

The Price of Altruism



Oren Harman

Natural Inheritance?

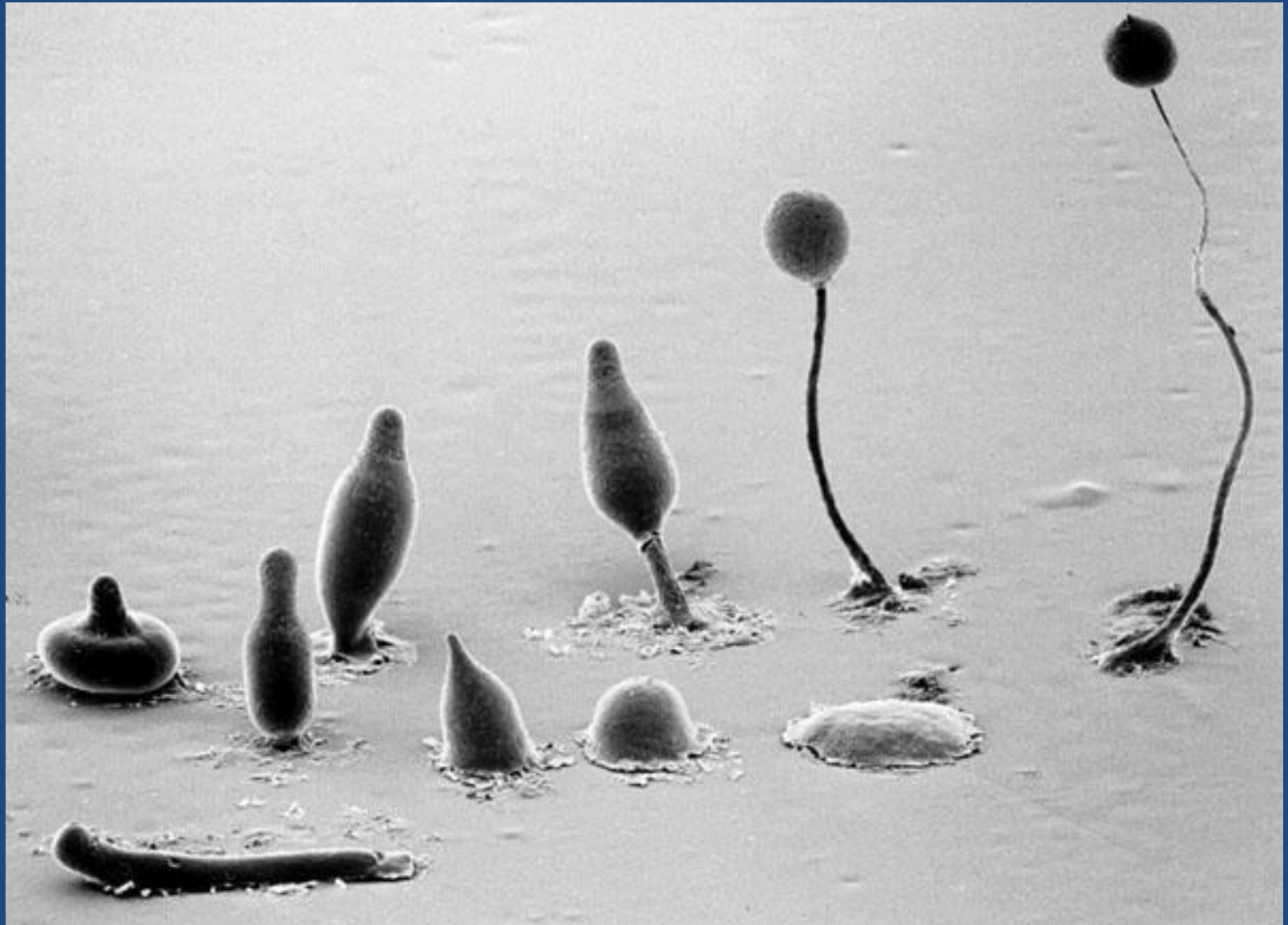


Cultural construction?











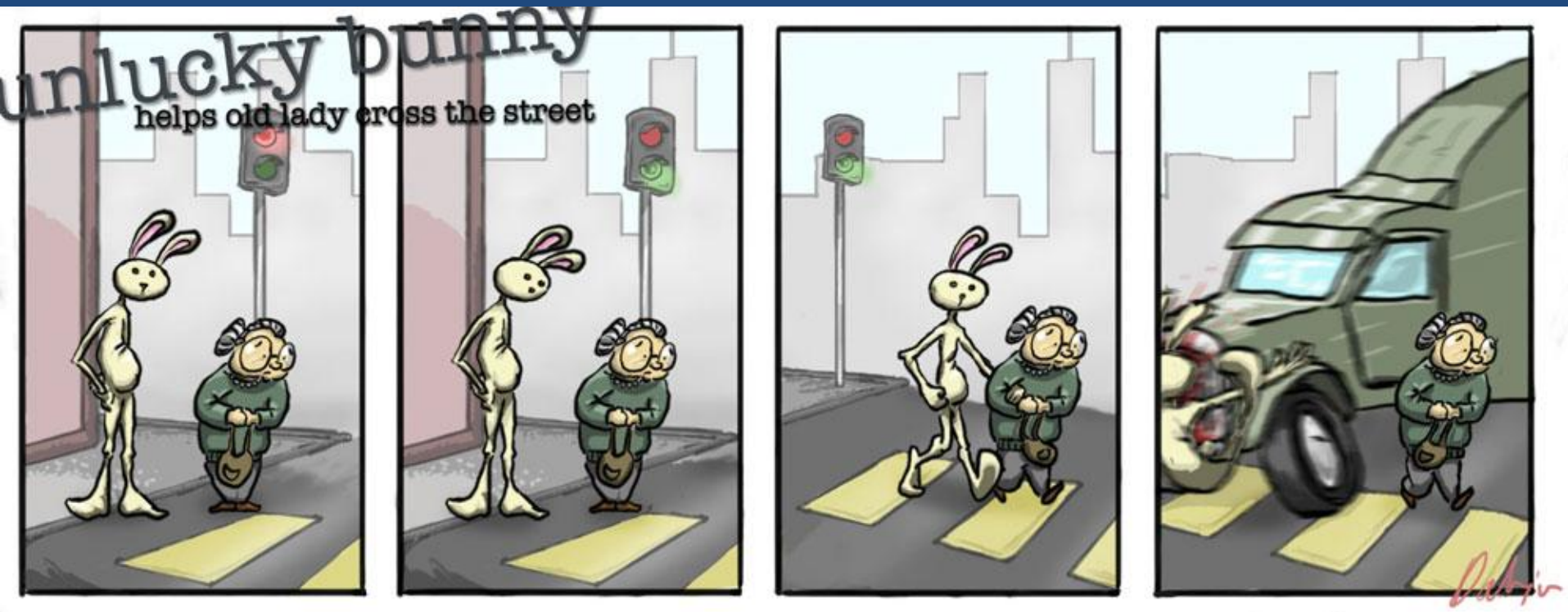








Biological altruism: result



Psychological altruism: intent



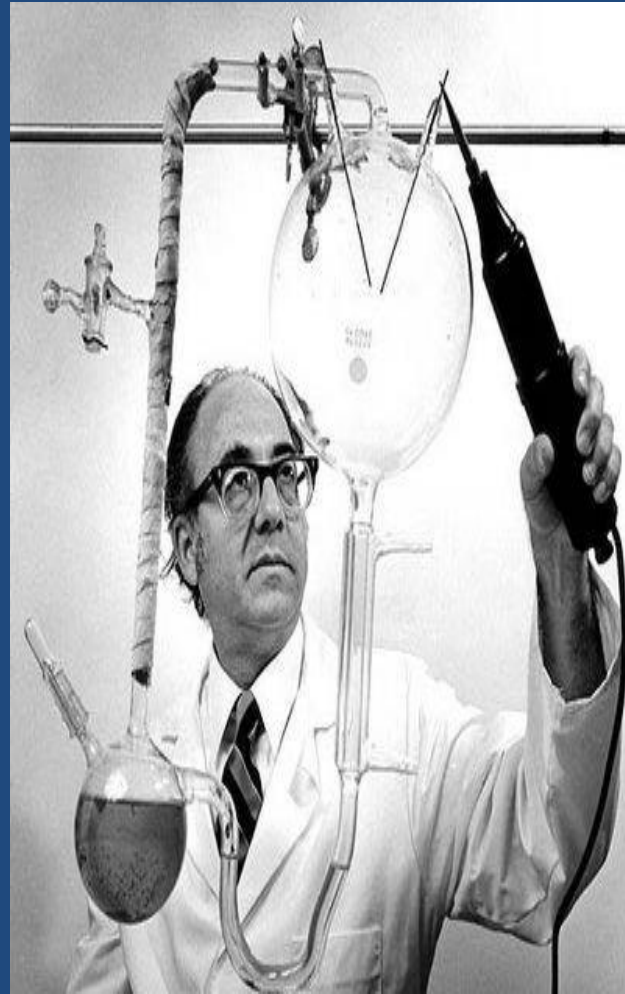
?

The Naturalistic Fallacy

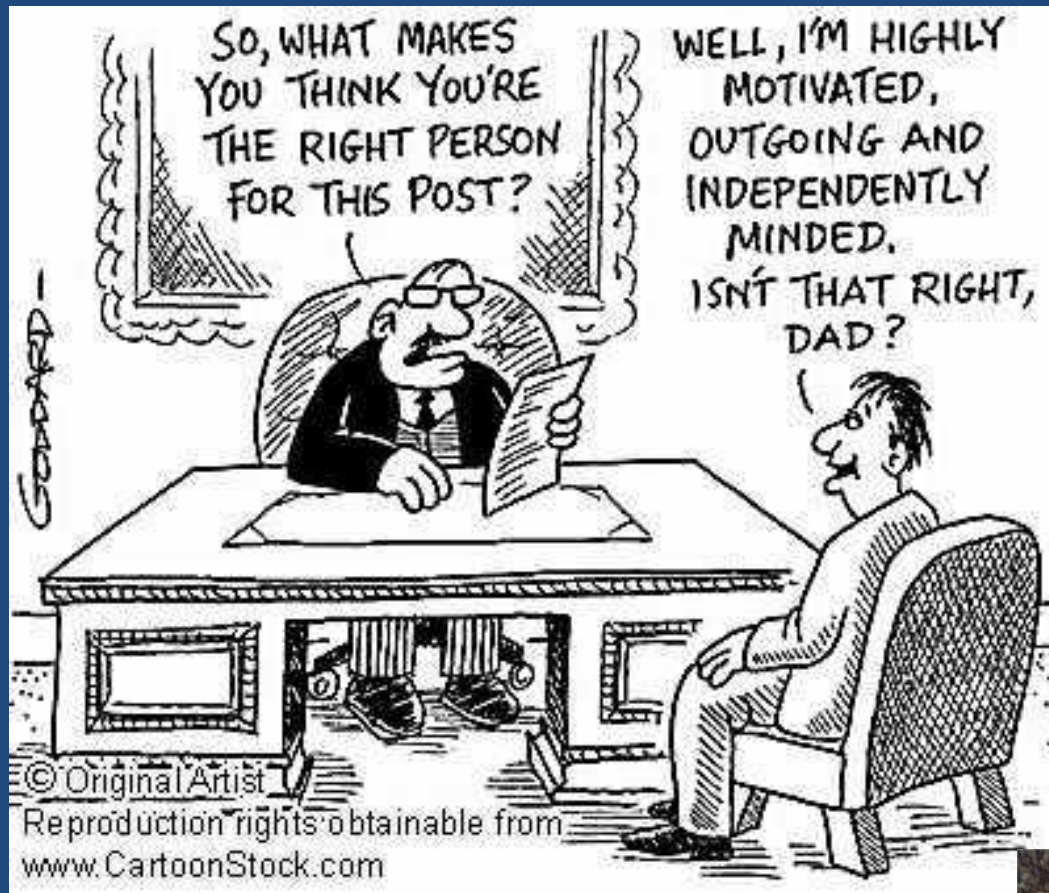


David Hume

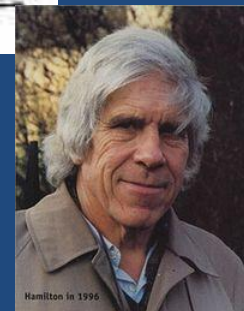
Originalism



Stanley Miller (Miller-Urey Experiment)



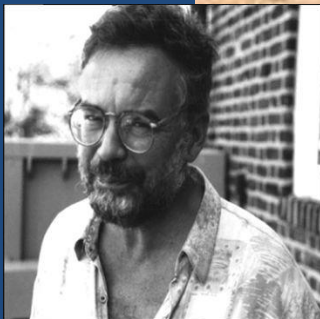
nepotism



W.D. Hamilton



“I’ll jump into a river
for two brothers and
eight cousins”



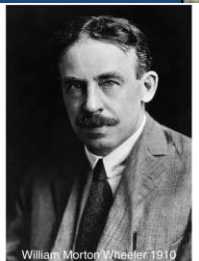
Robert Trivers

reciprocation

V.C. Wynne Edwards

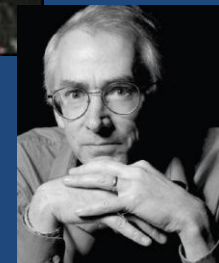


Alfred E. Emerson



William Morton Wheeler

Group selection

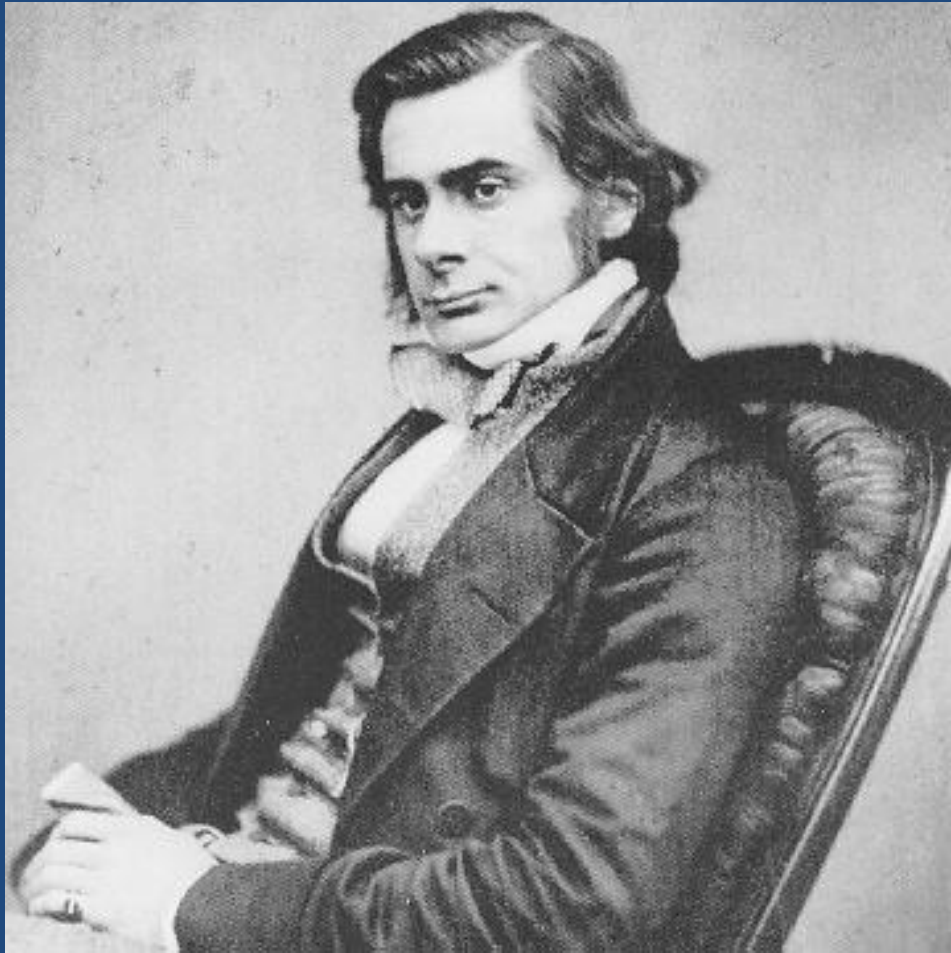


David Sloan Wilson



"every complex structure and instinct" should be "useful to the possessor." Natural selection could "never produce in a being anything injurious to itself, for natural selection acts solely by and for the good of each." - *The Origin*

"The social instincts which no doubt were acquired by man, as by the lower animals, for the good of the community, will from the first have given him some wish to aid his fellows, and some feeling of sympathy." - *The Descent*



T.H. Huxley

It might seem “an audacious proposal” to create thus “an artificial world within the cosmos”, but of course this was man’s “nature within nature”, sanctioned by his evolution, a “strange microcosm spinning counter-clockwise”.

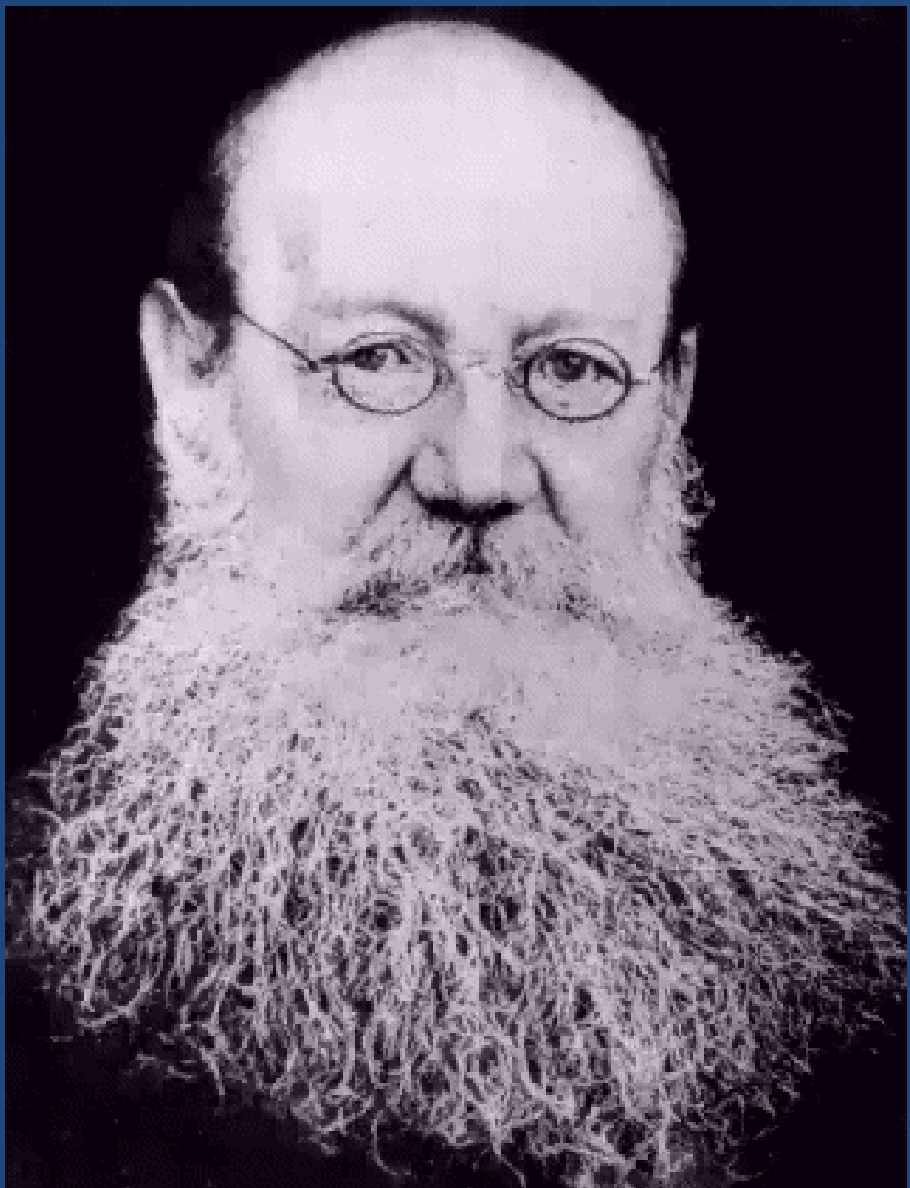
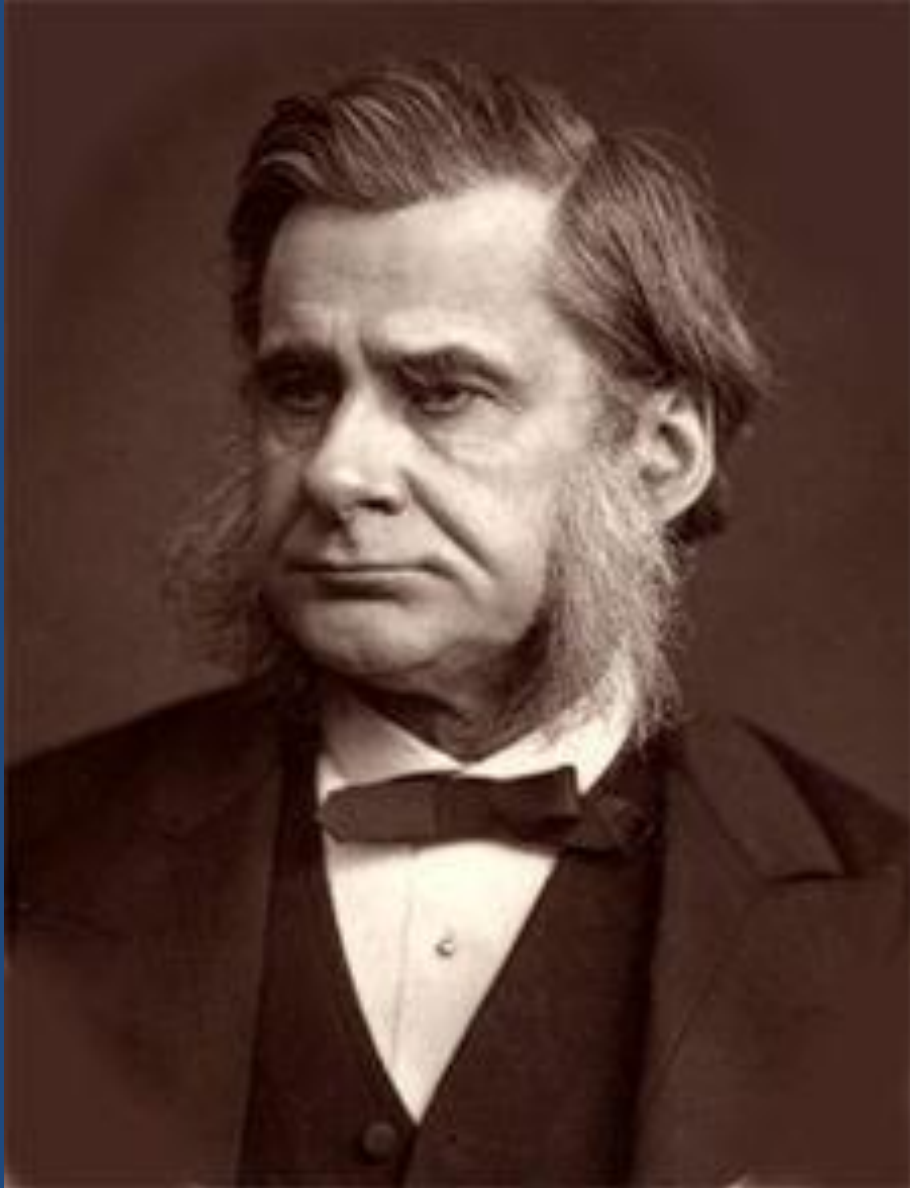
- *The Struggle for Existence in Human Society: A Programme*, 1888

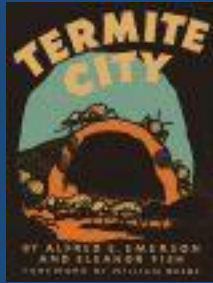


PETER KROPOTKIN IN 1864

“Don’t compete! competition is always injurious to the species, and you have plenty of resources to avoid it. That is the watchword which comes to us from the bush, the forest, the river, the ocean... Therefore combine – practice mutual aid! That is the surest means of giving to each other and to all the greatest safety, the best guarantee of existence and progress, bodily, intellectual, and moral”

– Mutual Aid, 1902





“Just as the cell in the body functions for the benefit of the whole organism so does the individual organism become subordinate to the population” – Alfred Emerson

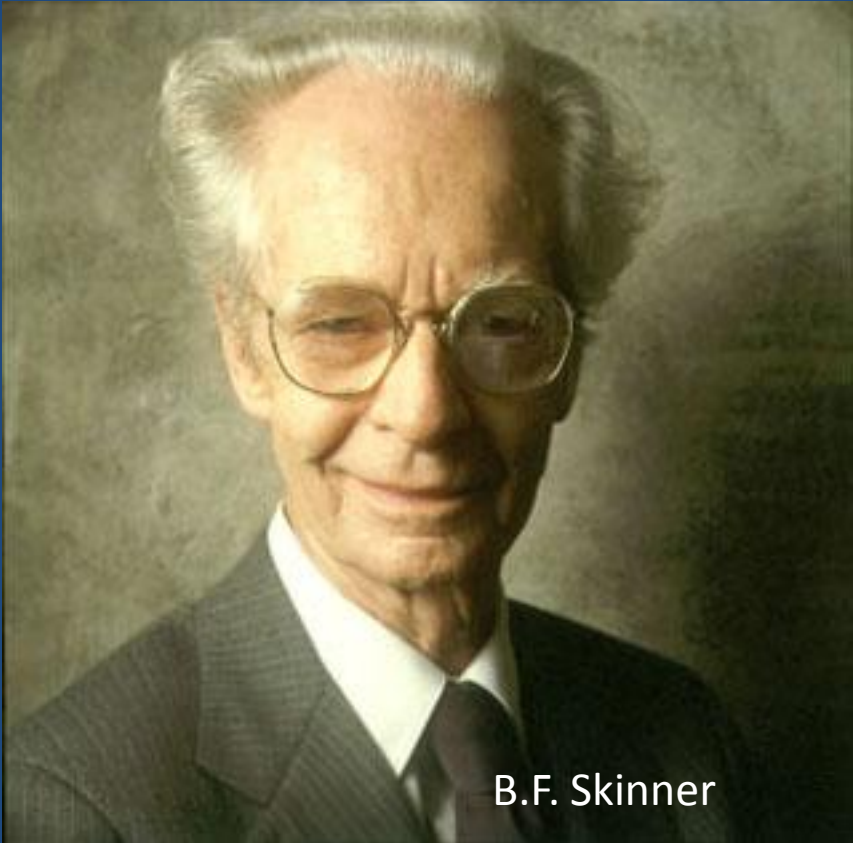


“on the international stage as among our groups of mice, or fish, or hens, or other animals, a subordinate always seriously challenges the *alpha* individual or nation. Although the challenger may be beaten back, often many times, eventually *alpha* rank is taken over by a new despot and the cycle starts again. In so far as any new international organization is based primarily on a hierarchy of power, as are the peck orders of the chicken pens, the peace that follows its apparent acceptance will be relatively short and troubled. Permanent peace is not to be won following the precedent established by the dominance of vertebrate animals”.

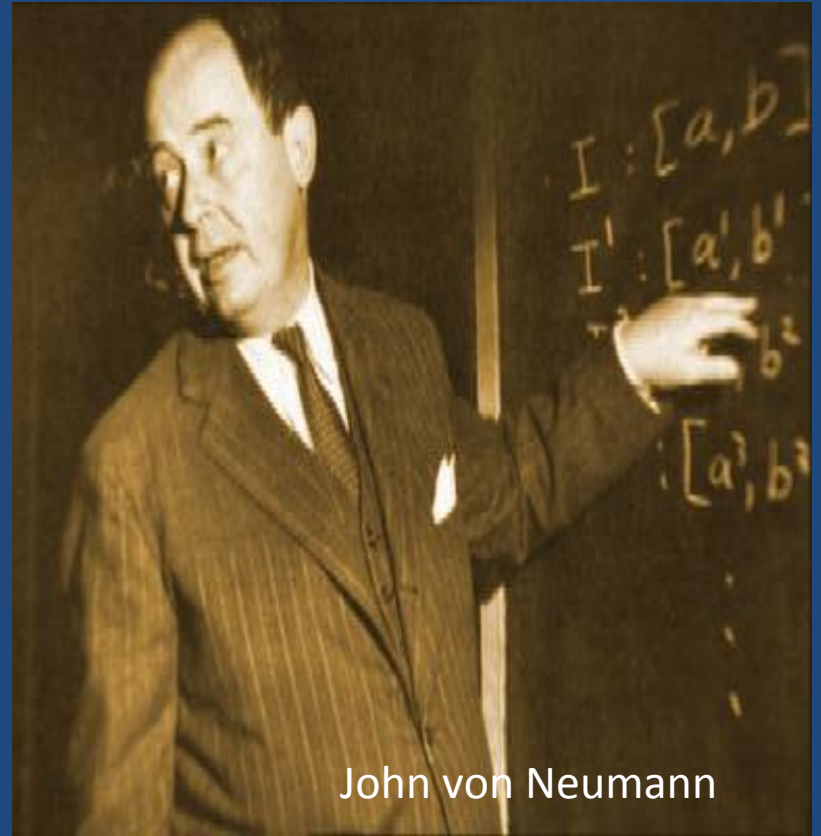
- Warder Clyde Allee, “Biology and International Relations”,
New Republic, 1945.



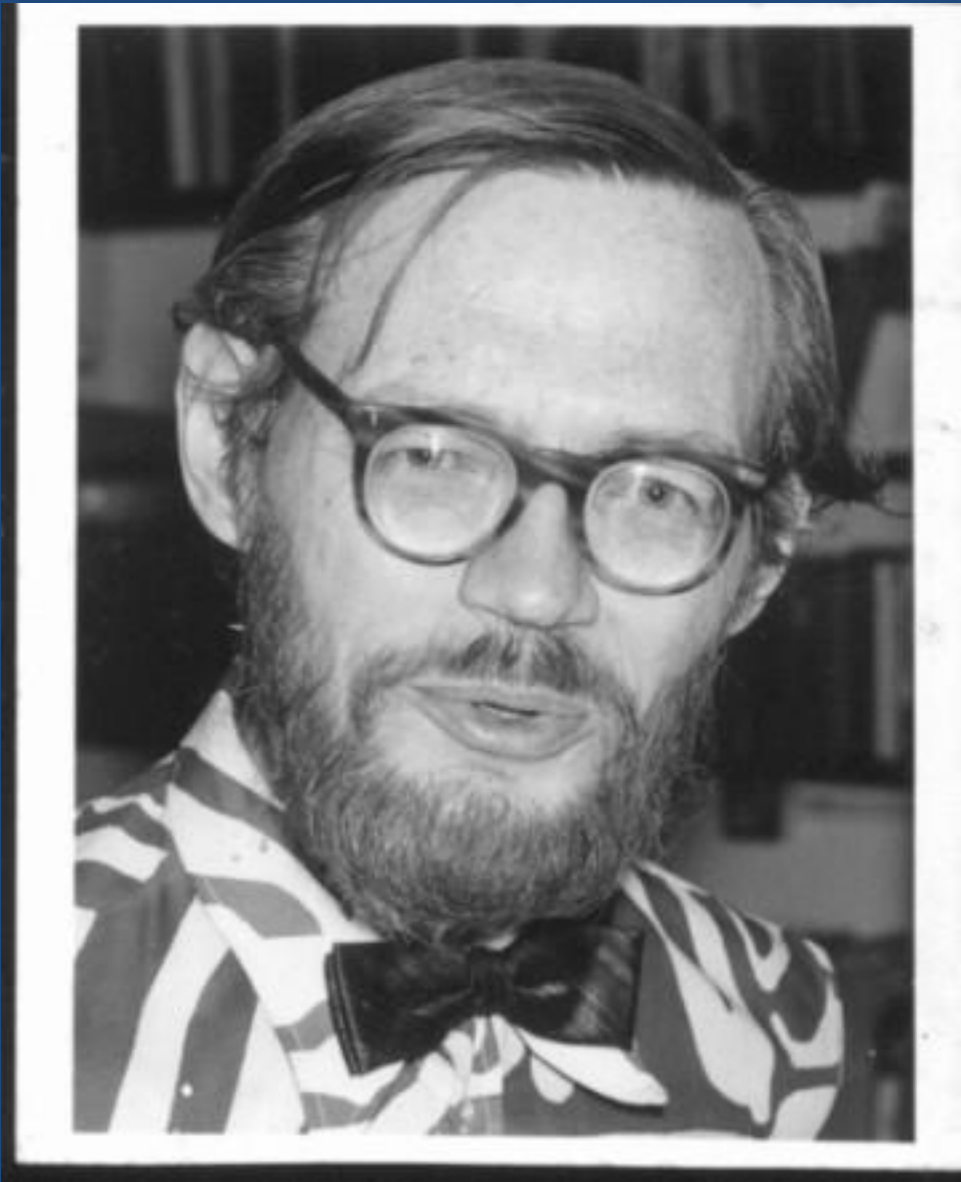
“After much consideration, it is my mature conclusion ... that the cooperative forces are biologically the more important and vital”



B.F. Skinner



John von Neumann



“Might go haywire but will never be humdrum”

George Price





Eckhart Hall, University of Chicago



Harvard University, Cambridge, 1947



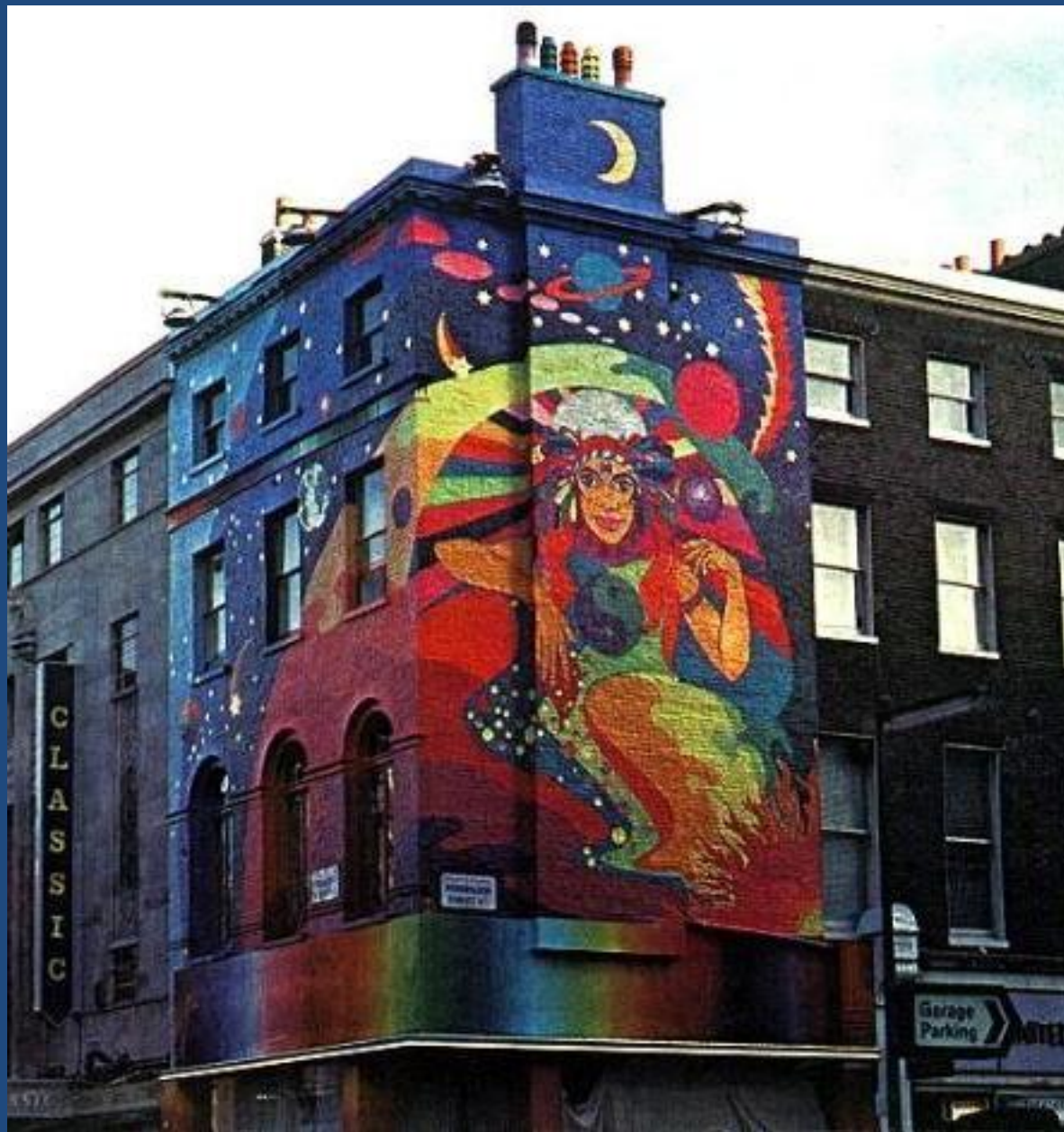
Bell Labs, Morristown New Jersey, 1950



University of Minnesota Medical Center



IBM, Phoughkeepsie



Apple Boutique, off Baker Street, London



Grosvenor Square, London, 1967

UNIVERSITY COLLEGE LONDON
WOLFSON HOUSE

WARNING
HAZCHEM

! Permit to Work
must be obtained
before work in this area

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Working Area
No reporting
Site Office

HAZCHEM
MULTI-
STORAGE

NO SMOKING
Thank you for not smoking

ATTENTION
COURIERS/
DELIVERY
DRIVERS!
DELIVERIES WILL
NOT BE ACCEPTED
BEFORE 09:00am

30 5 2008



All Souls Church at Langham

It thus has great transparency, making it useful as a tool in qualitative evolutionary reasoning. It can also be applied to non-genetical selection. For example, if students' expectations of passing a certain course vary with IQ and if student IQs do not change appreciably during the course, then equation 1 (with its variables suitably redefined) will give the difference in mean IQ between students entering the course and those completing it (and equation 4 below will apply if IQs do change during the course).

Derivation is as follows. Let P_1 and P_2 be populations of a single species, such that P_1 contains all parents of P_2 members and P_2 consists of all offspring of P_1 members. Let the number of P_1 members be N . We label these with identification numbers $i=1, 2, \dots, N$, assigned in any order. Let n_z be the zygotic ploidy of the species for gene A ; let g_i be the dose of gene A in individual i (for example, if $n_z=2$, $g_i=0, 1$, or 2 according to whether i lacks gene A , is heterozygous for A or is homozygous for A); let q_i be the frequency of gene A in individual i , defined by $q_i = g_i/n_z$; and let Q_1 be the frequency of gene A in population P_1 .

$$Q_1 = \sum g_i/n_z N = \sum n_z q_i/n_z N = \bar{q} \quad (2)$$

where the summations are taken over all members of P_1 ($i=1$ to N) and \bar{q} is the arithmetic mean in population P_1 (that is, \bar{q} is a population variable even though I use sample variable notation).

Now we turn attention to offspring. A gamete from a P_1 member that contributes genes to a P_2 member will be termed a "successful gamete". Let n_c be the gametic ploidy for gene A ; let z_i be the number of successful gametes produced by individual i (= the number of i 's offspring); let g'_i be the number of A genes in the set of all of i 's successful gametes; let q'_i be the frequency of gene A in this set of gametes, defined by $q'_i = g'_i/z_i n_c$ if $z_i \neq 0$, $q'_i = q_i$ if $z_i = 0$; let $\Delta q_i = q'_i - q_i$; and let Q_2 be the frequency of gene A in population P_2 . The following can be seen to hold

$$\begin{aligned} Q_2 &= (\sum g'_i)/\sum z_i n_c = (\sum z_i n_c q'_i)/\sum z_i n_c = \sum z_i q'_i/N \bar{z} \\ &= \sum z_i q_i/N \bar{z} + \sum z_i \Delta q_i/N \bar{z} = [\bar{z} \bar{q} + \text{Cov}(z, q)]/\bar{z} + \sum z_i \Delta q_i/N \bar{z} \\ &= \bar{q} + \text{Cov}(z, q)/\bar{z} + \sum z_i \Delta q_i/N \bar{z} \end{aligned} \quad (3)$$

where the summations are taken over all P_1 members, \bar{z} is the arithmetic mean of z in P_1 and $\text{Cov}(z, q)$ is the covariance (or first order central product moment) of z and q in population P_1 . Subtraction of equation 2 from equation 3 gives

$$\Delta Q = Q_2 - Q_1 = \text{Cov}(z, q)/\bar{z} + \sum z_i \Delta q_i/N \bar{z} \quad (4)$$

If meiosis and fertilization are random with respect to gene A , the summation term at the right will be zero except for statistical sampling effects ("random drift"), and these will tend to average out to give equation 1.

Five points about equation 1 will be briefly explained. First, equation 1 in its regression coefficient form can be visualized in terms of a linear regression line fitted to a scatter diagram of z against q . (A linear regression line is the best construction in terms of individual points.) Since the regression line has slope β_{zq} , gene frequency change due to selection is exactly proportional to the slope. Therefore, at any step in constructing hypotheses about evolution through natural selection—for example, about why human canines do not protrude, why deer antlers are annually shed and renewed, why parrots mimic, why dolphins play—one can visualize such a diagram and consider whether the slope really would be appreciably non-zero under the assumptions of the theory. If there is no slope, then there is no frequency change except by Δq effects, and the hypothesis is probably wrong.

Selection and Covariance

THIS is a preliminary communication describing applications to genetical selection of a new mathematical treatment of selection in general.

Gene frequency change is the basic event in biological evolution. The following equation (notation to be explained), which gives frequency change under selection from one generation to the next for a single gene or for any linear function of any number of genes at any number of loci, holds for any sort of dominance or epistasis, for sexual or asexual reproduction, for random or non-random mating, for diploid, haploid or polyploid species, and even for imaginary species with more than two sexes

$$\Delta Q = \text{Cov}(z, q)/\bar{z} \quad (1)$$

The equation easily translates into regression coefficient (β_{zq}) or correlation coefficient (ρ_{zq}) form

$$\Delta Q = \beta_{zq} \sigma_z^2/\bar{z} = \rho_{zq} \sigma_z \sigma_q/\bar{z}$$

Second, equation 1 fails if gene A ploidy is not the same in each P_1 member. Suppose, for example, that the A locus is in X but not Y chromosomes in a species with XX females and XY males. Then Q_1 is redefined as $Q_1 = (\sum g_i)/\sum n_i$, where n_i is A locus ploidy in individual i (that is, $n_i=1$ if i is male, or 2 if i is female); and Q_2, q_i , and q'_i are redefined in corresponding ways. If P_1 and P_2 have sex ratios of unity (as is commonly the case at conception), then the following can be derived

$$\Delta Q = \frac{2}{3} \text{Cov}(z, q)_F/\bar{z}_F + \frac{1}{3} \text{Cov}(z, q)_M/\bar{z}_M \quad (5)$$

where $\text{Cov}(z, q)_F$ is the z, q covariance and \bar{z}_F is the mean in P_{1F} , the female subset of P_1 , and $\text{Cov}(z, q)_M$ and \bar{z}_M apply to the male subset, P_{1M} .

Third, the specifications that were stated for P_1 and P_2 imply a "discrete generations model". This was done solely in order to simplify this preliminary report. Actually equation 1 can be applied to species with overlapping, interbreeding generations, and it is not necessary that P_2 should contain all offspring of P_1 members, nor that P_1 should contain all parents of P_2 members. Departure from the "all parents" condition, however, requires re-interpretation of what ΔQ means, and departure from the "all offspring" condition (meaning all zygotes conceived) must be done with insight to avoid introducing post-conceptual selection on P_2 (for post-conceptual selection would require the use of equation 4 instead of equation 1).

Fourth, as an example of how multiple gene functions can be handled, let us suppose that a regression analysis has given the relation

$$\varphi_i \approx 2.3 + 1.2q_{iA} - 0.7q_{iB} + 0.5q_{iC}$$

for the effects of genes A, B , and C on character φ . Then we may decide to define

$$\begin{aligned} q_i &= 2.3 + 1.2q_{iA} - 0.7q_{iB} + 0.5q_{iC} \\ \Delta Q &= Q_2 - Q_1 = (2.3 + 1.2Q_{2A} - 0.7Q_{2B} + 0.5Q_{2C}) \\ &\quad - (2.3 + 1.2Q_{1A} - 0.7Q_{1B} + 0.5Q_{1C}) \end{aligned}$$

and equation 1 will hold for these multiple gene functions or for any other linear function of z and Q for any number of genes, if it holds for each gene separately.

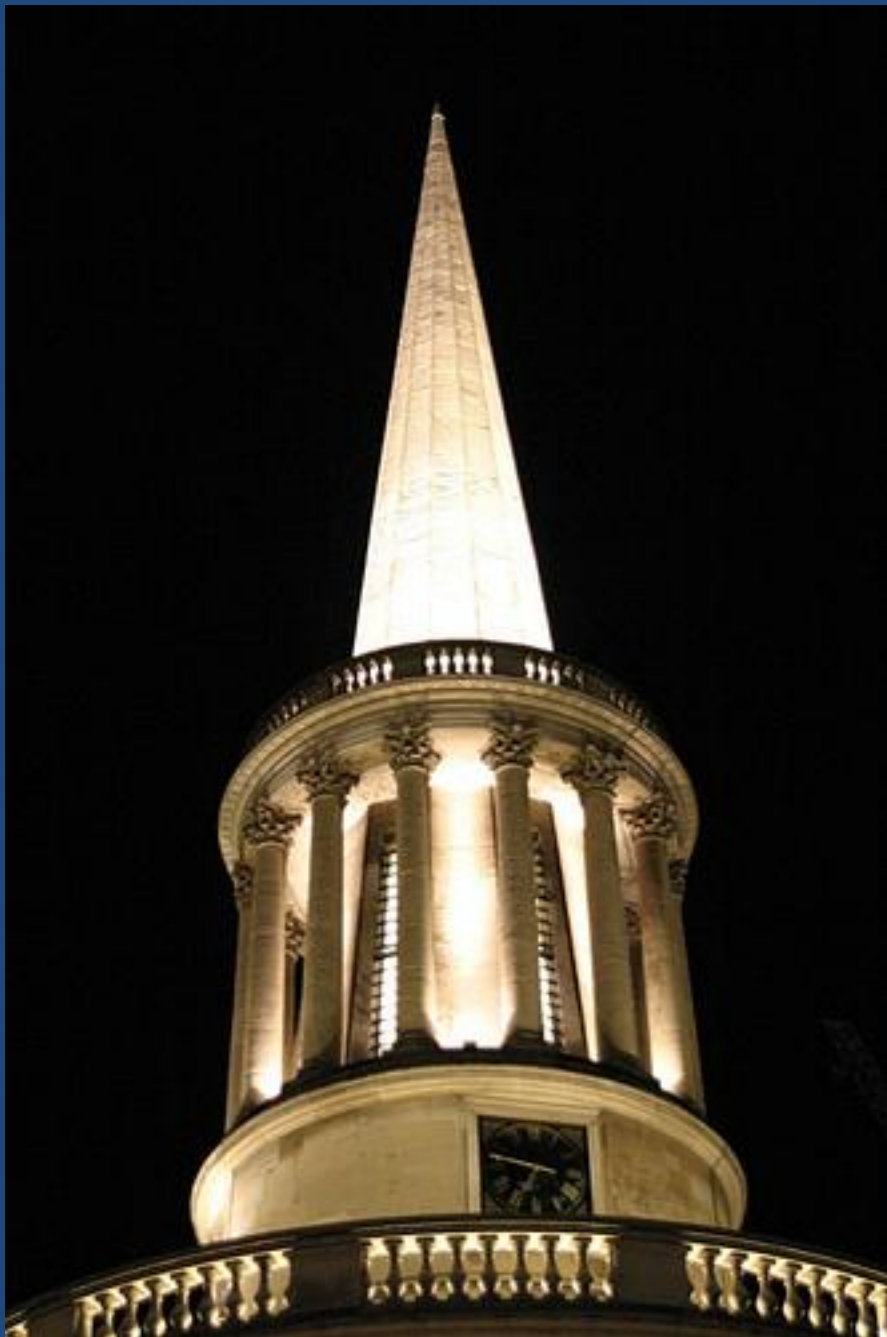
Fifth, it seems surprising that so simple a relation as equation 1 has not (to my knowledge) been recognized before. Probably this is because selection mathematics has largely been limited to genetical selection in diploid species, where covariance takes so simple a form that its implicit presence is hard to recognize (whereas if man were tetraploid, covariance would have been recognized long ago); and because, instead of using subscripts as "names" of individuals (as I have done), the usual practice in gene frequency equations is to use subscripts only as names of gene or genotype types, which makes the mathematics seem quite different. Recognition of covariance (or regression or correlation) is of no advantage for numerical calculation, but of much advantage for evolutionary reasoning and mathematical model building.

Some genetical selection cases (such as group selection) and many forms of non-genetical selection require more complex mathematics than that given here. I plan to discuss these and other matters in papers now in preparation.

I thank Professor C. A. B. Smith for help, and the Science Research Council for financial support.

GEORGE R. PRICE

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“I began to have a faint, vague impression of seeing Jesus walking before me bearing the Cross...This means that some suffering lies ahead for me”.

- George Price letter to Kathleen Price, March 24, 1973.

“I am now down to my last 15p... I look forward eagerly to when the 15p will be gone”

- George Price letter to John Maynard Smith, October 19, 1973



Fall, 1974



St Pancras Cemetery, London

Issues:

1. Mutual interplay between the social, psychological and political, and the scientific: Despite the myth of disinterested science, it is rarely the case that scientific issues of social importance remain pristine.
How to overcome:
2. The naturalistic fallacy
3. Originalism
4. Presentism
5. Celebrating the majesty of science while properly framing its magesterium

The Oxytocin Receptor (*OXTR*) Contributes to Prosocial Fund Allocations in the Dictator Game and the Social Value Orientations Task

Salomon Israel¹, Elad Lerer², Idan Shalev³, Florina Uzefovsky¹, Mathias Riebold², Efrat Laiba², Rachel Bachner-Melman¹, Anat Maril¹, Gary Bornstein^{1,4}, Ariel Knafo¹, Richard P. Ebstein^{1,5*}

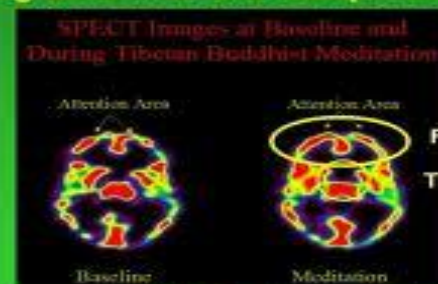
1 Department of Psychology, The Hebrew University of Jerusalem, Jerusalem, Israel, **2** Department of Human Genetics, The Hebrew University of Jerusalem, Jerusalem, Israel, **3** Brain and Behavior Science, The Hebrew University of Jerusalem, Jerusalem, Israel, **4** Center for the Study of Rationality and Interactive Decision Theory, Jerusalem, Israel, **5** S. Herzog Memorial Hospital, Jerusalem, Israel

Five Rules for the Evolution of Cooperation

Martin A. Nowak

Cooperation is needed for evolution to construct new levels of organization. Genomes, cells, multicellular organisms, social insects, and human society are all based on cooperation. Cooperation means that selfish replicators forgo some of their reproductive potential to help one another. But natural selection implies competition and therefore opposes cooperation unless a specific mechanism is at work. Here I discuss five mechanisms for the evolution of cooperation: kin selection, direct reciprocity, indirect reciprocity, network reciprocity, and group selection. For each mechanism, a simple rule is derived that specifies whether natural selection can lead to cooperation.

Neural Imaging: Tibetan Buddhism "unconditional loving-kindness and compassion."



With Permission of Andrew Newburg

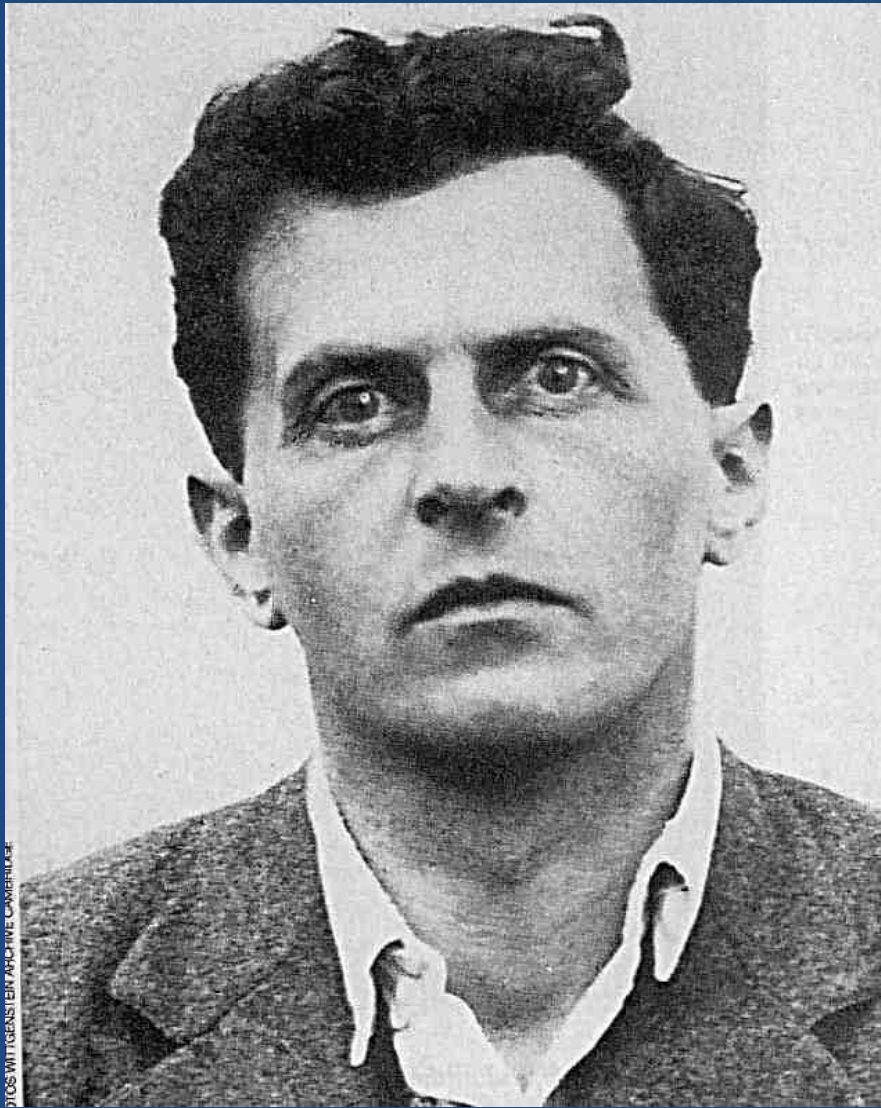
Monkeys reject unequal pay

Sarah F. Brosnan & Frans B. M. de Waal

Living Links, Yerkes National Primate Research Center, Emory University, Atlanta, Georgia 30329, USA

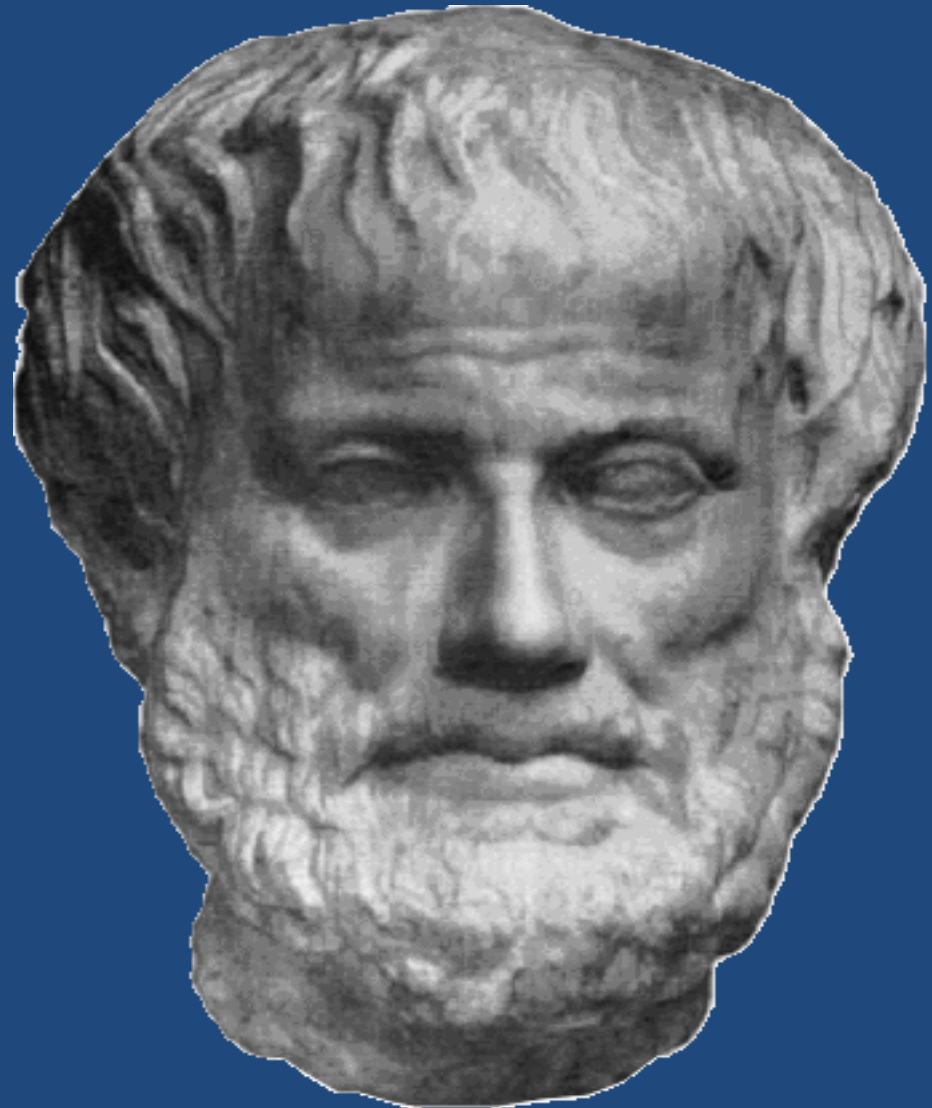
During the evolution of cooperation it may have become critical for individuals to compare their own efforts and pay-offs with those of others. Negative reactions may occur when expectations



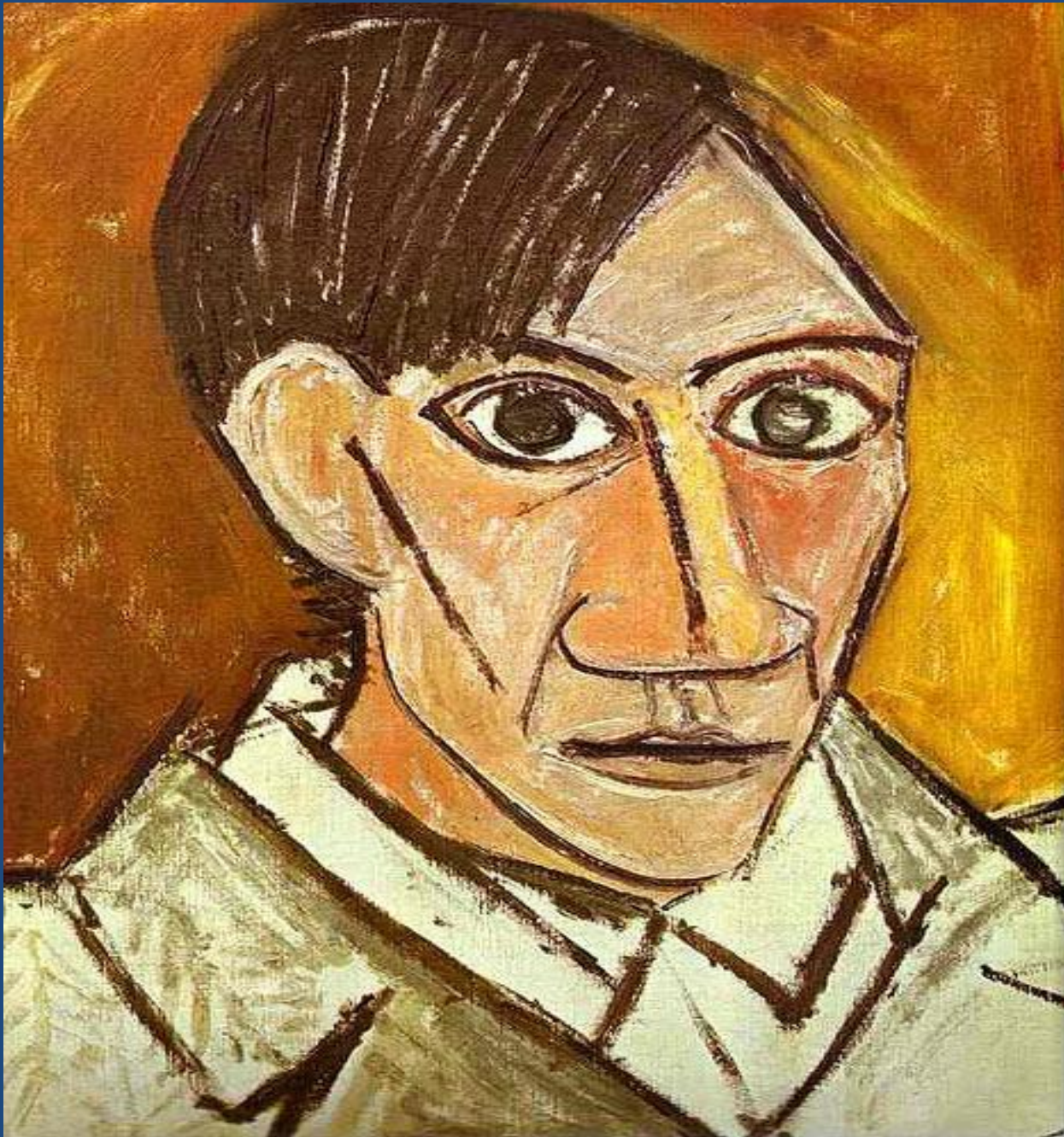


PHOTOS: WITTINGSTON ARCHIVE / CAMBRIDGE

*“Amicabilia quae sunt ad alterum vererunt
amicabilibus quae sunt ad seipsum”* - the love
we feel for others stems from the love we feel
for ourselves.



“Even if all possible scientific questions be
answered, the problems of life have still not
been touched at all. Of course there is then no
question left, and just this is the answer”



“Art is a lie that makes
us realize the truth”

– Pablo Picasso

History as art



“Men and women have always yearned for understanding, compassion, forgiveness, and deeds of loving kindness from their fellowmen but often they’ve been sadly disappointed. And today more than ever in a world torn by strife and dissension, the crying need is for a real demonstration of love. You see, love would pour the oil of quietness upon the troubled waters of human relationships, heal the ugly wounds of strife and contention, and bring together those separated by hatred, jealousy and selfishness. No wonder the apostle concludes the tremendous 13th chapter of 1 Corinthians by emphasizing that of all the gifts of the Spirit, including faith and hope, the greatest is love.”

Hvala!

Thank you!

תודה!

