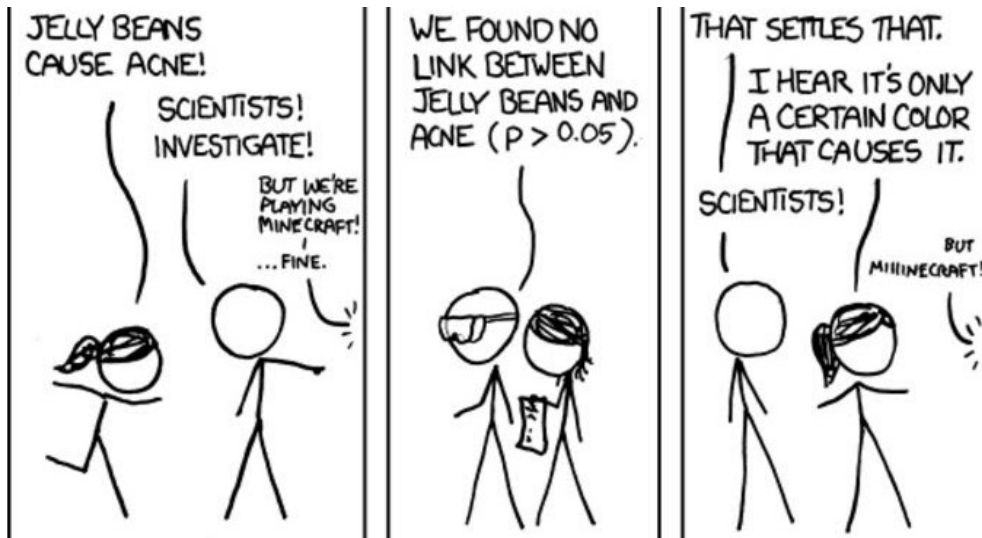


STA 235H - Randomized Controlled Trials I

Fall 2021

McCombs School of Business, UT Austin

Today



- Randomized Controlled Trials:

Assumptions: The power of randomization

Design: What should we consider?

Limitations: Gold Standard?

The Magic of Randomization

The Fundamental Problem of Causal Inference

- Remember that we can only see one potential outcome
 - E.g. if Z is binary, either $Y(0)$ **OR** $Y(1)$

Fundamental Problem of Causal Inference

- Need for the **ignorability assumption**

$$Y(z) \perp\!\!\!\perp Z \quad \forall z \in Z$$

- Most times, **the ignorability assumption doesn't hold**
 - Why? (Remember the two types of bias we saw the previous class?)

Ignorability Assumption

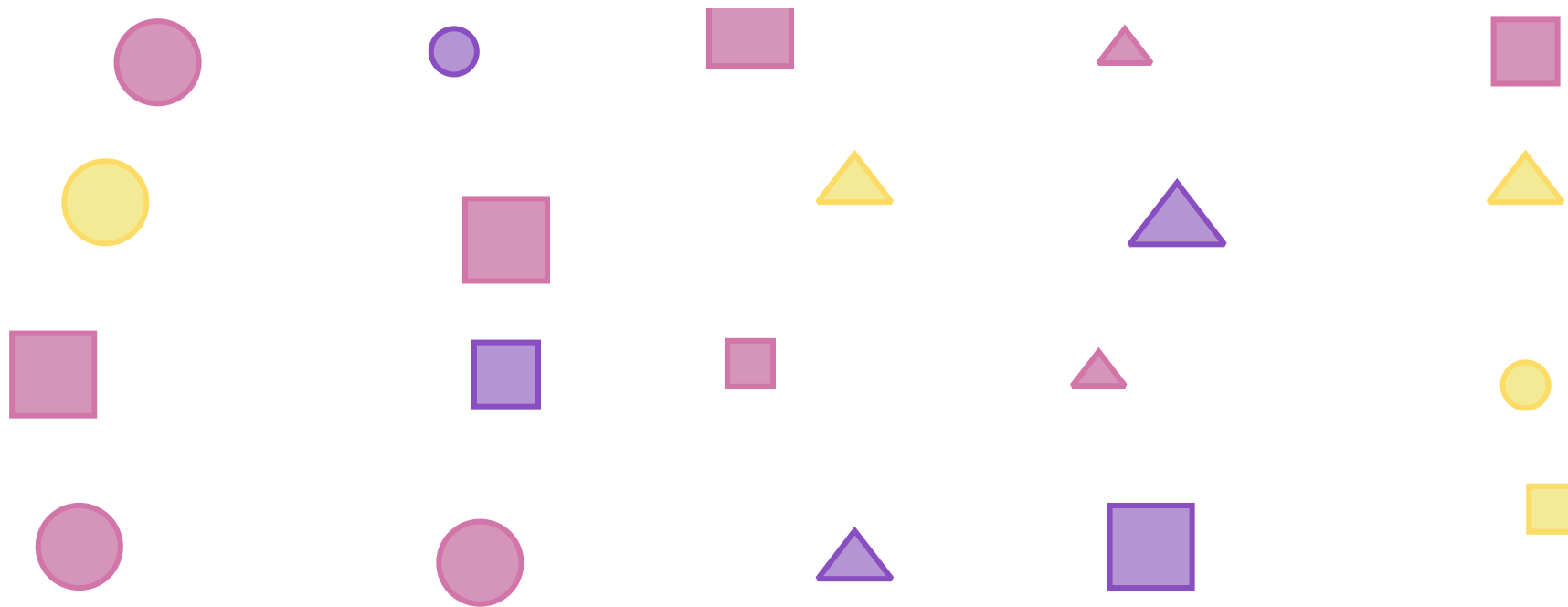
$$(Y(0), Y(1)) \perp\!\!\!\perp Z$$

- Most times, **the ignorability assumption doesn't hold**
 - For ATE:

Selection bias

Heterogeneous treatment effect bias

The problem with self-selection



Play

The power of randomization

- One way to make sure the ignorability assumption holds, is to do it by design:

Randomize the assignment of Z

i.e. Some units will **randomly** be chosen to be in the treatment group and others to be in the control group.

What does randomization buy us?

The power of randomization

- One way to make sure the ignorability assumption holds, is to do it by design:

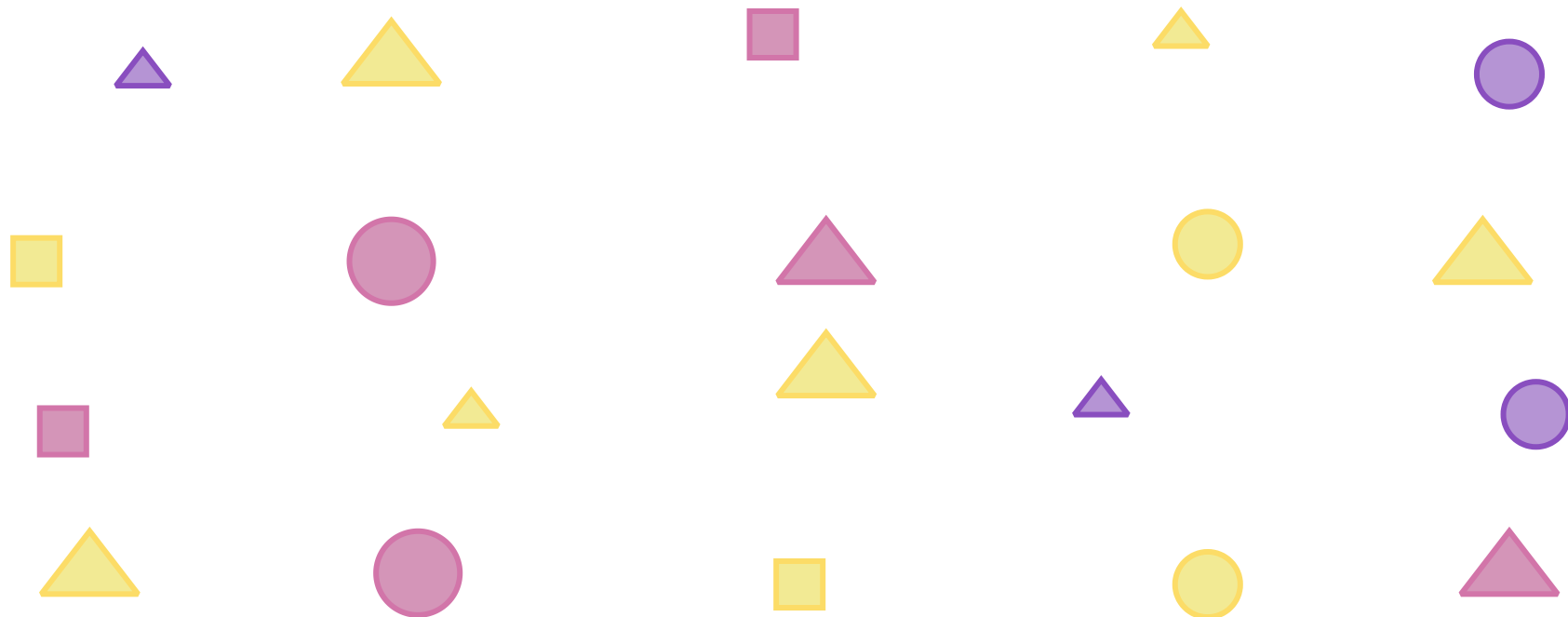
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i.e. Some units will **randomly** be chosen to be in the treatment group and others to be in the control group.

What does randomization buy us?

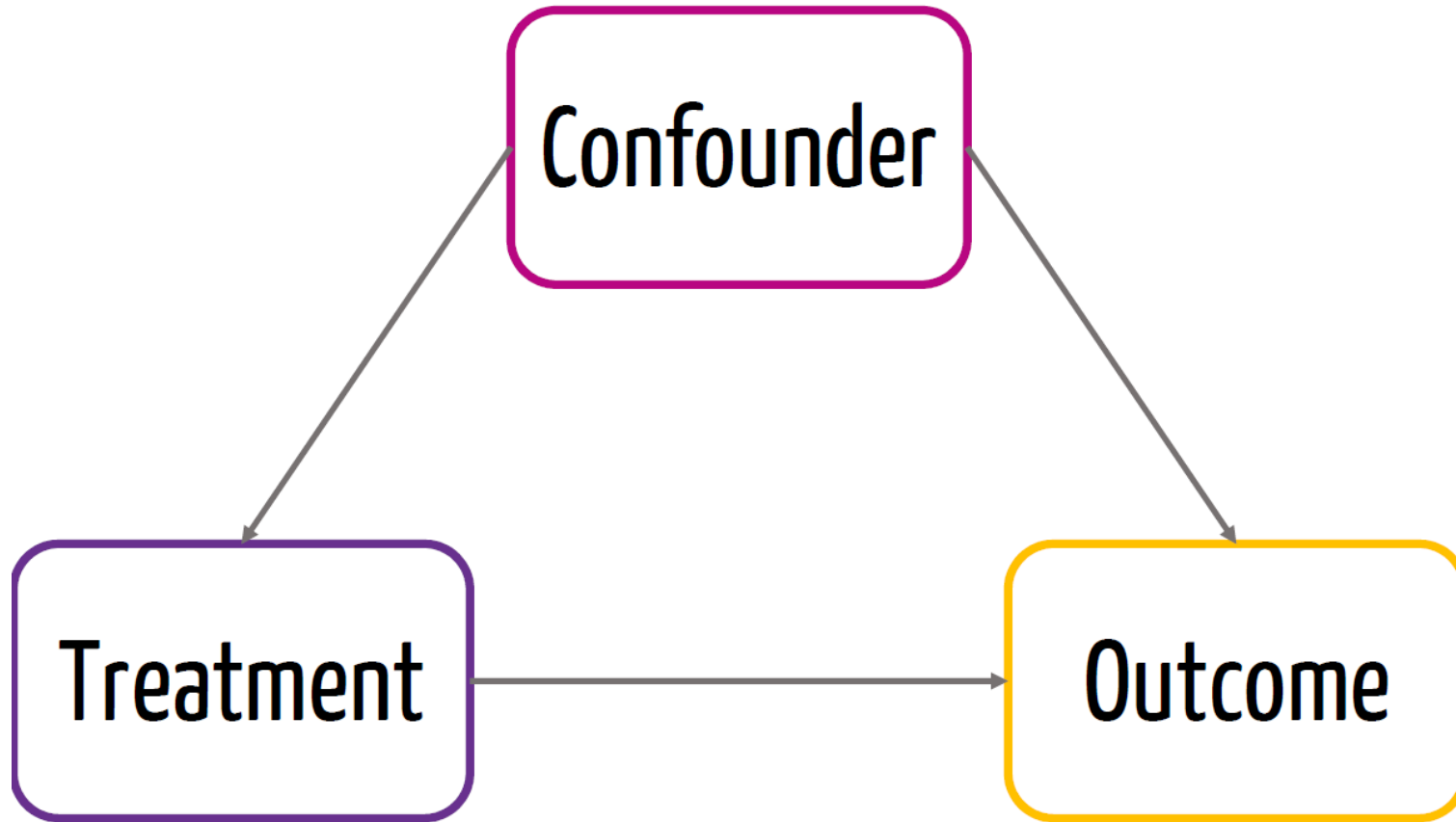
No (systematic) selection on observables OR unobservables

Randomization of z

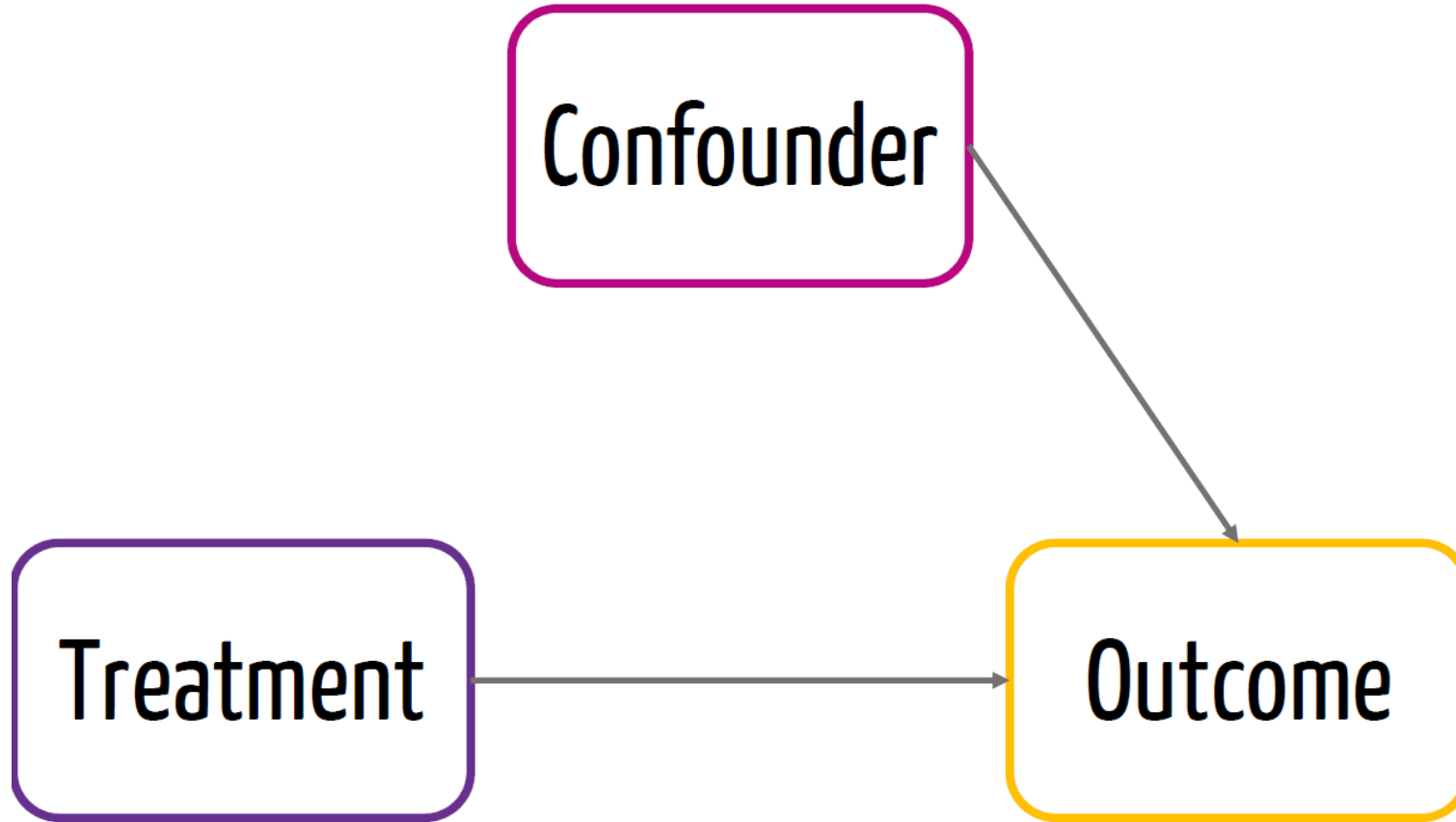


Play

Observational Causal Graph



Experimental Causal Graph

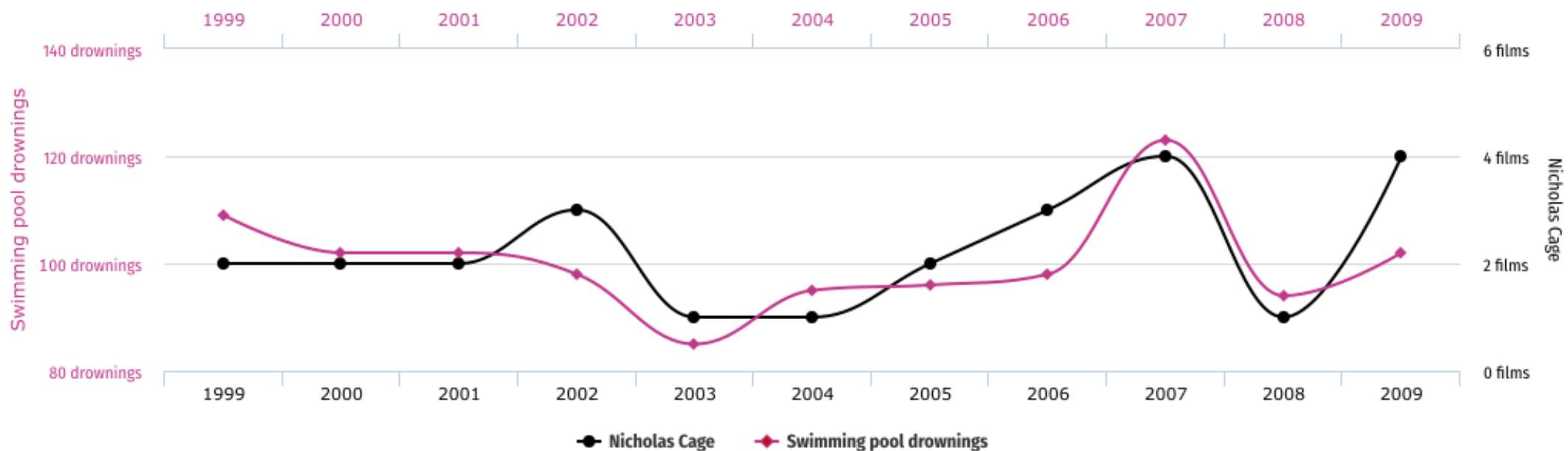


If I randomize treatment allocation...

Can the treatment be potentially correlated with a confounder?

Just by chance!

Number of people who drowned by falling into a pool
correlates with
Films Nicolas Cage appeared in



RCTs: The Gold Standard

The New York Times

Nobel Economics Prize Goes to Pioneers in Reducing Poverty

Three professors, Abhijit Banerjee and Esther Duflo, both of M.I.T., and Michael Kremer of Harvard, were honored.



Abhijit Banerjee and Esther Duflo, both of M.I.T., and Michael Kremer of Harvard University won the Nobel Memorial Prize in Economic Sciences. Jonathan Nackstrand/Agence France-Presse — Getty Images

The Nobel went to economists who changed how we help the poor. But some critics oppose their big idea.

Randomized controlled trials and the debate over them, explained.

By Kelsey Piper | Dec 11, 2019, 9:00am EST



The Laureates of The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel (L-R) Michael Kremer, Esther Duflo and Abhijit Banerjee pose after their Nobel Lectures at Stockholms University in Stockholm, Sweden, on December 8, 2019. | Photo by CHRISTINE OLSSON/TT News Agency/AFP via Getty Images

How to analyze RCTs?

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Easy! (Statistically speaking)

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1) Check for balance

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Easy! (Statistically speaking)

1) Check for balance

2) Calculate difference in sample means between treatment and control group

Let's see an example

Are Emily and Greg More Employable Than Lakisha and Jamal?

- Actual **field experiment** conducted in Boston and Chicago.
- Send out resumes with **randomly assigned names**:
 - Female- and male-sounding names.
 - White- and African American-sounding names
- Measure whether **applicant was called back**

Let's go to R

Next class

- Finish with **randomized controlled trials**:
 - How do we assign treatment randomly in practice?
 - Stratification
 - Limitations of RCTs.
- Selection on **observables**
- The wonderful world of **matching!**

