- **This notebook makes use of the RDL package by Selwyn Hollis, which at the current time only runs on Mathematica 5. The results may still be viewed in higher versions of Mathematica**

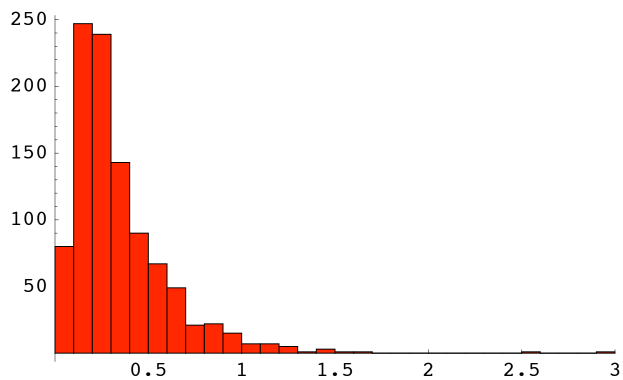
  - **The following generates the "noise"**

```
<< Statistics`ContinuousDistributions`
```

```
list1 = Table[0.2 Random[LogNormalDistribution[0.3, 0.7]], {1000}];
```

```
<< Graphics`Graphics`
```

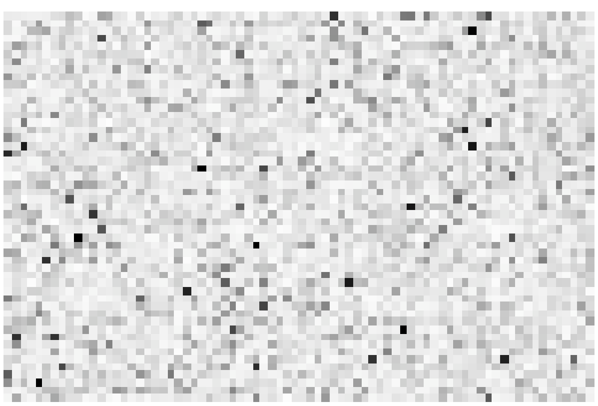
```
Histogram[list1]
```




```
- Graphics -
```

```
h = 1 / 50; u0 = Table[0.2 Random[LogNormalDistribution[0.3, 0.7]], {y, 0, 1, h}, {x, 0, 3 / 2, h}];
```

```
ListDensityPlot[1.2 u0,  Mesh → False, ColorFunction → (GrayLevel[1 - #] &),
 PlotRange → {0, 2.5}, AspectRatio → 2 / 3, Frame → False]
```



```
- DensityGraphics -
```

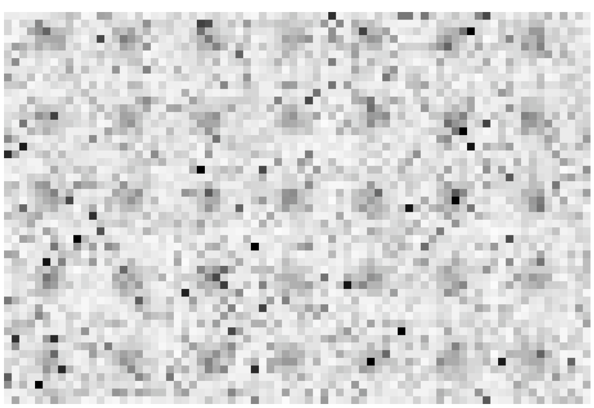
- **The following generates the pre-pattern**

```
u1 = Table[(Sin[15 x] Sin[15 y])^6, {y, 0, 1, h}, {x, 0, 3 / 2, h}];
ListDensityPlot[0.8 u1, Mesh → False, ColorFunction → (GrayLevel[1 - #] &),
 PlotRange → {0, 2.5}, AspectRatio → 2 / 3, Frame → False]
```

```
- DensityGraphics -
```

- **The following shows what the sum of the noise and prepattern looks like.**

```
u1 = Table[(Sin[15 x] Sin[15 y])^6, {y, 0, 1, h}, {x, 0, 3 / 2, h}];
ListDensityPlot[1.2 u0 + 0.8 u1, Mesh → False, ColorFunction → (GrayLevel[1 - #] &),
 PlotRange → {0, 2.5}, AspectRatio → 2 / 3, Frame → False]
```



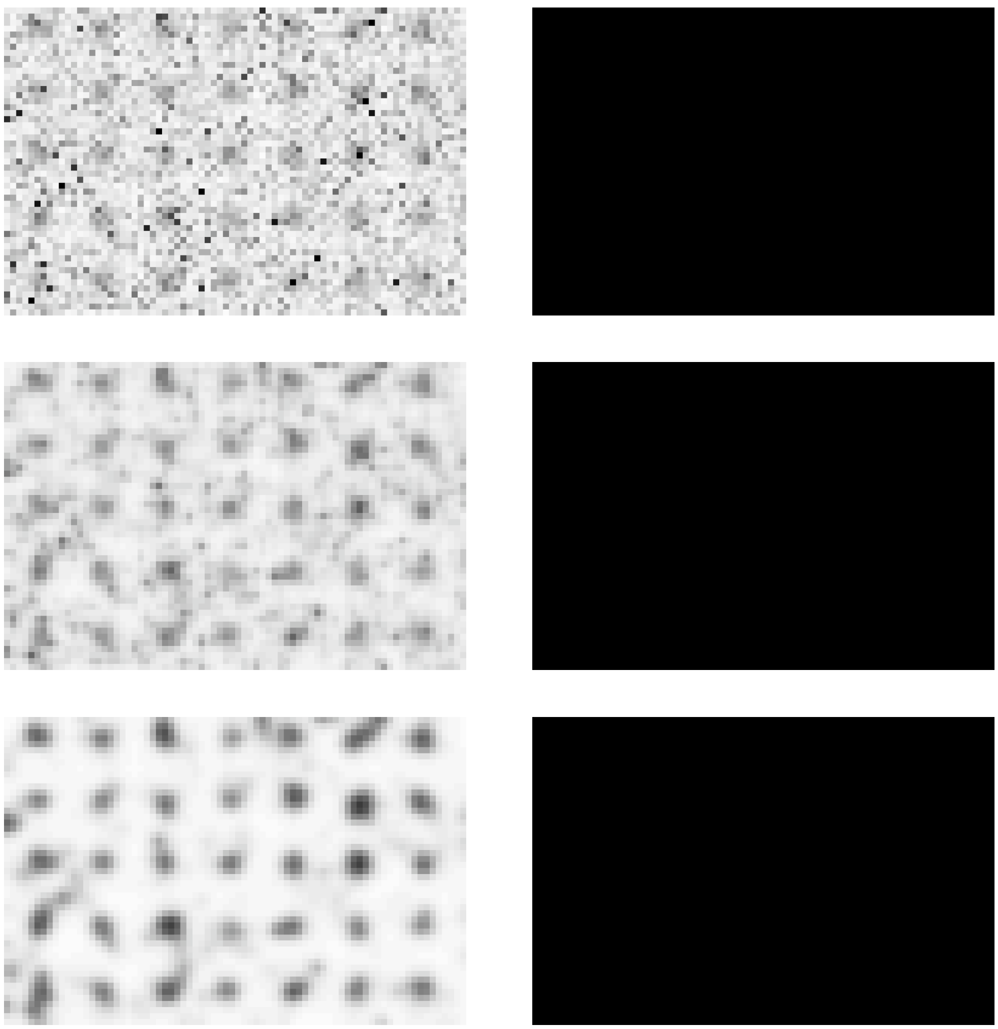
```
- DensityGraphics -
```

- **Next, RDL is loaded. This generates pairs of images for sequential time points. The image on the left is u (BMP7), and the one on the right is v (FST). Since FST is a constant, the image on the right may be ignored.**

```
<< RDL`ReactionDiffusionLab`

v0 = Table[1, {y, 0, 1, h}, {x, 0, 3 / 2, h}];

(*this makes FST=1 everywhere*)

SetOptions[RDDensityPlots, ColorFunction → (GrayLevel[1 - #] &)];
```

In the simulation below, FST is present and carrying out its normal function

```
actinhib := {11.43/v u^2/(u^2 + 2) - 3 u, 0};
d1 = .0005; d2 = .01; dt = .01 * h^2/Max[{d1, d2}];
RDDensityPlots[actinhib, {u, v}, {1.2 u0 + 0.8 u1, v0}, {d1, d2}, dt, 30,
 PlotRange → {{0, 2.5}, {0, Automatic}}, PlotEvery → 100, ImageSize → 500, ReturnLast → True];
(*below are shown just the first, tenth, and twenty-fifth images*)
```



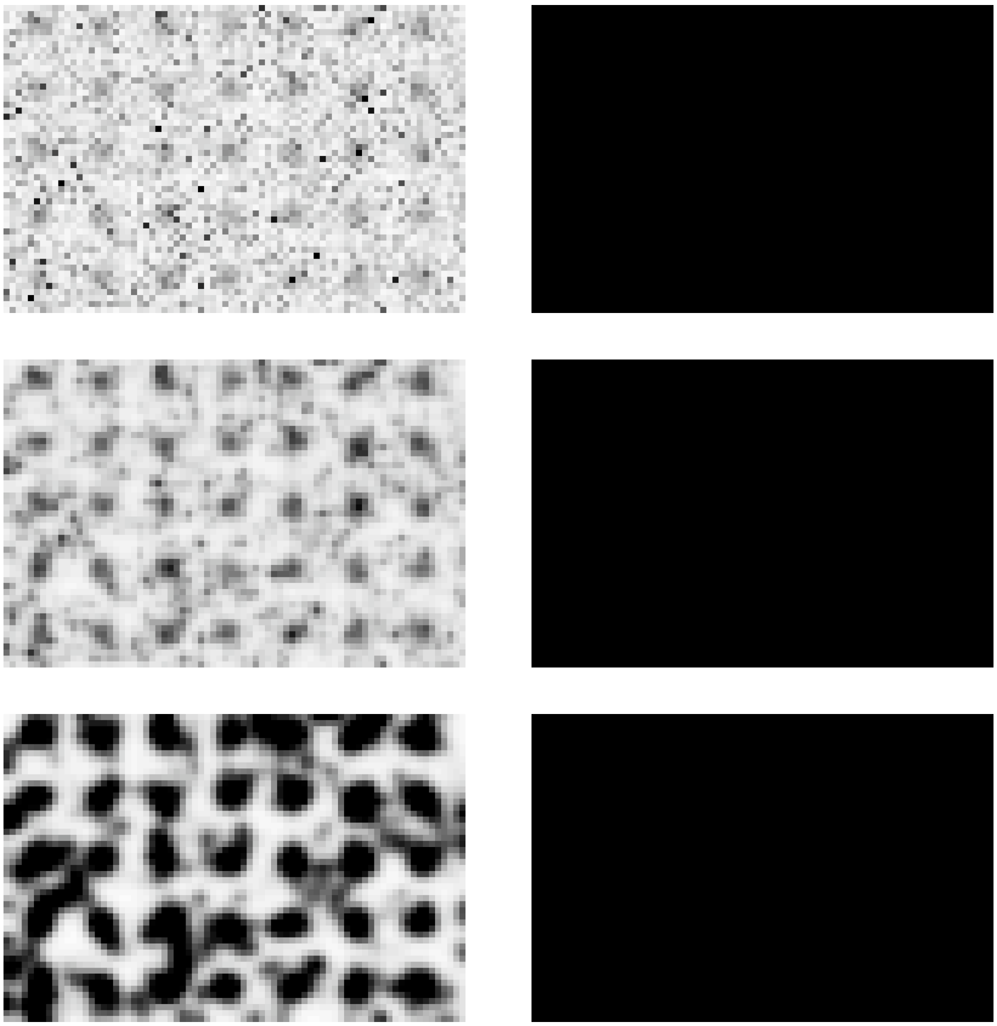
```
Max[Flatten[%]] (*this shows the highest value within the domain*)
```

2.17148

- **In the simulation below, the loss of FST was simulated by increasing the coefficient in front of the first term from 11.43 to 14.29**

$$\text{actinhib} := \left\{\frac{14.29}{v}\,\frac{u^2}{u^2+2} - 3\,u,\ 0\right\};$$

```
d1 = .0005; d2 = .01; dt = .01 * h^2 / Max[{d1, d2}];
RDDensityPlots[actinhib, {u, v}, {1.2 u0 + 0.8 u1, v0}, {d1, d2}, dt, 30,
 PlotRange → {{0, 2.5}, {0, Automatic}}, PlotEvery → 100, ImageSize → 500, ReturnLast → True];

(*below are shown just the first, tenth, and twenty-fifth images*)
```



```
Max[Flatten[%]]
```

```
3.64044
```

- **A word about units and the plausibility of these parameter choices: If the unit of distance is cm, then the box shown here is 1x1.5 centimeters. Now let's say the unit of time is 50000 seconds. Then the diffusion coefficient that is used here of 5 x 10^{-4}, can be understood as representing $10^{-8}$when converted to units of seconds.**

Now when we plot every 100 time steps for 30 plots, that's 3000 time steps. If the time step duration is 0.0004, then the total elapsed time is 3000*0.0004 = 1.2 time units. And if the time unit=50000 seconds, then the total elapsed time is 60000 seconds = 1000 min = 16.7 hours.

Note, in the manuscript, the figures shown are from the 25th plot rather than the 30th. So that means they represent a time of 50000 seconds, or 13.9 hours.

These distances, times and diffusion coefficients are all within reasonable ranges for tongue development.