We love our relatives, although sometimes we squabble with them. Why?
The evolutionary logic of kin selection (Hamilton’s Rule)

\[ c < rb \]

c; cost to actor
b: benefit to recipient
r: genetic relatedness between actor and recipient
Calculating the coefficient of relatedness ($r$)

$r$ between actor and recipient:

the expected (average) fraction of genes that are identical by virtue of their family relationship
But do animals do algebra?

- sterile workers in hymenoptera
- alarm calls in Belding’s ground squirrels
- “helpers at the nest” in scrub jays

No need to calculate Hamilton’s Rule. Biased behavior to relatives can involve kin recognition (e.g., via MHC or physical appearance). Can also result from living with kin, if neighbors more likely to receive the behavior.
Kinship and the sociobiology wars

”No system of human kinship relations is organized in accord with the genetic coefficients of relations as known to sociobiologists” (“The use and abuse of biology”, Sahlins, 1977 p. 57)

“the Yanomamo... discriminated in many subtle and not-so-subtle ways against non-kin, no matter how they classified them”. (Chagnon, 1979, p. 87)
Biological and classificatory kinship: Yanomamo

In our classificatory kinship system, you have a lot of relatives called by the same term (“cousin”). In other kinship systems, father and father’s brother are called by the same term. Is the psychological distance the same to each of them?

The Axe Fight (Chagnon and Bugos 1979): In a fight between two genealogically-overlapping villages, men were more likely to fight to support their genetic kin.
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Biological and classificatory kinship: Fundamentalist Mormons

“Unlike most polygamous families living in Montana, the Salt Lake Valley, and northern Mexico, the preferred ideal in Angel Park is to live together in one ‘united and harmonious’ household."

(from Jankowiak et al. 2000)
Relationships among co-wives

Polygynously-married wives usually live in separate dwellings. ...unless the wives are sisters (sororal polygyny).

<table>
<thead>
<tr>
<th></th>
<th>shared dwelling</th>
<th>separate dwelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>sororal polygyny</td>
<td>60 (81%)</td>
<td>14 (19%)</td>
</tr>
<tr>
<td>nonsororal polygyny</td>
<td>96 (32%)</td>
<td>207 (68%)</td>
</tr>
</tbody>
</table>
Homicide risk at home

Denver (UPI) – A just-completed national survey indicates the American home is the most violent place in the country, three sociologists reported Friday. The pioneering study led researchers to conclude that physical violence occurs between family members more often than it occurs between any other individuals...
Homicide risk at home

Doesn’t kin selection predict less violence among family members?

Killing requires access. People have a lot of access to family members.

Kin selection predicts that, given the same opportunity and access: there will be fewer homicides between blood relatives than others.
Homicide risk at home

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Kinship predictions selfishness to non-kin

Daly and Wilson looked at homicides in the household, because not everyone in a household is a genetic relative. Households include:

- blood relatives (parents, children, sibs)
- non-blood relatives (e.g., spouses, in-laws)
- non-relatives

In 1970, the average Detroit resident, 14 years or older, lived with 3.0 other people, and 60% lived with a spouse. There were 98 total domestic homicides. If homicide was randomly distributed within households, how many domestic homicides would be spousal homicides?
# Homicide risk to kin and non-kin

<table>
<thead>
<tr>
<th></th>
<th># in household A</th>
<th>% in household B=(A/3)</th>
<th>Expected Homicides C=(B*98)</th>
<th>Actual Homicides D</th>
<th>Relative Risk E=(D/C)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-Kin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spouses</td>
<td>0.6</td>
<td>0.20</td>
<td>19.60</td>
<td>65</td>
<td>3.32</td>
</tr>
<tr>
<td>Other non-kin</td>
<td>0.1</td>
<td>0.03</td>
<td>3.27</td>
<td>11</td>
<td>3.37</td>
</tr>
<tr>
<td>Total non-kin</td>
<td>0.7</td>
<td>0.23</td>
<td>22.87</td>
<td>76</td>
<td>3.32</td>
</tr>
<tr>
<td><strong>Kin</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offspring</td>
<td>0.9</td>
<td>0.30</td>
<td>29.40</td>
<td>8</td>
<td>0.27</td>
</tr>
<tr>
<td>Parents</td>
<td>0.4</td>
<td>0.13</td>
<td>13.07</td>
<td>9</td>
<td>0.69</td>
</tr>
<tr>
<td>Other kin</td>
<td>1.0</td>
<td>0.33</td>
<td>32.67</td>
<td>5</td>
<td>0.15</td>
</tr>
<tr>
<td>Total kin</td>
<td>2.3</td>
<td>0.77</td>
<td>75.13</td>
<td>22</td>
<td>0.29</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>3.0</td>
<td>1.00</td>
<td>98.00</td>
<td>98</td>
<td>1.00</td>
</tr>
</tbody>
</table>

(from Daly and Wilson 1988)
Daly and Wilson study homicide because it is an extreme example of conflict, one with an objectively observable outcome.

They study it to identify psychological factors that underpin such conflicts

This does not mean that killing people has been favored by selection as an adaption.
Kin-directed altruism depends on more than “r”

Hard to demonstrate a precise match of altruism with “r” because:

- “b” and “c” matter (for yearling jays, c depends on territory)
- real “r” reflects paternity uncertainty
- friends ($r = 0$) confer other benefits
- reproductive value of the recipient matters
Kin altruism and reproductive value

Intensity of grief at a lost child matches reproductive value of a child in the EEA, not in modern societies:

(from Crawford et al. 1989)
“Some mornings I just stayed around and my tears fell and I cried and refused food. That was because I saw him [the brother] nursing, I saw with my eyes the milk spilling out. I thought it was mine” (Shostak 1976)

Weaning among the Ache is “an extremely unpleasant experience for mothers (and apparently for children), with children screaming, hitting, and throwing tantrums for several weeks.” (Hill and Hurtado 1996).

“Farmer parents explained that the timing of weaning was important because it enabled mothers to leave their youngest children at home and thus farm more productively.” (Fouts et al. 2005).
Parent-offspring Conflict: Theory

The optimal time for weaning is different for mother and child
Parent-offspring Conflict: Implications

“Are you worried about the change in your 3-year-old’s behavior after your second child?” (caption)

- Weaning conflicts
- Children “regressing” (acting more needy) when new baby arrives
- Mom wants children to “share” with each other more than they do
- Maternal-fetal conflict
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Parent-offspring conflict in utero (David Haag)

- fetal cells remodel spiral arteries into low-resistance vessels → mother can’t restrict blood to fetus
- endometrial spiral arteries a countermeasure?
Parent-offspring conflict in utero

Conflicts over nutrients:

- fetal hormones increase output of glucose from liver
- fetal hormones increase insulin resistance in mother (more sugar in blood)
- mother increases insulin production (restricts fetal access)

In a cooperative system, mother should evolve a sensitivity to fetal hormones, not resistance. Maternal insulin production + hormones for insulin resistance by fetus is a sign of conflict. Implies an arms race. (from David Haag).
Mother-daughter conflict in Trinidad

When mother and daughter live in the same household, typically only one reproduces. If they are both reproductive, there is more conflict between them (from Flinn 1989, describing a rural village in Trinidad)
Summary

▶ We love our family (genes shared by descent) and are more altruistic to them than to non-kin, other things equal. But...
▶ Family conflicts (parent-child, sibling rivalry, husband-wife) are inevitable because we are not genetically identical.
▶ Evolutionary theory predicts familial interactions shaped by:
  ▶ degree of relatedness
  ▶ costs to actor, benefit to recipient
  ▶ age (reproductive value) of the recipient