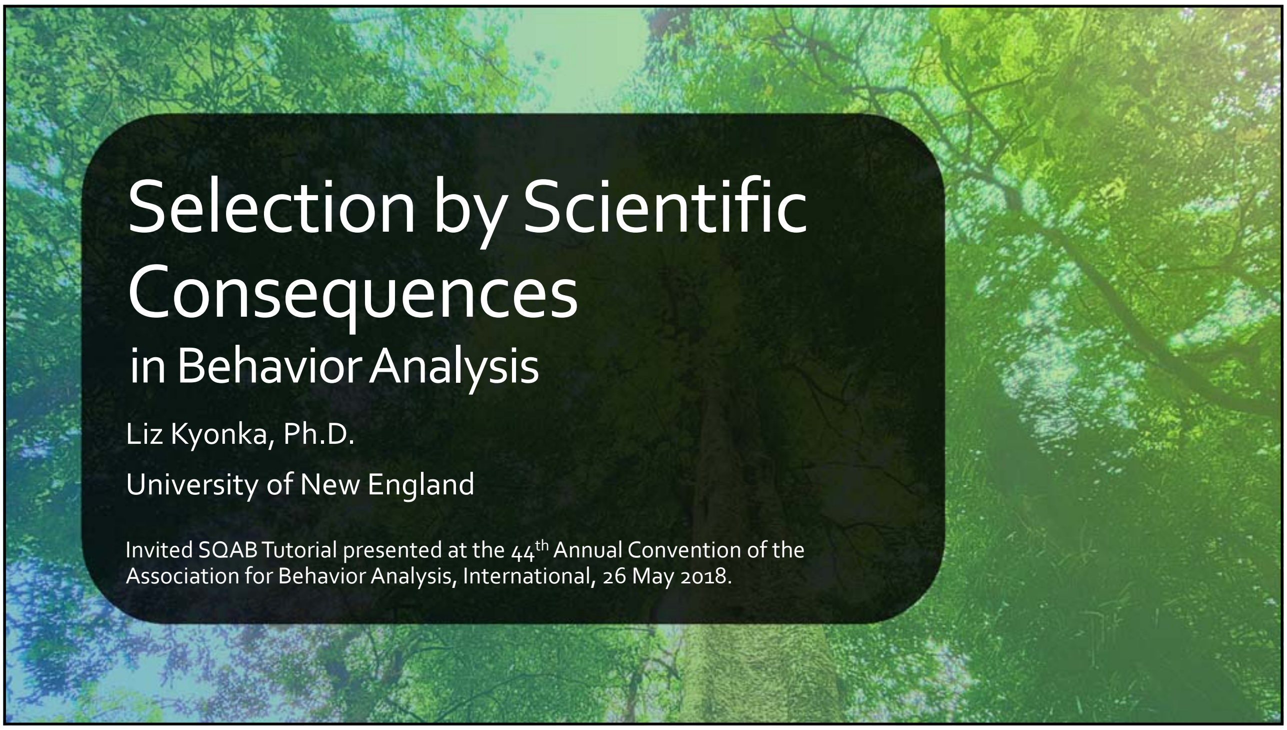
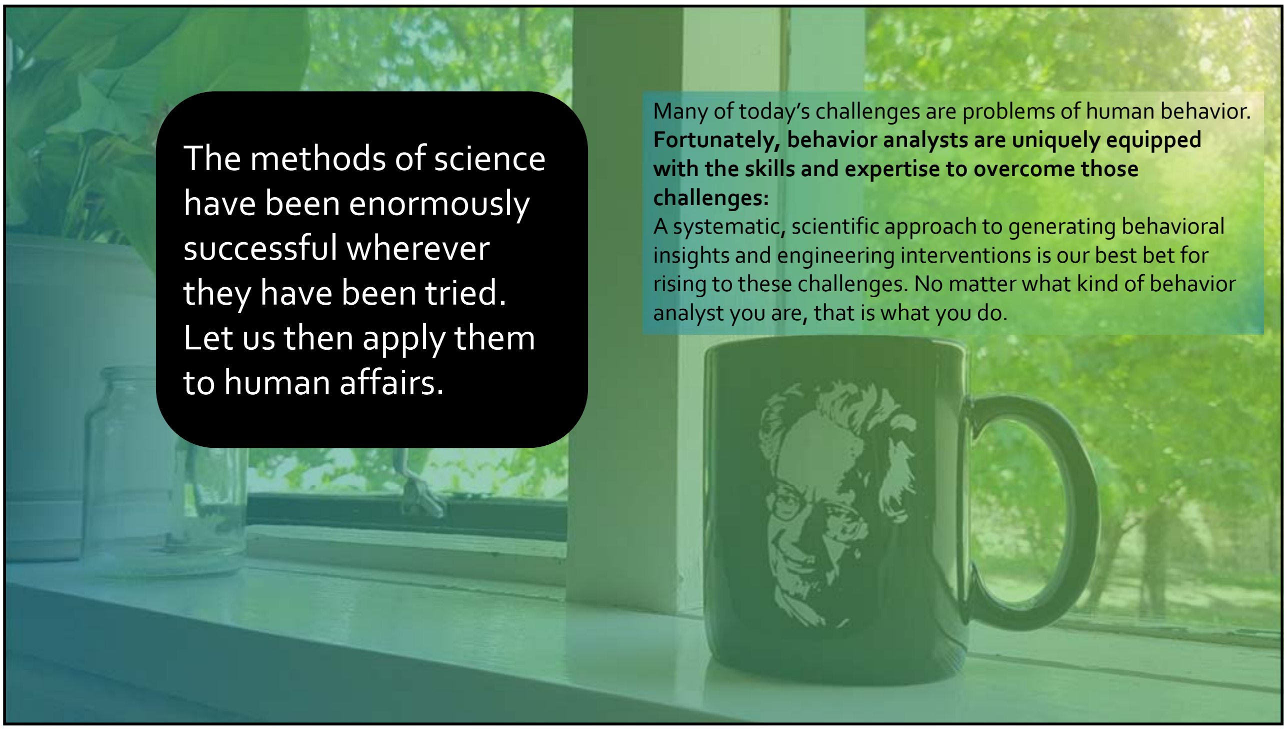


Selection by Scientific Consequences
in Behavior Analysis

Liz Kyonka, Ph.D.
University of New England

Invited SQAB Tutorial presented at the 44th Annual Convention of the Association for Behavior Analysis, International, 26 May 2018.



The methods of science have been enormously successful wherever they have been tried. Let us then apply them to human affairs.

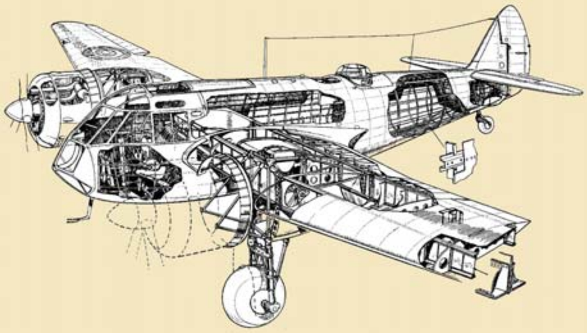
Many of today's challenges are problems of human behavior. **Fortunately, behavior analysts are uniquely equipped with the skills and expertise to overcome those challenges:**
A systematic, scientific approach to generating behavioral insights and engineering interventions is our best bet for rising to these challenges. No matter what kind of behavior analyst you are, that is what you do.

Ensure your own mask is secure before assisting others

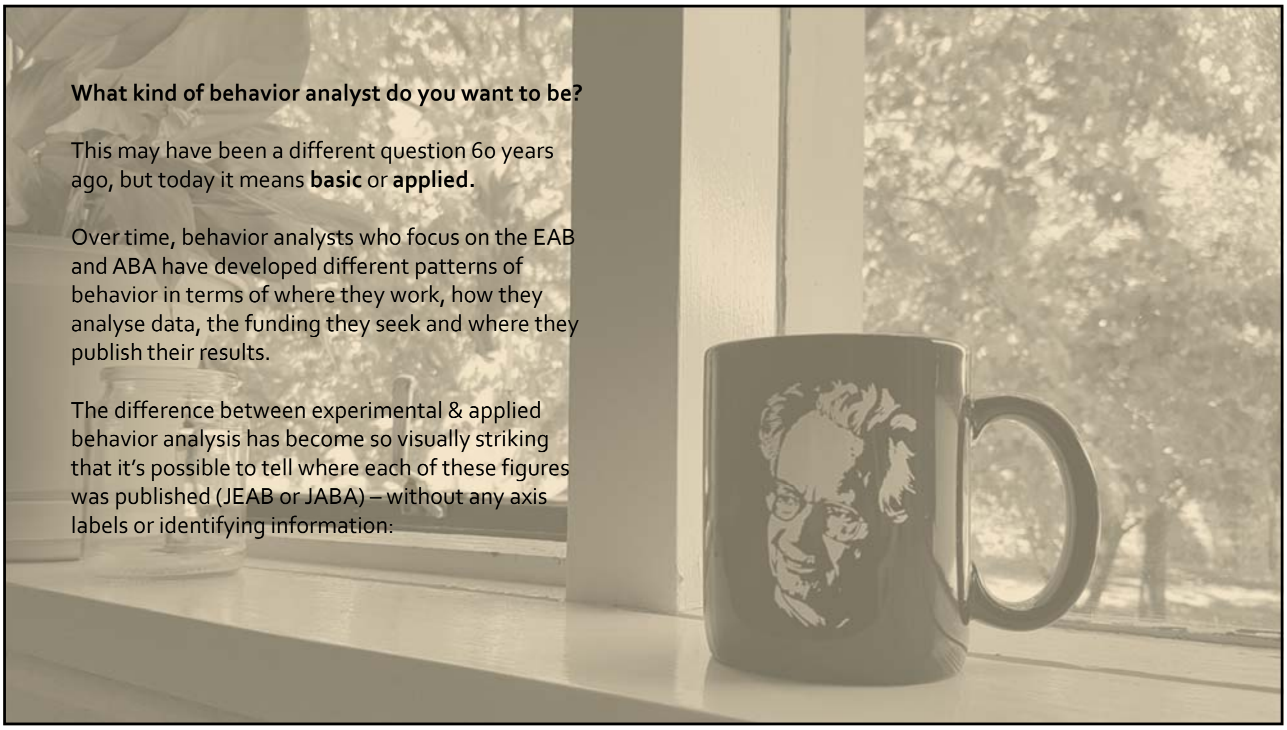
We have an obligation as well as an opportunity to put our own behavior under a microscope.

Behavior analysts can use ideas from related behavioral sciences to guide decisions about what kind of scientists we want to be and to shape the future of behavior analysis research.

After all, our work should be subjected to the rigor and scrutiny of other fields, and seeking out ideas other than our own is one way for behavior analysis to grow.



Patrick Tschudin, © 2012

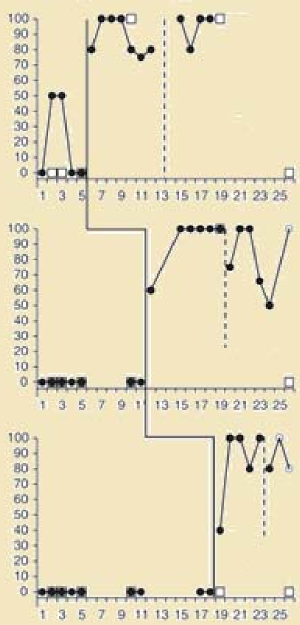


What kind of behavior analyst do you want to be?

This may have been a different question 60 years ago, but today it means **basic** or **applied.**

Over time, behavior analysts who focus on the EAB and ABA have developed different patterns of behavior in terms of where they work, how they analyse data, the funding they seek and where they publish their results.

The difference between experimental & applied behavior analysis has become so visually striking that it's possible to tell where each of these figures was published (JEAB or JABA) – without any axis labels or identifying information: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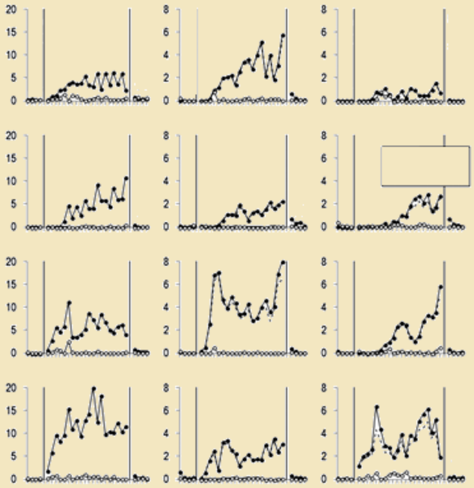
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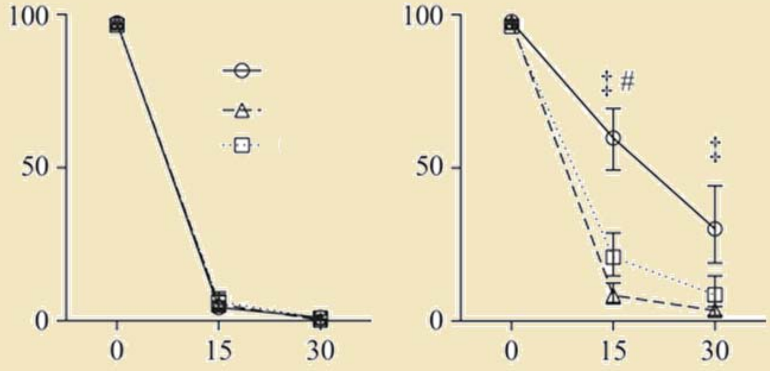
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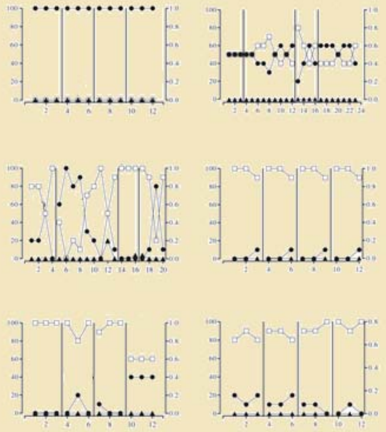

1. Stauch et al. (2018), Teaching social perception skills to adolescents with autism and intellectual disabilities using video-based group instruction. ***JABA***
2. Kuroda & Mizutani (2018). Response acquisition by zebrafish (*Danio rerio*) with delayed reinforcement. ***JEAB***, 109, 520-532.
3. Renda et al. (2018). Impulsive choice and pre-exposure to delays: iv. effects of delay- and immediacy-exposure training relative to maturational changes in impulsivity. ***JEAB***, *109*, 587-599.
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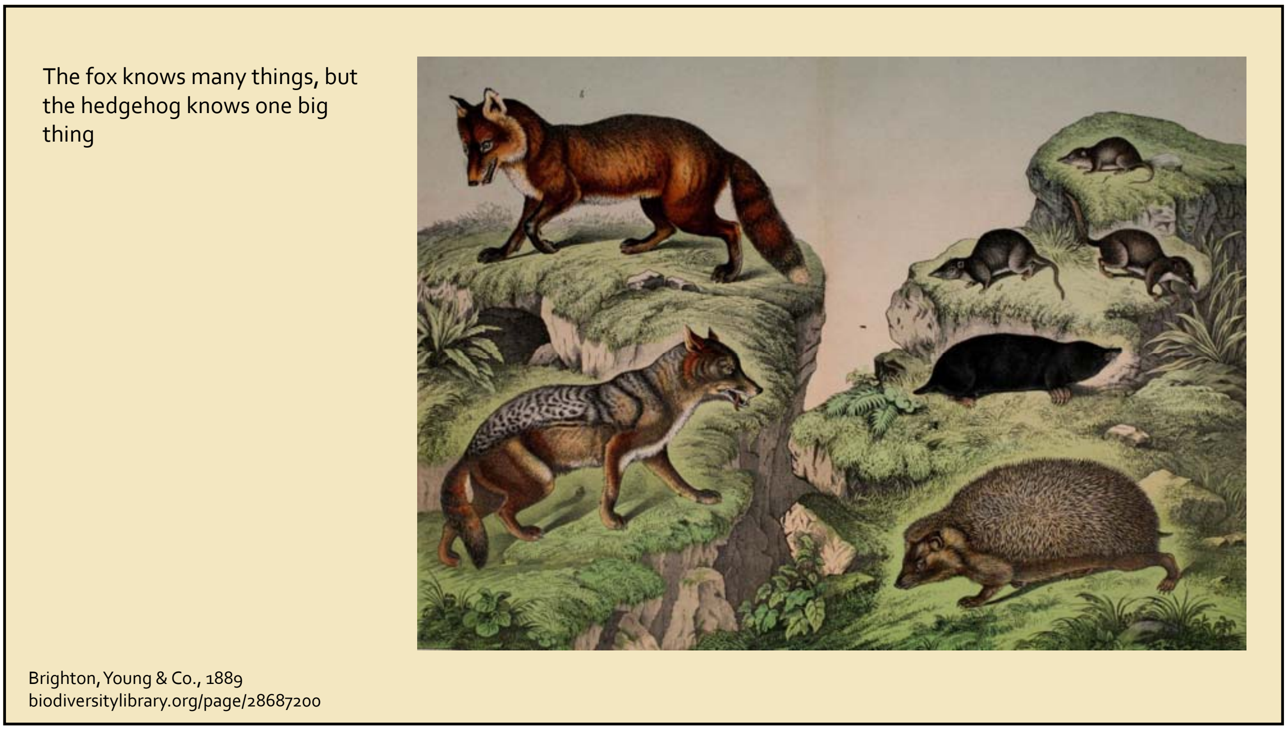
Rider (1991) called this divergence of basic & applied behavior analysts **speciation.**

John Van Hoorst
biodiversitylibrary.org/page/12839545

Divergence speciation *n.*
Populations gradually adapt to disparate environments, accumulating differences in genotype and phenotype frequencies; reproductive barriers between the populations evolve coincidentally, and the populations become different species.

Burrows, 2011



The fox knows many things, but the hedgehog knows one big thing

Brighton, Young & Co., 1889
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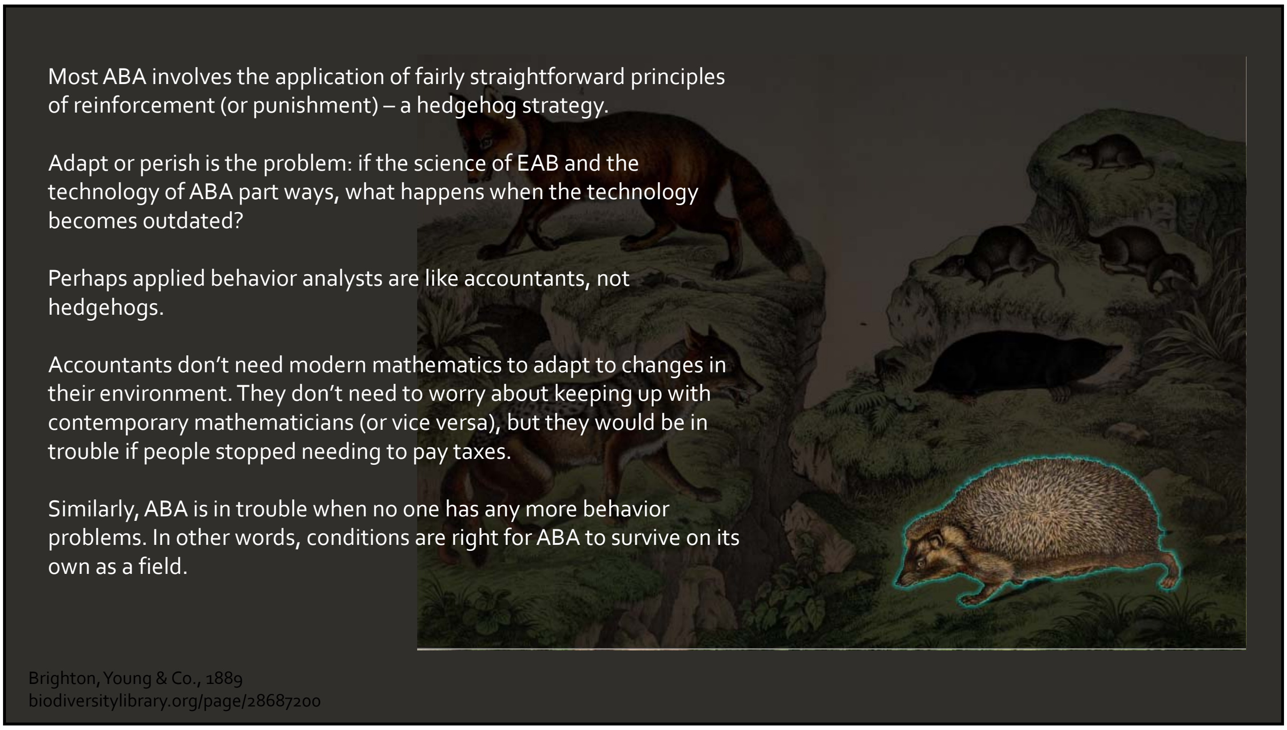


Most ABA involves the application of fairly straightforward principles of reinforcement (or punishment) – a hedgehog strategy.

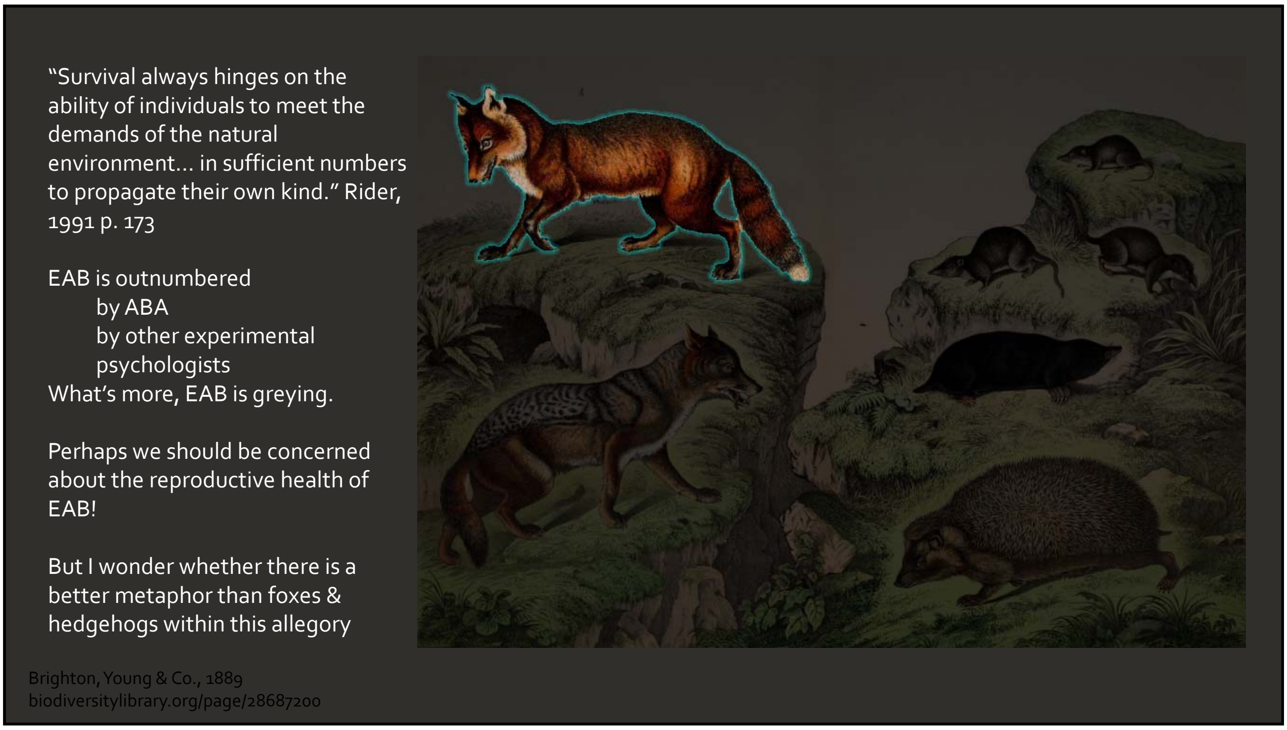
Adapt or perish is the problem: if the science of EAB and the technology of ABA part ways, what happens when the technology becomes outdated?

Perhaps applied behavior analysts are like accountants, not hedgehogs.

Accountants don't need modern mathematics to adapt to changes in their environment. They don't need to worry about keeping up with contemporary mathematicians (or vice versa), but they would be in trouble if people stopped needing to pay taxes.

Similarly, ABA is in trouble when no one has any more behavior problems. In other words, conditions are right for ABA to survive on its own as a field.

Brighton, Young & Co., 1889
biodiversitylibrary.org/page/28687200



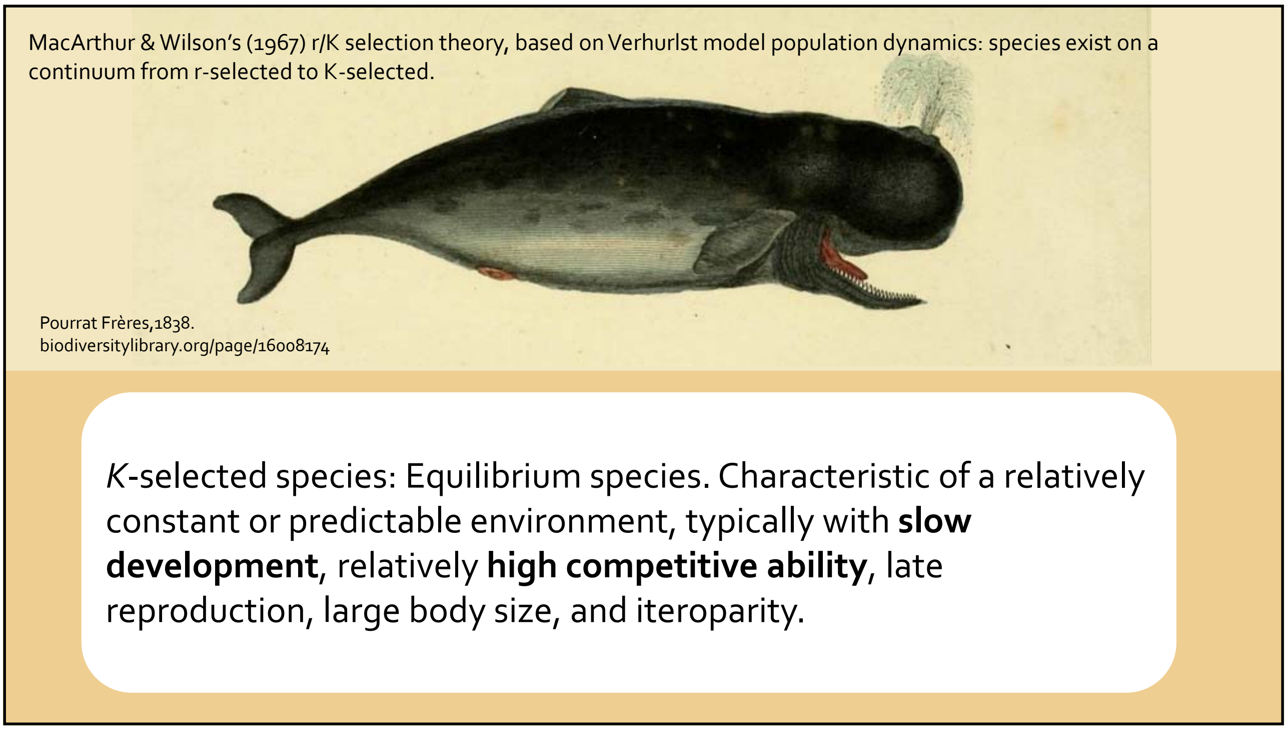
"Survival always hinges on the ability of individuals to meet the demands of the natural environment… in sufficient numbers to propagate their own kind." Rider, 1991 p. 173

EAB is outnumbered
  by ABA
  by other experimental psychologists
What's more, EAB is greying.

Perhaps we should be concerned about the reproductive health of EAB!

But I wonder whether there is a better metaphor than foxes & hedgehogs within this allegory

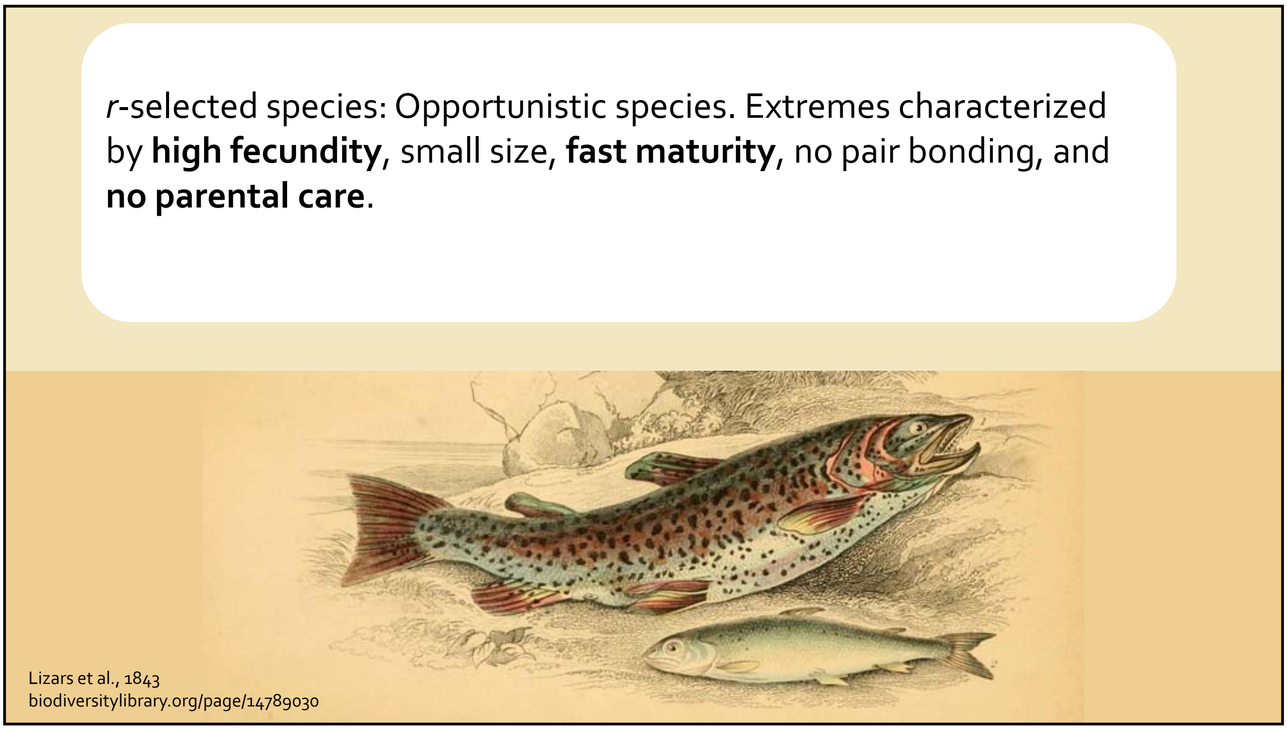
Brighton, Young & Co., 1889
biodiversitylibrary.org/page/28687200



MacArthur & Wilson's (1967) r/K selection theory, based on Verhurlst model population dynamics: species exist on a continuum from r-selected to K-selected.

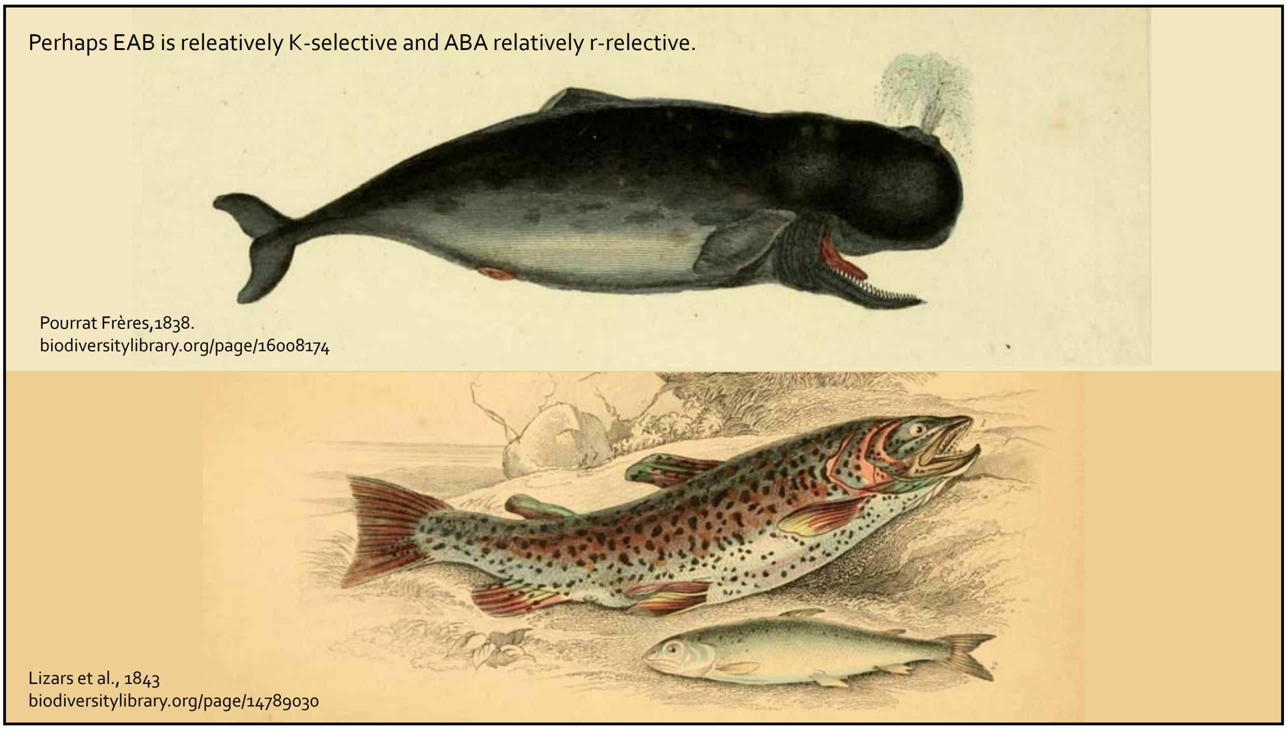
Pourrat Frères,1838.
biodiversitylibrary.org/page/16008174

K-selected species: Equilibrium species. Characteristic of a relatively constant or predictable environment, typically with **slow development**, relatively **high competitive ability**, late reproduction, large body size, and iteroparity.



r-selected species: Opportunistic species. Extremes characterized by **high fecundity**, small size, **fast maturity**, no pair bonding, and **no parental care**.

Lizars et al., 1843
biodiversitylibrary.org/page/14789030



Perhaps EAB is releatively K-selective and ABA relatively r-relective.

Pourrat Frères,1838.
biodiversitylibrary.org/page/16008174

Lizars et al., 1843
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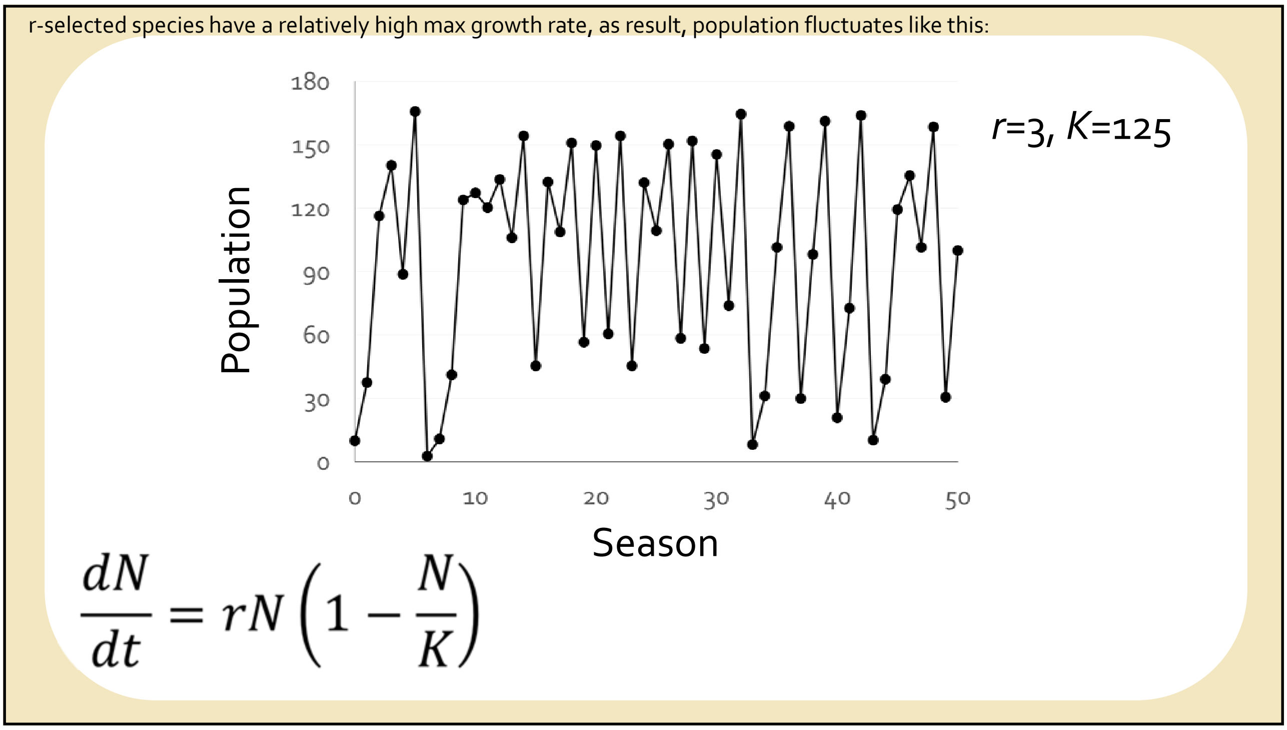
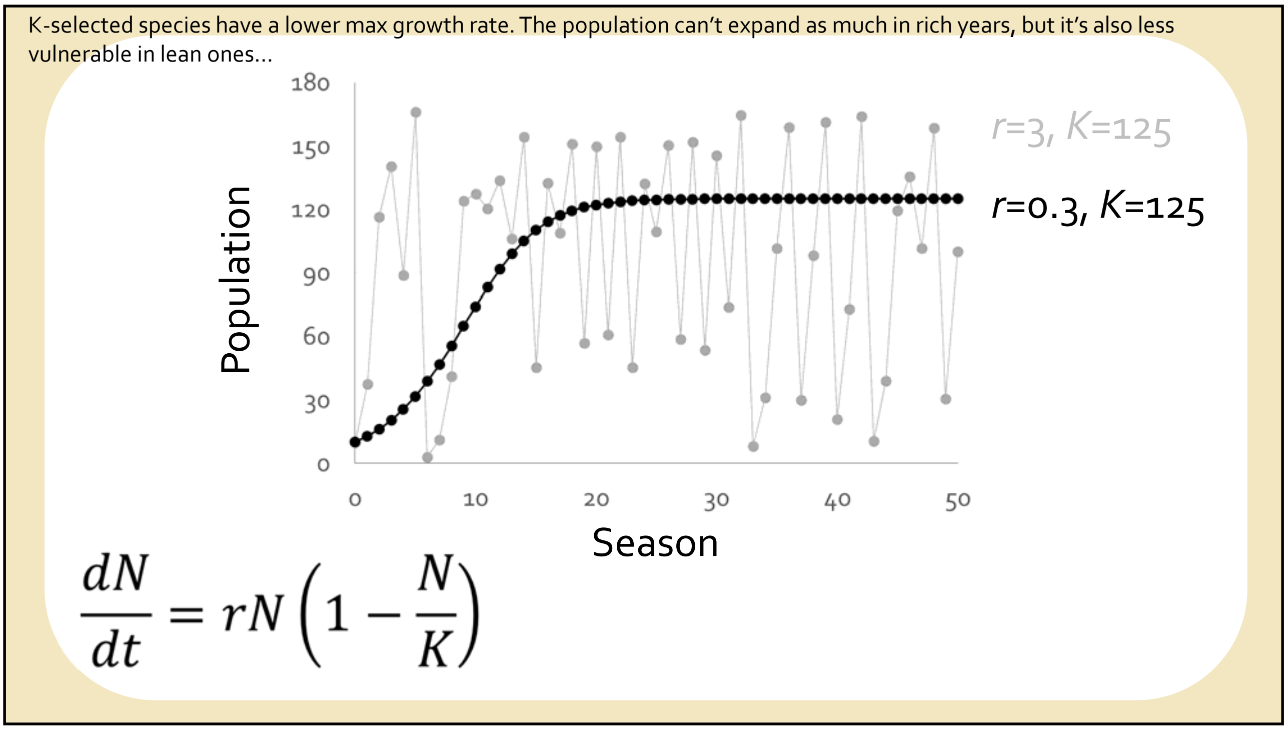


r-selected species have a relatively high max growth rate, as result, population fluctuates like this:

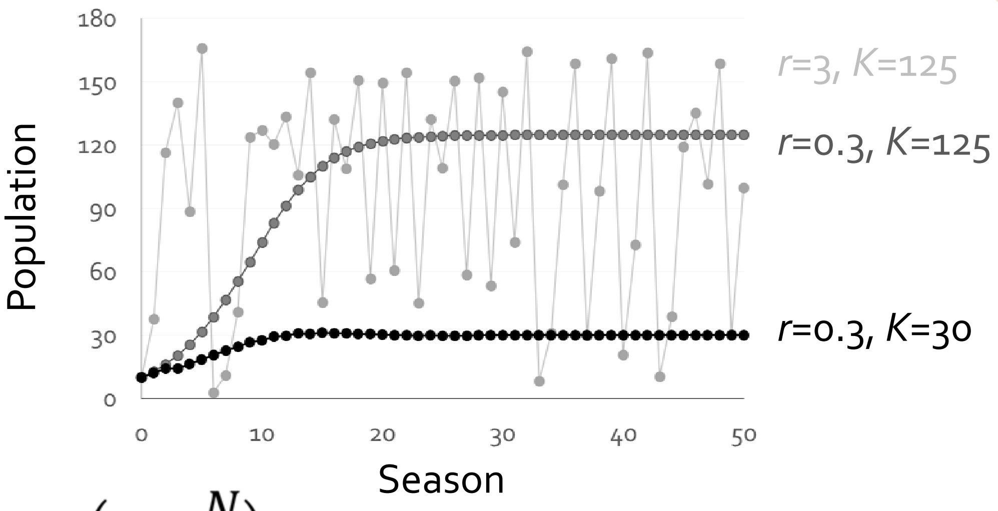
$$\frac{dN}{dt} = rN\left(1-\frac{N}{K}\right)$$



K-selected species have a lower max growth rate. The population can't expand as much in rich years, but it's also less vulnerable in lean ones…

$$\frac{dN}{dt} = rN\left(1-\frac{N}{K}\right)$$

…which means that small populations are sustainable as long as the ‘natural environment’ is fairly stable.



$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right)$$

I think EAB and ABA can survive independently as separate ‘species,’ but I hope our symbiotic relationship continues.

Regardless whether our speciation continues, Behavior analysts do lots of research that is not clearly ‘pure’ basic or ‘pure’ applied, and we have an unfortunate tendency to label all of that work **translational**, even though there is little agreement about what that means.

This does a disservice to translation (the process of turning research into practice) and to behavior analysts (particularly young ones) who want to do and especially to publish this type of work.

NYMPHALIDÆ.
CATAGRAMMA VIII

John Van Hoorst
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Taxonomy, *n.*

1. Classification, especially in relation to its general rules or principles
2. The science of classification
3. The theory and practice of delimiting kinds of organisms and classifying them

Burrows, 2011

Kyonka & Subramaniam (2018) proposed ***a new taxonomy of behavior analysis.*** A basic-applied spectrum divided into five tiers based on whether research subjects, target behaviors, study stimuli and data collection setting are “convenient” or “socially important.”
Our objective with this taxonomy was a more specific, concrete classification system.

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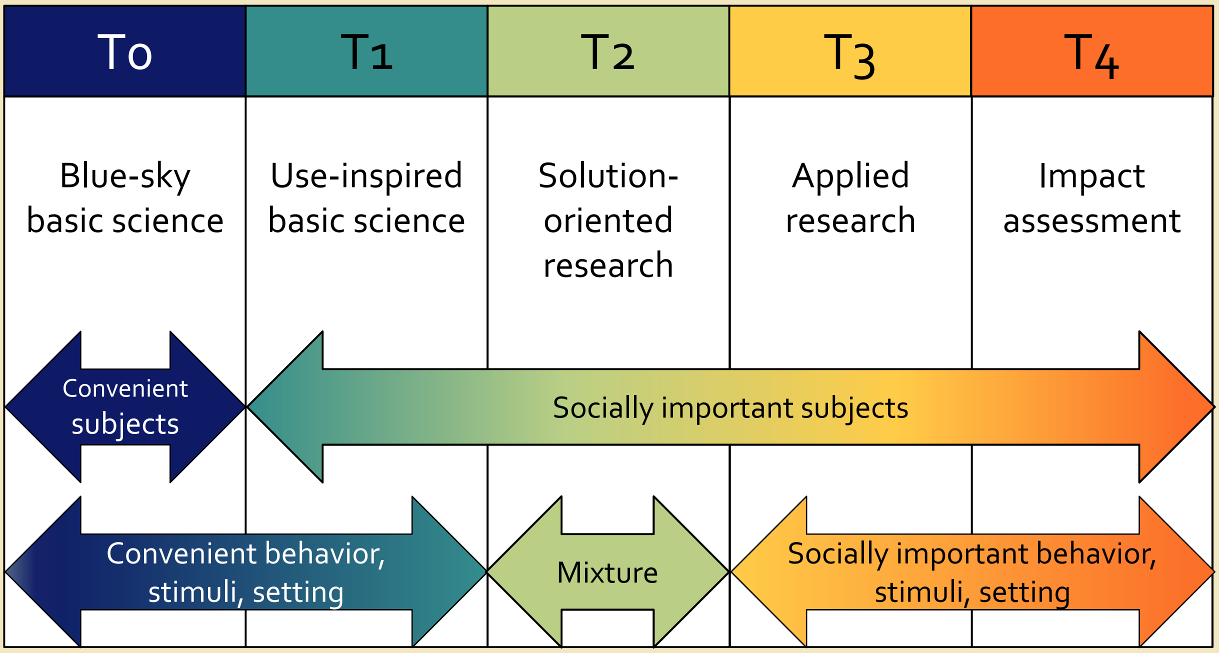


T0	T1	T2	T3	T4
Blue-sky basic science	Use-inspired basic science	Solution-oriented research	Applied research	Impact assessment

Convenient subjects

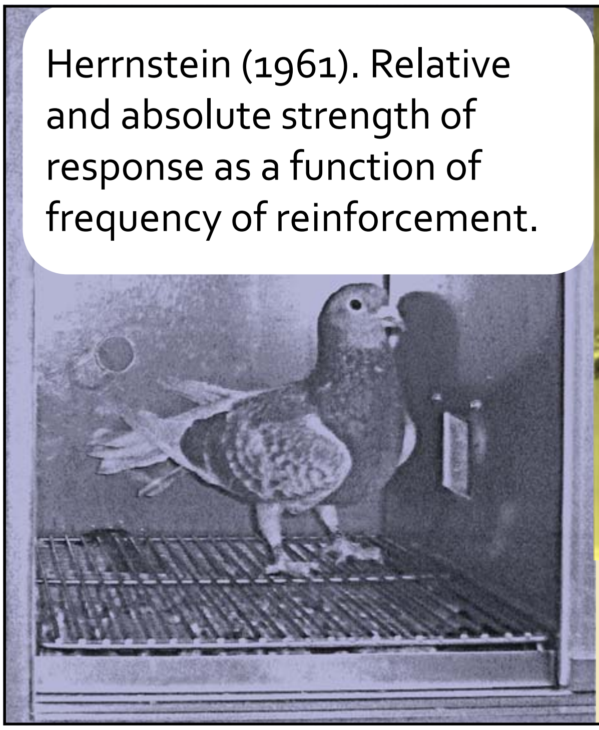
Socially important subjects

Convenient behavior, stimuli, setting

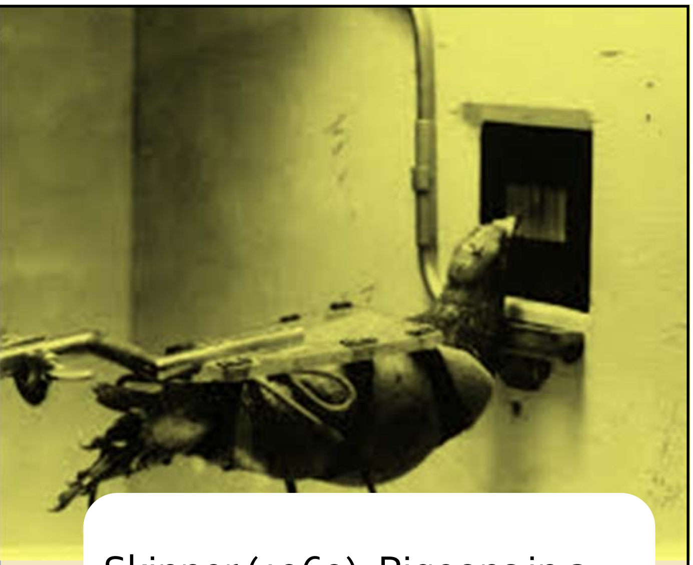
Mixture

Socially important behavior, stimuli, setting

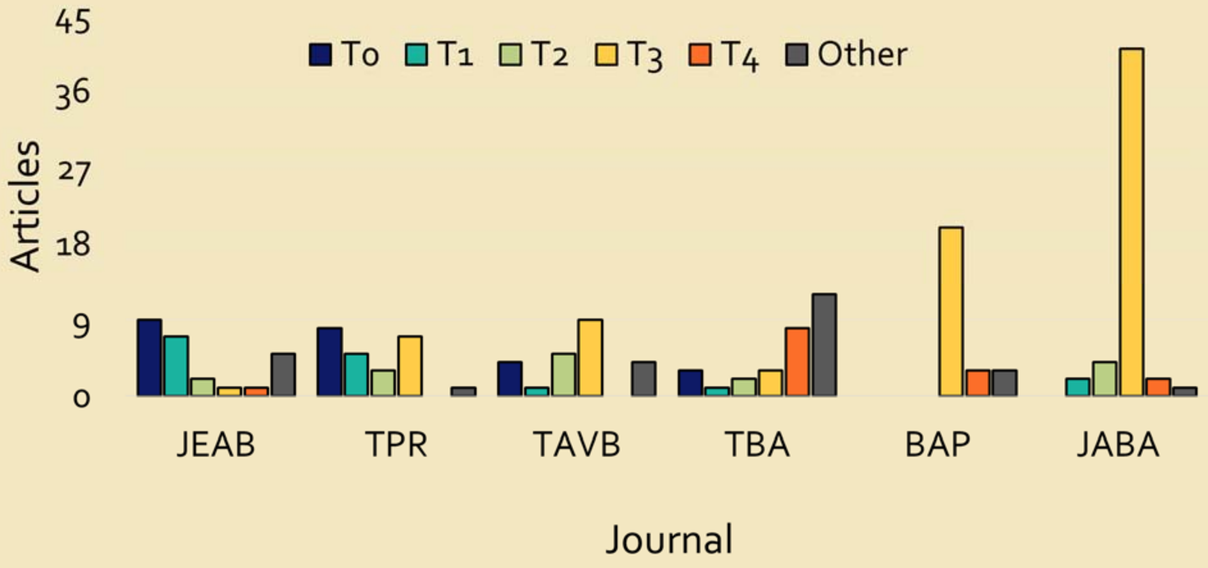
Kyonka & Subramaniam, 2018

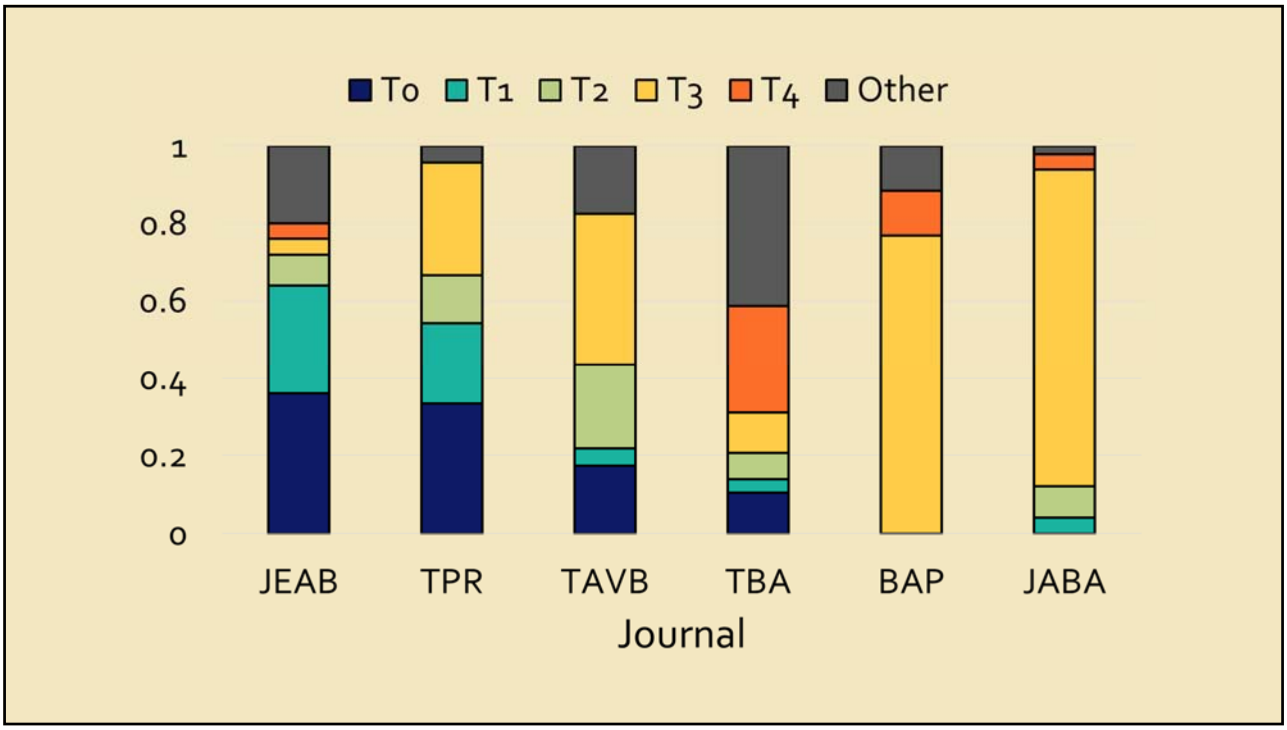


Herrnstein (1961). Relative and absolute strength of response as a function of frequency of reinforcement.



Skinner (1960). Pigeons in a pelican.

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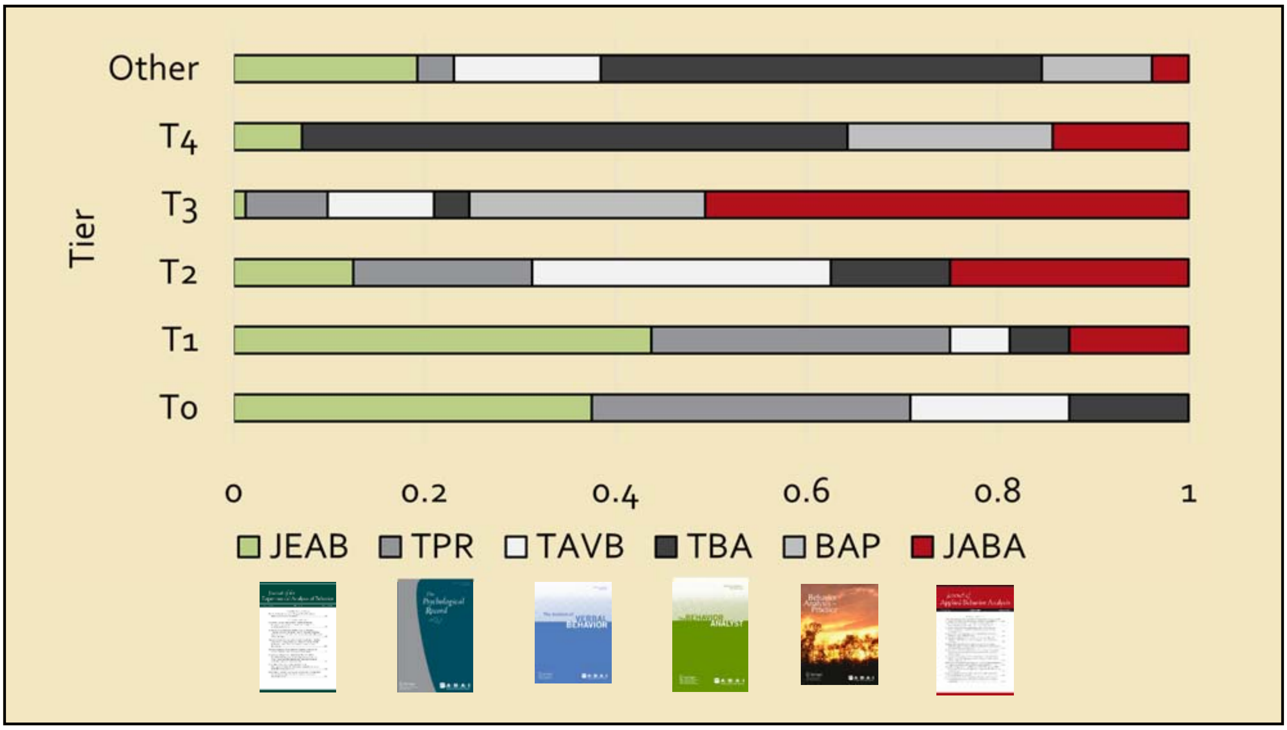
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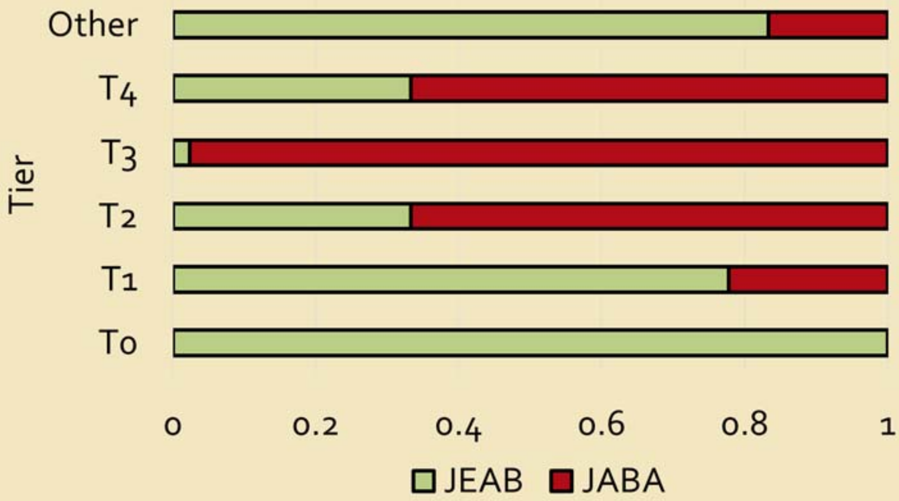
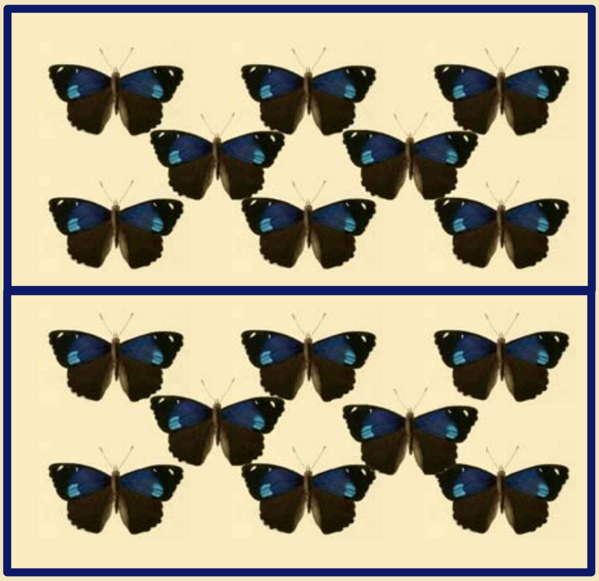


Ideal free distribution *n.*
A theoretical dispersion pattern in which individuals that occupy intrinsically higher-quality habitats achieve the same average fitness as those that occupy intrinsically poorer-quality habitats

Burrows, 2011

Go where the food ***is*** and your competition ***isn't***

When two patches have equivalent resources, animals will distribute themselves equally between them, but if the lower patch is twice as rich as the upper patch…



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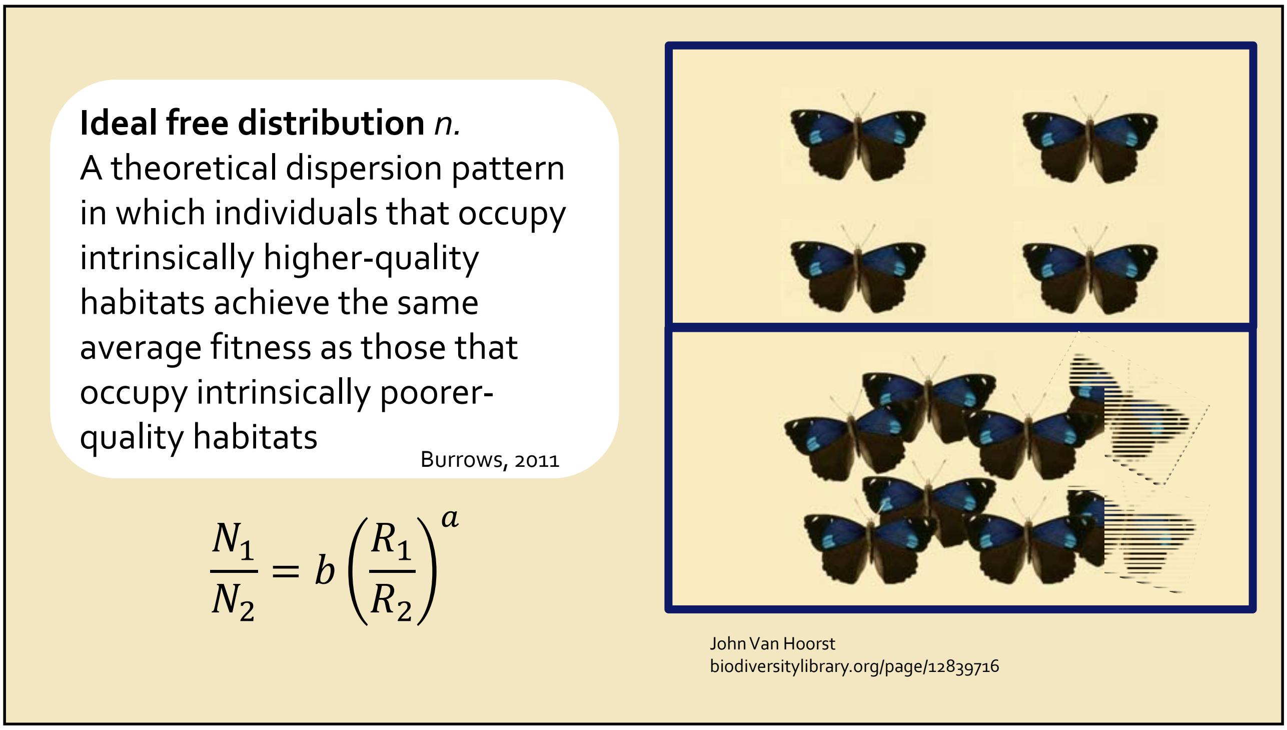

Ideal free distribution *n.*
A theoretical dispersion pattern in which individuals that occupy intrinsically higher-quality habitats achieve the same average fitness as those that occupy intrinsically poorer-quality habitats

Burrows, 2011

$$\frac{N_1}{N_2} = b\left(\frac{R_1}{R_2}\right)^a$$

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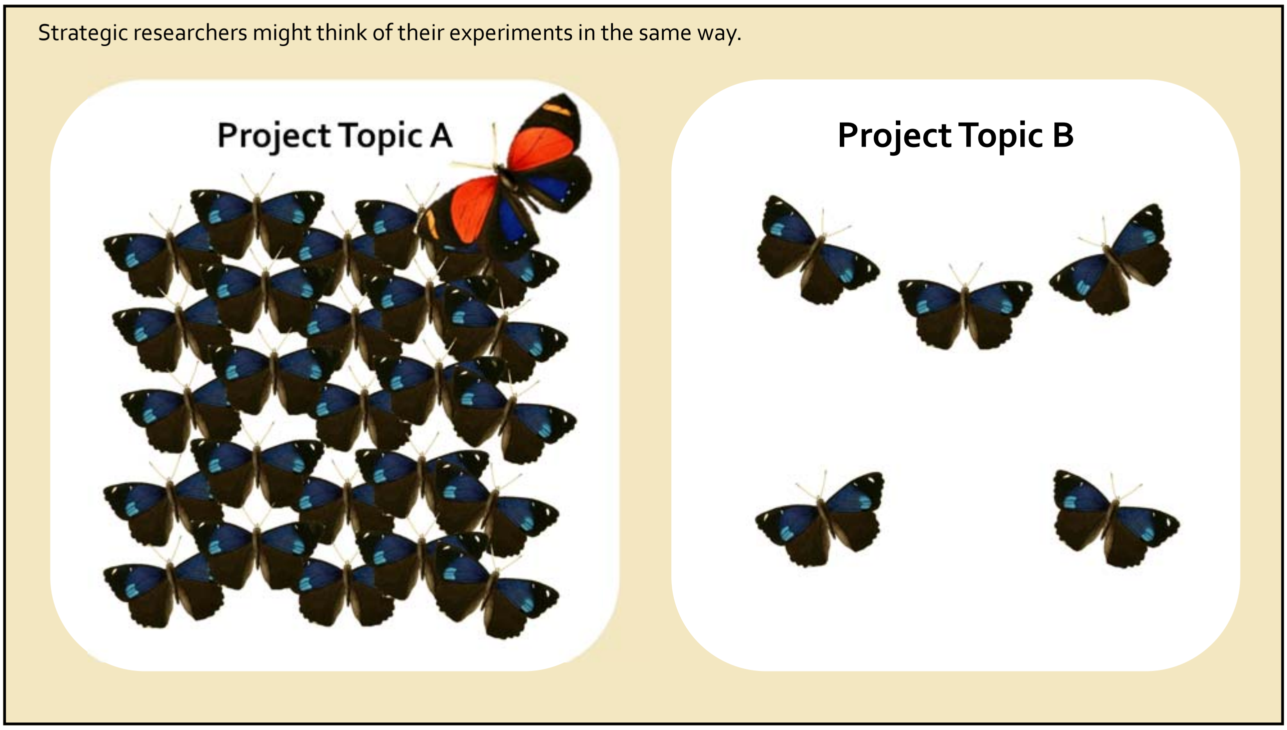
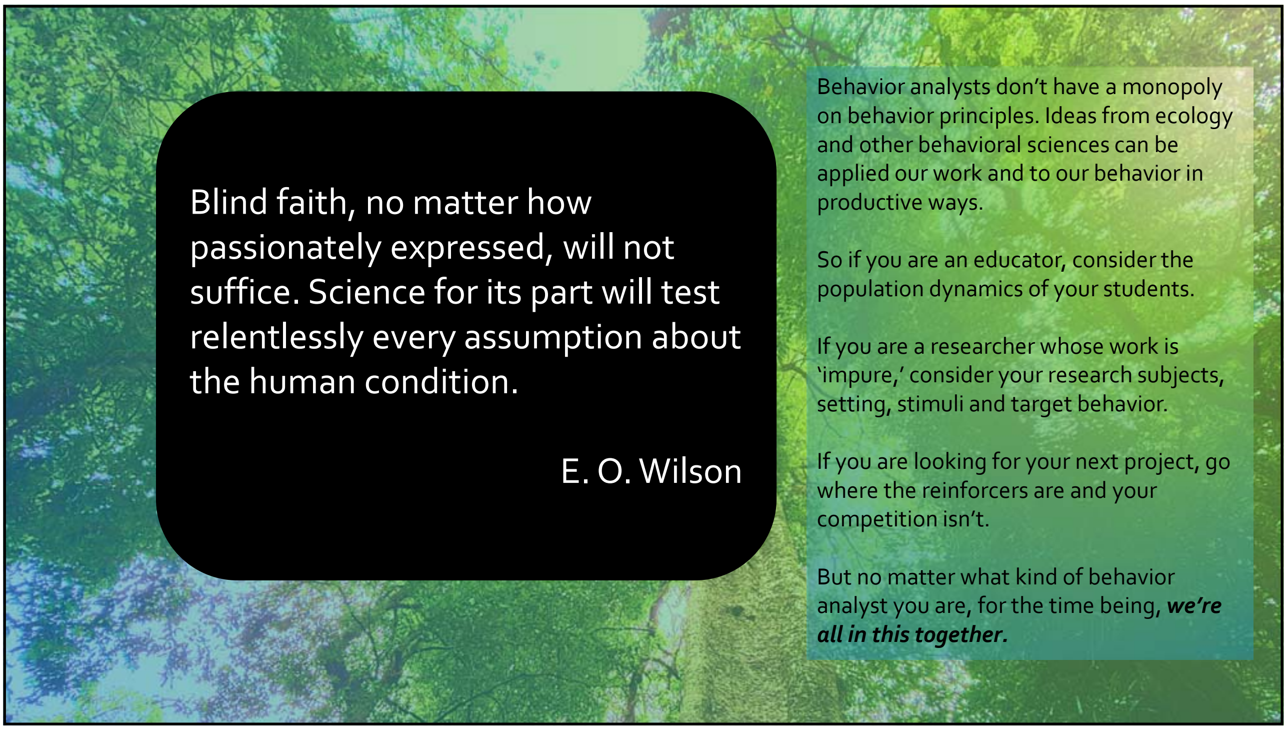


Strategic researchers might think of their experiments in the same way.

Project Topic A

Project Topic B



> Blind faith, no matter how passionately expressed, will not suffice. Science for its part will test relentlessly every assumption about the human condition.
>
> E. O. Wilson

Behavior analysts don’t have a monopoly on behavior principles. Ideas from ecology and other behavioral sciences can be applied our work and to our behavior in productive ways.

So if you are an educator, consider the population dynamics of your students.

If you are a researcher whose work is ‘impure,’ consider your research subjects, setting, stimuli and target behavior.

If you are looking for your next project, go where the reinforcers are and your competition isn’t.

But no matter what kind of behavior analyst you are, for the time being, ***we’re all in this together.***

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