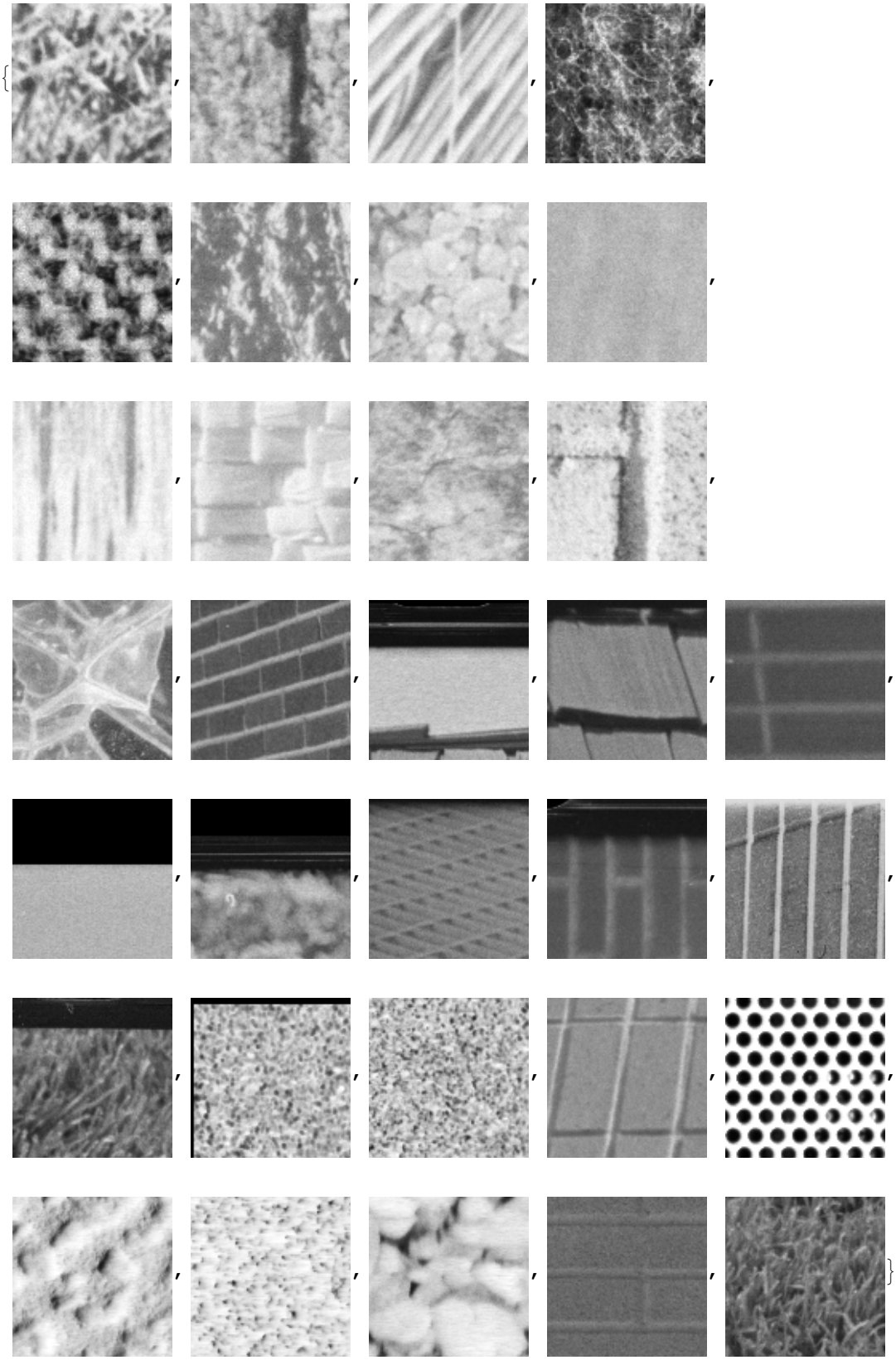
Lacunariy Calculations - Parameterization

Load image and converto grayscale

In[1]:=
```
filePath1 = "/Users/danthac/Work/MSc/Lacunarity-MSMath-CSUCI";
filePath2 = {"imagesBrodatzTexture/textures"};
fileNames = Import[filePath1 <> "/" <> filePath2][[1 ;; -2]];
images0 = Import[filePath1 <> "/" <> filePath2 <> "/" <> #] & /@ fileNames;
images1 = ColorConvert[#, "Grayscale"] & /@ images0;
imgDims = ImageDimensions[#] & /@ images1;
(* Remove large images *)
(* pos=Position[imgDims,<512] *)
dimMinMax = {Min[imgDims], Max[imgDims]};
szPicked = Min[dimMinMax[[1]], 100]
images2 = ImageTake[#, {0, szPicked}, {0, szPicked}] & /@ images1
images3d = ImageData[#, "Byte"] & /@ images2;
images3dF = Flatten[#] & /@ images3d;
```

Out[8]=
```
100
```

Out[9]=



Histogram equalization & Thresholding

In[12]:=
```
(*Histogram[#,256,"CDF"]& /@ images3dF
   histCount=HistogramList[#,256,"Count"]& /@ images3dF;*)
hists = HistogramList[#, 256, "CDF"] & /@ images3dF;
intFuns = Interpolation[Transpose[{#[[1]], Join[{0.}, #[[2]]]}]] & /@ hists;
lenImg = Length[images2];
imageEq1 = ArrayReshape[intFuns[[#]][images3dF[[#]]], {szPicked, szPicked}] & /@
   Array[# &, lenImg];
images4 = Image[#] & /@ imageEq1;
images4d = ImageData[#, "Byte"] & /@ images4;
(*Histogram[Flatten[#],256,"CDF"]&/@images4d*)
```

Threshold

In[18]:=
```
(* thresholdLevel = 128;
    thresholdLevel1 = FindThreshold[image2O[[1]]]*255
       thresholdLevel2 = FindThreshold[image2O[[2]]]*255
        image3=Image[If [#≥ thresholdLevel,1,0]& /@#&/@ image2n]
         image3 = Binarize[image2O]*)
images5Bin = Binarize[#] & /@ images4;
```

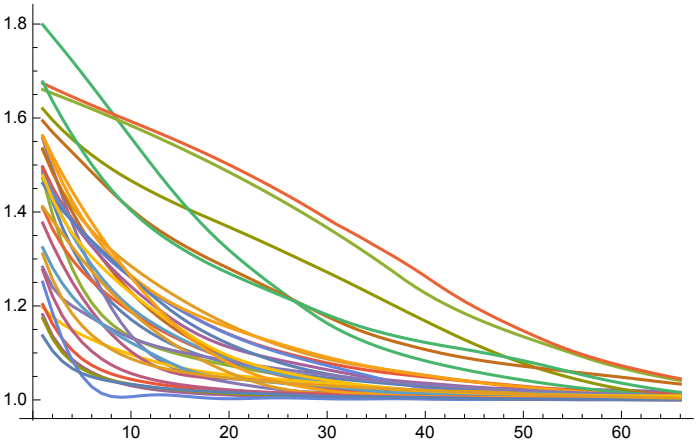
In[19]:=
```
GetLacunarityM1[imageIn__Image, w__] :=
 1 + N[StandardDeviation[#]^2] / N[Mean[#]^2] & [
    Total[Flatten[ImageData[#, "Byte"]]] & /@
     Flatten[ImagePartition[imageIn, {#, #}, {1, 1}]]] & /@ w
```

In[20]:=
```
(*w={2,10,25,50,75,100,125};
w = Range[1,szM-1];
w = Range[5,szM*0.7];*)
w = Range[5, Floor[szPicked * 0.7]];
ld1 = GetLacunarityM1[#, w] & /@ images5Bin; // AbsoluteTiming
```

Out[21]=
```
{869.275106, Null}
```

In[22]:=
```
ListLinePlot[ld1, PlotRange → All ]
resPath = "/Volumes/D16SD_TD/Study/MSc/results/restmp/group1" <> ".csv"
Export[resPath, ld1, "CSV"];
```

Out[22]=

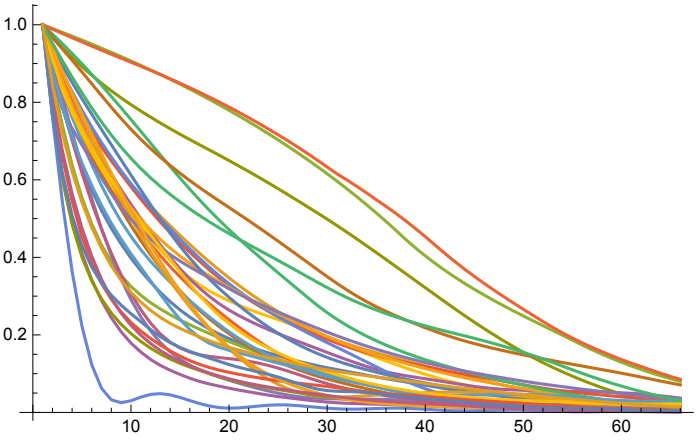


Out[23]=
```
/Volumes/D16SD_TD/Study/MSc/results/restmp/group1.csv
```

Normalize lacunarity - (Malhi method)

In[25]:=
```
nldl1 = Log[ld1[[#]]] / Log[ld1[[#]][[1]]] & /@ Range[1, lenImg];
ListLinePlot[nldl1, PlotRange → All ]
```

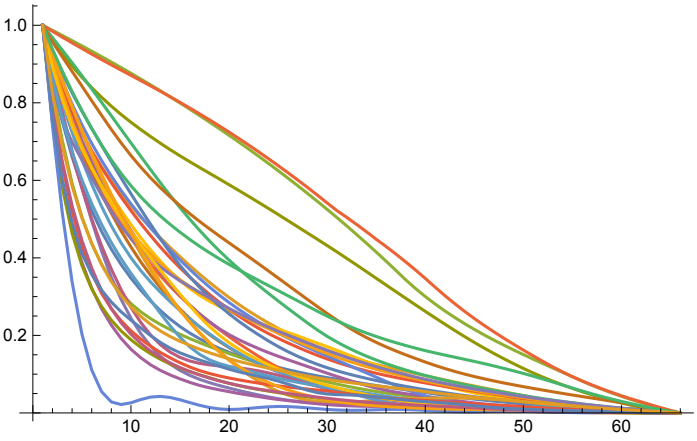
Out[26]=



Normalize lacunarity - (Roy's Method)

In[27]:=
```
lMin = Min[ld1[[#]]] & /@ Range[1, lenImg];
lMax = Max[ld1[[#]]] & /@ Range[1, lenImg];
lRange = lMax - lMin;
nldl1 = (ld1[[#]] - lMin[[#]]) / lRange[[#]] & /@ Range[1, lenImg];
ListLinePlot[nldl1, PlotRange → All ]
```

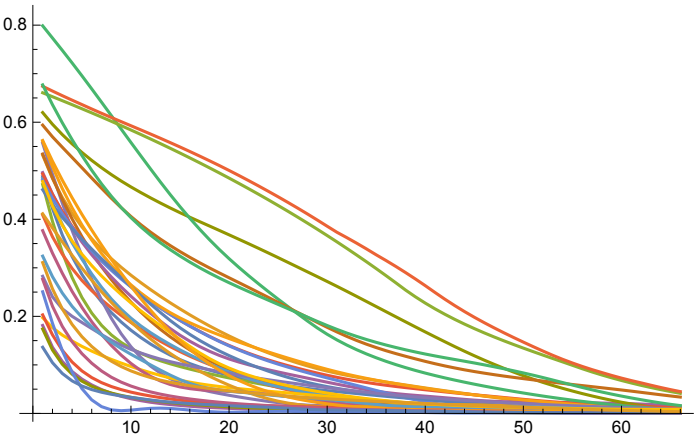
Out[30]=



Line Fit

In[31]:=
```
ld1p = # - 1 & /@ # & /@ ld1;
ListLinePlot[ld1p, PlotRange → All ]
fitData = Values[FindFit[#, {a x1^b}, {a, b}, x1] & /@ ld1p];
ca1 = FindClusters[fitData]
```

Out[32]=



Out[34]=
```
{{{0.609516, -0.666283}, {0.714729, -0.560792},
  {0.5693, -0.707014}, {0.53774, -0.633359}, {0.706702, -0.779627},
  {0.712622, -0.6686}, {0.63258, -0.660049}, {0.259482, -0.572733},
  {0.659268, -0.593737}, {0.893696, -0.40803}, {0.661127, -0.558473},
  {0.660047, -0.582923}, {0.735906, -0.57425}, {0.474038, -0.736012},
  {1.17696, -0.518465}, {0.644006, -0.590593}, {0.560595, -0.666749},
  {0.993801, -0.352621}, {1.00341, -0.341166}, {0.354239, -0.542628},
  {0.84038, -0.453588}, {0.409429, -0.667395}, {0.633888, -0.630436},
  {0.207684, -0.860645}, {0.197871, -0.829682}, {0.23607, -0.773979},
  {0.279209, -1.09205}, {0.770888, -0.680531}, {0.325935, -0.809558},
  {0.916927, -0.476512}, {0.156016, -0.759809}, {0.368589, -0.681885}}}
```

In[35]:=
```
dataOrg1 = {{"1.2.12", 6.3919, 0.942, 0.79984}, {"1.2.03", 3.6320, 1.064, 0.81465},
    {"1.1.01", 2.6585, 1.603, 0.92995}, {"1.1.07", 4.4211, 2.166, 0.86573},
    {"1.5.02", 0.6992, 1.815, 0.9197}, {"texmos3.s512", 3.9872, 1.089, 0.82053}};
dataOrg2 = {{"1.2.12", 6.3919, 0.942}, {"1.2.03", 3.6320, 1.064},
    {"1.1.01", 2.6585, 1.603}, {"1.1.07", 4.4211, 2.166},
    {"1.5.02", 0.6992, 1.815}, {"texmos3.s512", 3.9872, 1.089}};
c0 = FindClusters[Drop[dataOrg1, None, {1}] → dataOrg1]
c1 = FindClusters[Drop[dataOrg1, None, {1, 2}] → dataOrg1]
c2 = FindClusters[Drop[dataOrg2, None, {1, 2}] → dataOrg2]
```

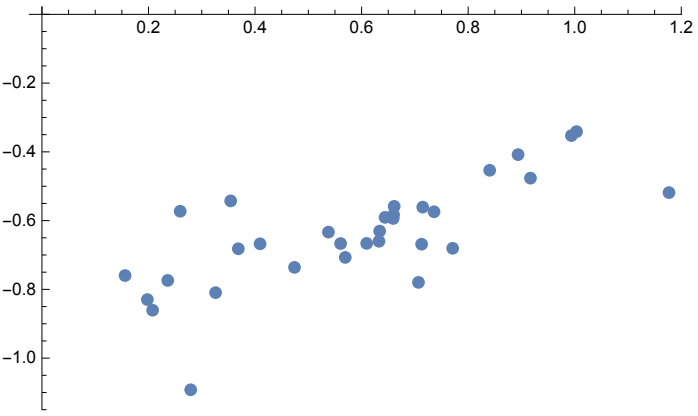
Out[37]=
```
{{{1.2.12, 6.3919, 0.942, 0.79984}, {1.2.03, 3.632, 1.064, 0.81465},
  {1.1.01, 2.6585, 1.603, 0.92995}, {1.1.07, 4.4211, 2.166, 0.86573},
  {1.5.02, 0.6992, 1.815, 0.9197}, {texmos3.s512, 3.9872, 1.089, 0.82053}}}
```

Out[38]=
```
{{{1.2.12, 6.3919, 0.942, 0.79984}, {1.2.03, 3.632, 1.064, 0.81465},
  {texmos3.s512, 3.9872, 1.089, 0.82053}}, {{1.1.01, 2.6585, 1.603, 0.92995},
  {1.1.07, 4.4211, 2.166, 0.86573}, {1.5.02, 0.6992, 1.815, 0.9197}}}
```

Out[39]=
```
{{{1.2.12, 6.3919, 0.942}, {1.2.03, 3.632, 1.064}, {1.1.01, 2.6585, 1.603},
  {1.1.07, 4.4211, 2.166}, {1.5.02, 0.6992, 1.815}, {texmos3.s512, 3.9872, 1.089}}}
```

In[40]:=
```
ListPlot[ca1]
```

Out[40]=

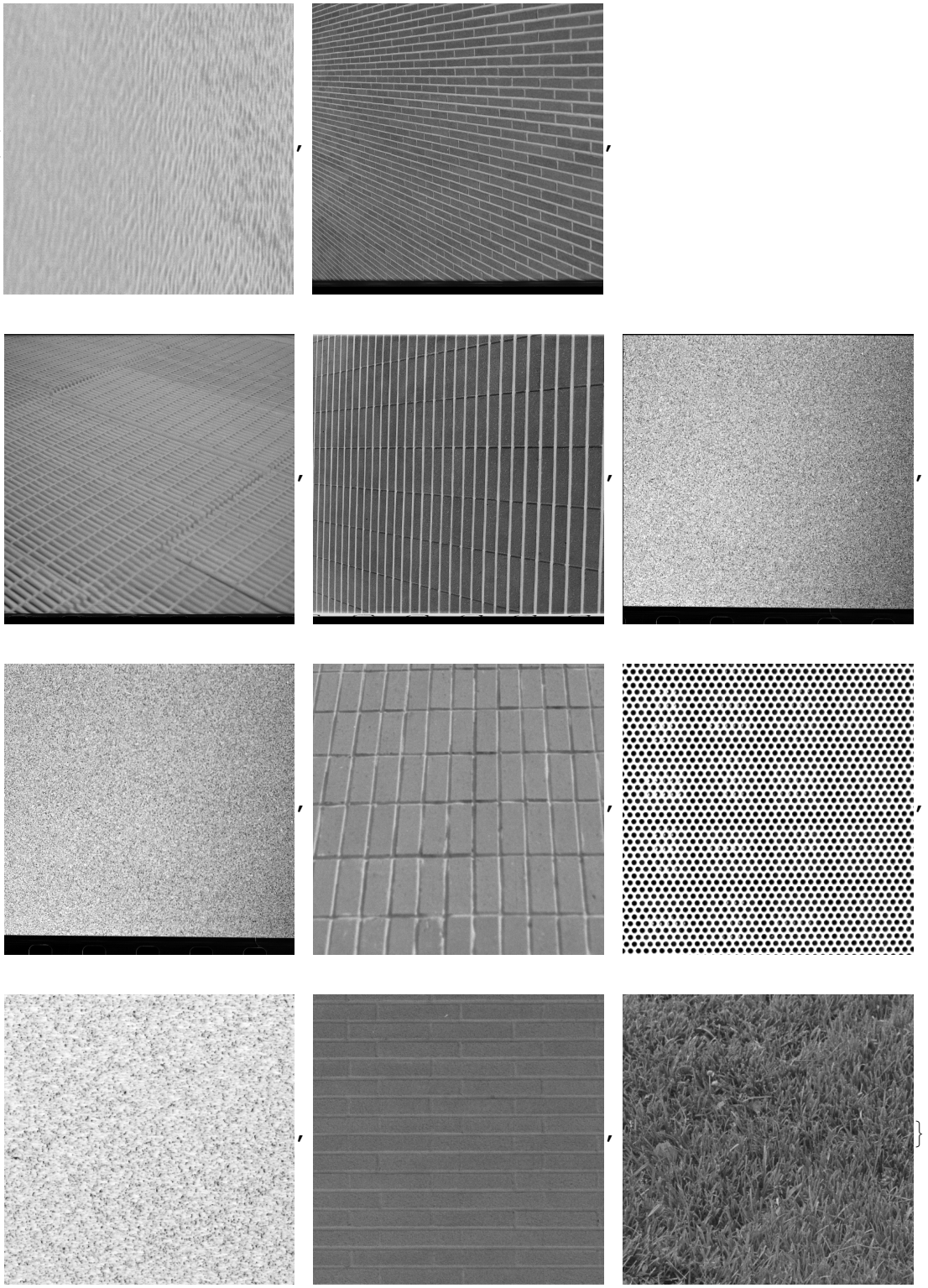


In[41]:=
```
Length[fileNames]
set1 = Position[ca1[[1]], {x_, y_} /; x < 0.5]
Length[set1]
pic1 = Extract[images1, set1]
set2 = Position[ca1[[1]], {x_, y_} /; 0.5 < x < 0.8]
Length[set2]
pic2 = Extract[images1, set2]
set3 = Position[ca1[[1]], {x_, y_} /; x > 0.8]
Length[set3]
pic3 = Extract[images1, set3]
```

Out[41]= 32

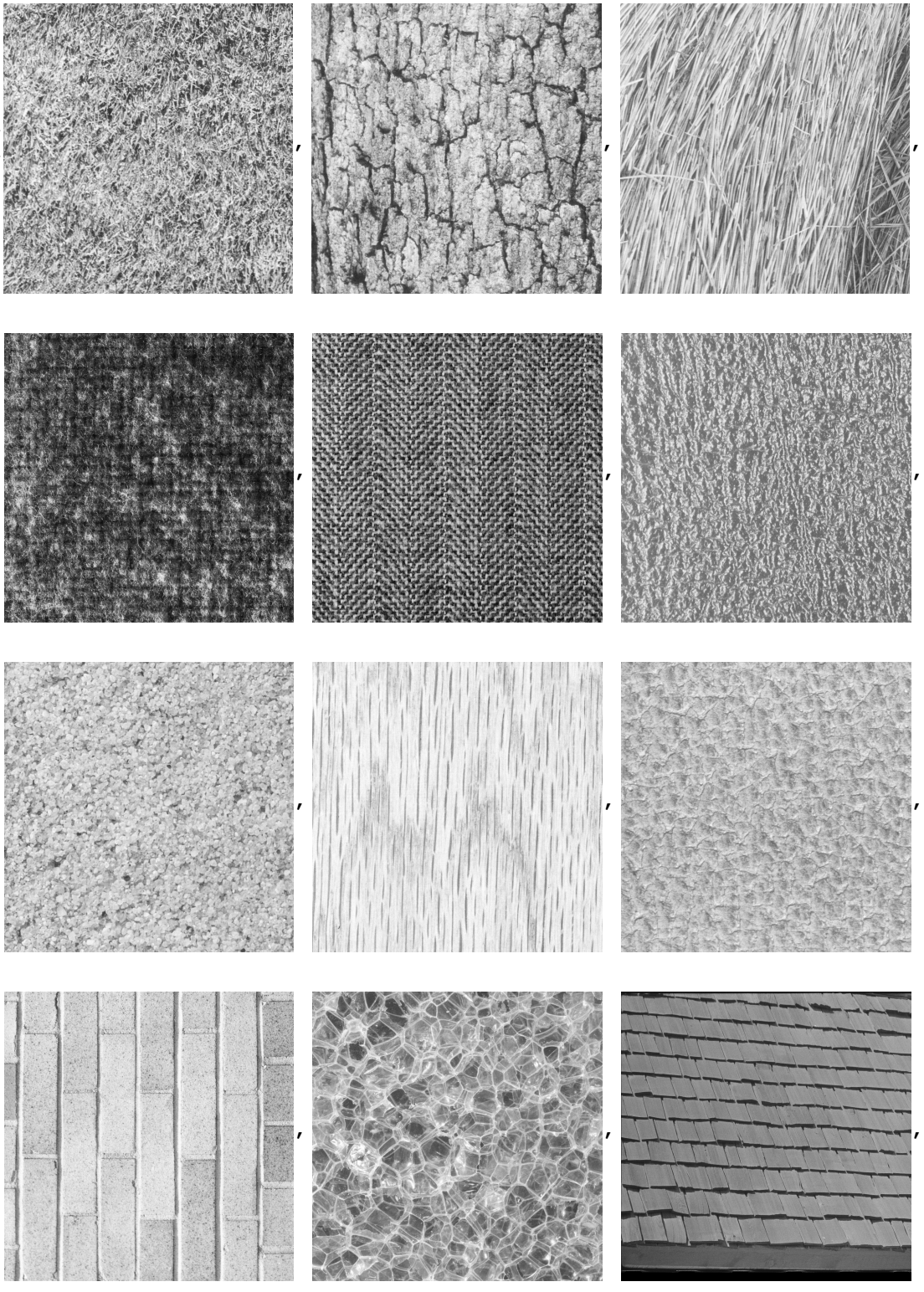
Out[42]= {{8}, {14}, {20}, {22}, {24}, {25}, {26}, {27}, {29}, {31}, {32}}

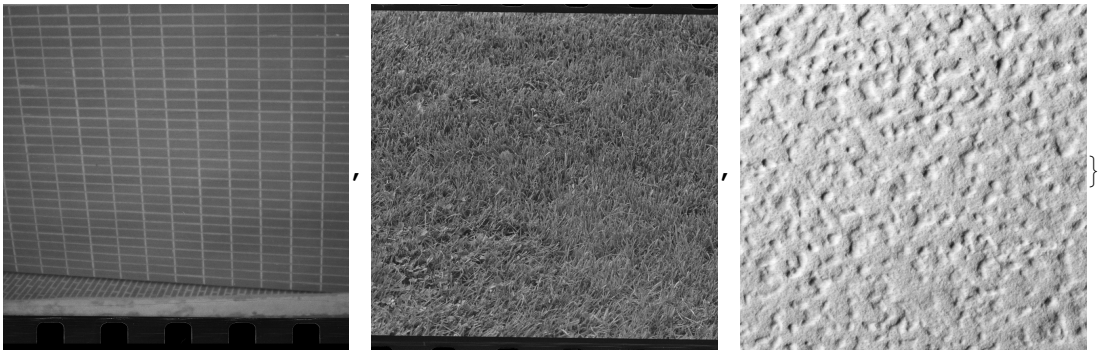
Out[43]= 11

Out[44]= 

Out[45]= {{1}, {2}, {3}, {4}, {5}, {6}, {7}, {9}, {11}, {12}, {13}, {16}, {17}, {23}, {28}}

Out[46]= 15

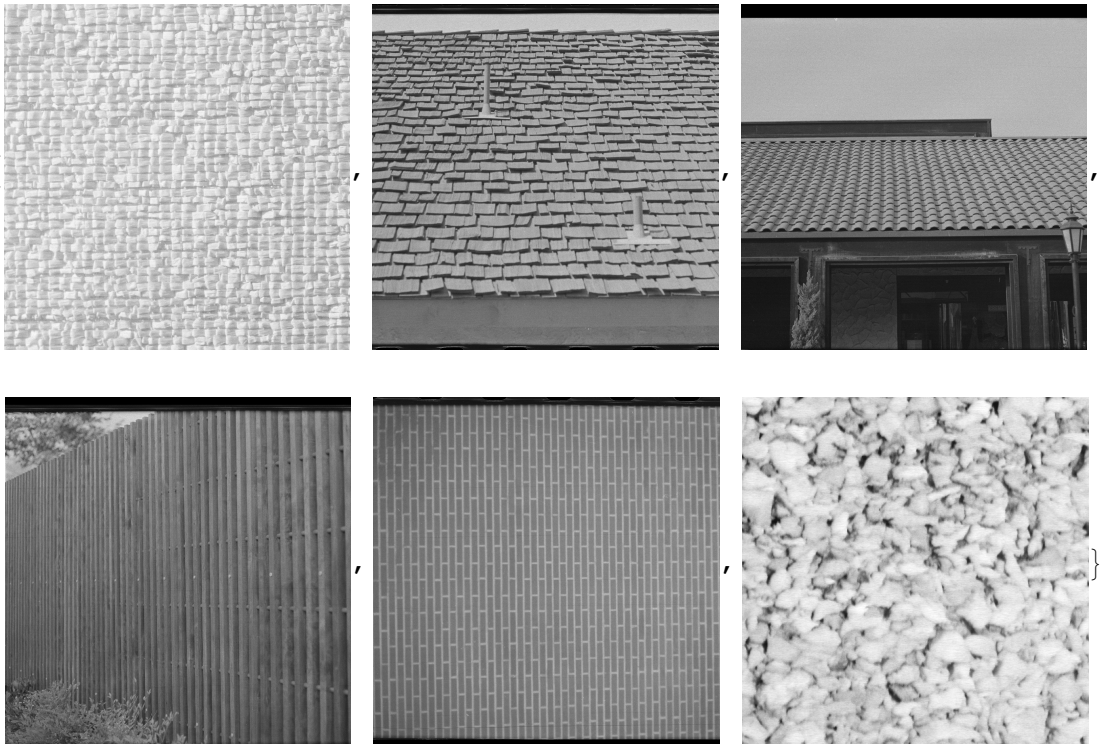
Out[47]= {  }



Out[48]= {{10}, {15}, {18}, {19}, {21}, {30}}

Out[49]= 6

Out[50]=



In[51]:=