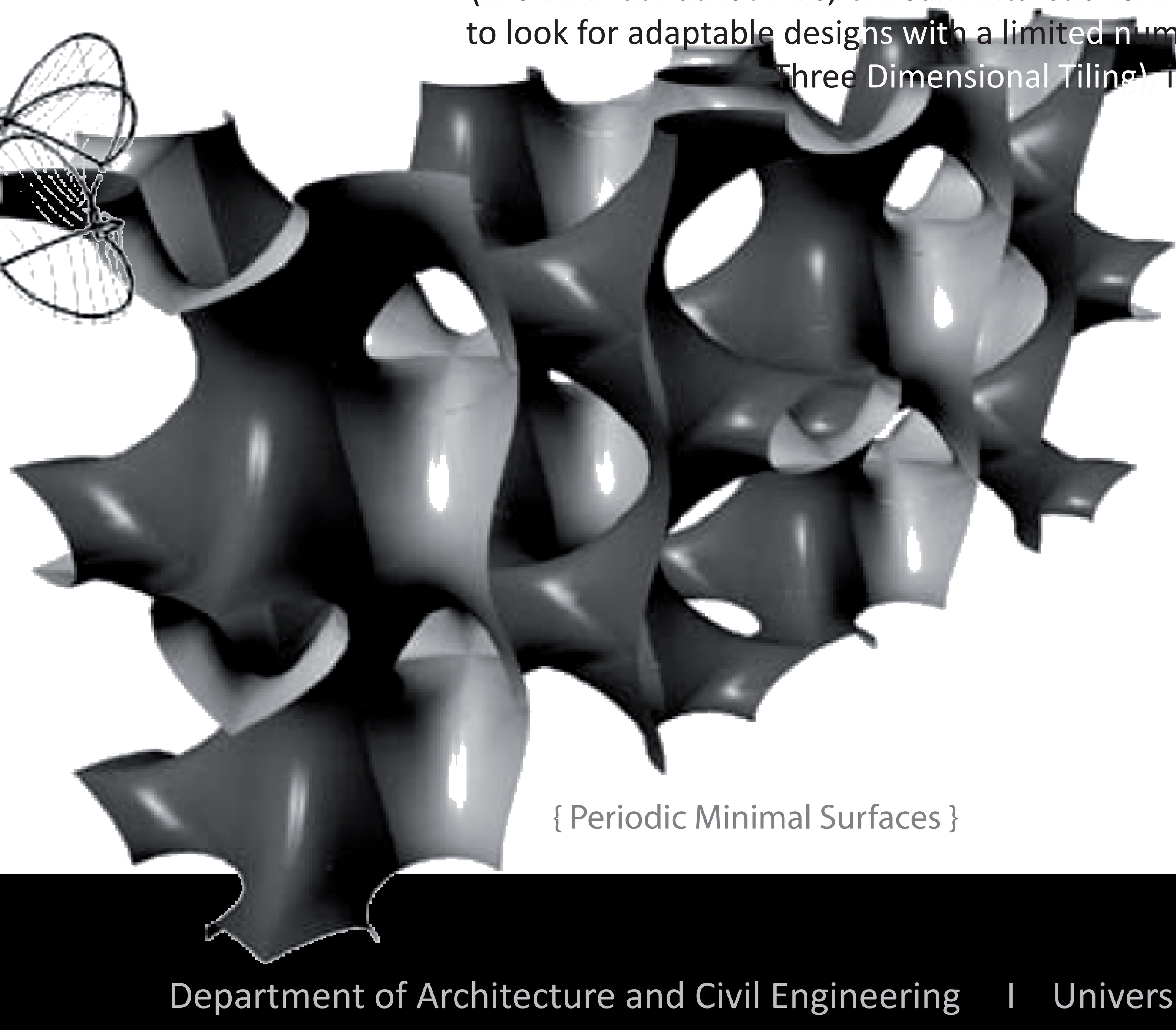
a d a p t a b l e   s t r u c t u r e s   f o r   r e m o t e   a r e a s
[research proposal]



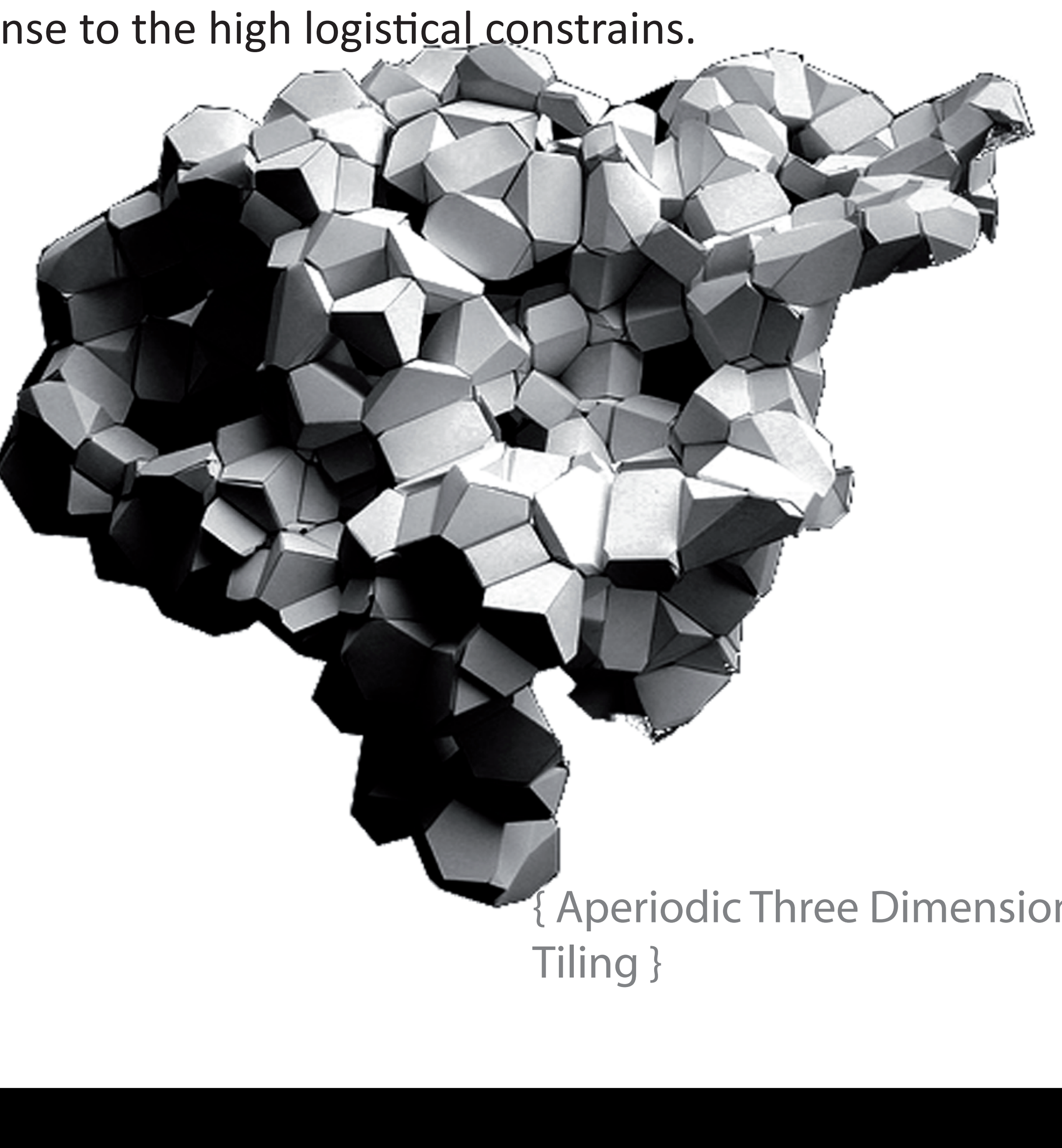
{ ETAP, 82 S, Chilean Antarctic Territory }



The research proposal is focused on the design of temporary facilities for remote protected areas (Antarctic and Subantarctic Eco-regions), based on the aim of making a contribution for their environmental conservation. The population in this areas is mostly floating, thus it experiments an important variation through the year. However, only few projects have dealt with the variability on their configurations as a critical aspect for an efficient usage (like ETAP at Patriot Hills, Chilean Antarctic Territory, 82°S). In order to this, different geometries are being used to look for adaptable designs with a limited number of components (as Periodic Minimal Surfaces and Aperiodic Three Dimensional Tiling), in response to the high logistical constrains.



{ Periodic Minimal Surfaces }



{ Aperiodic Three Dimensional Tiling }