Weekly Assignment 7, Clare Churchouse – photocell sensor project

Recording light change over day-time on windowsill to find optimal light/placing for edible plants. Inspired by attempts to grow plants at home with buildings going up across the street. Also by recent coverage of Farmshelf at NewLab ("*Turning your living room into a farm via advanced hydroponic agriculture")* and Gotham Greens rooftop urban agriculture.

One of Gotham Green's farms on rooftop in Greenpoint, Brooklyn, NYC

Grow edible plants indoors – many benefits:
Health – choose not to use fertilizers, pesticides, and herbicides – result is chemical-free vegetables right at your fingertips, organic, fresh, ready to pick and eat
Ecological - lower environmental footprint - reducing the carbon emissions and waste created by shipping and packaging vegetables

Best plants to grow indoors and how to grow them:
http://greatist.com/health/best-plants-to-grow-indoors

Light level in NY apartments – do apartments get enough light to grow edible plants? Use a photocell sensor to measure light during the day in different places.
Questions:
1. what times of day do the plants get light?
2. when there is sunlight is the reading bright or very bright?
3. what is the light reading when the sun is blocked out by buildings?
4. which windowsill is brighter / can all the windowsills be used for growing plants?
5. overall assessment of light during the day - is there enough light to grow edible plants indoors?

Data collection: collect data from 2 windows during daylight hours (6.30am – 6.30pm) over 3 days (to check weather differences across days). Collect light reading and time of reading, 12000 delay, to plot light against time. Checked light against readings to group brightness into very bright; bright; light; dim; very dim; dusk; nearly dark; night.
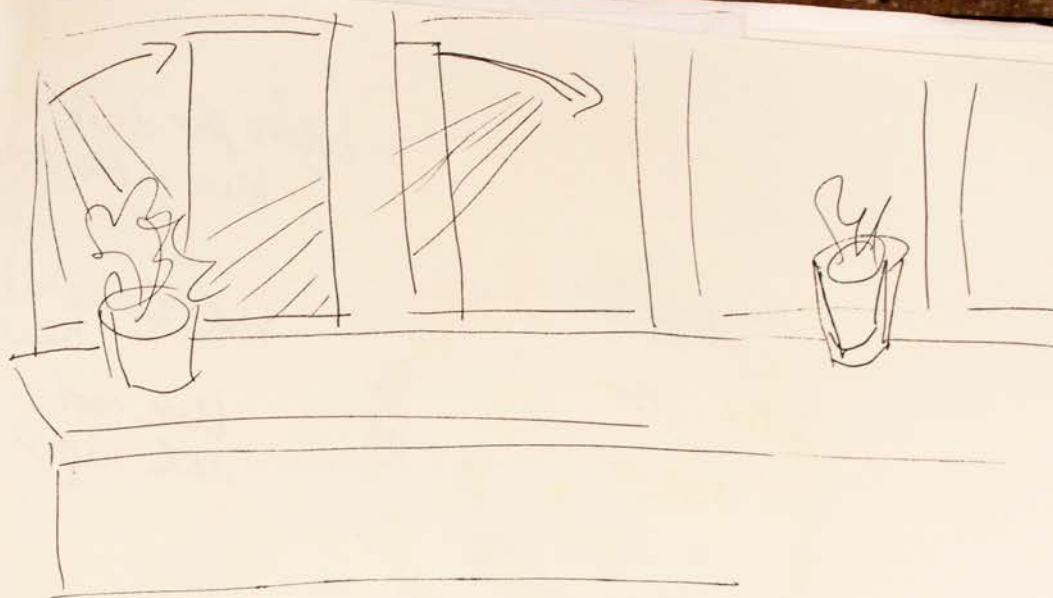
Plants on windowsill

Windows 1 & 2– sun going about to go behind window 1 – same time view from windows 2

Data visualization: since collecting data in the Fall, can use 12-hour time circle to show data.
Looked at Georgia Lupi , NYT visualization, and other examples, e.g.
http://www.nytimes.com/interactive/2012/10/15/us/politics/swing-history.html?_r=0

Drawing ideas below – circles – each circle representing 12 hours, each concentric circle for each week.
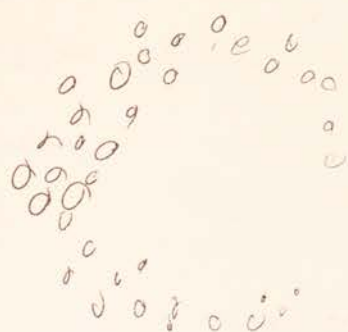Two circles, one for each window.

① What times during the day does a plant get light?

② Is the sunlight bright / very bright?

③ What is the light when the sun is behind the reading new building?
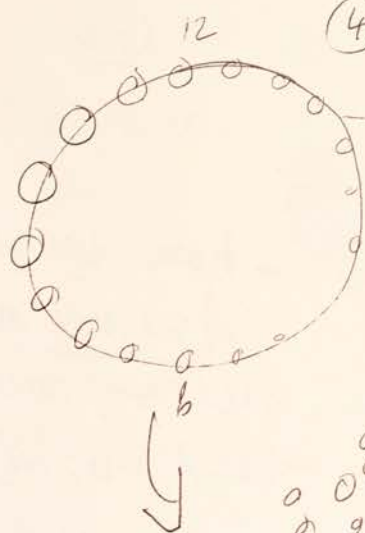
④ Which windowsill is brighter / can they all be used for plants?

12 hrs period — 1 day

size of circle / strength sunlight

⑤ Is there enough sun to grow plants indoors?

× several days
spread circles out
/ more 3D pattern

NY Mag. oct.

very bright

bright

dark — not
enough light

size of dot — larger
the number / larger the
dot

circles
depict a
week's data
collection

12

9

3

b

12

2¾4 hours

3 hrs

9

7

3

b

Assign color to each light reading group – yellow for very bright – to red for dark. Or through green to dark blue / black? Do slight color variants for each window / color code by window.

Hover over dot to get reading – when cursor highlights dot, have small, minimal pop-up with light reading number and a very small image of a plant which grows in that light condition, e.g.

Microgreens - bright ;   Chives – bright/dim;   Mushrooms – dim; Basil – bright – pop up ideas for light readings

In addition, when hover cursor, have the whole timeline for that day highlighted as well. Or have dots being shown in real time as each reading is logged –sequentially around the circle, completing one complete circle per 12 hour day. Each concentric circle for each week so dots overlap to an extent. Use semitransparency so stronger color where overlap.
Consider, instead of dots, having lines coming out from circle's center that are longer if light reading is higher, i.e. brighter – might look of sunlight to circles.

colors for dark -
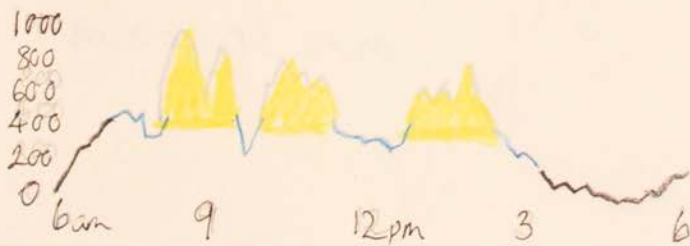blue rather than
red

red connotes
heat

blue cool
dark "night
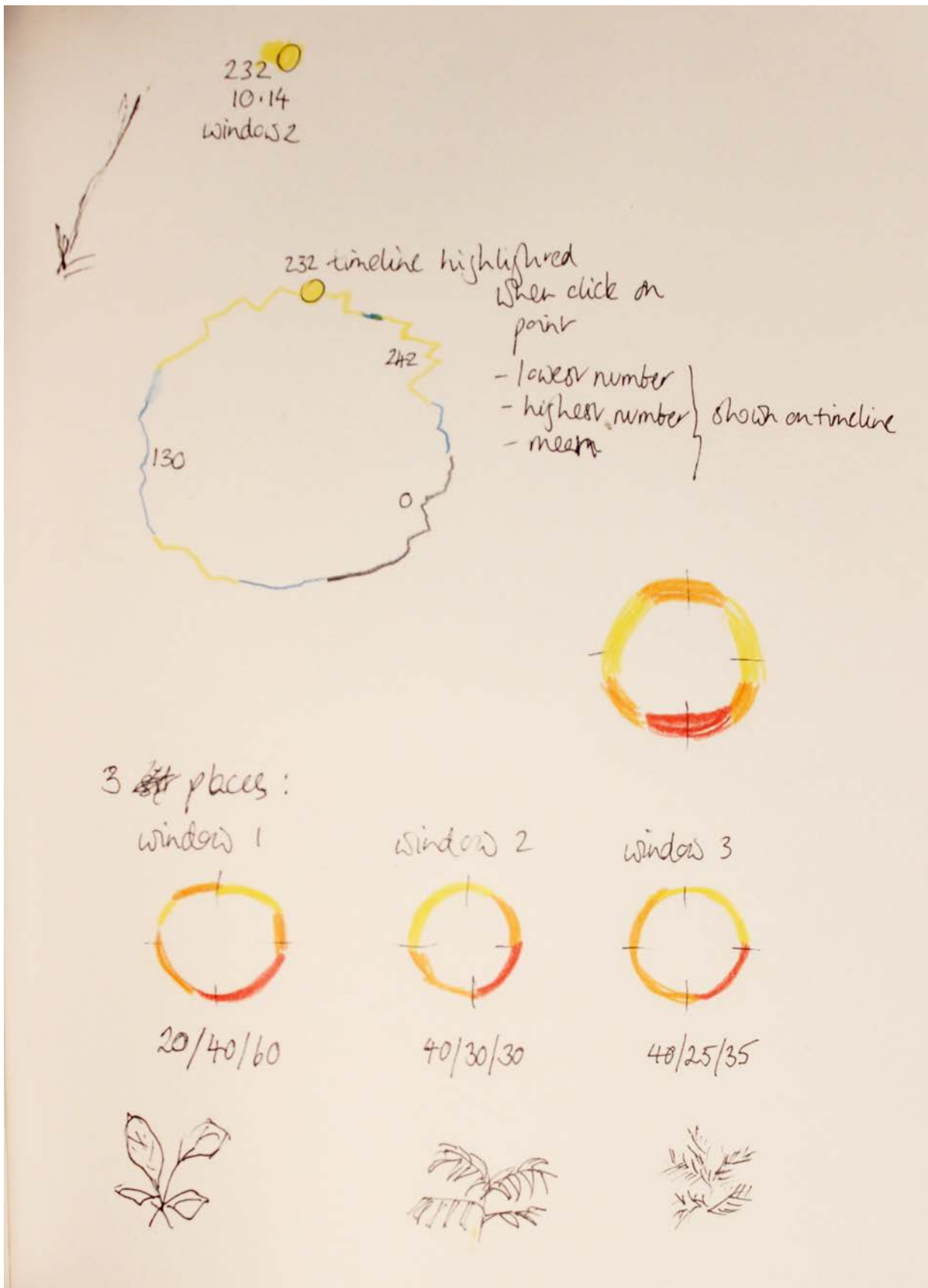
dots / lines semi-
transparent so
aggregate - darker

— show details on
hover

— highlight timeline
colors on
hover

— have dots move
in sequence as
speeded up timeline
— larger when highlighted
continually moving

1000
800
600
400
200
0
6am   9   12pm   3   6

232 ⬤
10.14
windows 2

232 timeline highlighted
when click on
point
242
- lowest number ⎫
- highest number ⎬ shown on timeline
- mean ⎭

130

0

3 places:

window 1	window 2	window 3
20/40/60	40/30/30	48/25/35

Dot is highlighted when you hover it, as is the circular timeline it is part of, i.e. all the readings from 12 hours are highlighted.

```
// read from the analog input connected to the LDR
// and print the value to the serial port.
// the delay is only to avoid sending so much data
// as to make it unreadable.

void loop() {
  int photocellReading = analogRead(photocellPin);
 // Serial.println(photocellReading);
  int v = analogRead(LDR);
  Serial.write("  ");
//  Serial.println(v);

  if (photocellReading < 50) {
   Serial.write("  Night:");
   Serial.println(v);
 } else if (photocellReading < 200) {
   Serial.write("  Nearly dark:");
   Serial.println(v);
   } else if (photocellReading < 350) {
   Serial.write("  Dusk:");
   Serial.println(v);
   } else if (photocellReading < 500) {
   Serial.write("  Very dim:");
   Serial.println(v);
   } else if (photocellReading < 650) {
   Serial.write("  Dim:");
   Serial.println(v);
 } else if (photocellReading < 800) {
   Serial.write("  Light:");
   Serial.println(v);
 } else if (photocellReading < 950) {
   Serial.write("  Bright:");
   Serial.println(v);
 } else  {
   Serial.write("  Very bright:");
   Serial.println(v);
 }
  delay(5000);
}
```

Done uploading.

/dev/cu.usbmodem1451 (Arduino/Genuino Uno)

Send

```
Nearly dark:69
Nearly dark:66
Nearly dark:65
Nearly dark:67
Nearly dark:65
Nearly dark:64
Nearly dark:64
Nearly dark:63
Nearly dark:63
Nearly dark:61
Nearly dark:60
Nearly dark:60
Nearly dark:59
Nearly dark:58
Nearly dark:58
Nearly dark:57
Nearly dark:56
Nearly dark:56
Nearly dark:55
Nearly dark:54
Nearly dark:53
Nearly dark:55
Nearly dark:54
Nearly dark:54
Nearly dark:52
Nearly dark:52
Nearly dark:51
Nearly dark:51
Nearly dark:50
Nearly dark:50
Nearly dark:50
Night:49
Night:48
Night:48
Night:47
Night:46
```

Autoscroll   Both NL & CR   9600 baud

Late day reading: 6.24pm – 6.29pm

Need to add time of day.
Initial explorations in r - note data not plotted with time:
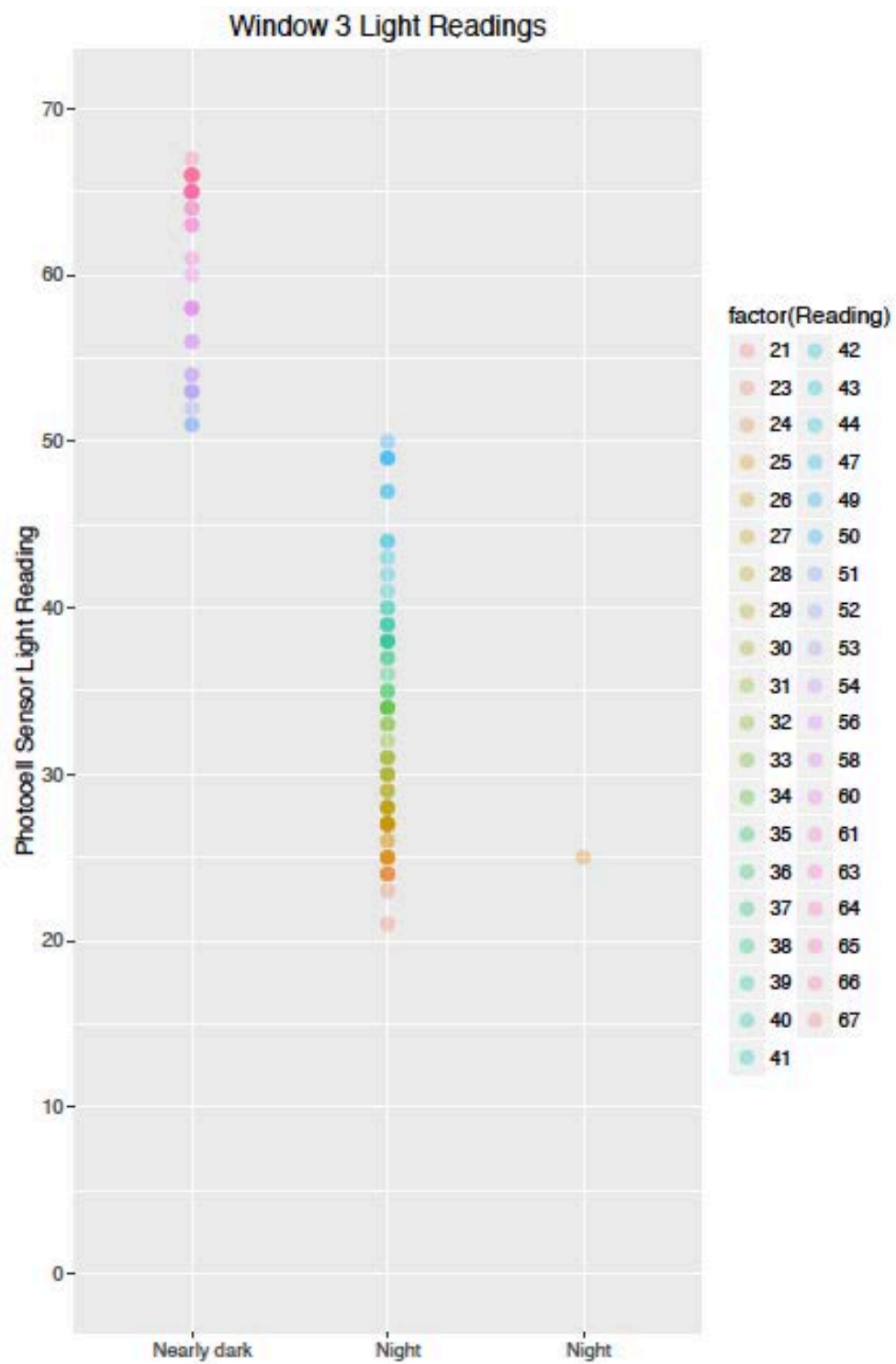
First try at plotting points in concentric circles in r.
Again, note, data not plotted with time: