

Scatterplots and Scientific Hypotheses

Bellringer question

- What is a hypothesis?

Bellringer question

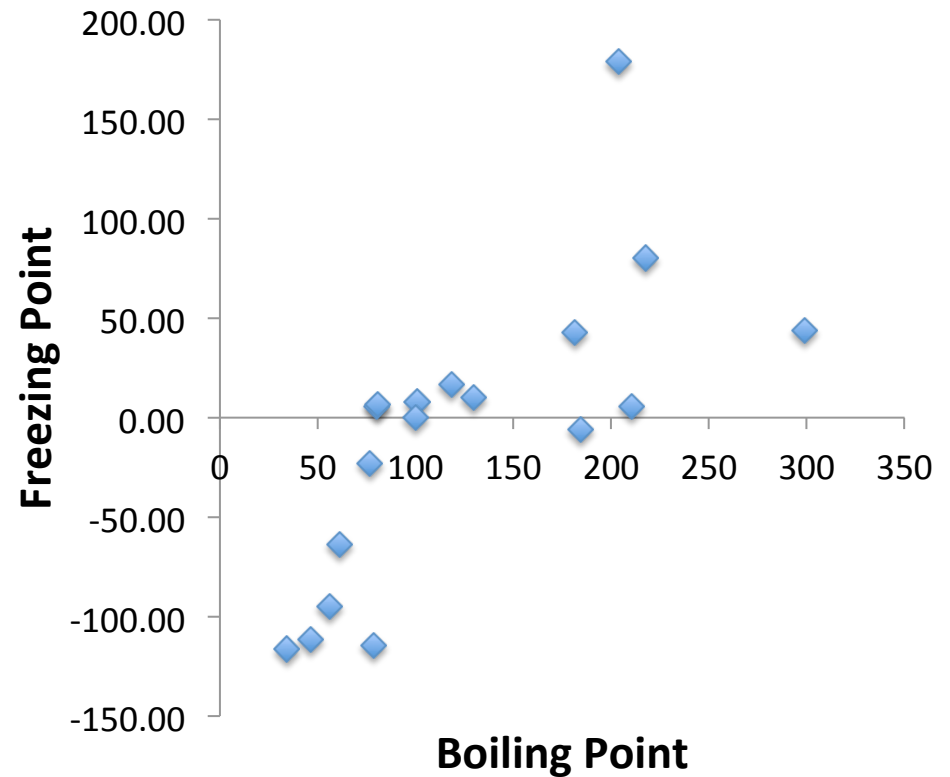
- If you roll a dice two times, and get a high number, what does that mean about your next roll?
 - Hypothesis 1: It should be a high number.
 - Hypothesis 2: It should be a low number.
 - Hypothesis 3: It doesn't matter.
- Let's test it!

The experiment

- I will need 10 volunteers.
- Roll 2 dice, and add up the score.
 - Write down that sum.
- Roll 2 dice again, and add up their score.
 - Write down that sum.
- If you got a high score on the roll, are you more or less likely to get a high score again?

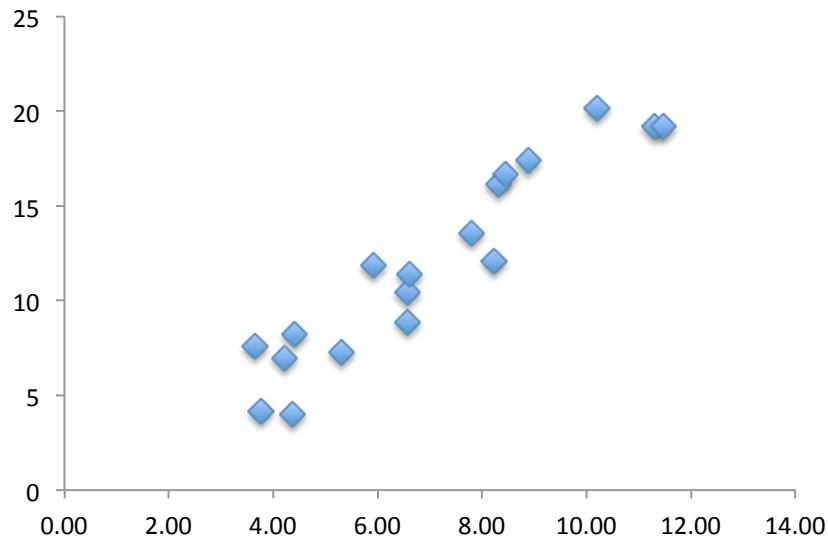
Scatter Plots

- A scatter plot is a graph of (x,y) points, but without a line connecting all of them.

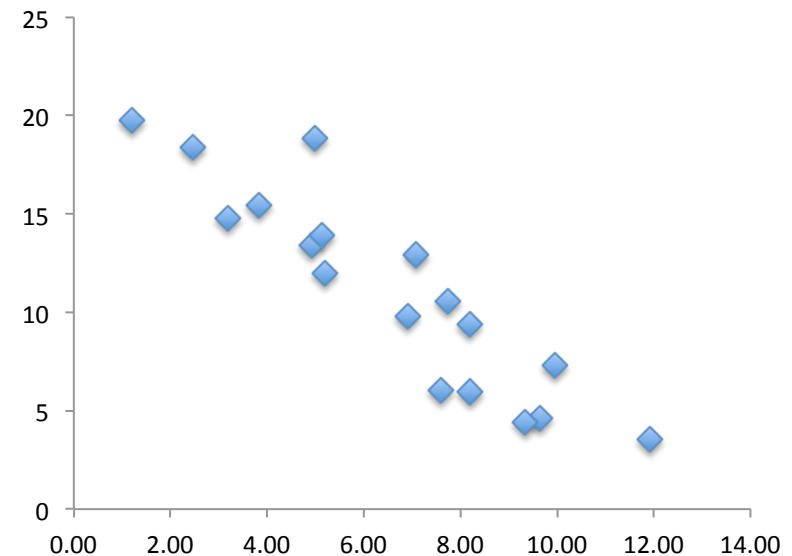


Ways to describe a scatter-plot

- Positive association-
When one thing happens, another thing will probably happen too.

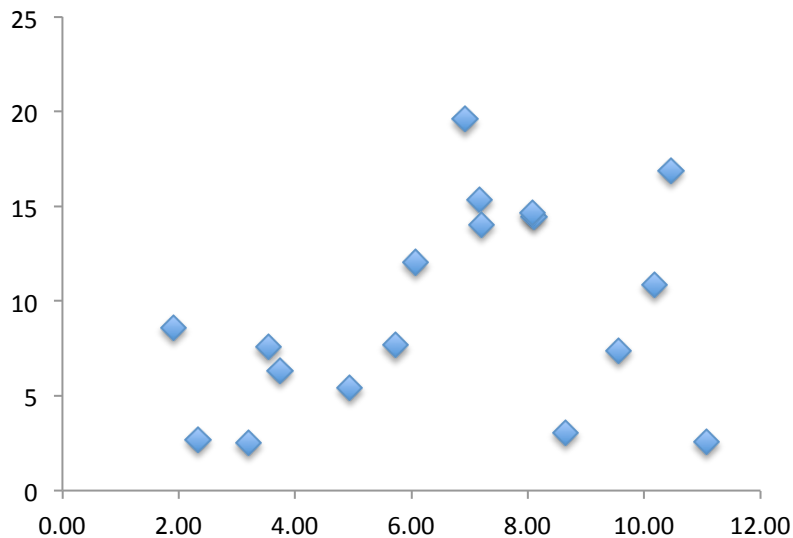


- Negative association-
When one thing happens, another thing probably will not happen.



Ways to describe a scatter-plot

- No association- When one thing happens, it has no effect on the other thing.



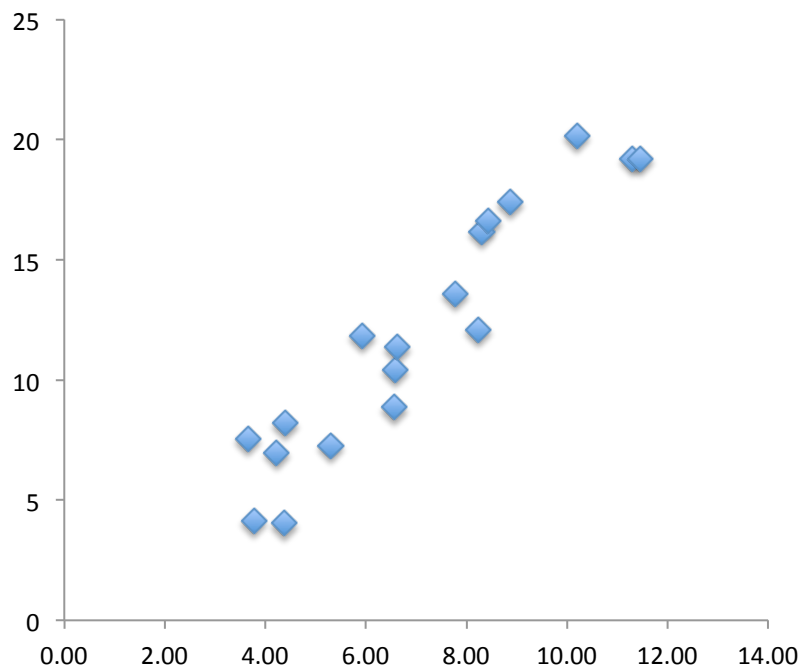
So, which one are our dice rolls?

Bellringer question

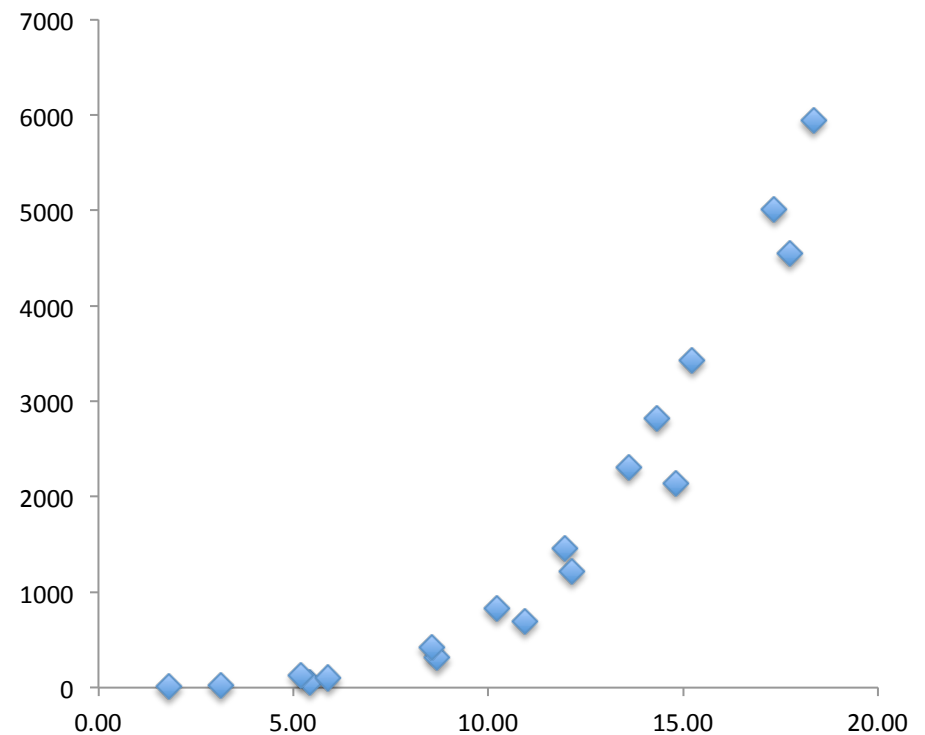
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More ways to describe a scatter-plot

- Linear- The points fit in a straight line (or close to it).

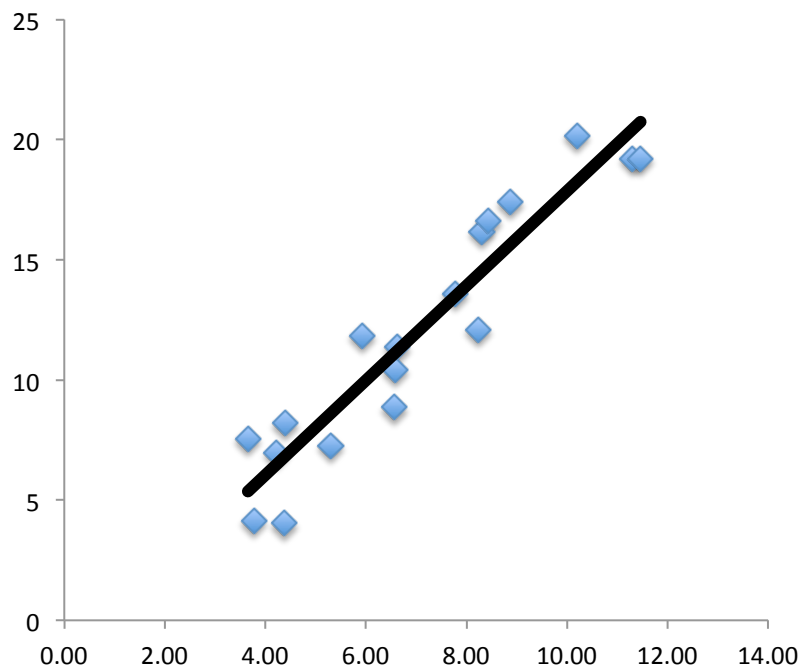


- Non-linear- The points do not fit in a straight line.

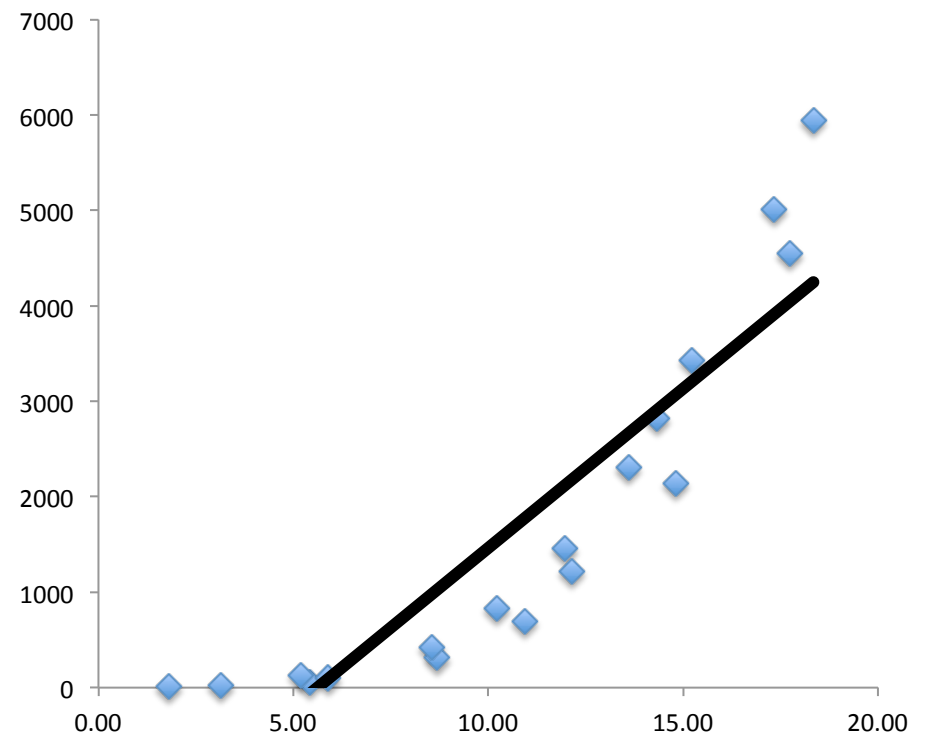


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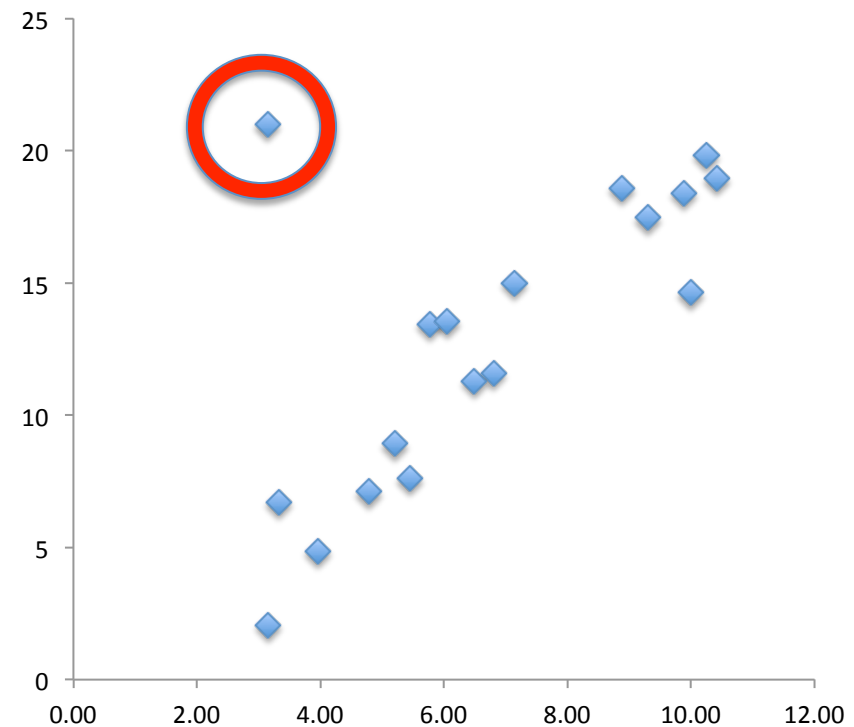
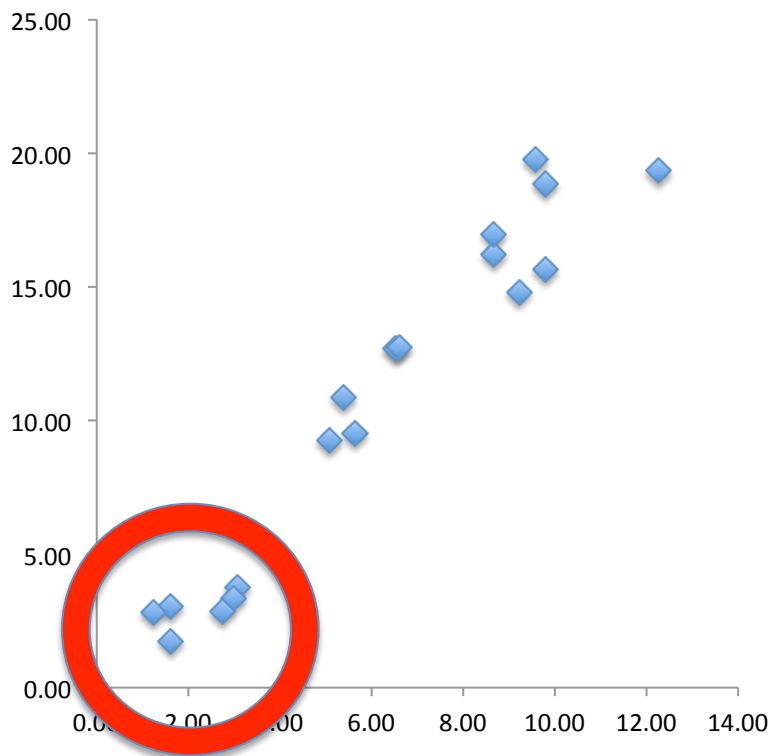


- Non-linear- The points do not fit in a straight line.



More ways to describe a scatter-plot

- Cluster- Lots of points that are close together.
- Outlier- A point that is really far from the others.



1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 -71	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 -103	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo

57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Known in antiquity	akw Seaborg published his periodic table (1945)
also known when (akw) Lavoisier published his list of elements (1789)	also known (ak) up to 2000
akw Mendeleev published his periodic table (1869)	ak to 2012
akw Deming published his periodic table (1923)	

Picture from Wikipedia, Author Sandbh

Experiments in Panama

We know that tree seeds are sometimes killed by fungus.

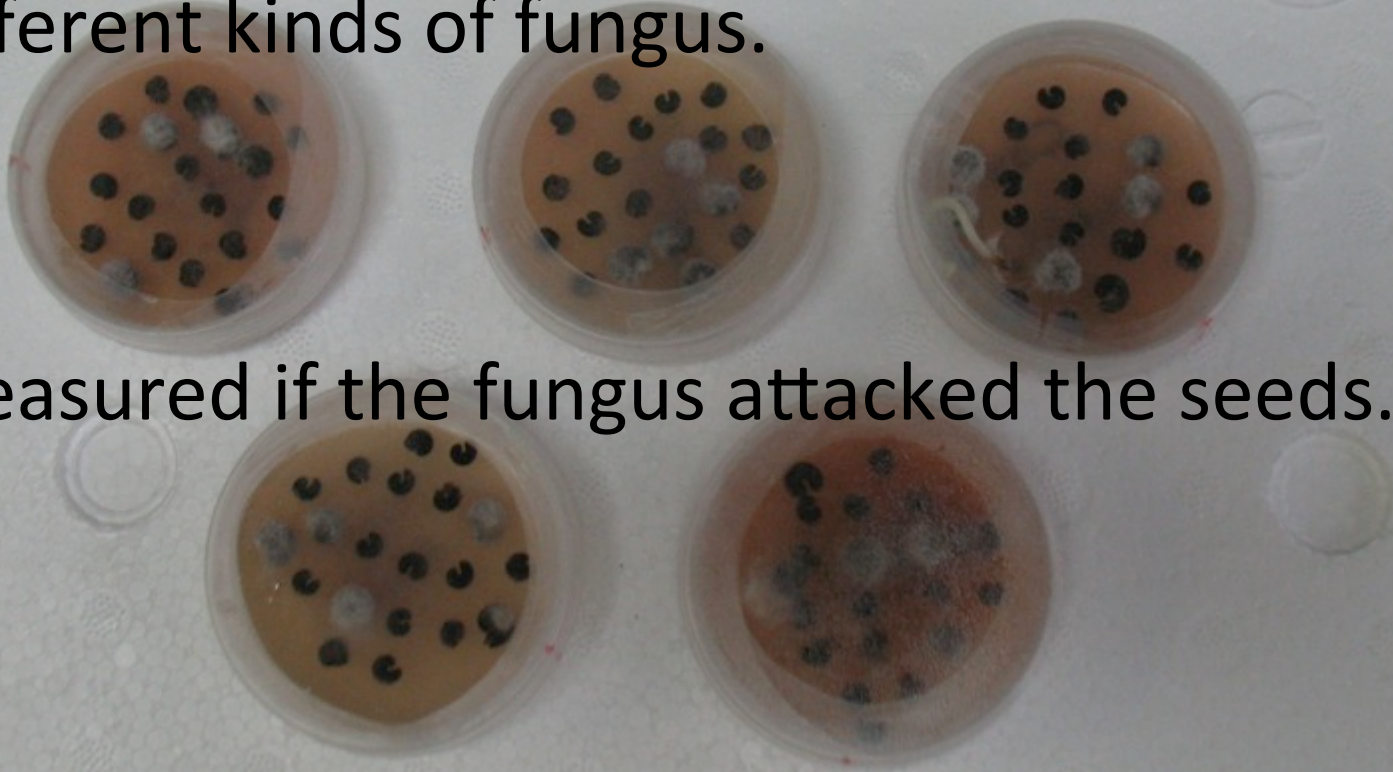
How do seeds defend themselves?

Are there ways to classify how different fungi act?

Photo by Simon Stump

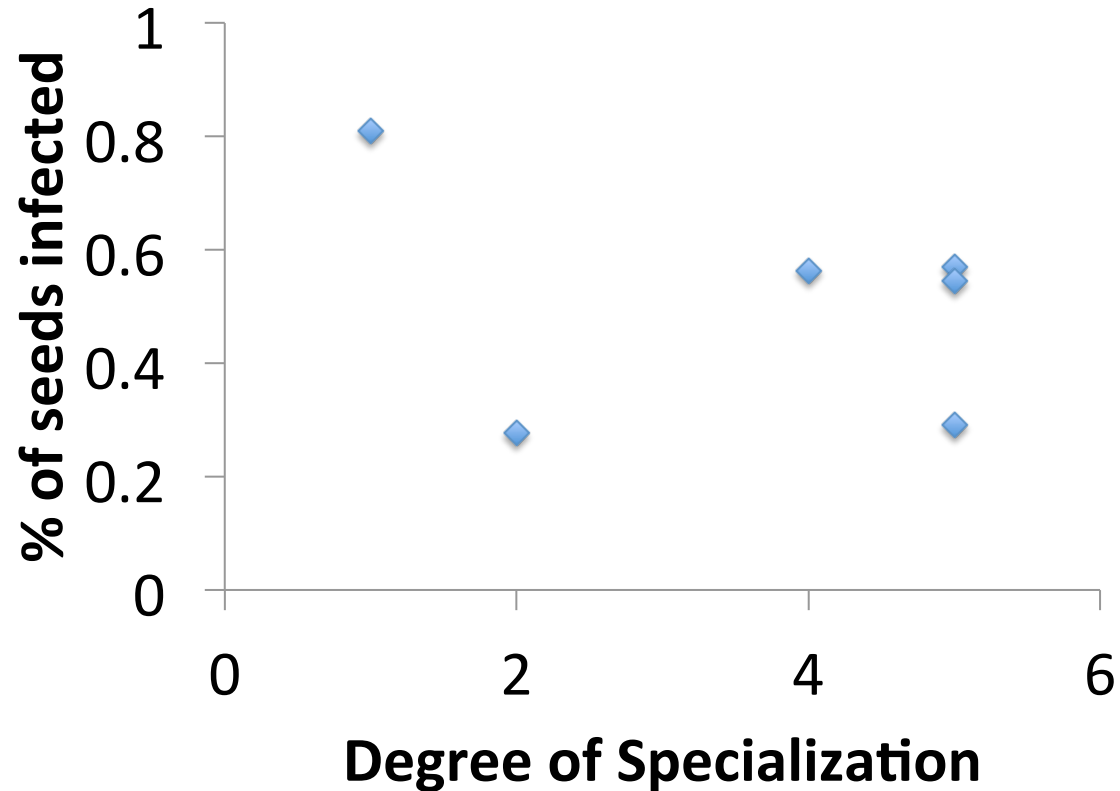
The Experiment

- Took clean seeds, and exposed them to different kinds of fungus.
- Measured if the fungus attacked the seeds.



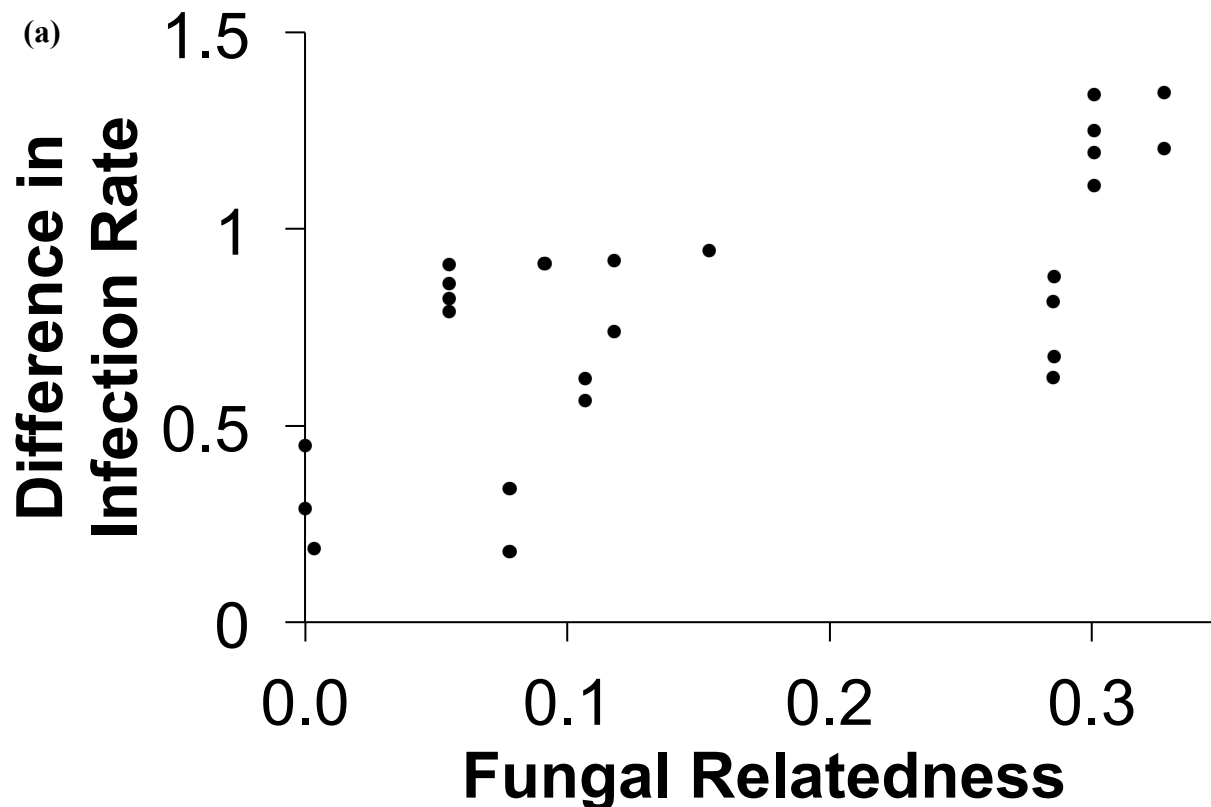
Hypothesis 1

- Specialist fungi will have higher infection rates.



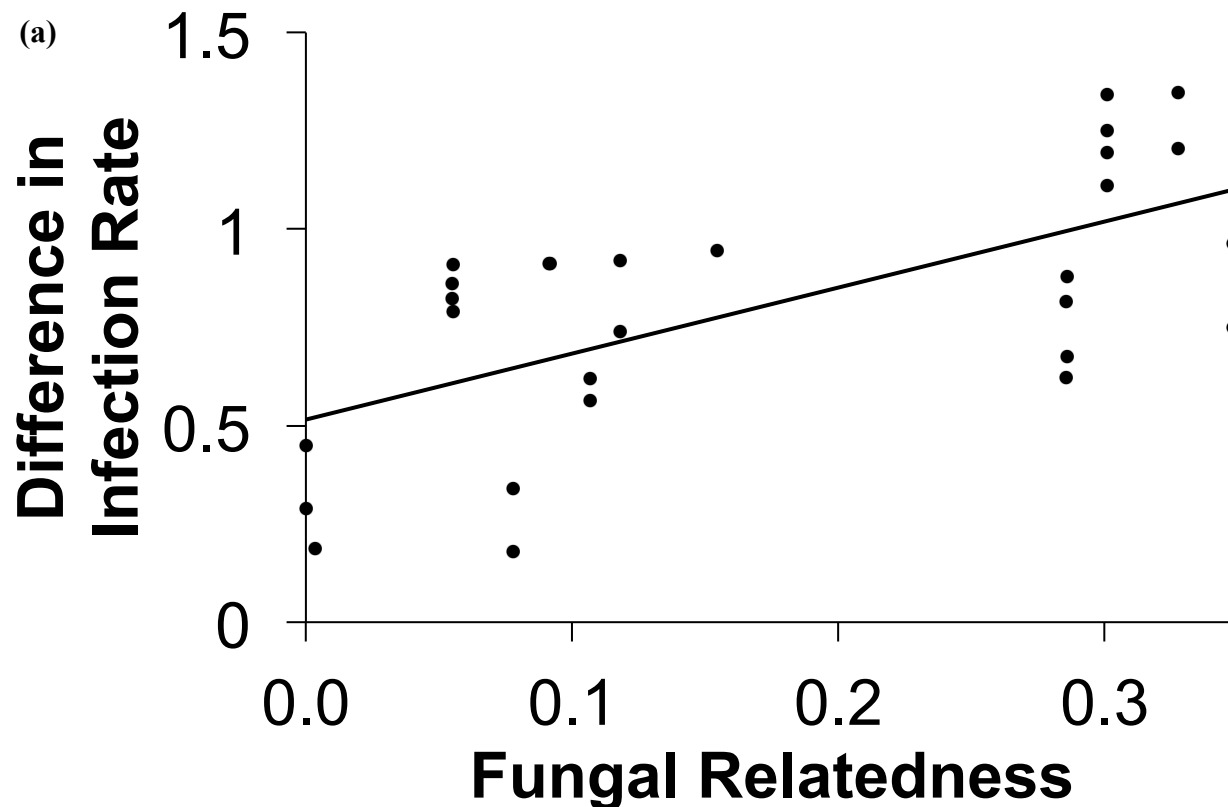
Hypothesis 2

- If a fungus has a really high infection rate, then related fungi should also have a high infection rate.



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Data from Stump and Arnold, Unpublished