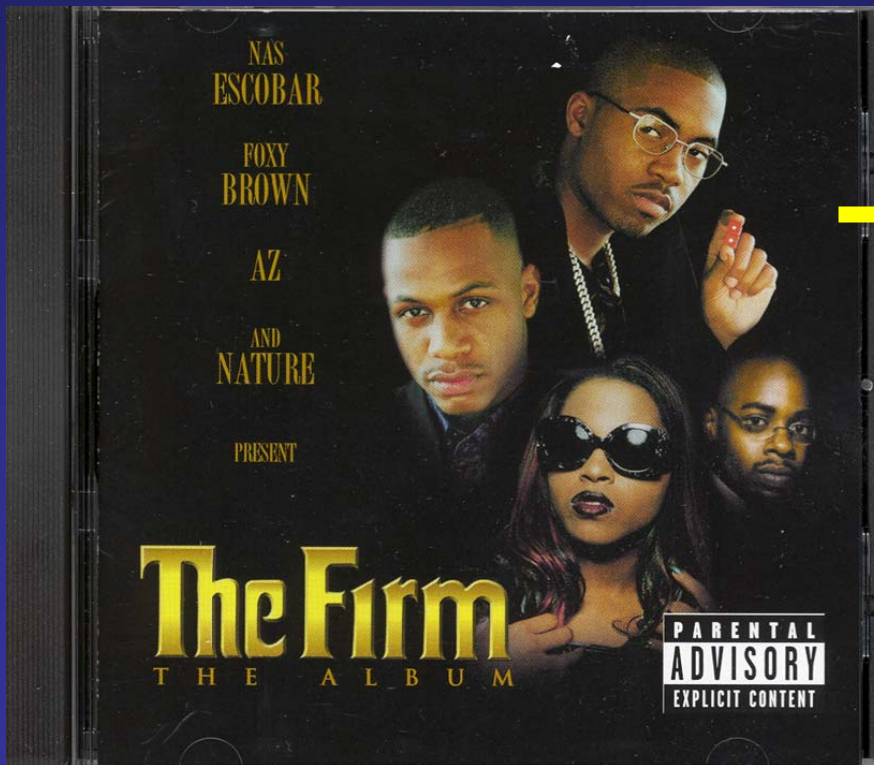


Cultural Transmission and Evolution – A Parasitological Analogy (Pushing parasitism to its philosophical limits)



J. JANOVY JR. \$10.50
in the U.S. only

Cultural Transmission
and Evolution:

A QUANTITATIVE APPROACH

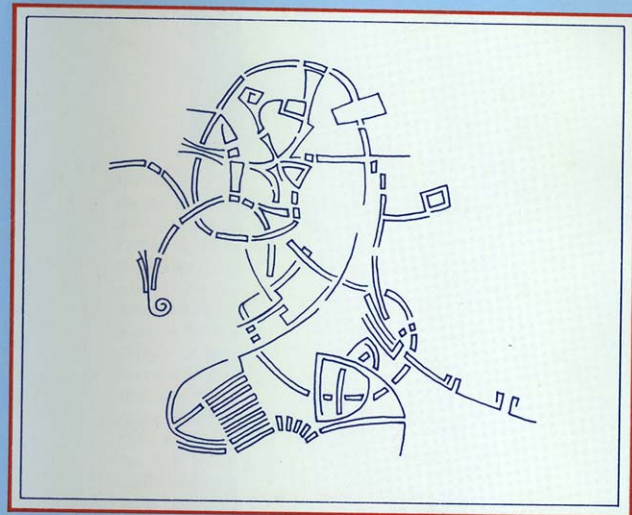
L. L. CAVALLI-SFORZA
M. W. FELDMAN

MONOGRAPHS IN POPULATION BIOLOGY . 16

**METAMAGICAL
THEMAS:**

Questing for the Essence
of Mind and Pattern

DOUGLAS R. HOFSTADTER



*An Interlocked Collection of
Literary, Scientific, and Artistic Studies*

Q: What do the following items have in common?

- SUV
- “. . . weapons of mass destruction . . .”
- Rap music
- “9/11”
- Duct tape
- No Smoking
- Amazon.com
- Powerball
- Super Bowl
- Talk radio
- CNN
- CD
- Digital camera
- An understanding of the role disease plays in politics and war

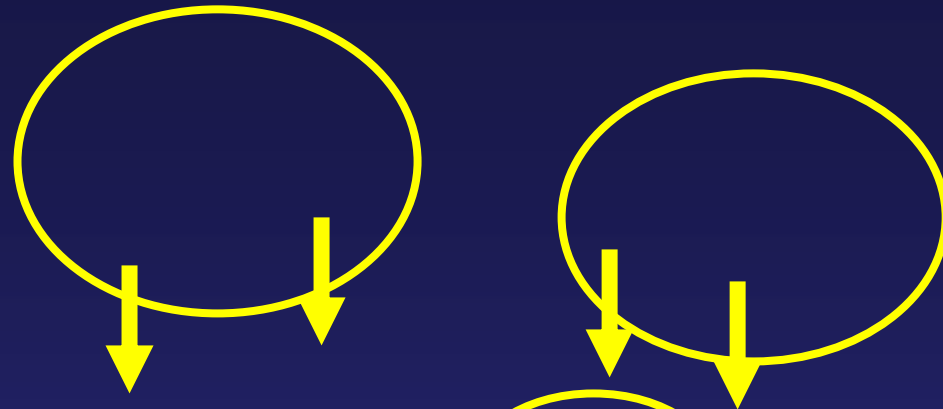
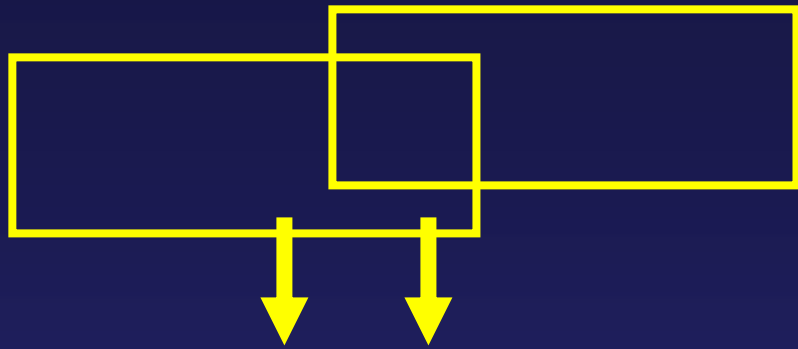
A: They are entities that originate in the human brain, and in some cases have taken on material substance, but in other cases have remained only ideas or words, but in all cases have the power to move through human populations in a manner analogous to infectious disease.

“The first process, growth of awareness, depends on . . . a source--for instance, the makers of a new product, salespeople, or evangelistic users--and transmitters--for example . . . newspapers, journals, radio, or TV. The second step involves . . . decision . . . which may be motivated by economic, emotional, or other types of factors . . .”

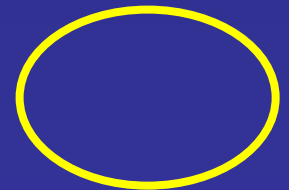
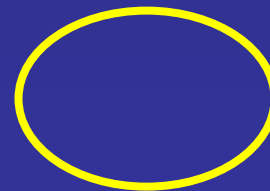
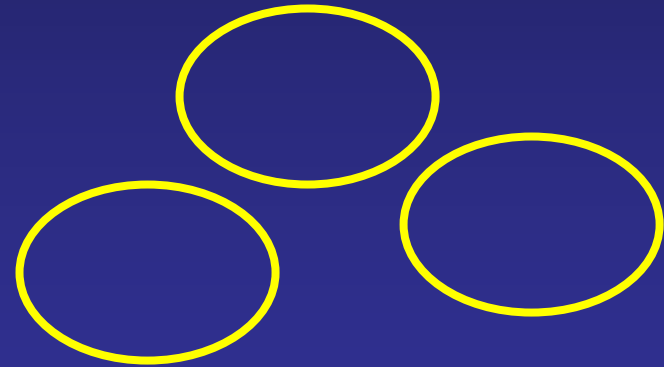
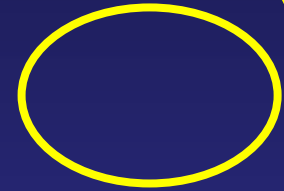
Cavalli-Sforza and Feldman, 1981

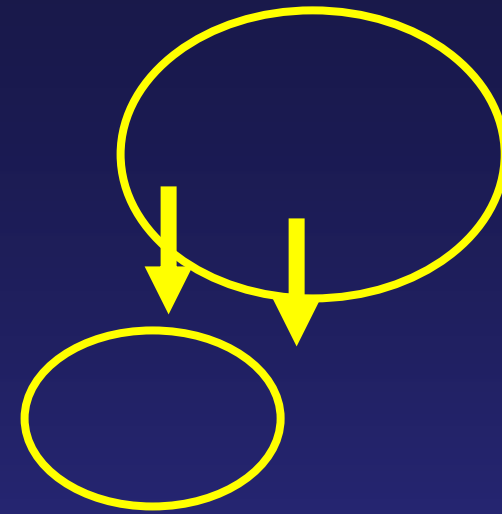
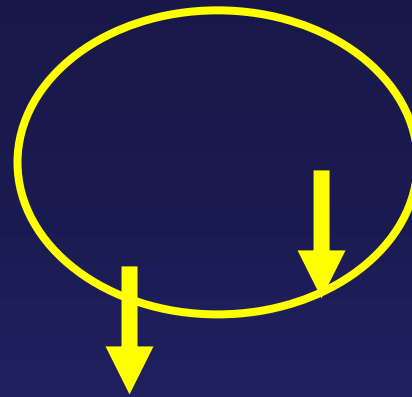
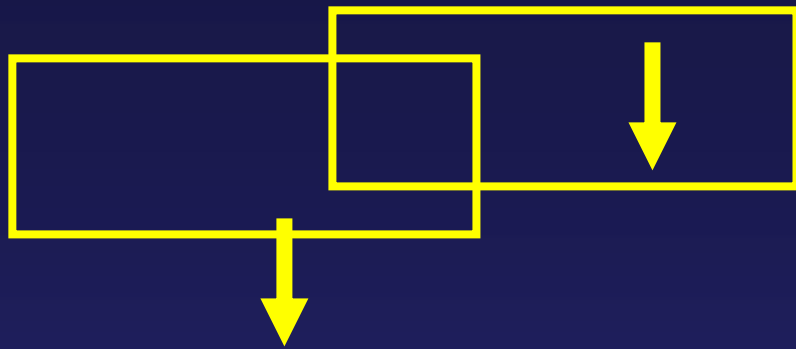
Terminology (there is a LOT of math to go with the vocabulary, if you want it)

- Vertical transmission
- Horizontal transmission
- Oblique transmission
- Host capture (~ “crossover”)
- Phylogenetic congruence (and topology)
- Mutation (innovation)
- Virulence and infectivity
- Replication with descent
- Self-referential

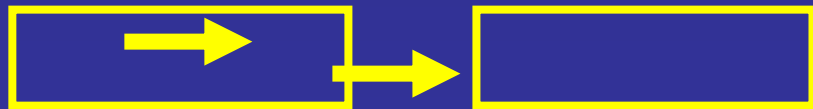
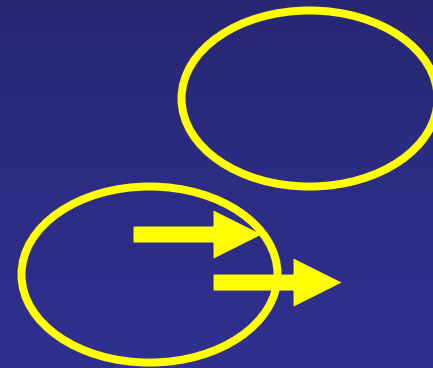


Vertical transmission –
parent to offspring





Vertical and horizontal transmission – parent to offspring and between members of the same generation



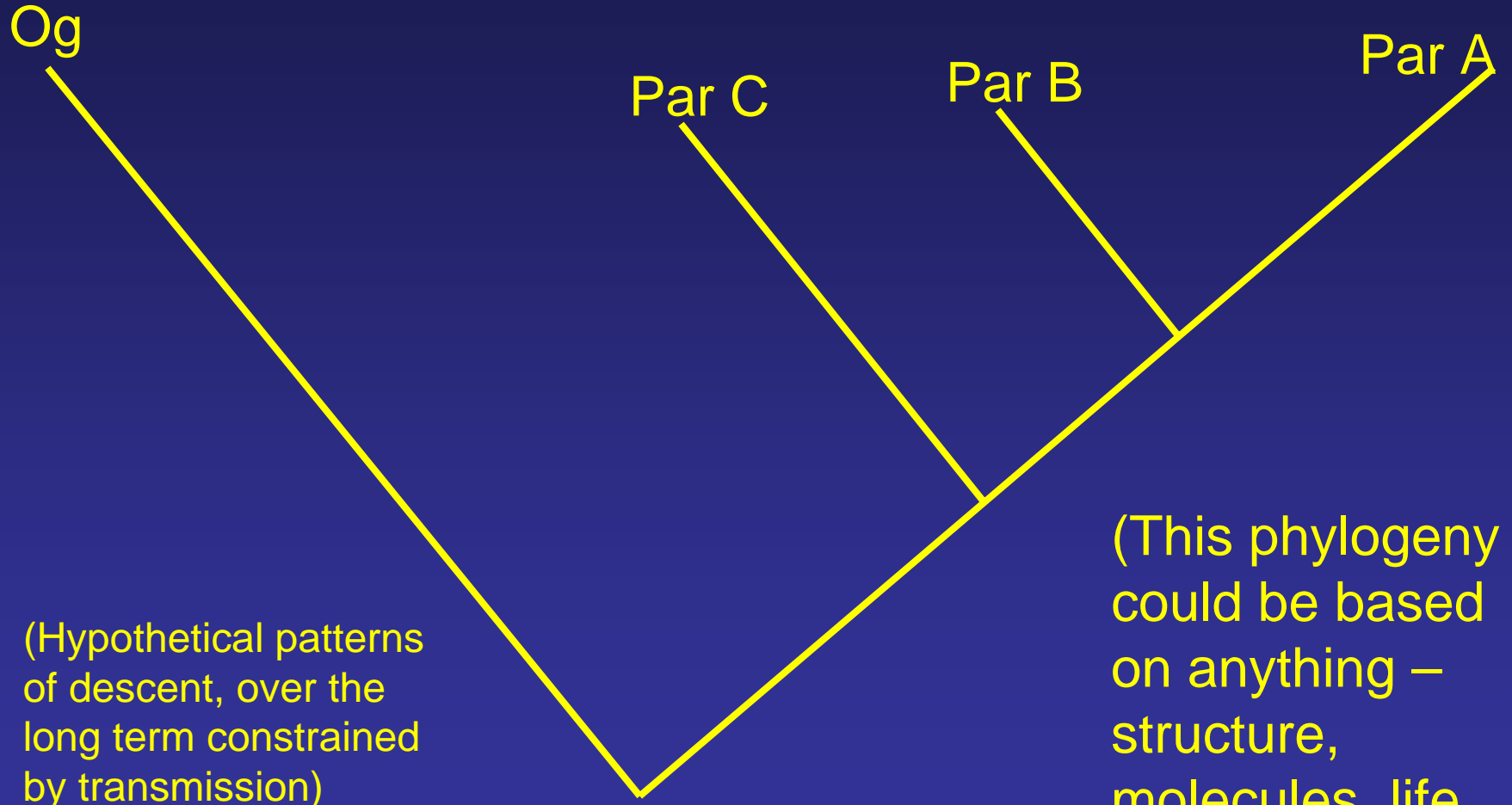
Vertically-transmitted items (some cultural):

- Religious beliefs
- Voting patterns
- Wealth
- Attitudes (in part) about art, music, etc.
- Reading skills and habits
- Use of technology
- Pinworms, body lice, *Giardia duodenalis*,
Toxocara canis

Horizontally-transmitted cultural items:

- Clothing styles
- Peer-group language (slang; verbal shorthand)
- Music
- Old exams (un-infective when transmitted vertically?)
- Use of technology

A very simplified parasite phylogeny:



(Hypothetical patterns of descent, over the long term constrained by transmission)

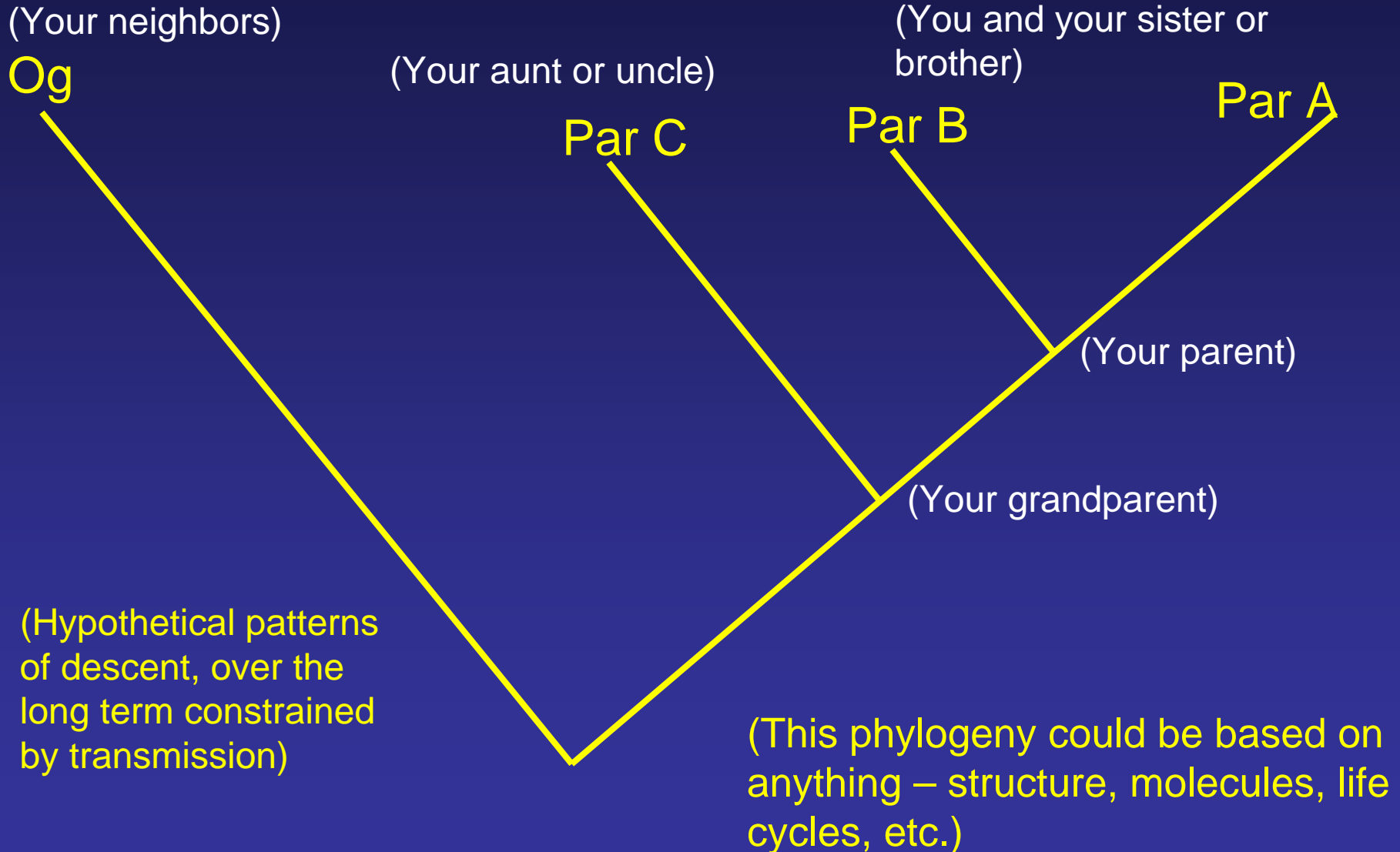
(This phylogeny could be based on anything – structure, molecules, life cycles, etc.)

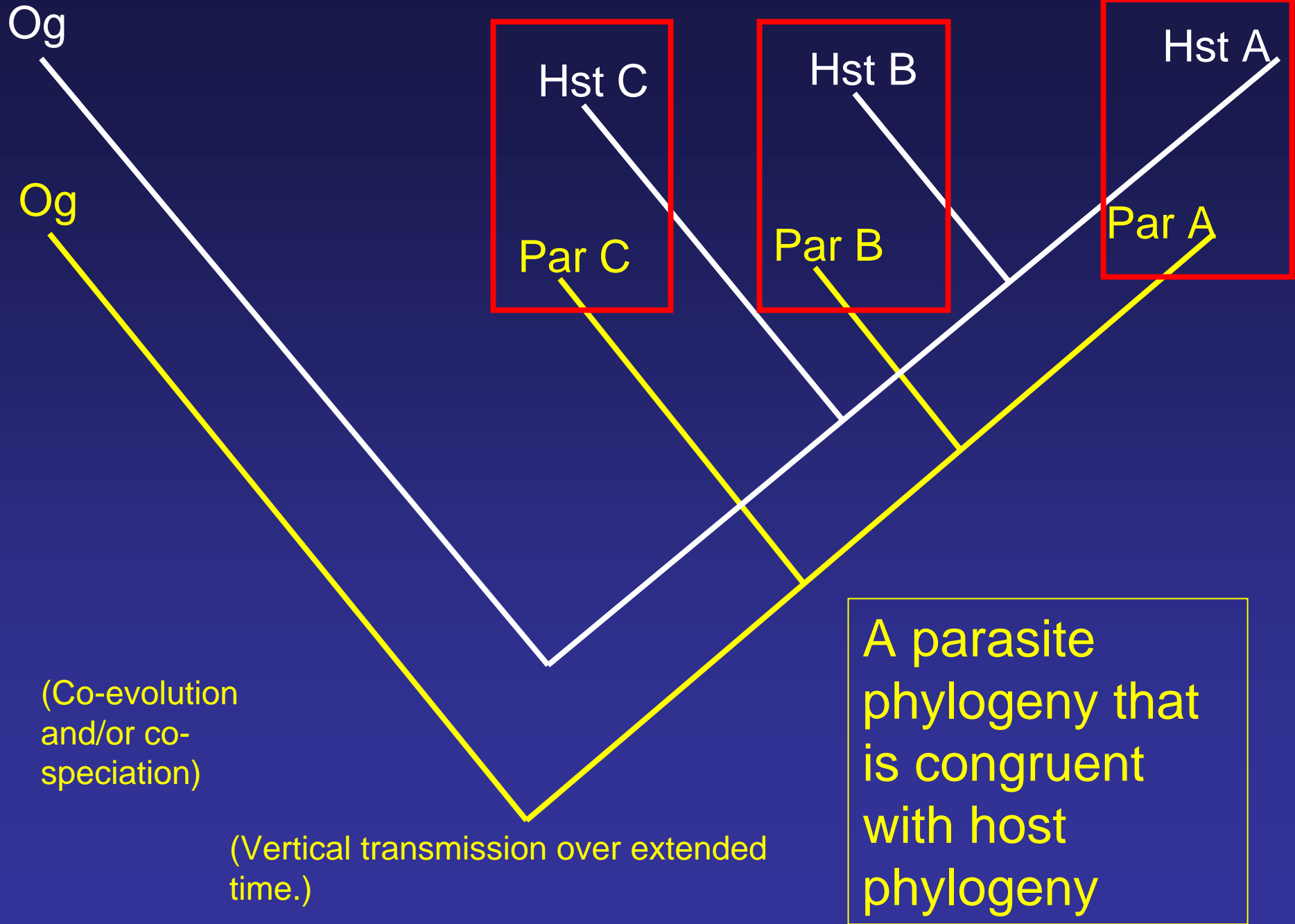
Cultural items transmitted via descent:

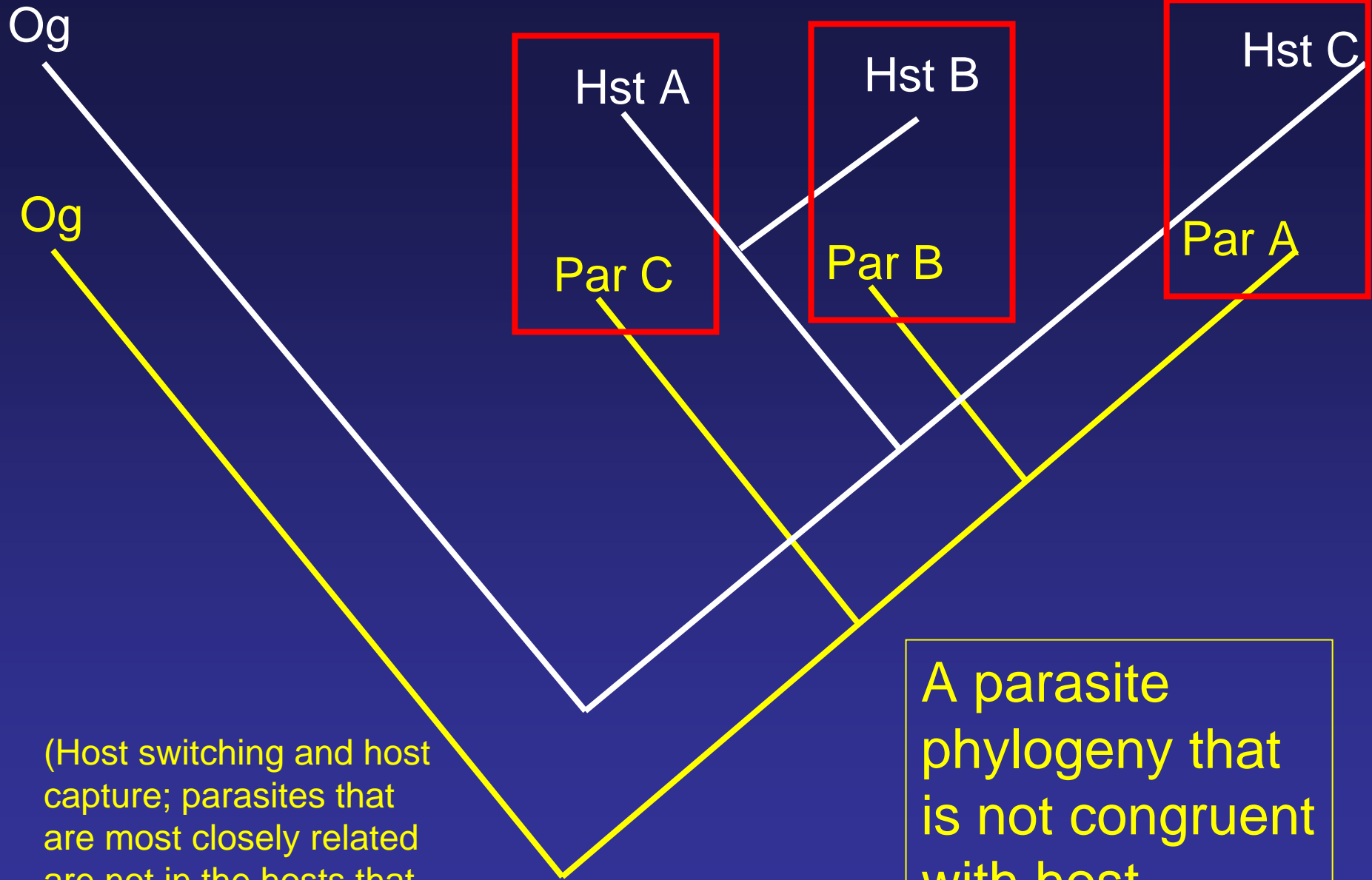
- Silver and jewelry
- Pottery and glassware
- Books (including Bibles)
- Photographs
- Letters, deeds, etc.
- Stories*
- Furniture*

*May be modified in transmission, i.e., may evolve.

A very simplified family “phylogeny”:







(Host switching and host capture; parasites that are most closely related are not in the hosts that are most closely related.)

A parasite phylogeny that is not congruent with host phylogeny

Bullfrog Host Specificity

— Damsselfies

— Damsselfies and Dragonflies

— Dragonflies

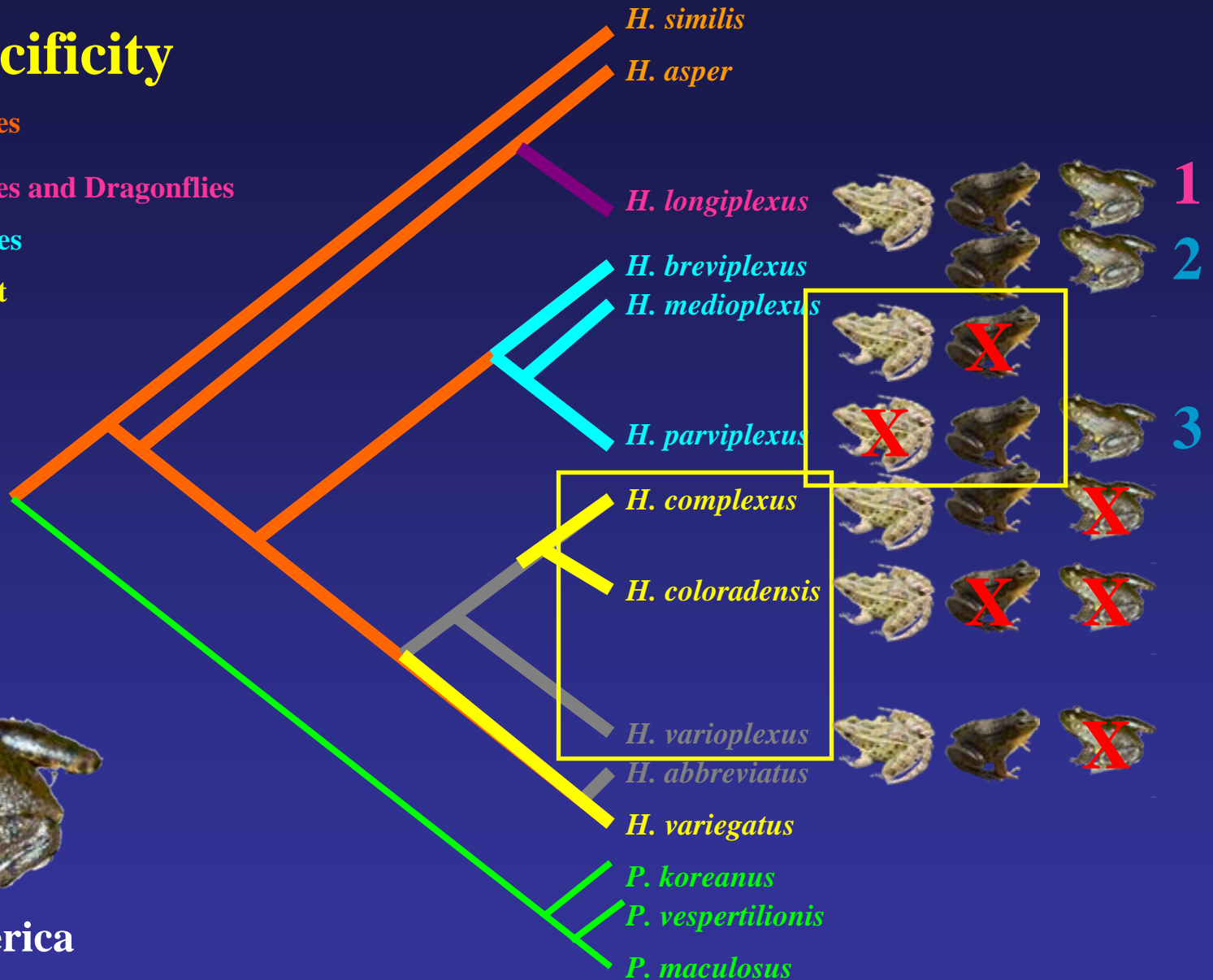
— Generalist

— ?



North America

Matt Bolek's thesis data





A B C D E F G

Hofstadter's letterform problems:

What feature(s) of the letter "A" make(s) it recognizable as an "A" in so many fonts?

What feature(s) of the human brain allow the design to "infect" the brain with the concept of "A"?

Infectivity and virulence of ideas (memes):

“The idea of hell fire is, quite simply, *self-perpetuating*, because of its own deep psychological impact. It has become linked with the god meme because the two reinforce each other, and assist each other’s survival in the meme pool.”

--Richard Dawkins
(*The Selfish Gene*)

(Viral text)

Infectivity and virulence of ideas (memes):

System X

Begin

S(1): Blah.

S(2): Blah, blah.

S(3): Blah, blah, blah.

.

.

S(n): Blah, blah, blah,

S(n+1): It is your duty to convince others that
System X is true

End

(The Hofstadter example)

Infectivity and virulence of ideas (memes):

System X

Begin

S(1): Anyone who does not believe in
System X will burn in Hell.

S(2): It is your duty to save others from
suffering.

End

(The Hofstadter example of viral and self-replicating texts)

Self-replicating viral memes:

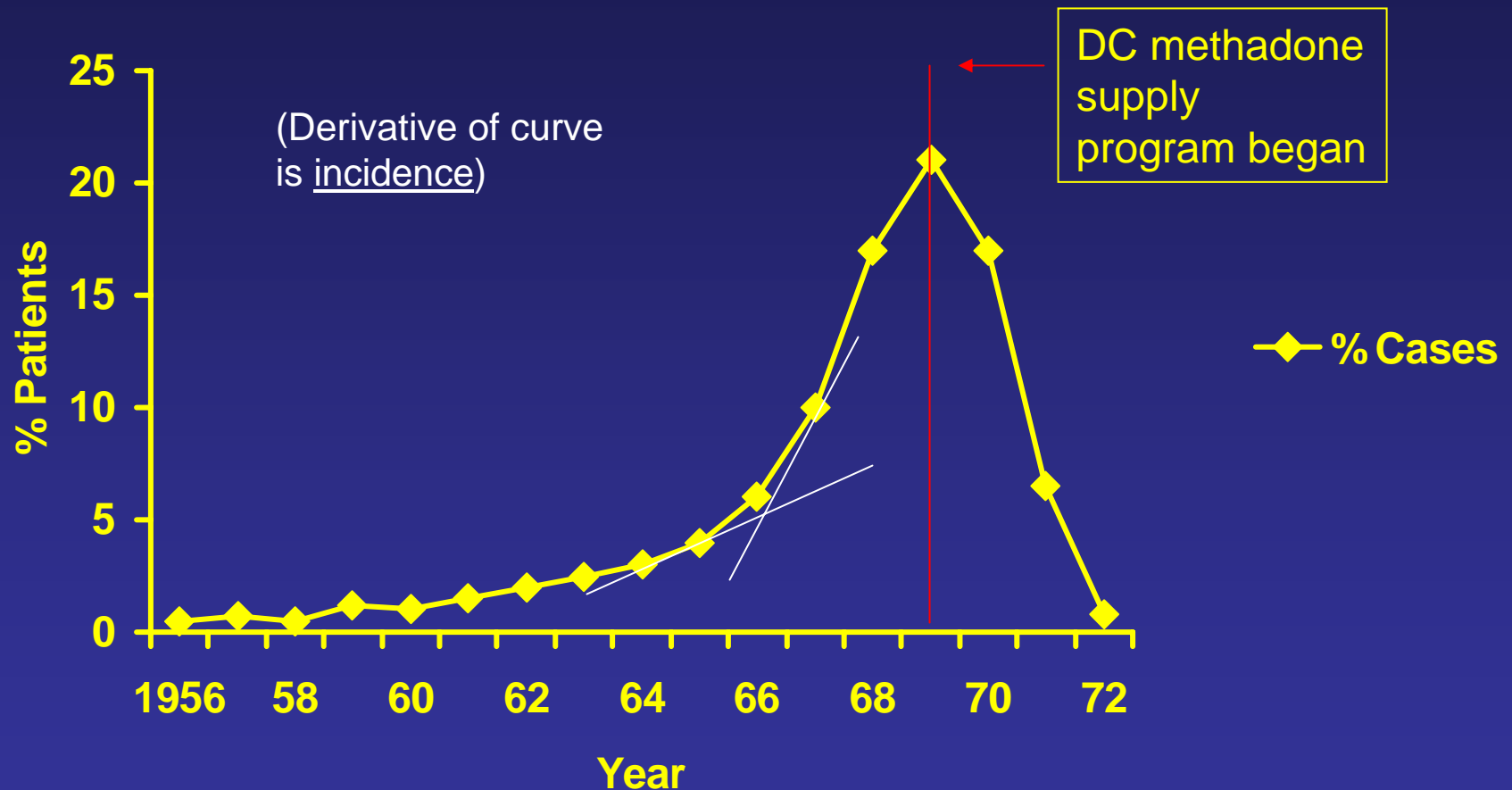
- The whales are in danger of extinction.
- The bourgeoisie is oppressing the proletariat.
- The villain is wronging the victim.
- Self-replicating ideas are conspiring to enslave our minds.

“The performance value of an idea depends upon the change it brings to the behavior of the person or group that adopts it. The human group upon which a given idea confers greater cohesiveness, greater ambition, and greater self-confidence thereby receives from it an added power to expand which will insure the promotion of the idea itself. Its capacity to ‘take,’ the extent to which it can be ‘put over’ has little to do with the amount of objective truth the idea may contain.”

Jacques Monod

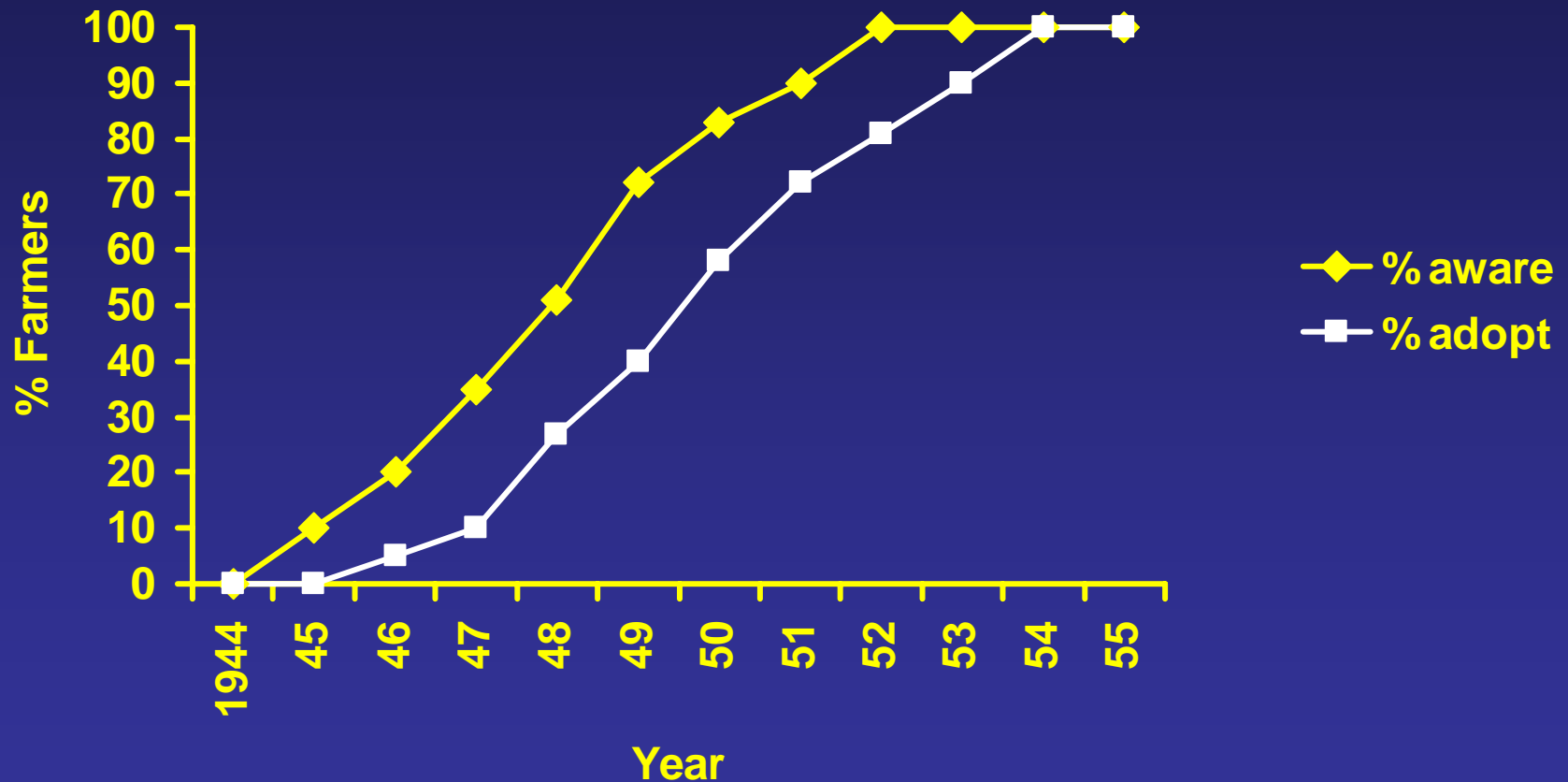
Chance and Necessity (1970)

A “cultural” epidemic – Heroin addiction in Washington, DC



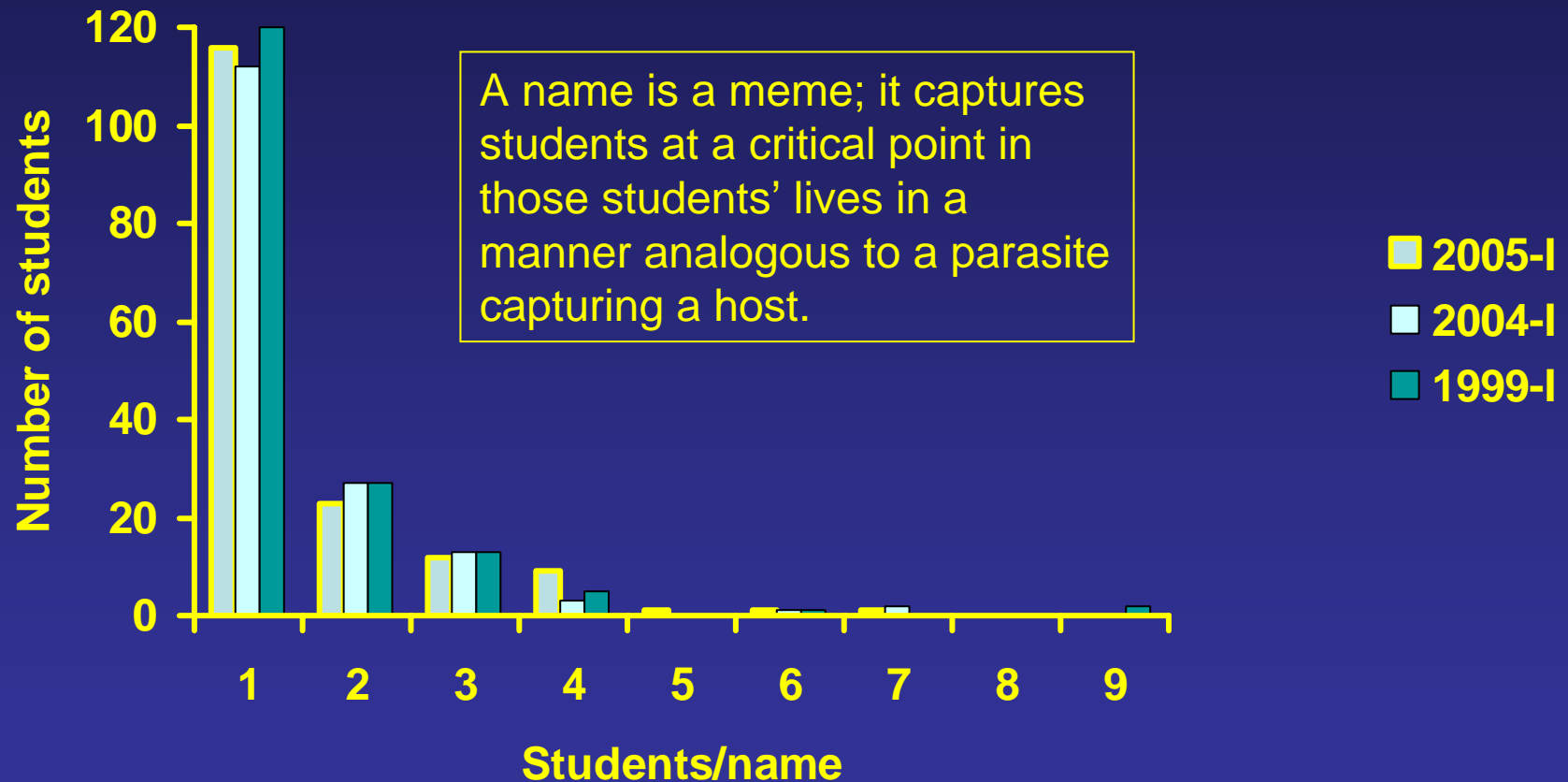
Percentages of patients entering Narcotics Treatment Administration in December, 1972, against year the patients began using heroin. (C-S & F, 1981)

Cultural transmission – awareness vs. adoption of 2-4D weed spray among Iowa farmers



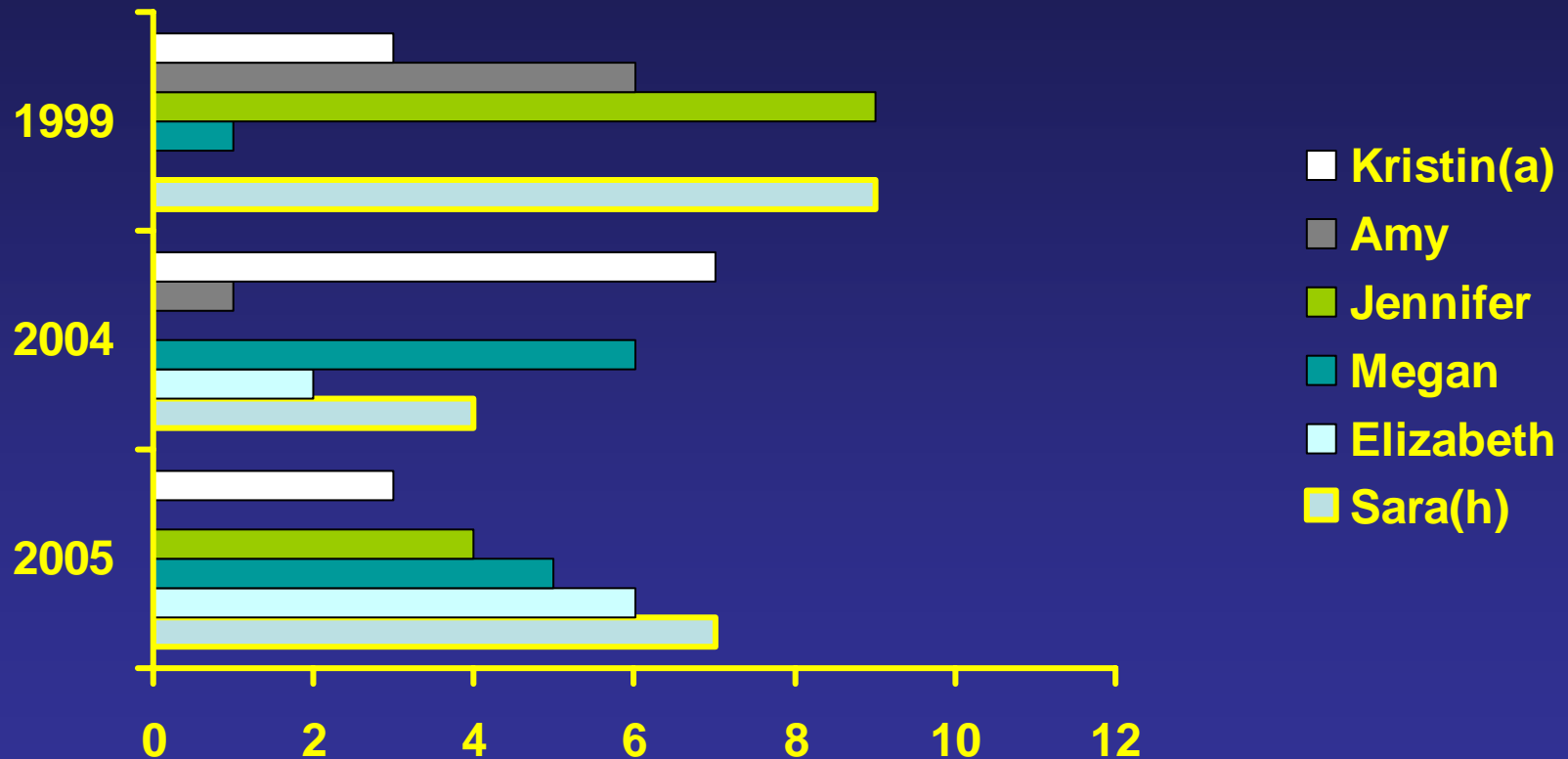
Percentages of farmers adopting 2-4D lags awareness by ~2-3 years. (C-S & F, 1981)

Cultural infection with names (BIOS 101 students)



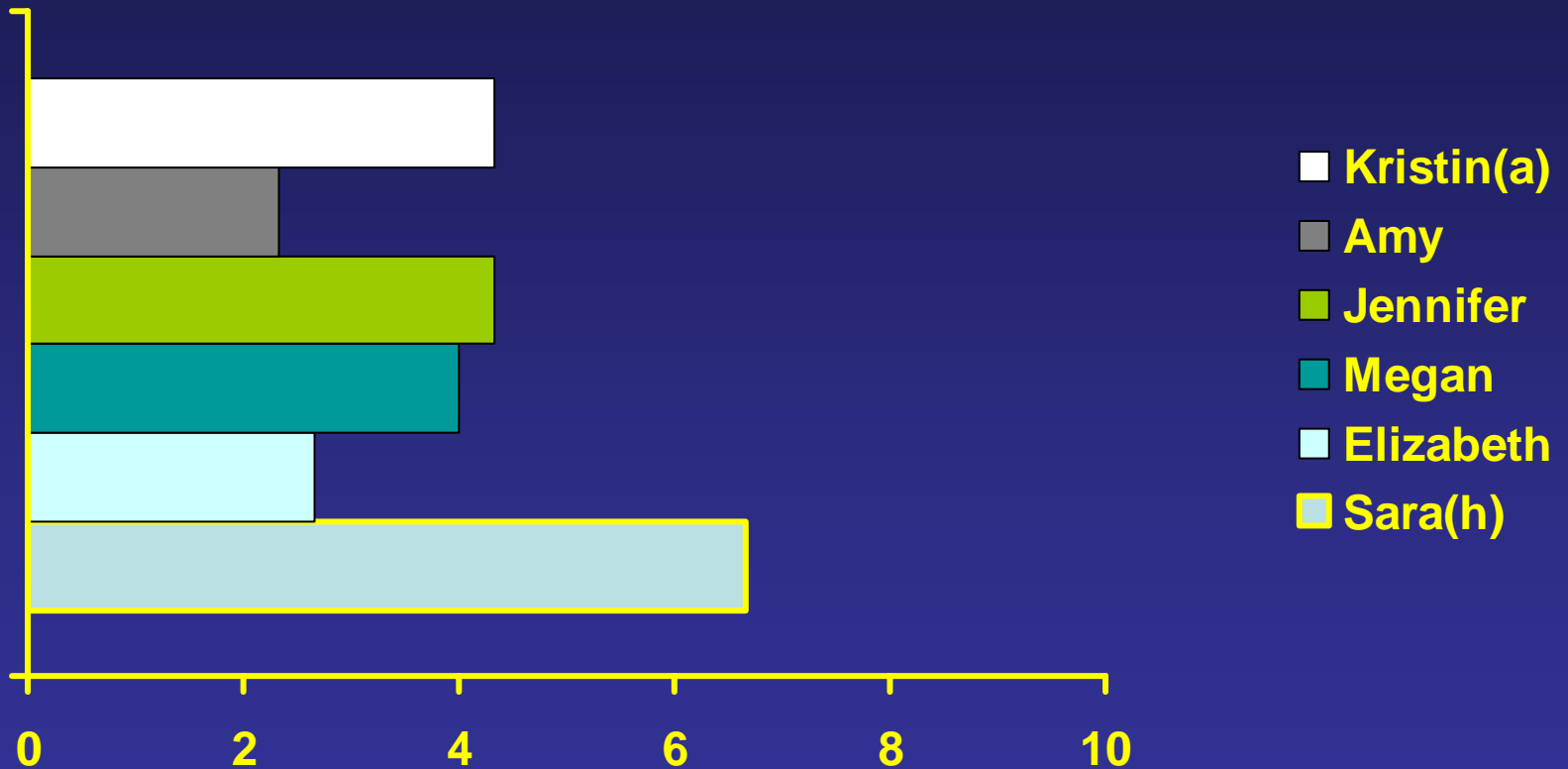
Distribution of students per given name in typical BIOS 101 classes.

Cultural infection with names (BIOS 101 students - female)



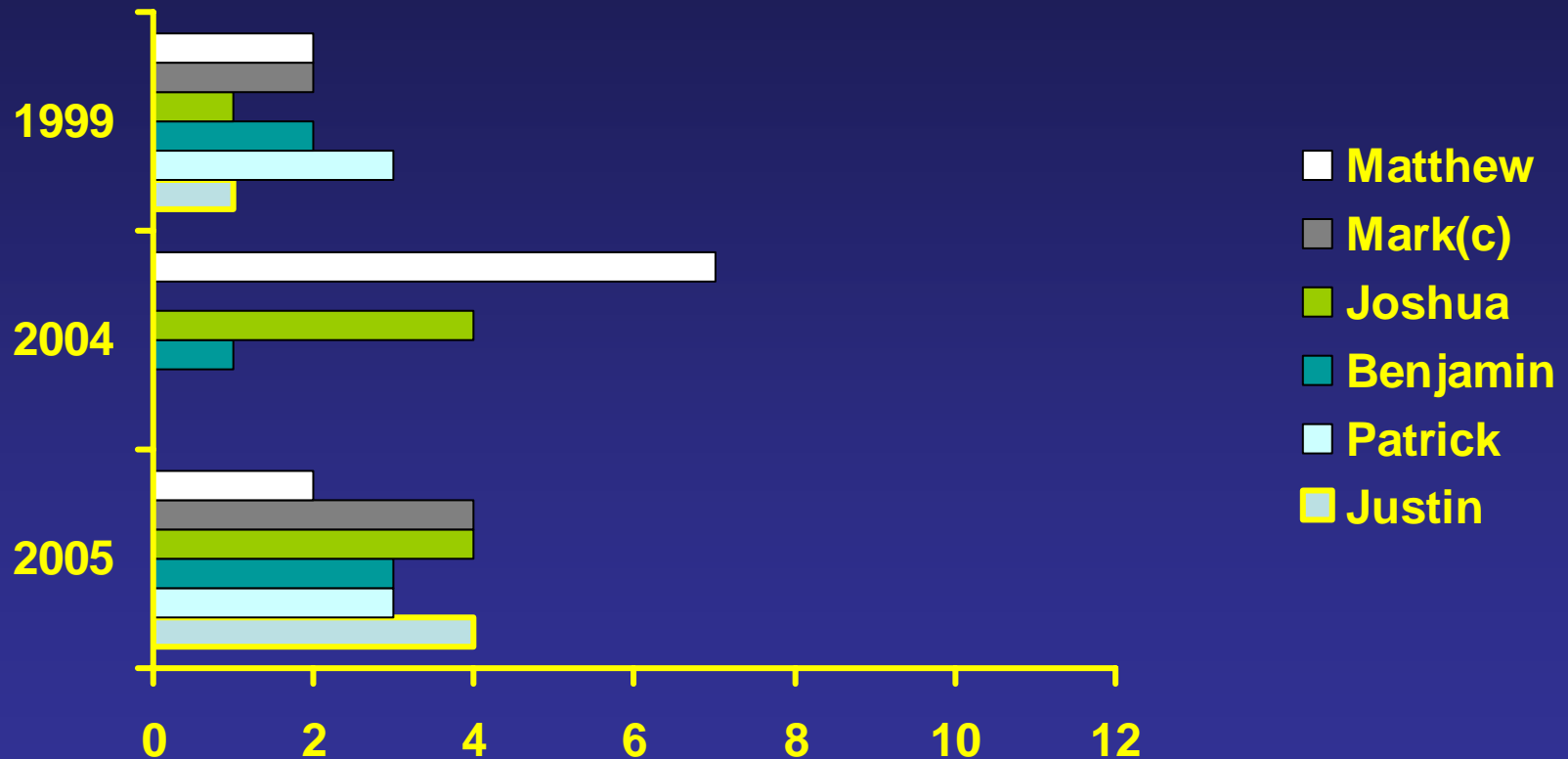
Distribution of students per given name in typical BIOS 101 classes.

Average cultural infection with names (BIOS 101 students - female)



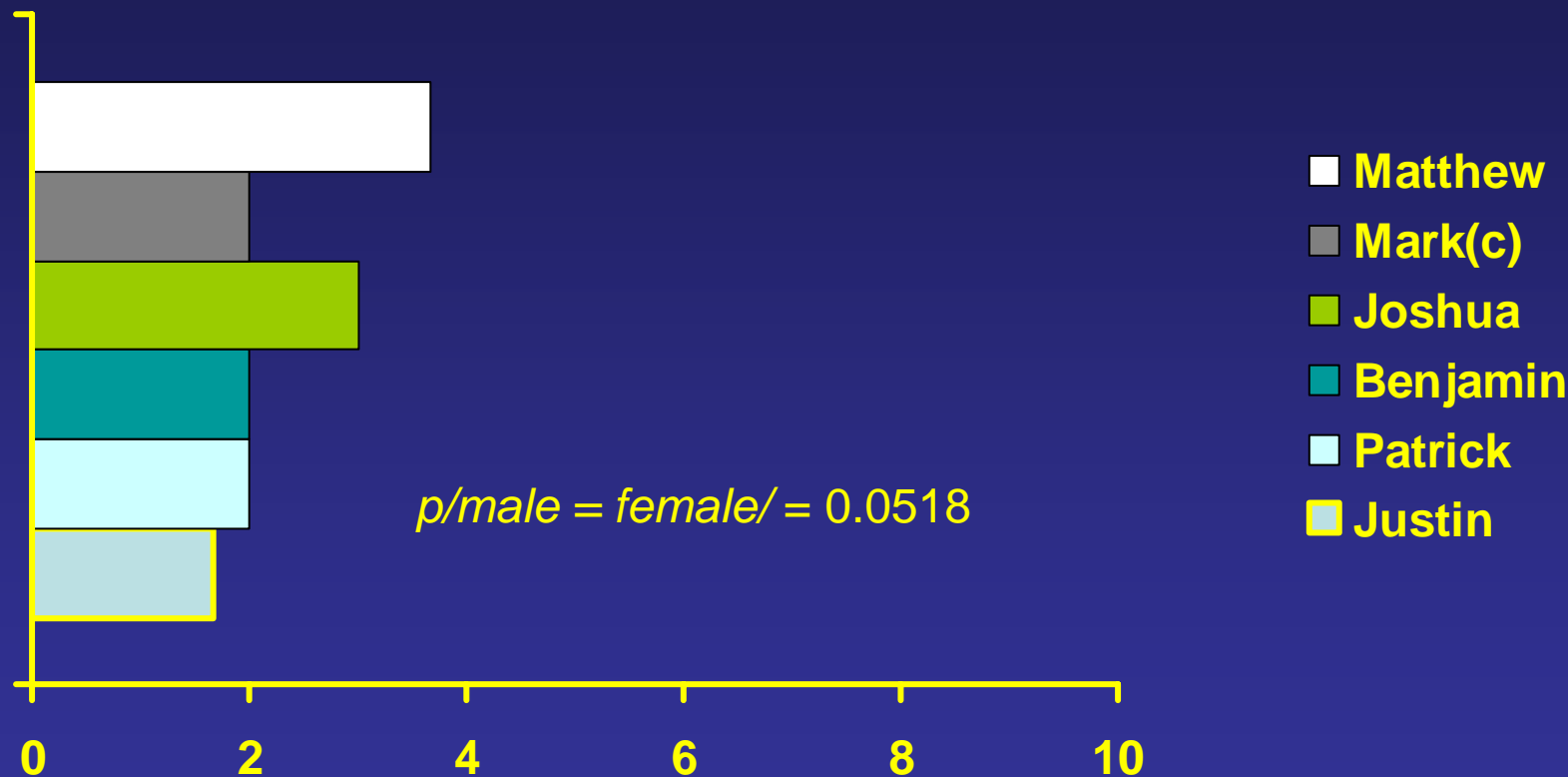
Distribution of students per given name in typical BIOS 101 classes.

Cultural infection with names (BIOS 101 students - male)



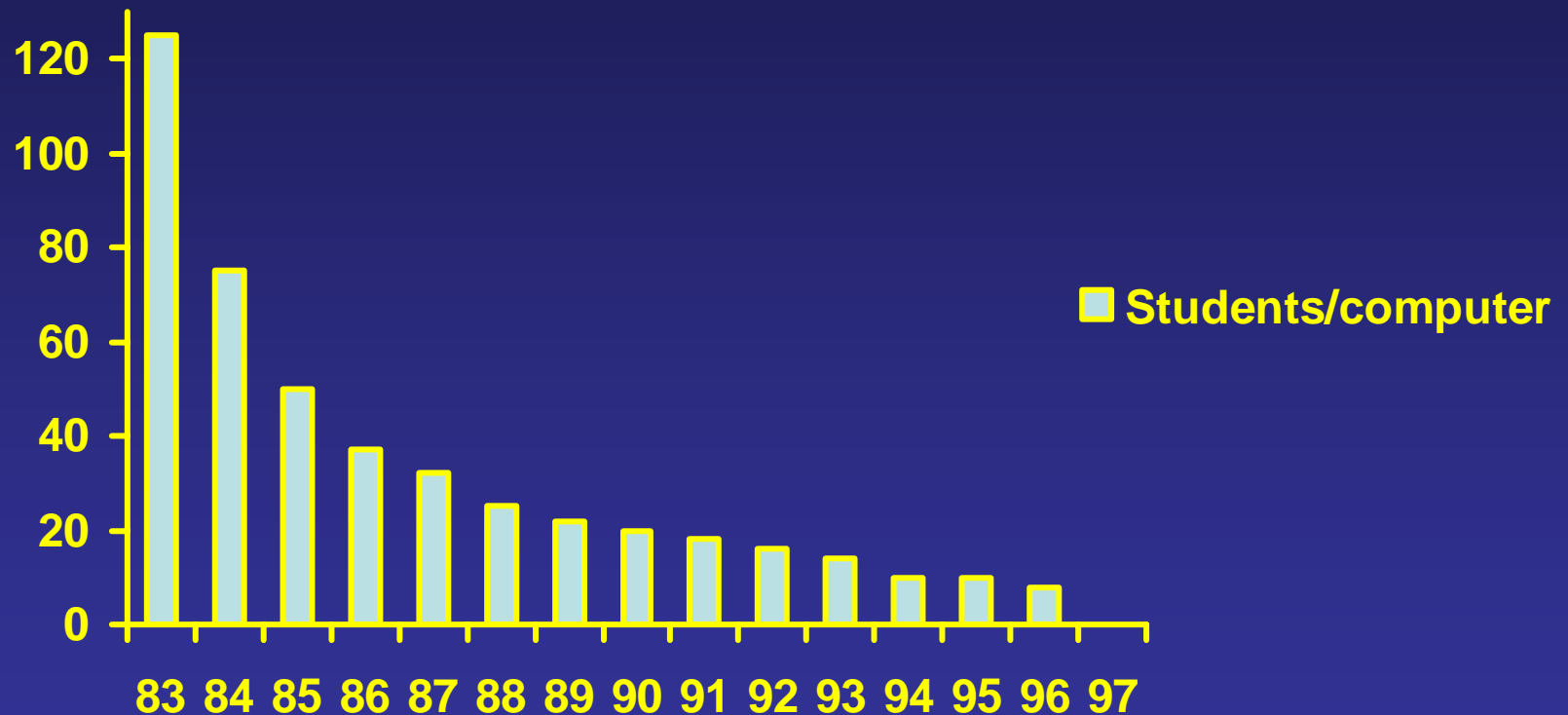
Distribution of students per given name in typical BIOS 101 classes.

Average cultural infection with names (BIOS 101 students - male)



Distribution of students per given name in typical BIOS 101 classes.

Students per computer in US public schools (World Almanac)



The relationship between host and parasite population is changing over time.

Take home messages:

- Ideas, innovations, etc., can behave in a manner analogous to parasites.
- These memes can have infectivity and virulence, and can occur in endemic and epidemic forms.
- Memes can, in a manner analogous to parasites, alter the socio-economic situations of individuals and populations.

The most infective meme of all:

System X

Begin

S(1): Anyone who does not take Invertebrate Zoology and Parasitology next year will burn in Hell.

S(2): It is your duty to save others from suffering.

End

Questions?

