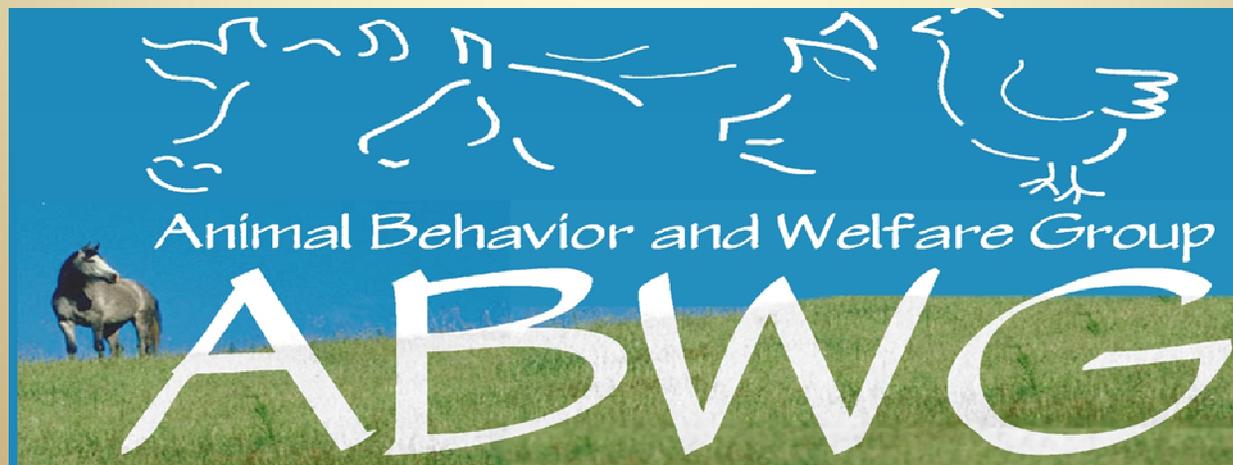


# How Welfare is Measured? Why do Scientists Differ?

Janice C. Swanson, PhD  
Professor and Director Animal Welfare  
Departments of Animal Science &  
Large Animal Clinical Sciences



# What is Animal Welfare?

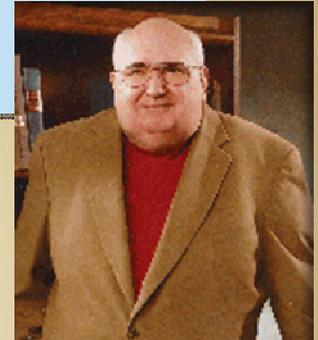
- **Biological phenomenon**
  - Animal experience
- **Social phenomenon**
  - Human experience
    - **Evidence for the evolution of the human mind**
  - A reflection of the current human condition
    - We do well – They gain status
    - They gain status – Increased obligation
    - Social demands

# Defining Animal Welfare

- **Definitions have varied among scientists**
  - How the animal **feels** (Duncan)
  - **Pre-pathological** state (Moberg)
  - Animal's attempts to **cope** with its environment (Broom)
  - “**Performance Axiom**” – emphasize sensitive but quantifiable measures like productivity, reproductive performance, etc. (Curtis)
  - **State** of the animal (World Organization for Animal Health)
    - the treatment that an animal receives is covered by other terms such as animal care, animal husbandry, and humane treatment.

**“Therefore, others advocate more objectively measurable animal-performance traits as more valid indicators of ASB [animal state of being] today. The reasons for this are the following: what cannot be measured cannot be managed; we can directly, objectively measure productive and reproductive performance but not feelings (e.g., suffering); and performance reductions are early, sensitive indicators that is being compromised.”**

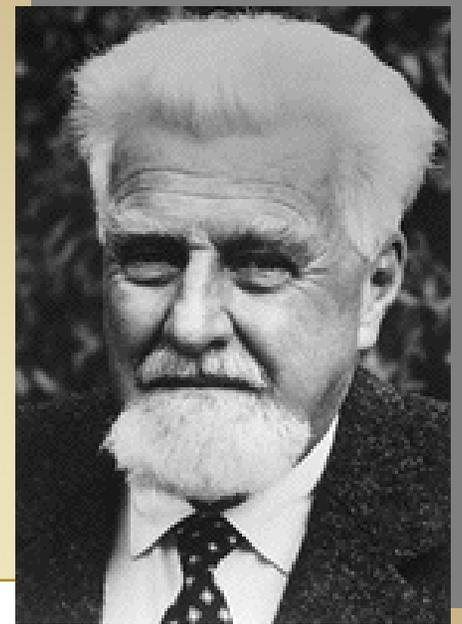
*S E Curtis, 2007*



**“Apart from verbal reports of subjective feelings, which are uniquely human, I argue that it is possible to study negative emotions we refer to as suffering by the same methods we use in ourselves. In particular, by asking animals What they find positively and negatively reinforcing (what they want and what they do not want), we can define positive and negative emotional states. Such emotional states may or may not be accompanied by subjective feelings but fortunately it is not necessary to solve the problem of consciousness to construct a scientific study of suffering and welfare.”**

*M. Stamp Dawkins, 2008*





**“I can never help a shrewd suspicion that a worship of quantification and despise of **perception** may occasionally mislead one into thinking that 2 goats plus 4 oxen are equal to 6 horses. Counting the pecks of pigeons in Skinner boxes without observing what the birds really do might occasionally add up to just this.”**

*-- Konrad Lorenz, 1960*

# Scientific Training

- **Different training and different views**
  - **1. Biological function**
    - Health, Growth and Reproduction
    - Minimize pain and injury
  - **2. Quality of Life (plus biological function)**
    - Biological function + reasonable accommodation of the animal's nature + minimizing pain and distress
  - **3. Natural life (plus biological function)**
    - Animal should be allowed to satisfy most aspects of its nature
- All based on a system of values

(Fraser, 2003)

# Funding Scientific Research

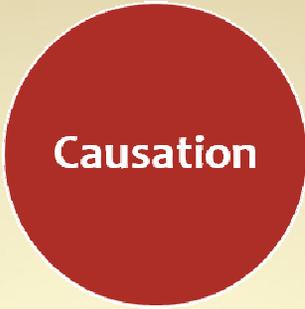
- **Scientific research is conducted, integrated and applied based upon its value**
  - Human expectations for derived benefits
  - Reflected in specifications for funding
- **Scientific research can be biased toward specific social values**

Multi-Disciplinary

Physiology

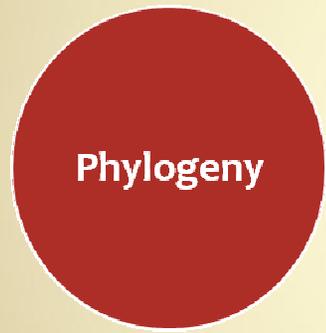
Applied Ethology

Immunology



Affective Neuroscience

Ethology



Behavioral Ecology

Cognitive Science



Genetics

Consciousness

Psychology

(Dawkins, 2008)

# Commonly Used Indicators

## BEHAVIORAL

- Abnormal / normal behavior
- Stereotypies
- Frustration behavior
- Changes in time budgets
- Changes in behavior
- Affective states
- Preferences

## PHYSIOLOGICAL

- Health measures
- Stress measures
- Immune function
- Acute phase proteins
- Growth
- Reproduction
- Metabolic measures

# SPACE



# SPACE REQUIREMENTS

- Use of the space
- The effects of different space allowances
- The quality of space

(J.A.Mench and J.C. Swanson, 2000)

# USE OF SPACE



\_\_\_\_\_ stand

\_\_\_\_\_ turn around

\_\_\_\_\_ groom

\_\_\_\_\_ wing flap

(J.A.Mench and J.C. Swanson, 2000)

# USE OF SPACE

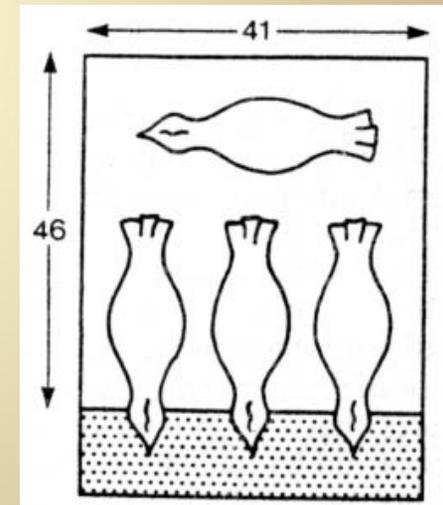
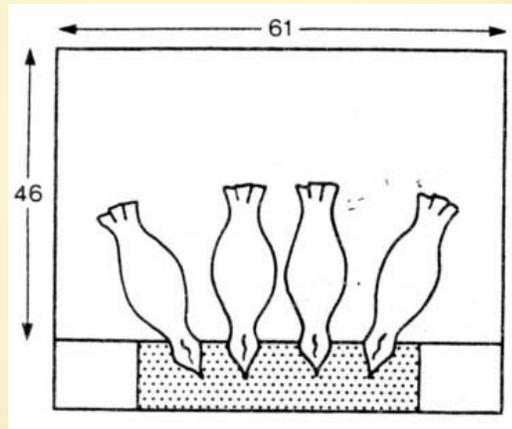
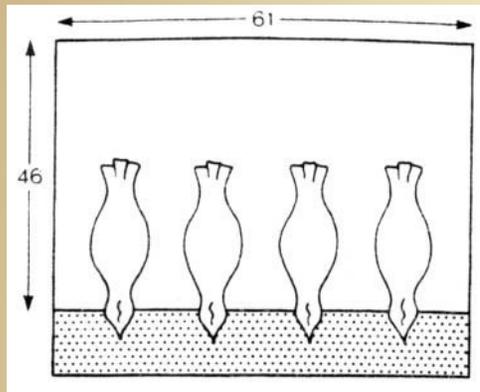
- Social factors are important
  - 5.5 to 35 inches between hens, depending upon behavior
  - Hens prefer large cages to small (i.e. prefer 242 sq in/hen versus 62/hen)
  - **But** studies also indicate:
    - hens housed in large cages do not use all the space available - still prefer social contact with other hens

(J. A. Mench and J.C. Swanson, 2000)

# Scientific studies/reviews

- Early Studies:
  - Adams and Craig (1985)
    - Compared 30 studies with high (42-55 sq in/hen), medium (55-66) and low (67-86) densities
    - Mortality and production decreased as birds were more crowded
- Recent studies:
  - included stress measures , feather cover, and fear in addition to mortality and production: agree
- Advantage at 72 square inches numerous studies

# Feeder Space Important



Performance standard: Hens must be able to eat at the same time.

(J.A.Mench and J.C. Swanson, 2000)

# SPACE REQUIREMENTS

IF ....



- Productivity
- Standing/Lying  
Turning around  
Partial wing flap
- Morbidity/Mortality
- Feather Cover
- Fearfulness
- Corticosterone

Then: 72 SQUARE INCHES (average)

(J.A.Mench and J.C. Swanson, 2000)

# SPACE REQUIREMENTS

IF....



- **Additional behaviors also important**
  - Wing flap
  - Dustbathing
  - Nesting
  - Perching
- **MORE THAN 72 SQUARE INCHES required**

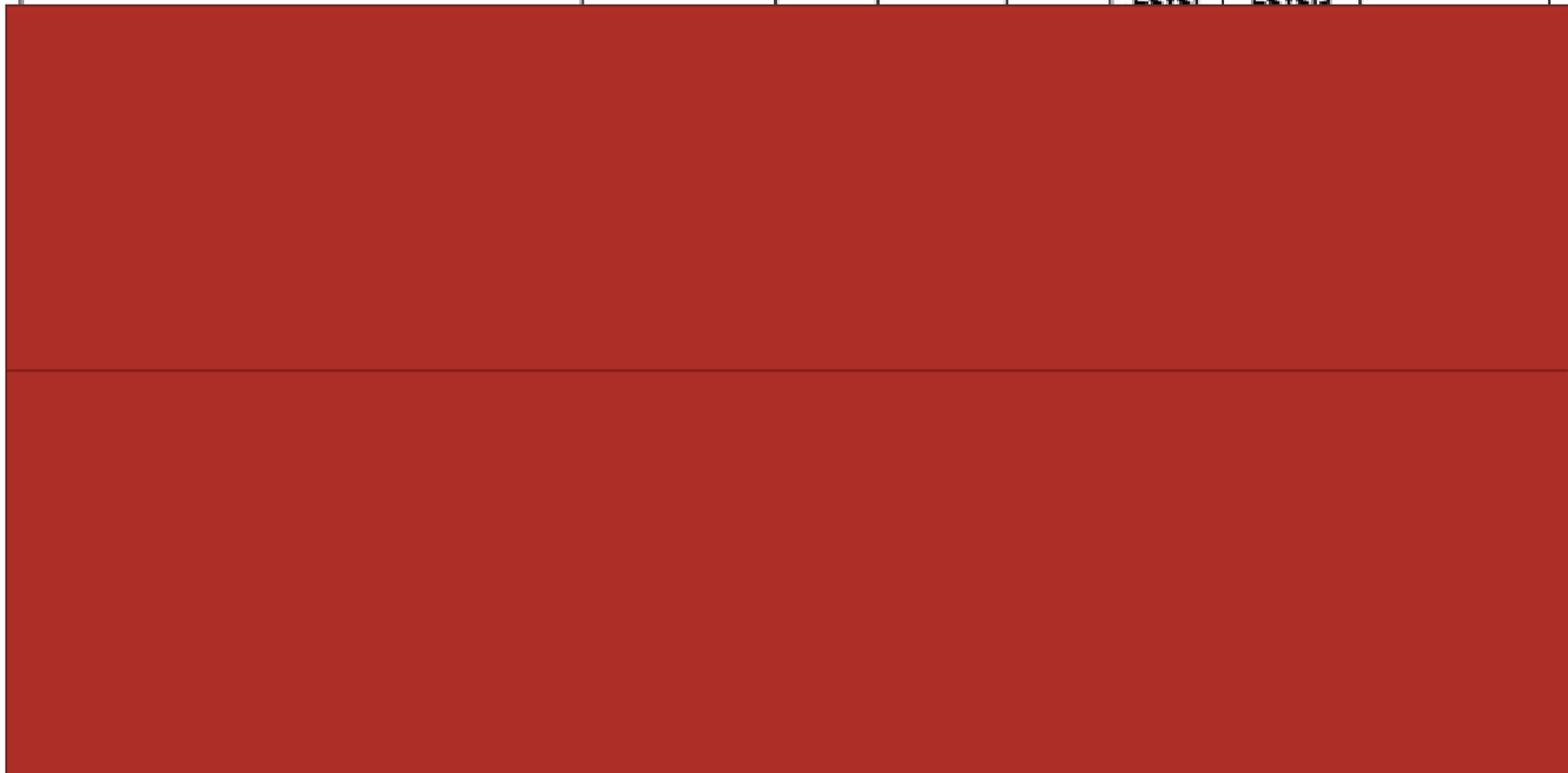
# Why do space guidelines differ?

- **If living conditions to accommodate the “nature” of the hen most important**
  - Natural postural adjustments and behaviors important
    - Wing flaps and stretch, dust bathe
- **If health and production combined with efficiency most important**
  - Natural postural adjustments may be minimized in the assessment process (lying and standing)
- **Empirical work: supports both cases**

# Animal Welfare Assessment Models

- Reflect different values
  - Selection of criteria to be measured
  - Interpretation of data
- Result in different conclusions
- Scientific disagreement between value systems

Indicators	Conventional Cage	Furnished Cage			Non-cage (Barn)		Outdoor (Free-range)
		Small	Medium	Large	Single Level	Multiple Levels	



§ = Recent unpublished data indicate lower mortality may be achievable in large furnished cages

† = Reduced bone strength, fractures when birds are caught

\* = bones stronger from perch use but increased incidence of deformation of the keel

‡ = More fractures during lay despite stronger bones

How well welfare measures are met:

Good	Medium	Poor	Insuff Data
------	--------	------	-------------

Indicators	Conventional Cage	Furnished Cage			Non-cage (Barn)		Outdoor (Free-range)
		Small	Medium	Large	Single Level	Multiple Levels	


§ = Recent unpublished data indicate lower mortality may be achievable in large furnished cages

† = Reduced bone strength, fractures when birds are caught

\* = bones stronger from perch use but increased incidence of deformation of the keel

‡ = More fractures during lay despite stronger bones

How well welfare measures are met:

Good	Medium	Poor	Insuff Data
------	--------	------	-------------

Indicators	Conventional Cage	Furnished Cage			Non-cage (Barn)		Outdoor (Free-range)
		Small	Medium	Large	Single Level	Multiple Levels	



Level of egg production and cleanliness							
---	--	--	--	--	--	--	--



§ = Recent unpublished data indicate lower mortality may be achievable in large furnished cages

† = Reduced bone strength, fractures when birds are caught

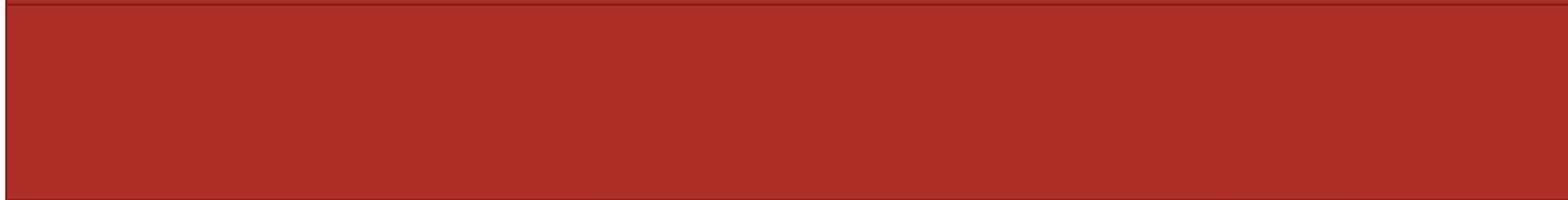
\* = bones stronger from perch use but increased incidence of deformation of the keel

‡ = More fractures during lay despite stronger bones

How well welfare measures are met:

Good	Medium	Poor	Insuff Data
------	--------	------	-------------

Indicators	Conventional Cage	Furnished Cage			Non-cage (Barn)		Outdoor (Free-range)
		Small	Medium	Large	Single Level	Multiple Levels	



Use of nest boxes	Red	Green	Green	Green	Green	Green	Grey
Use of perches	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Foraging behavior	Yellow	Yellow	Yellow	Yellow	Green	Green	Green
Dustbathing behavior	Red	Yellow	Yellow	Yellow	Green	Green	Green



† = Reduced bone strength, fractures when birds are caught

\* = bones stronger from perch use but increased incidence of deformation of the keel

‡ = More fractures during lay despite stronger bones

How well welfare measures are met:

Good	Medium	Poor	Insuff Data
------	--------	------	-------------

Indicators	Conventional Cage	Furnished Cage			Non-cage (Barn)		Outdoor (Free-range)
		Small	Medium	Large	Single Level	Multiple Levels	
Mortality (%)	Good	Medium	Poor	§	Poor	Poor	Poor
Mortality from feather pecking and cannibalism	Good	Medium	Medium	Medium	Medium	Medium	Medium
Bone strength and fractures	†	*	*	*	‡	‡	‡
Exposure to disease vectors (e.g., wild birds)	Good	Good	Good	Good	Medium	Medium	Poor
Internal parasites (e.g., coccidia, roundworms)	Good	Good	Good	Good	Poor	Poor	Poor
External parasites	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Bumblefoot	Good	Medium	Medium	Medium	Poor	Poor	Poor
Feather loss	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Hen hysteria and piling/smothering	Good	Good	Good	Medium	Poor	Poor	Medium
Risk of predation	Good	Good	Good	Good	Good	Good	Poor
Level of egg production and cleanliness	Good	Good	Good	Good	Medium	Medium	Poor
Use of nest boxes	Poor	Good	Good	Good	Good	Good	Insuff Data
Use of perches	Poor	Medium	Medium	Medium	Medium	Medium	Medium
Foraging behavior	Medium	Medium	Medium	Medium	Good	Good	Good
Dustbathing behavior	Poor	Medium	Medium	Medium	Good	Good	Good
Air quality (e.g., dust, ammonia)	Good	Medium	Medium	Medium	Poor	Poor	Good

§ = Recent unpublished data indicate lower mortality may be achievable in large furnished cages

† = Reduced bone strength, fractures when birds are caught

\* = bones stronger from perch use but increased incidence of deformation of the keel

‡ = More fractures during lay despite stronger bones

How well welfare measures are met:

Good	Medium	Poor	Insuff Data
------	--------	------	-------------

# Summary

- Animal Welfare Science is advancing and developing methodologies to measure animal welfare
- Animal Welfare is a multidisciplinary science
- Societal values and scientific training can play a role in determining what is most important
- Scientific design and methods should properly reflect the “question asked”

