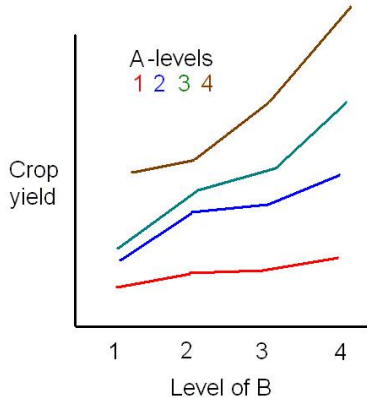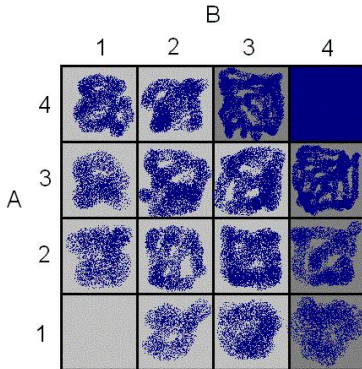# Unit 1: Getting Data

O(ne) F(actor) A(t) A T(ime)???

The experimental ideal used to be "change only one factor at a time" in different runs of an experiment. But more recently scientists are realizing the possibility of interaction of two (or more) different stimuli, so they'll try varying them independently.

The picture on the next slide is a cartoon of an aerial photo of several plots of farmland, which received different levels of two different kinds of fertilizer.

If none of fertilizer A was used, the crop yield didn't change much as more of B was added. But with higher levels of A, the effect of using more B was much more dramatic.

The experimental design is not very well thought out, however; the plots receiving more A or more B should have been scattered around randomly, maybe by making slips saying "A1 B1", "A1 B2", etc., and drawing them out of a hat, instead of always increasing B as we move to the right and A as we move upward.

From an episode of The Simpsons
(Season 7, "Much Apu About Nothing")

Springfield had just spent millions of dollars creating a highly sophisticated "Bear Patrol" in response to the sighting of a single bear the week before.

- ▶ Homer: Not a bear in sight. The "Bear Patrol" is working like a charm!

- ▶ Lisa: That's specious reasoning, Dad.

- ▶ Homer: [uncomprehendingly] Thanks, honey.

- ▶ Lisa: By your logic, I could claim that this rock keeps tigers away.

- ▶ Homer: Hmm. How does it work?

- ▶ Lisa: It doesn't work. (pause) It's just a stupid rock!

- ▶ Homer: Uh-huh.

- ▶ Lisa: But I don't see any tigers around, do you?

- ▶ Homer: (pause) Lisa, I want to buy your rock.

"Denmark's Social Research Institute says single fathers are calmer and less likely to punish their children than lone mothers ..."

- Study: 1200 kids, aged 3–5, half with only mom, half with dad.
- Moms were found to be more stressed and depressed, less self-confident, have more nightmares and insomnia, more conflict with kids, be quicker to hit or punish ... not because of genetics, but less money (jobless or underpaid)
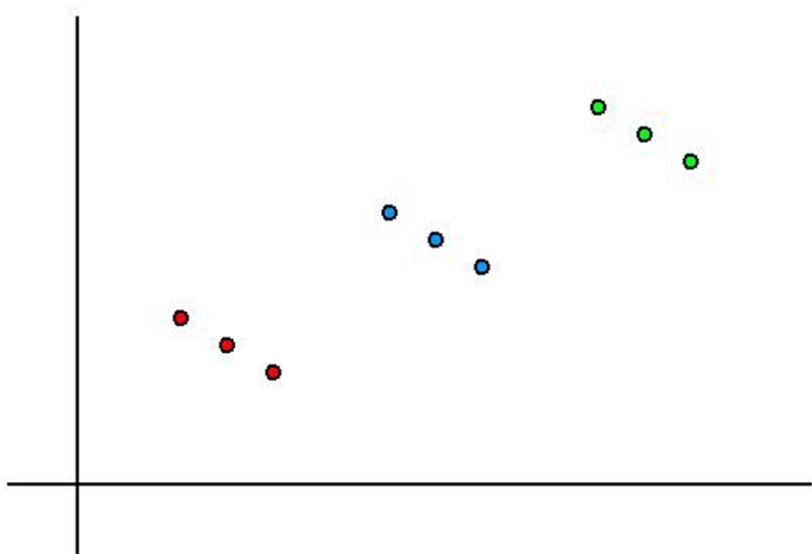
But what caused what?:

- Being a single mom caused poverty and stress?
- Or poverty and stress caused a single parent to be Mom?

Researcher Mögens Nygaard: "Only 6% of all single-parent children aged 3 to 5 lived with their fathers, implying that the relatively few men who actively sought responsibility for their children were strongly motivated to meet the challenges."

So what? Well, if being single mom causes poverty and stress, remedy sex bias in jobs. If poverty and stress causes single parent to be Mom, go after deadbeat dads.
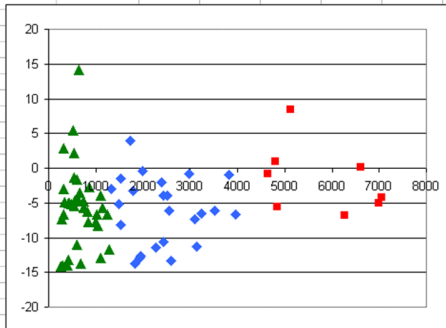
Artificial example of Simpson's Paradox II

Real example of Simpson's Paradox II

The graph on the next slide shows the population of cities in New York State versus their rate of growth. The value on the horizontal axis is the city's population in 1900 (I've left out NYC and Buffalo because they would be "outliers" to the right), and the vertical is the ratio of its population in 1950 to that in 1900. I divided the data into three parts by population in 1900; the "correlations" show that, while within each group the larger cities grew faster (the correlation is positive), overall the larger a city was, the more slowly it grew (the correlation was negative).

Village populations in CNY vs. % population increase 1990 to 1998

	r's:
small	-0.086383
medium	-0.030814
large	-0.402356
overall	0.137419

Is there a lurking variable here? If so, I don't know what it is.