

# **Who Gets What?: The New Economics of Matchmaking and Market Design**

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# Market designers study markets and marketplaces

- What are they for?
- How do they work?
- How do they fail?
- How can we fix them when they're broken?

# Today I'll start with an even simpler question

- What is the role of money in markets?

# Commodity markets

**Fruit market**



**NY Stock Exchange**



# Small trades in large commodity markets can be arms-length and anonymous

- When buying 100 shares of AT&T on the New York Stock Exchange, you don't need to worry about whether the seller will pick you—**you don't have to submit an application or engage in any kind of courtship.** Likewise, the seller doesn't have to pitch himself to you.
- The price does all the work, bringing the two of you together at the price at which supply equals demand. **On the NYSE, the price decides who gets what.**
- The market helps do “price discovery” to find prices that work.

# But in many markets prices don't do all the work

- **Stanford doesn't raise tuition until just enough applicants remain to fill the freshman class.**
- Selective colleges in the U.S. try to keep the tuition low enough so that *many* students would like to attend, and then they admit a fraction of those who apply.
- Colleges don't rely on prices alone to equate supply and demand
- **Labor markets and college admissions are more than a little like courtship and marriage:** each is a two-sided matching market that involves searching and wooing on both sides.

# *Matching markets*

- *Matching markets* are markets in which **you can't just choose what you want, you also have to be chosen.**
- You can't just inform Stanford that you're enrolling, or Google or Facebook that you're showing up for work. You also have to be *admitted* or *hired*. Neither can Google or Stanford simply choose who will come to them, any more than one spouse can simply choose another: each also has to be *chosen*.

# Market design:

- Medical labor markets
  - Medical Residents: in the U.S.: NRMP in 1995
  - Gastroenterology in 2006 , and other Fellowship markets
- American labor market for new Ph.D. economists
  - Scramble March 2006
  - Signaling December 2007
- School choice systems:
  - New York City since Sept. 2004 (high schools only)
  - Boston since Sept. 2006
  - Denver, D.C., New Orleans—presently underway for Sept. 2012
  - In discussion with Chicago, Newark
- **Kidney exchange**
  - New England and Ohio (2004)
  - National US (2010-?)



# Matching is important throughout our lives

1. Nursery School, Kindergarten and Schools
2. College: getting in, and after (College is a nexus of matching markets...)
3. Job markets
4. Dating and marriage markets
5. Medical care: Allocation of organs for transplant

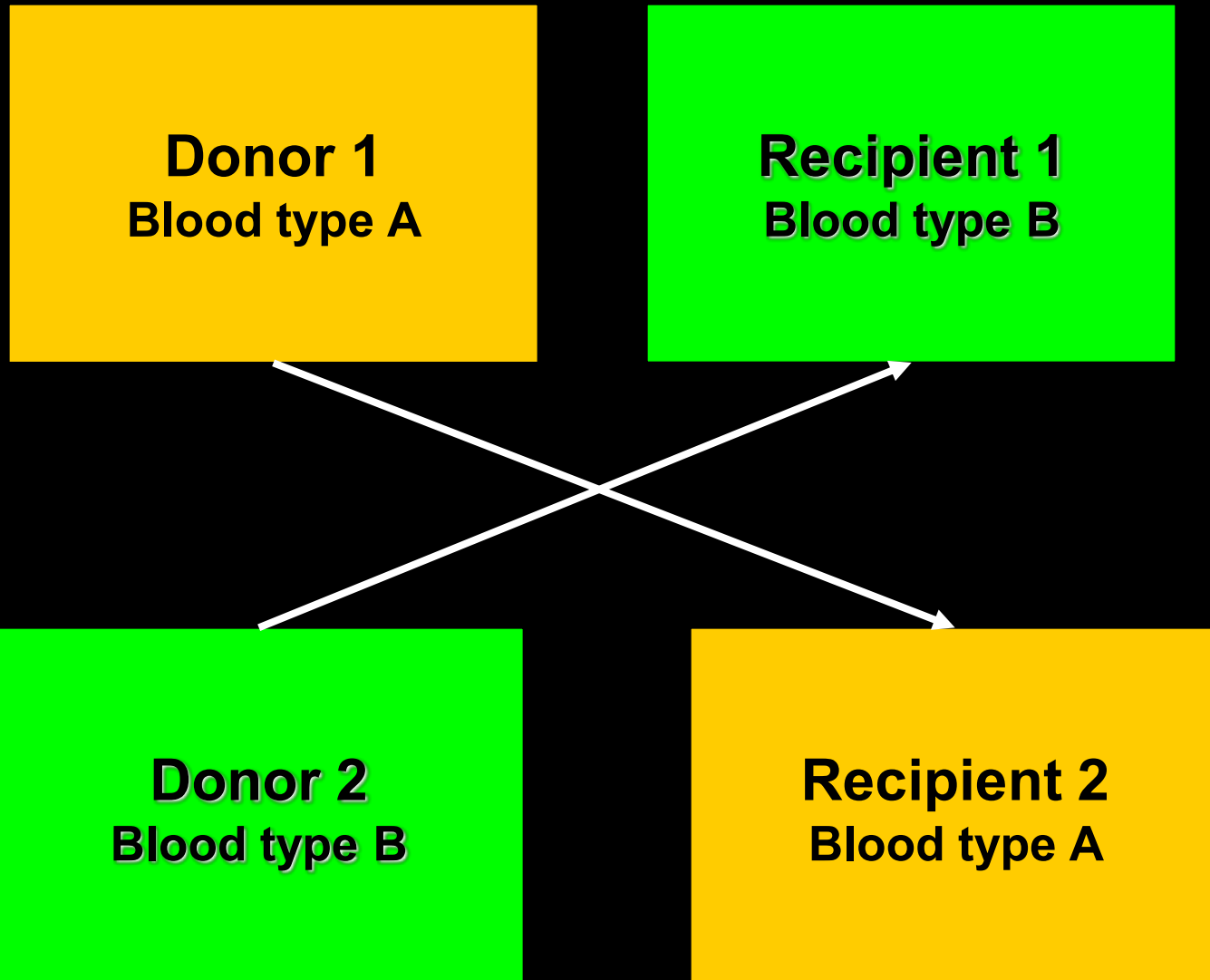
# Organ transplantation

- An example of allocation of scarce resources, without the use of money.
- Kidney exchange may expand your idea of what constitutes a marketplace.

# Kidney exchange--background

- Many more people are in need of kidney transplants than there are available organs.
- The waiting list in the US has almost 100,000 people on it
- The wait can be many years, and many die while waiting.
- Transplantable organs can come from both deceased donors and **living donors**.
- Sometimes donors are incompatible with their intended recipient.
- This opens the possibility of *exchange* .

# Two Pair Kidney Exchange



# Notice that no money changes hands...

- Kidney exchange is an “in kind” exchange

**Section 301, National Organ Transplant Act  
(NOTA), 42 U.S.C. 274e 1984:**

**“it shall be unlawful for any person  
to knowingly acquire, receive or otherwise  
transfer any human organ for valuable  
consideration for use in human  
transplantation”.**

# Charlie W. Norwood Living Organ Donation Act

Public Law 110-144, 110th Congress, Dec. 21, **2007**

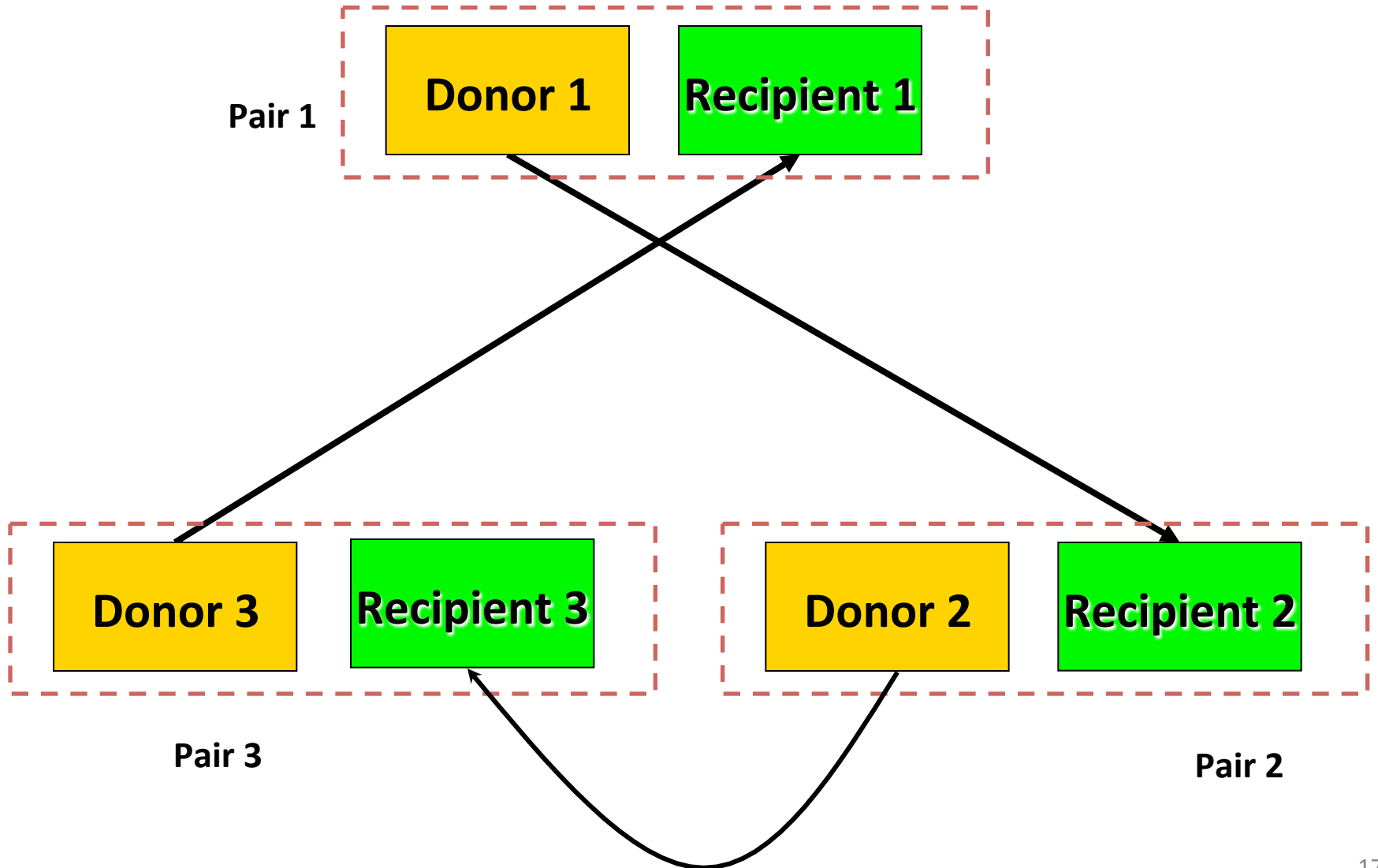
- Section 301 of the National Organ Transplant Act (42 U.S.C. 274e) is amended-- (1) in subsection (a), by adding at the end the following:
- **“The preceding sentence does not apply with respect to human organ paired donation.”**

# 2-way exchange involves 4 *simultaneous* surgeries

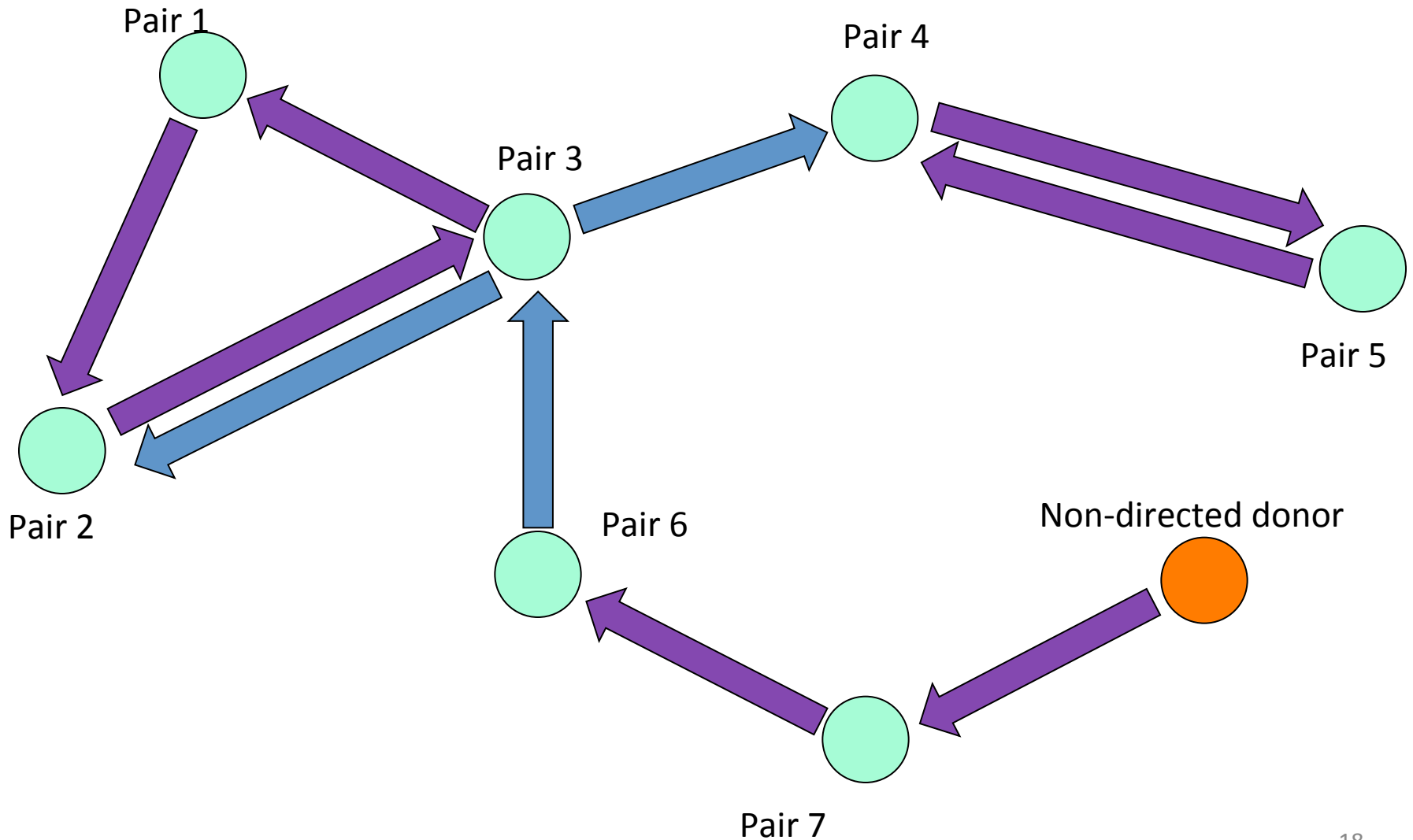




# 3-pair exchange (6 simultaneous surgeries)

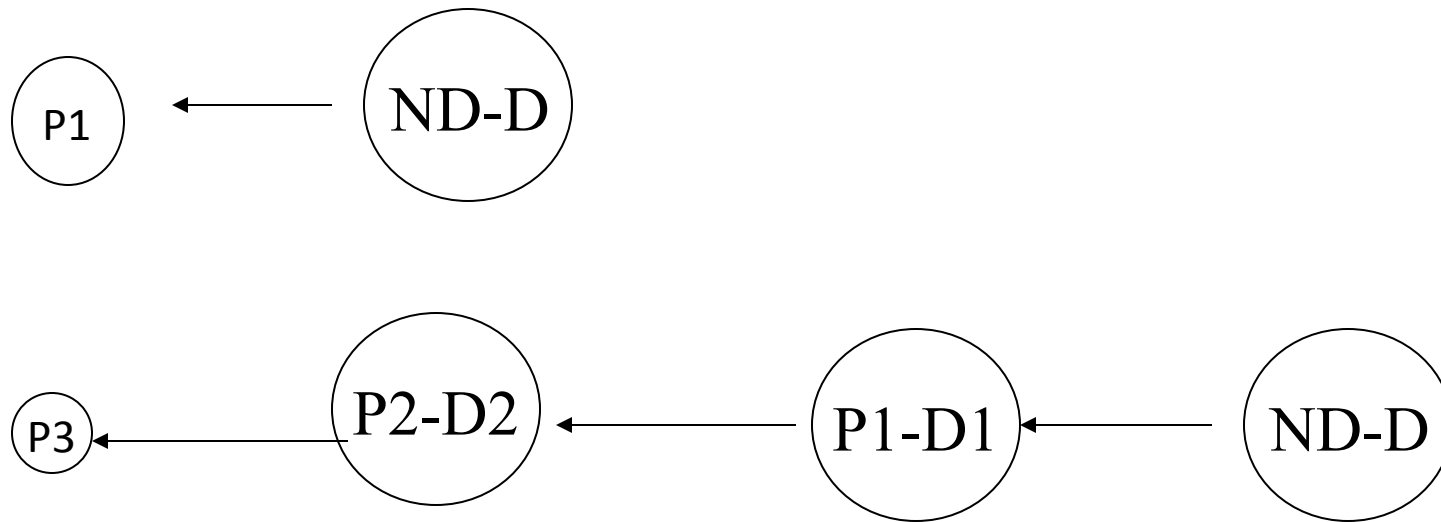


# Non-directed donors: cycles plus chains



# Non-directed donor chains

- Non-directed donors



# Here's a better picture...

## Rare 6-Way Transplant Performed *Donors Meet Recipients*

March 22, 2007

**BOSTON** -- A rare six-way surgical transplant was a success in Boston.

NewsCenter 5's Heather Unruh reported Wednesday that three people donated their kidneys to three people they did not know. The transplants happened one month ago at Massachusetts General Hospital and Beth Israel Deaconess.

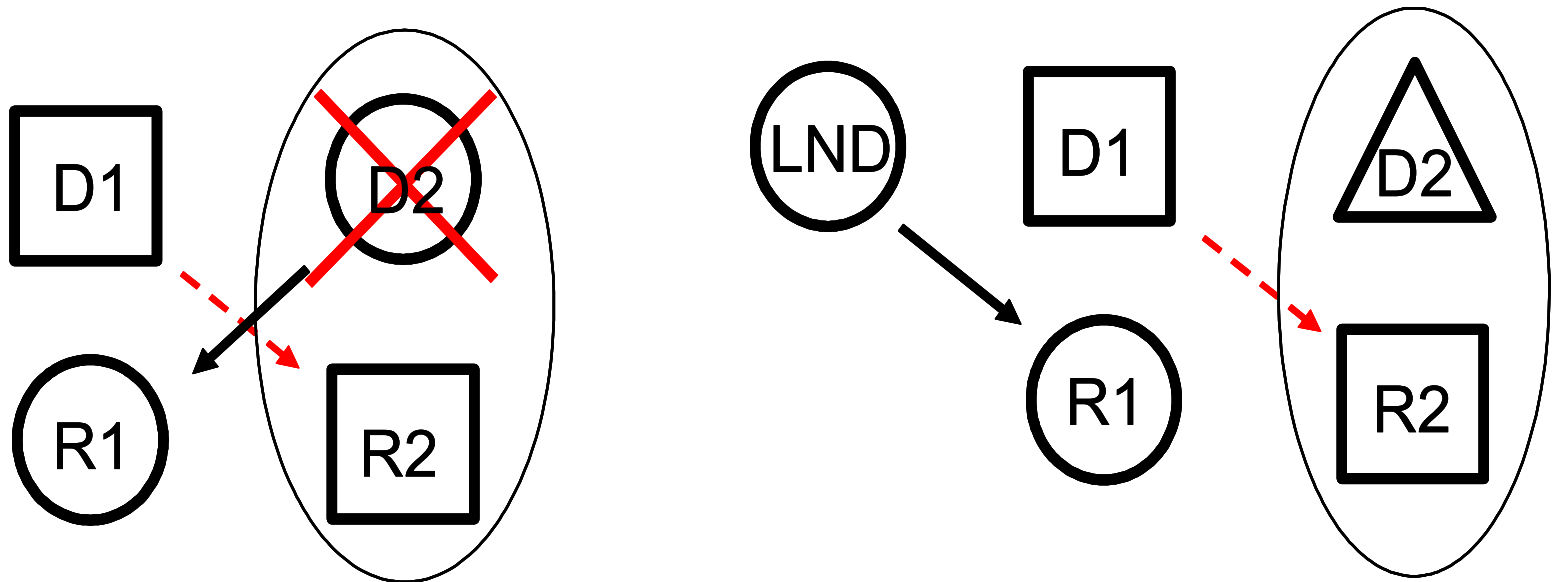
The donors and the recipients met Wednesday for the first time.



Why are there only 6 people in this picture?

**Simultaneity congestion: 3 transplants + 3 nephrectomies = 6 operating rooms, 6 surgical teams...**

# ‘Never ending’ altruistic donor chains (non-simultaneous, reduced risk from a broken link)



A. Conventional 2-way Matching

B. NEAD Chain Matching

Since NEAD chains don't need to be simultaneous, they can be long...if the 'bridge donors' are properly identified.

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## A Nonsimultaneous, Extended, Altruistic-Donor Chain

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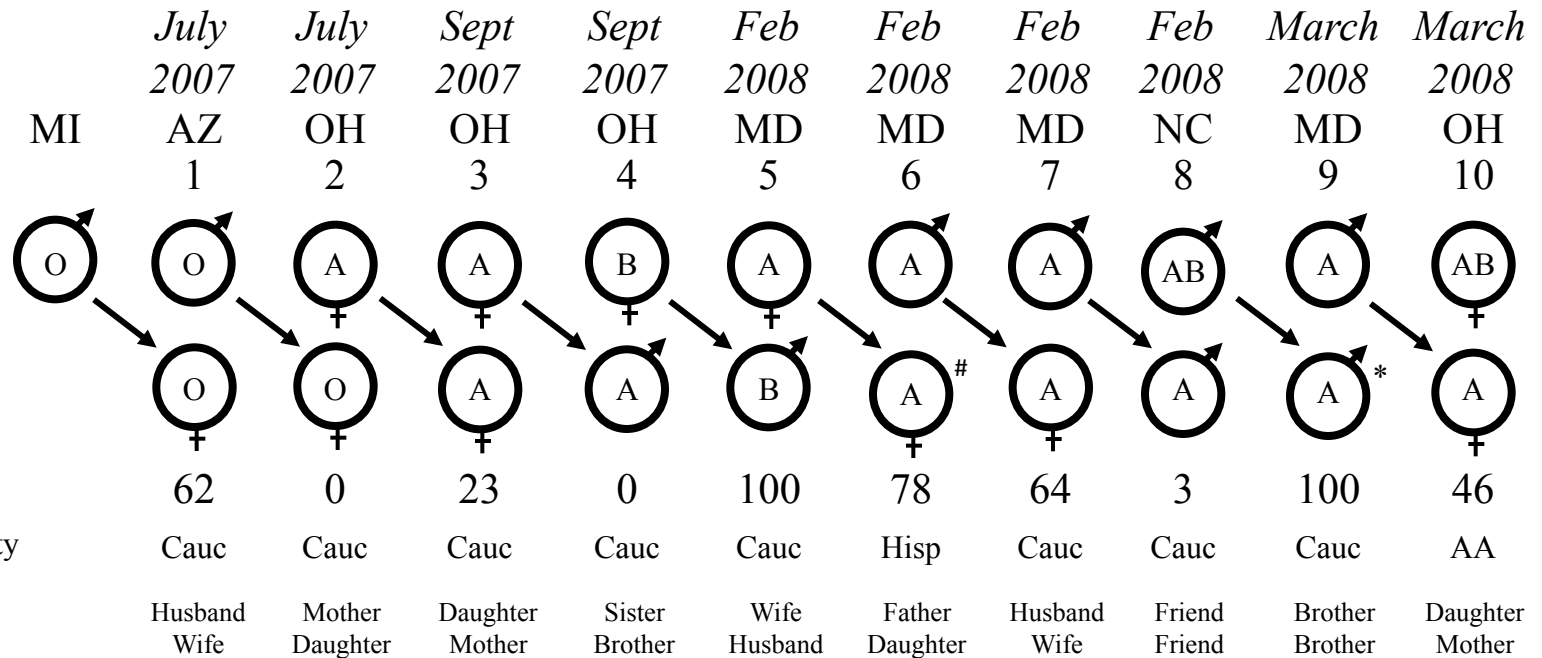
### SUMMARY

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We report a chain of 10 kidney transplantations, initiated in July 2007 by a single altruistic donor (i.e., a donor without a designated recipient) and coordinated over a period of 8 months by two large paired-donation registries. These transplantations involved six transplantation centers in five states. In the case of five of the transplantations, the donors and their coregistered recipients underwent surgery simultaneously. In the other five cases, “bridge donors” continued the chain as many as 5 months after the coregistered recipients in their own pairs had received transplants. This report of a chain of paired kidney donations, in which the transplantations were not necessarily performed simultaneously, illustrates the potential of this strategy.

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# The First NEAD Chain (Rees, APD)



\* This recipient required desensitization to Blood Group (AHG Titer of 1/8).

# This recipient required desensitization to HLA DSA by T and B cell flow cytometry.

# THE KIDNEY CHAIN

How a single organ donation changed 20 lives and created the longest-running transplant chain



Dr. Mike Rees (center, left) and his team perform a kidney transplant.



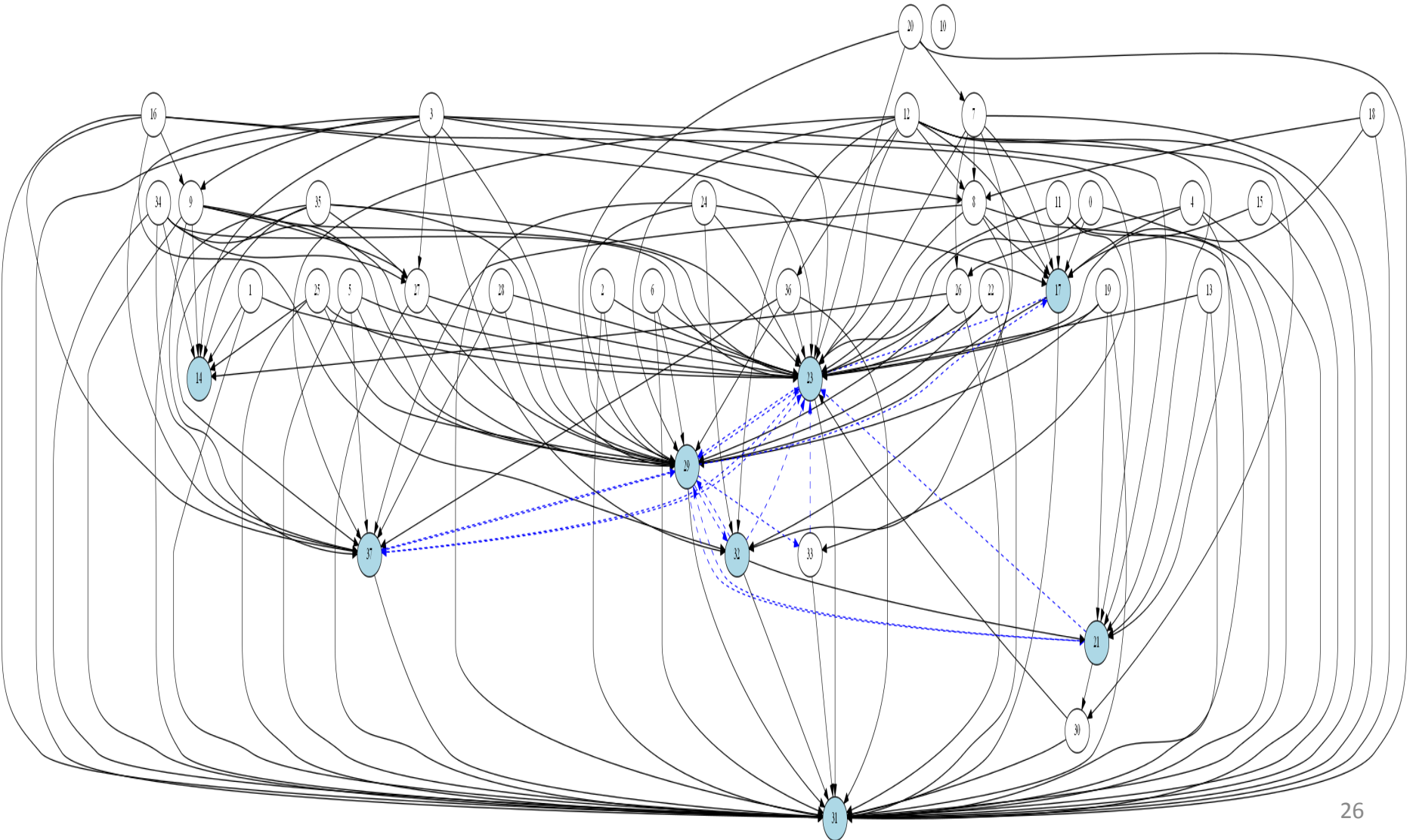
Chains become more important as patient pools become more “highly sensitized”

**Graph induced by pairs with A patients and A donors. 38 pairs (30 high PRA).**

**Dashed edges are parts of cycles.**

**No cycle contains only high PRA patients.**

**Only one cycle *includes* a high PRA patient**





# Feb 2012: a NEAD chain of length 60 (30 transplants)



# Why do we have laws against simply buying and selling kidneys?

- I don't know the answer to this, but I think it's a subject that needs more study...
- Making markets illegal doesn't stop illegal markets

# Repugnance

- Let's call a transaction *repugnant* if some people want to engage in it, and others don't think they should be allowed to.

# Repugnant transactions

- some historically important repugnances
  - Sex (outside of marriage, incest, homosexuality, pornography, prostitution...)
    - **Same-sex marriage**
  - Servitude: Slavery and serfdom and **indentured servitude**
  - Worship (Inquisitions, expulsions, heresy, religious wars, blasphemy)
  - **Interest on loans** (was repugnant, no longer so much)
- Note that the arrow of time points both ways

# Why can't you eat horse or dog meat in a restaurant in California?

1. Short answer: It's against the law.
  - California Penal Code Section 598 states in part "...horsemeat may not be offered for sale for human consumption."
2. Longer answer: many Californians find it repugnant that *anyone* should eat a horse
  - and this repugnance was enacted into law, by popular referendum (Prop. 6 in 1998)



What transactions are repugnant  
varies from place to place

# Dwarf tossing

The longest midget toss on record that we could find was made during the British Dwarf Tossing championships of 2002 when Jimmy Leonard of England tossed all 4'4" and 98 pounds of Lenny the Giant a giant 11 feet 5 inches.



Lenny The Giant

# Ontario *Dwarf Tossing Ban Act, 2003*

- **Bill 97 2003 An Act to ban dwarf tossing**
- Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:
- **Dwarf tossing banned**
- **1. (1) No person shall organize a dwarf tossing event or engage in dwarf tossing.**
- **Offence**
- (2) A person who contravenes subsection (1) is guilty of an offence and on conviction is liable to a fine of not more than \$5,000 or to imprisonment for a term of not more than six months, or to both.
- **Commencement**
- **2. This Act comes into force on the day it receives Royal Assent.**
- **Short title**
- **3. The short title of this Act is the *Dwarf Tossing Ban Act, 2003*.**

# France and the UN Human Rights Committee

## U.N. Human Rights Committee backs 'dwarf-tossing' ban (2002)

Manuel Wackenheim began his fight in 1995 after dwarf tossing bans were upheld in France.

- The U.N. case report quotes Wackenheim to the effect that “there is no work for dwarves in France and that his job does not constitute an affront to human dignity since dignity consists in having a job.”
- The UN committee found for France, saying *"the ban on dwarf-tossing was not abusive but necessary in order to protect public order, including considerations of human dignity."*

# Repugnance can be hard to predict

- Why is dwarf tossing widely regarded as repugnant?
- It's not just the small size of the dwarfs
  - E.g. jockeys are small

# Wife Carrying—Not Repugnant?



Boston champs 2005--traditional



World champs—Estonian position

# Money and repugnance

- Often  $x + \$$  is repugnant, even when  $x$  alone isn't.
  - E.g. interest on loans,
  - payments to birth mothers in adoption,
  - Prostitution
- Sometimes \$\$\$\$\$\$ is repugnant even when \$ is not
  - E.g. laws against price gouging in emergencies
  - Certain kinds of very high compensation: e.g. current debates in Europe



**“We didn’t have time to pick up a bottle of wine,  
but this is what we would have spent.”**

(New Yorker)



# Money and repugnance

- There seem to be three principal lines of argument about how adding money makes a non-repugnant transaction repugnant:
  - Objectification
  - Coercion (“exploitation”)
  - Slippery Slope

# Transactions between consenting adults

- Test yourself for repugnance: are you willing to contemplate carefully regulated sales of live:
  - Kidneys?
  - Hearts?

# Kidney Exchange...

...achieves some of the benefits of a market, without using money, and thus without running into the barrier raised by the repugnance that kidney sales arouse.

# What is a free market?

- One with rules and institutions that let it operate freely...
  - Think of a wheel that can rotate freely, because it has an axle and well-oiled bearings
- Friedrich August von Hayek (Nobel 1974):
  - decentralization of information

# Hayek on market design in *The Road to Serfdom*

- “There is ... all the difference between deliberately creating a system within which competition will work as beneficially as possible and passively accepting institutions as they are. Probably nothing has done so much harm to the liberal cause as the wooden insistence of some liberals on certain rules of thumb, above all the principle of laissez faire.”
- ...
- “The attitude of the liberal towards society is like that of the gardener who tends a plant and, in order to create the conditions most favorable to its growth, must know as much as possible about its structure and the way it functions.”

# What have we learned from market design?

- To achieve efficient outcomes, marketplaces need make markets sufficiently
  - **Thick**
    - Enough potential transactions available at one time
  - **Uncongested**
    - Enough time for offers to be made, accepted, rejected, transactions carried out...
  - **Safe**
    - Safe to participate, and to reveal relevant information
- Some kinds of transactions are **repugnant**...and this can constrain market design.
  - The repugnance of some markets may give us a new viewpoint on regulation of familiar markets—markets often require a lot of social buy-in to work well.