

NEWSLETTER

Volume 27 Number 1 Spring 05

IACUC-Advanced/New Orleans

SCAW held yet another successful IACUC-Advanced workshop on March 21, 2005 at the beautiful and historic Hotel Monteleone in New Orleans, Louisiana. The workshop which was co-sponsored with GlaxoSmithKline, Our Animal WARDS, The Schering-Plough Research Institute and USDA-APHIS-AC was well attended. An expert panel of speakers was present to address many advanced IACUC topics such as: Compliance: Nontraditional Research Animal Protocol Considerations, Health and Safety Issues and Addressing Difficult and Complex Protocols.

Upcoming SCAW Seminars, Workshops and Conference

May 1

SCAW Workshop

”Current Animal Welfare Issues and ARVO Member Research”

held at the Association for Research in Vision and Ophthalmology Conference
Ft. Lauderdale, FL

September 19

IACUC-Advanced

Research Triangle Park, NC

*registration form on page 15 or you can register
and pay on-line at www.scaw.com*

October 14

IACUC-Advanced

Chicago, IL

*registration form on page 15 or you can register
and pay on-line at www.scaw.com*

December 5-6

SCAW Winter Conference

San Antonio, TX

register and pay on-line at www.scaw.com

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Mission

The Scientists Center for Animal Welfare (SCAW) is a non-profit educational association of individuals and institutions whose mission is to promote the best practices of humane care, use, and management of animals involved in research, testing or education in laboratory, agricultural, wildlife or other settings.

Newsletter

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SCAW Board

SCAW wishes to thank the following Board member, Molly Greene, who freely gave of her time and expertise in promoting SCAW and its mission. Each Board member serves a minimum three year term. We extend our gratitude for all she has done for SCAW during the past 6 years and wish her well in her future endeavors.

We also wish to welcome two new Board members. Ernest D. Prentice, PhD who is Associate Vice Chancellor for Academic Affairs and Regulatory Compliance, Associate Dean for Research at the University of Nebraska Medical Center who has agreed to serve on the SCAW Board again. John L. VandeBerg, PhD, Director, Southwest National Primate Research Center will also join as a new Board member.

NABR Conference 2005 “Animal Research: In the Court of Law and Public Opinion”

NABR's 2005 conference to be held May 17 & 18, 2005 at the Hyatt Regency in Crystal City Arlington, Virginia will address the continuing assault on animal research through both the realm of public opinion and the direct targeting of people and institutions by extremists.

A panel of journalists will discuss how public opinion is shaped through media coverage of advances in scientific research, animal activism, and terrorism. A provocative case study will be presented for discussion among participants.

To register please visit: <https://secure.webfirst.com/nabr.org/Members/Events/Conf2005.htm>

New Website

Allentown Caging Equipment, a leader in providing quality-built animal caging and related animal care products to the biomedical research community, is now offering their customers another benefit: a revamped website. Their new up-to-date website, www.acecaging.com, is more user-friendly and contains a significant increase in overall content—including a detailing of product information.

For more information about Allentown Caging Equipment Company and their new website, visit www.acecaging.com or call (609) 259-7951.

New Law on Economic Damage

A new offence of causing economic damage to organisations carrying out, or connected with, animal research will be introduced as part of the Serious Organised Crime and Police Bill. This will give police more powers to stamp out organised campaigns of intimidation and violence. The maximum sentence for the offence will be five years in prison.

The Bill is currently going through parliament and is expected to become law this spring.

For further information please e-mail please visit the RDS website: www.rds-net.org.uk

Division of Compliance Oversight

Dr. Axel Wolff, M.S., D.V.M., has been appointed as Director, Division of Compliance Oversight, Office of Laboratory Animal Welfare (OLAW), Office of Extramural Research, NIH. Dr. Wolff has been serving in an acting capacity since May of 2004, prior to which he was a Senior Assurance Officer in OLAW's Division of Assurances. Dr. Wolff graduated from the University of Missouri- Columbia's College of Veterinary Medicine and holds a Master's Degree in Zoology from the University of Wisconsin-Milwaukee for work conducted with tropical fruit bats. Before joining OLAW in 1999, Dr. Wolff was the Director of the Veterinary Resources Program, intramural NIH's centralized laboratory animal and biomedical research support program. He also served as the Director of both NIH's animal quarantine center in Poolesville, MD and the farm animal unit. An NIH employee of over 20 years, Dr. Wolff has also served in the National Institute of Neurological Disorder and Stroke Ft. Detrick facility working with animals under biocontainment. His interest in unique research animals has involved him with armadillos in leprosy studies as well as chimpanzees used in the examination of Kuru, a fatal brain disorder discovered in cannibals. Dr. Wolff is a Commissioned Officer in the U.S. Public Health Service and has attained the rank of Captain. He serves on the editorial board of the journal Lab Animal and has published on various topics including primate environmental enrichment and PHS Policy interpretation. He serves as faculty for IACUC 101 and represents OLAW in multiple educational and conference settings.

Source: Email from OLAW

Short Course

June 13 - 17, 2005

19th Annual Charles River Laboratories Short Course, Sheraton Ferncroft, Danvers, MA. Contact: Lisa Antolick, 978-658-6000 ext.1217 or lantolick@criver.com
Registration at www.criver.com/shortcourse2005.

Scholarships are available for veterinarians and junior veterinary students who are new to lab animal medicine. Please visit our website at www.criver.com/events/shortcourse for an application.

Guidelines for the Care and Use of Mammals in Neuroscience and Behavioral Research

The Office of Laboratory Animal Welfare, NIH, is pleased to announce that the "Guidelines for the Care and Use of Mammals in Neuroscience and Behavioral Research" is now available via the OLAW website in PDF format with permission from the National Academy of Sciences at http://grants.nih.gov/grants/olaw/National_Academies_Guidelines_for_Use_and_Care.pdf.

Report on the Evaluation of the Current Validation Status

ICCVAM (Interagency Coordinating Committee on the Validation of Alternative Methods) has made available on line the Expert Panel Report on the Evaluation of the Current Validation Status of *In Vitro* Test Methods for Identifying Ocular Corrosives and Severe Irritants. The link is <http://iccvam.niehs.nih.gov/methods/ocudocs/EPreport/ocureport.htm>

The public is invited to comment. Written comments should be received by noon on Thursday, May 5, 2005. Please send comments by: Email to iccvam@niehs.nih.gov, Fax to 919-541-0947, Mail to Dr. William S. Stokes, Director, NICEATM, NIEHS, 79 T.W. Alexander Drive, PO Box 12233, MD EC-17, Research Triangle Park, NC 27709

The Expert Panel Report was made available in March of this year.

Sources: *Email from ICCVAM and iccvam.niehs.nih.gov website.*

SCAW will host a workshop at the upcoming ARVO meeting on May 1 at 1:00 p.m. in Ft. Lauderdale, Florida. Please see the SCAW web site for the full workshop program, speakers include: Jeffery W. Kiel, PhD, Christopher J. Murphy, PhD, Ernest D. Prentice, PhD, Jacquie Calnan from Americans for Medical Progress, and Richard C. Van Sluyters, OD, PhD. If you will be at the meeting or are in the area, please join us for this session. See the ARVO website at www.arvo.org for additional information on this meeting.

APHIS Issues E-FOIA “Stakeholder” Letter

APHIS issued its long-anticipated “Stakeholder” update on its plan for re-implementing the posting of “regularly requested” inspection reports to its Web site pursuant to E-FOIA (Electronic Freedom of Information Act).

It is NABR’s understanding that much of the inspection reporting process will remain the same as it was in 2001. NABR will continue to work closely with APHIS to insure that this will, in fact, be the case while still fulfilling the mandate of the E-FOIA law.

The stakeholder letter does furnish the following details:

- Beginning March 15, 2005, APHIS Animal Care will be making regularly requested inspection reports available on its Web site.
- Initially only regularly requested reports will be accessible with the goal of eventually making all inspection reports available.
- This effort is a work in progress due to the need to analyze every inspection report to ensure personal and confidential information is removed.
- A new database is being developed that will contain all information related to inspection reports. This database will enable APHIS FOIA staff to review and redact information electronically. The database is not expected to be fully operational until FY 2006.
- Upon completion of the new database, the focus of the FOIA office will be on posting inspection reports of facilities in full compliance. Following that, all inspection reports where “non-compliant” have been identified will be reviewed.

For further questions please contact NABR at (202) 857-0540 or info@nabr.org.

AAALAC International launches a “Technician Fellowship Award”

The Association for Assessment and Accreditation of Laboratory Animal Care International has launched a new awards program, the “AAALAC International Technician Fellowship.” The program is made possible through a grant by **Priority One Services, Inc.** (POS) and in cooperation with the American Association for Laboratory Animal Science (**AALAS**), the Institute of Animal Technology (**IAT**), the U.K. Medical Research Council (**MRC**), and the National Institutes of Health (**NIH**).

The Fellowship recognizes two outstanding technicians—one IAT Registered technician (RAnTech) and one AALAS certified technician (ALAT, LAT, LATG, or CMAR)—who have made (or have the potential to make) significant contributions to the field of laboratory animal care and use.

As part of the Fellowship, the IAT Registered recipient will participate in a week-long educational internship at an animal care and use program within a U.S. institution, then attend the National AALAS meeting in St. Louis, MO. The AALAS certified recipient will participate in a week-long educational internship at an animal care and use program within an institution in the United Kingdom or the Republic of Ireland, then attend the IAT meeting (location of the meeting still to be determined). Both recipients will write an article about their experiences for AAALAC International's *Connection* publication.

Formal calls for nominations will be posted on the web sites of sponsoring organizations in the months ahead.

Questions about the Fellowship Award may be directed to:
AAALAC International +301.231.5353, accredit@aaalac.org.

ACLAM and AAALAC launch new web site

ACLAM and AAALAC are pleased to announce a new service to facilitate direct contact between laboratory animal veterinarians worldwide — the Laboratory Animal Veterinary Information Network.

This web-based service allows colleagues to ask fellow veterinary professionals questions related to laboratory animal veterinary activities, including animal health standards, certification requirements, transportation issues, local contacts, etc. (The service is not intended for general facility or operational questions — the purpose of this web site is to complement other well-established communication links such as COMPMED.)

For details or to ask a question, please visit the website at www.labanimalvet.info

NCAB/AALAS Newsletter Update

The March/April National Capital Area Branch newsletter has just been posted to the website. Go there now to get the latest edition. As always, please print and share your copy with others who do not have access to the website or a printer.

SPREAD THE WORD!
www.ncabaalas.org

CAAT Winter 2004/2005 Newsletter

CAAT's latest year-end newsletter, an annual update on the center's activities, is available for download as a PDF file.

<http://caat.jhsph.edu/pubs/caatnews.pdf>

Russell & Burch Award

The Humane Society of the United States (HSUS) presents the Russell and Burch Award to scientists who have made outstanding contributions toward the advancement of alternative methods in the areas of biomedical research, testing, or higher education. Alternative methods are those that can *replace* or *reduce* the use of animals in specific procedures, or *refine* procedures so that animals experience less pain or suffering. The award, which carries a \$5,000 prize, is named in honor of William M. Russell and Rex L. Burch, the scientists who formulated the Three Rs approach of replacement, reduction, and refinement. Prior to 1999, The HSUS presented the award on an annual basis. It is now bestowed every three years at the triennial World Congresses on Alternatives and Animal Use in the Life Sciences. The next World Congress will be held August 2005 in Berlin, Germany. For more information, go to: www.worldcongress.net.

Send nominations by **May 16, 2005** to: Russell & Burch Award, Animal Research Issues Section, The HSUS, 2100 L Street, NW, Washington, DC 20037, USA (tel.: 301-258-3042, fax: 301-258-7760, e-mail: ari@hsus.org). No special forms are necessary. Persons nominating themselves should submit a cover letter explaining their suitability for the award, a curriculum vita, and representative published articles. Persons nominating others should submit a letter explaining the nominee's suitability for the award and arrange to have supporting documents forwarded. Winners are selected with the aid of an advisory panel.

SCAW now has on-line registration and payment available for our Workshops and Conferences. Please visit the website at www.scaw.com

RDS Web Page on Reduction Techniques

There is a dearth of accessible examples of the three Rs for the public. This is particularly true for reduction techniques. RDS: Understanding Animal Research in Medicine has just added a page on its web site giving examples, based on an article by Sylvia Vaughan of the FRAME Reduction Committee in the Winter 2004 issue of RDS News.

The page is at www.rds-net.org.uk/pages/page.asp?i_ToolbarID=4&i_PageID=1761

It complements their other web pages on animal welfare and the three Rs at: http://www.rds-net.org.uk/pages/page.asp?i_ToolbarID=4&i_PageID=4

TestSmart DNT Meeting

TestSmart programs generally feature one or more open registration meetings that serve as a clearinghouse for ideas and as a forum for sharing both science and policy concerns. The first TestSmart DNT open registration meeting is slated for March 13-15, 2006 in the Washington, DC/Baltimore area.

Developmental neurotoxicity (DNT) is a major issue in children's health worldwide. The developing human nervous system is susceptible to many toxicants, and chemical exposure during development may cause lasting neurological deficits. Such damage can range from subtle to severe, and it may impose substantial burdens on affected individuals, their families, and society.

For additional information please visit caat.jhsph.edu/dnt/

Guidance

New guidance for institutions in meeting the prompt reporting requirements of the PHS Policy on Humane Care and Use of Laboratory Animals is published in the NIH Guide for Grants and Contracts, NOT-OD-05-043, 2/24/2005, <http://grants.nih.gov/grants/guide/notice-files/NOT-OD-05-034.html>

Spotlight on IMS

(spotlight on IMS is an occasional SCAW newsletter feature that highlights SCAW's Institutional Members. Are YOU an Institutional Member?)

As Allentown Caging Equipment Company, Inc. approaches its 37th year in business, I find it necessary to reflect and thank the multitude of people who have contributed to our success. Without the confidence of our customers, we could still be working in an old horse barn, the birthplace of Allentown Caging. We have been able to make a name for ourselves within the biomedical research community by offering quality made products and supporting our clients' needs.

We continue to offer a variety of equipment including ventilated cage racks and airflow accessories, biological workstations and specialized stainless steel caging. We have also partnered with an aquatics housing manufacturer customizing in Zebrafish and Xenopus systems. The growth of our company has led to our name being recognized all over the world. With many years of hard work and persistence by our CEO, Michael A. Coiro, Sr., we went from that original barn to a professional manufacturing establishment comprising over 200,00 square feet. We would not have been able to expand fourteen times and be where we are today without the help of none other than you – our customers.

In addition to our building growth, we have also grown internally reaching over 300 employees at our corporate headquarters. This progression has led to the development of new departments such as our Air Flow Technology group. As the backbone of the Sales Department, the AFT team of professional engineers specializes in design assistance for our customers. They do anything from designing room layouts to meeting with architect to assist in facility planning.

Although we do not anticipate many more expansions at our corporate headquarters, our latest expansion includes travel “across the pond” into Europe and the United Kingdom. With the rise of global opportunities for Allentown Caging, we have established sales representation in Great Britain, France and The Netherlands. We are also entering into agreements with representatives in Australia and New Zealand, Israel and Spain. Our European and British customers not only welcome the competition, but also are also enthusiastic about the various features of our Individually Ventilated Caging Equipment.

We are undeniable proud of our success and new ventures but also continue to give something back to the community. We are members of local community organizations as well as support our industry associations such as AALAS, NABR, SCAW, FBR

continued on last page...

Behavioral Needs, Stereotypies and Animal Welfare

Ian J.H. Duncan
Department of Animal and Poultry Science
University of Guelph

When considering “behavioral needs”, we are interested in how important it is for an animal to perform particular behavior patterns. In other words, we are interested in what causes the behavior and how strongly motivated the behavior is.

Causation and Function

Right from the start, I wish to distinguish functional explanations of behavior from causal explanations. The statement “That rat is grooming itself in order to keep its pelage in good condition” is a functional that rats that groom under these ‘fitter’ than rats that do not. “That visual, olfactory and tactile stimuli triggering brain areas controlling grooming behavior is now more motivation” is a causal living in the environment in which usually be a fairly close match function. With animals that have selection pressure for many very artificial environments, the example, artificial selection has having much bigger appetites fitness; causation and function example would be human particular function such as doing However, many of the causal factors for hunting may still be present and the dogs may be motivated to hunt although the functional consequences are unimportant.

The following is from a presentation at the SCAW Winter Conference 21st Century Challenges: Keeping Pace with Changing Research Programs and Technology held on December 6-7, 2004 in San Antonio, Texas. The subject matter was Understanding Animal Behavior & Enrichment

explanation. The implication is particular circumstances will be rat is grooming itself because from its soiled pelage are grooming behavior and important than any other explanation. With wild animals they have evolved, there will between causation and been subjected to artificial generations and are kept in match may be poor. For resulted in Bassett Hounds than they require for optimal are out of step. Another caretakers that carry out a the ‘hunting’ for meat for dogs.

Causation and Needs

All behavior is both internally and externally controlled. However when the proximate factors governing the immediate expression of particular behavior patterns are considered, it is obvious that some are triggered primarily from within the animal, some from outside the animal and others by complex interactions between the two (Hughes and Duncan, 1988).

Nesting behavior in hens is an example of behavior that is largely controlled by internal factors, mainly hormonal and neural factors. This type of control means that no matter what type of environment is provided for hens, they are going to perform or attempt to perform nesting behavior for 1-1½ hours before they lay an egg. Surprisingly, nesting behavior is not caused by the presence of a hard-shelled egg in the shell gland but by events connected with ovulation 24 hours previously (Wood-Gush, 1975).

There is also strong evidence that it is the performance of nesting behavior that is important for the hen and not the construction of a nest. If we provide a nest (say a nest that the hen has built herself on a previous occasion) it makes no difference; the bird will still go through the routine of

nest-building each day (Duncan and Kite, 1989; Hughes et al., 1989). It is this category of behavior that poses the biggest threat to welfare under artificial (laboratory) conditions since the behavior will be triggered in all environments but the given artificial environment may not allow a satisfactory performance of the behavior. It is this category of behavior that can truly be called a 'need'.

Predator avoidance is an example of behavior that is almost entirely governed by external factors. If predators (or the key stimuli associated with predators) are not present, then the behavior will not be triggered. Under laboratory conditions it should be possible to eliminate all cues associated with predators. However, it should be remembered that in many of our domestic species such as sheep, cattle, poultry, rabbits, rats and mice, human beings may be perceived as predators and steps may have to be taken to habituate the animals to the caretakers (Caine, 1992; Duncan, 1992; Hemsworth et al., 1992). Since the triggering factors governing this class of behavior are external to the animal and can therefore be controlled in the laboratory, there is no behavioral need.

Dust bathing behavior in domestic fowl is an example of behavior that is controlled by complex interactions between internal and external factors. The tendency to dust bathe fluctuates according to time of day and it increases with time if the bird is prevented from dust bathing (Vestergaard, 1982). However, external factors such as environmental temperature, radiant heat, radiant light, the sight of a dry dusty substrate, and the presence of other birds dust bathing, are all very important triggering factors (Duncan et al., 1998).

Appetitive and Consummatory Behavior

A further complicating factor is that behavior often consists of two elements, an appetitive phase and a consummatory phase. Thus, hunting is appetitive and ingestion is consummatory, courtship is appetitive and copulation is consummatory, nest-building is appetitive and laying or giving birth is consummatory. Although, in any particular behavioral sequence, the appetitive elements usually precede the consummatory elements and although there is usually some link in the motivating systems that trigger both phases, the order is not invariable and the links are not complete. Thus a cat may consume the feed it requires in a very short time, but thereafter may be motivated to show many of the elements of hunting behavior which are appetitive components that normally precede feed consumption.

Models of Motivation

What is motivation? Some descriptions are :

- The 'energy' that drives behavior
- The impelling power behind behavior
- The tendency to act in a particular way
- Whatever it is that induces that action

Motivation is therefore to do with causation, and particularly with the internal causal factors. Examples of motivations would be hunger, thirst, libido, fear, anger and so on.

A "model" is some representation of the real world that helps us understand how the real world works. Examples of different kinds of model would be architectural models, molecular models, mathematical models and system control models. In considering models of motivation, we will be dealing mainly with system control models.

In the 1970s and 1980s, research into causation was largely ignored by main-stream

ethologists as they moved into behavioral ecology and took a functional approach. However, during this period, particularly in Europe, the debate over intensive livestock husbandry methods was gaining momentum, and a crucial question was one about “behavioral needs”.

Some countries were actually enacting legislation which stated that environments for farm animals should allow for “behavioral needs”. But what was a “behavioral need”? Presumably it meant a behavior pattern that was very strongly motivated. However, there was no theory to give guidance about how motivation should be measured. Applied ethologists, working with farm animals, were forced into developing theories of motivation.

FIGURE!!!

Figure 1 shows a simple model of motivation developed by Piet Wiepkema (1982, 1985) after Deutsch (1960). This model was developed at the Agricultural University in Wageningen in The Netherlands. Behavior is motivated by a mismatch between Istwert and Sollwert and is switched off once the Istwert has been changed and negative feedback has occurred through the receptor and evaluation system.

Figure 2 shows a very similar model of motivation developed by Baxter (1983) working at the Scottish Farm Buildings Institute. Baxter (1983) thought that it might be possible to build a perfect environment for a farrowing sow such that the sow was not motivated to show any nest-building behavior herself. In this model the functional consequences of behavior are all-important. If the functional consequences are taken care of artificially, then nest-building behavior is not triggered.

However, we now know that this is not necessarily true. The example has already been given of hens that continue to show nest-building behavior each day before they lay an egg even though they are given a ‘perfect’ nest to lay in (Hughes *et al.*, 1989). Experience tells us that for many species and many motivational systems, the performance of a particular behavior sequence seems to be just as important as the functional consequences that results from the behavior. Cats will show elements of hunting behavior even when all their nutritional needs are met. Rodents will show nest-building behavior even when excellent nests are provided. Featherless chickens will show dust-bathing behavior although there is no oil to be removed from their feathers.

FIGURE!!!

In order to take account of the short-comings of these earlier models, Hughes and Duncan (1988), also working at an agricultural institute, the Poultry Research Centre in Edinburgh, proposed the more complex model of motivation shown in Figure 3. The main difference from Baxter's (1983) model is that the performance of behavior *itself* can have an effect on motivation quite apart from any functional consequences. Generally speaking, the performance of appetitive behavior will have a positive feedback effect and increase motivation. The performance of consummatory behavior will, at first, also have a positive feedback effect and increase motivation (think of "appetizers" increasing hunger and intromission increasing sexual motivation). Of course, in the longer term, the performance of consummatory behavior has a negative feedback effect and decreases motivation. Also in the longer-term, the functional consequences eventually reduce motivation by acting through the organism variables.

Behavioral Needs and Welfare

For any behavior pattern that is largely governed by internal factors, motivation levels will eventually rise above threshold. This will trigger appetitive behavior, but in some artificial environments it may be impossible to proceed to the consummatory phase. The appetitive behavior will continue, sometimes in an abbreviated or incomplete form, and this will have the effect of raising motivation further. Not only will this lead to a state of frustration and a reduction of welfare, but the animal may well become stuck in an endless loop; performance of appetitive behavior raises motivation but the environment prevents the normal transition to consummatory behavior, and so the appetitive elements are repeated for long periods of time. This may well account for many (but probably not all – see Mason (1991)) of the stereotypies seen in laboratory animals kept in barren environments and in farm animals kept intensively (Rushen *et al.*, 1993).

This suggests that modern husbandry systems for all captive animals should take account of behavioral needs, i.e. behavior motivated largely by internal factors. Animals should be able to perform these behavior patterns without injuring themselves or others. Whether or not allowing these patterns to occur as vacuum activities is sufficient to safeguard welfare, is still open to debate.

A 'need' is not an all-or-none phenomenon. So far in this discussion, we have not distinguished between 'slight need', 'critically important need' and all the range of needs between these extremes. Dawkins (1983) suggested that the term 'behavioral need' should be restricted to an ultimate requirement or, in a slightly weaker sense, a very high level of causal factors. She also applied consumer demand theory to this problem and reinterpreted 'needs' using the economic definition of 'necessities'. 'Necessities' continue to be bought when income is reduced (showing inelastic demand) in contrast to 'luxuries', consumption of which falls when income is reduced (showing elastic demand) (Varian, 1996). Similarly, some behavior patterns show inelastic demand and continue to appear even when constraints are imposed. Others are the equivalent of luxuries and appear only when constraints are absent. The elasticity of a behavior pattern can be measured experimentally by imposing constraints, such as limiting the total time available for the animal to perform all its activities, or by making the animal work in order to obtain an environment in which it can perform the behavior pattern in question. Using such methods, Mason *et al.*, (2001) have shown that mink will work very hard to obtain water in which they can swim. In the case of mink, swimming shows inelastic demand and should be considered a necessity. Mason *et al.* (2001) have also pointed out that there are various ways of calculating the value an animal places on a resource, and it might be wise not to rely on one of these alone.

There is another aspect to 'elasticity' of behavior, as pointed out by Hughes and Duncan (1988). In captive environments, the range of behavior patterns available to the animal is limited compared with those seen under less restricted conditions. Certain activities must therefore extend in duration in order to fill the available time. Therefore, the concept of elasticity should be extended to include these circumstances. This means that environments should be designed to allow the performance of behavior showing inelastic demand, but in addition should allow the performance of behavior that can be extended to fill up the available time and so is 'elastic' in another sense of the word.

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