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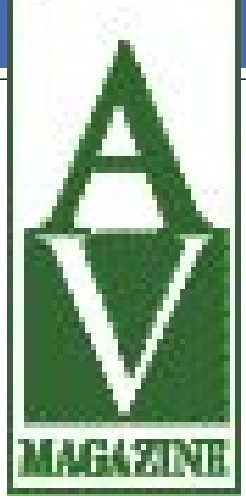

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Reaching for the future: The Evolution of Humane Science Education

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FEATURES

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Organized and established in 1883.

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www.animalearn.org

A teacher-focused online resource for alternatives to dissection information!

"As a teacher looking for alternative projects, www.animalearn.org was all that I needed. The site provided me with information as well as a free program to try out with my students."

Jennifer Walker,
10th grade Biology teacher

This site gives teachers and professors information on:

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- *What educators who use alternatives have to say*
- *Alternative lending information*
- *Where to find online alternatives*
- *And much much more!*

For more information on ordering alternatives for your classroom, please call us at (800)729-2287 or e-mail info@animalearn.org.

www.humanestudent.org

A student-focused online resource for alternatives to dissection information!

"Being a student opposed to dissection, I found rescources on alternative projects hard to find....www.humanestudent.org saved me from having to dissect in my class. It also helped other students in my class who didn't want to dissect animals."

Kevin
11th grade

This site gives students and activists information on:

- *Animals used in education*
- *Students' rights*
- *Other students' testimonials*
- *Alternative lending information*
- *And much more!*

For more information on ordering alternatives for your class or advice on implementing a students' choice policy at your school, please call us at (800)729-2287 or e-mail info@animalearn.org.

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info@animalearn.org

Who Are We?

Founded in 1883, the American Anti-Vivisection Society (AAVS) is the oldest non-profit animal advocacy and educational organization in the United States dedicated to ending experimentation on animals in research, testing, and education. AAVS also opposes and works to end other forms of cruelty to animals. We work with students, grassroots groups, individuals, teachers, the media, other national organizations, government officials, members of the scientific community, and advocates in other countries to legally and effectively end the use of animals in science through education, advocacy, and the development of alternative methods to animal use.

AAVS has two main divisions, each involved in specific activities. Animalearn is the education program of AAVS, which focuses on ending vivisection and dissection in the classroom. From elementary through college levels, Animalearn helps countless individuals make theirclassrooms more humane. Animalearn operates the most aggressive dissection alternatives lending library in the country, The Science Bank; it provides alternatives to using animals, from basic dissection, through psychology experiments. Animalearn also participates in national teacher conferences and hosts workshops to help teachers learn ways of educating without harmingother living creatures. Animalearn's National Humane Educators Network links interested parties with speakers across the country, bringing the message of humane education to thousands.

The Outreach division of AAVS educates the general public about animal issues through one of the top-rated literature collections in the animal advocacy movement and the informative AAVS website. Our quarterly publication, AV Magazine, and bi-monthly newsletter, ActiVate For Animals, provide comprehensive up-to-date information on the scientific and ethical dimensions of animal experiments and alternatives. Both publications encourage AAVS members and supporters to become actively involved in our campaigns. Outreach staff also travel to speaking engagements and conferences and place advertisements in national publications to spread the AAVS message across the country.

The Alternatives Research & Development Foundation (ARDF), an affiliate of AAVS, awards grants to scientists and educators working to develop non-animal methods. ARDF's unique program provides the necessary resources for the development of alternatives to the use of animals. ARDF promotes alternatives through seminars and workshops as well as writing articles for various scientific publications. ARDF promotes scientificsolutions for today with humane visions for the future.

We ask you to become a member of AAVS and help us to end the use of animals in science through education, advocacy, and the development of alternative methods. It is only through the support of members and other individuals that we are able to continue our vital and successful programs.

American Anti-Vivisection Society

First Word

By Tina Nelson, Executive Director

As a parent of a 14-year-old daughter, I have personally been faced with the issue of dissection at the middle school level. The students in my daughter's basic science class were presented with a lesson requiring the dissection of an earthworm. My daughter quickly responded, spoke with the teacher, and explained the number of non-animal alternatives available. In this case, the teacher was amenable to the use of alternatives and actually welcomed the idea of viewing and using the alternatives himself. After learning of the Animalearn lending library, the Science Bank, several other students joined my daughter in the use of the earthworm CD-ROM which uses 3-dimensional technology. The program contains over 60 dissections including an examination of the earthworm's external anatomy and the reproductive, circulatory, nervous, muscular, excretory, and digestive systems. The CD-ROM also includes a tutorial, lecture, and quiz mode. To follow-up after the class, I met with the teacher to discuss his assessment of the alternative. In his words, "I was amazed at the sophistication and thoroughness of this technology. I had no idea that alternatives like this existed, and for the future will continue to make them available and possibly faze out dissection entirely."

This was a success; however, not all students have teachers willing to try new methods as evidenced by a recent survey. Five thousand middle and high school level biology teachers were asked questions to determine attitudes regarding dissection practices and the use of non-animal alternatives. Out of 494 respondents, 79 percent of teachers disclosed that they used dissection in the classroom, 72 percent believed that dissection was an important part of the curriculum, and 68 percent considered dissection to be a critical hands-on activity. When asked the question, are alternatives as good as dissection for teaching anatomy and physiology, 55 percent disagreed and 31 percent agreed.

Clearly, based on the results of this survey, there has to be a major shift in the attitudes of teachers regarding the effectiveness of alternative methods. Animalearn continues to work toward that goal by providing the most innovative, up-to-date alternatives and by educating and communicating with teachers from the elementary level through the tertiary level. For example, the press release that appears on this page was distributed by Animalearn, AAVS's education division, to announce that a Baltimore student won her right to refuse to dissect. Animalearn staff provided expert testimony to the Baltimore County Public Schools Board of Education on behalf of the student in an effort to help her implement a policy change at her high school.

I applaud the brave students and parents who are persistent and steadfast in their convictions to elicit change and I am proud of our dedicated staff in the education department who provide the necessary support. Animalearn could not carry out its vital work without the help and dedication of our members. Thanks to each and every one of you

Tina Nelson

Animalearn
Animals, Ethics, and Education

Baltimore student wins right not to dissect

Kenwood Senior High School in Baltimore County is to be congratulated for earlier today announcing that 11th grade student Jennifer Watson would be allowed not to dissect. Watson, who has a cat of her own, was forced out of an anatomy and physiology class and forced to take earth sciences instead, after being told she would be required to dissect a cat. Watson, who is an honors student aiming to enter law school, was last night forced to testify before the Baltimore County Public Schools Board of Education to request that her deeply held conviction against harming animals be respected.

Earlier today a school representative told Watson that the school had reversed its earlier decision; that she would be allowed back into the class; and that the school had purchased dissection CD-ROMs to ensure that students like her would not have to dissect once-living animals.

Said veterinarian, Dr. Andrew Knight, Director of Education for the national humane education organization Animalearn,

"The need for animals is clearly strongest in veterinary school, and the fact that I and other veterinarians were able to graduate without harming any animals proves that this is unnecessary at all levels of education. Kenwood SHS should remove dissection from its curriculum and should instead use humane methods that instill a respect for life, rather than teaching that animals are disposable teaching tools."

Humane alternatives include computer simulations, videos, models, and dissection atlases, many of which are available for free from Animalearn's national lending library The Science Bank. Almost every study performed has shown that students learning via such methods perform at least as well as those trained by harming animals. At least 28 scientific studies now exist.

Said Maria Watson, Jennifer's mother,

"I'm very proud of my daughter. I'm glad other students can speak up without fear of being penalized, now it's all out in the open."

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Crystal Miller-Spiegel, Outreach Director, American Anti-Vivisection Society (AAVS)
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Animalearn is the education division of the American Anti-Vivisection Society (AAVS), a national animal protection organization.

Animalearn
Animals, Ethics, and Education

ANIMALEARN

ANIMALS, ETHICS, AND EDUCATION IN ACTION

By Katherine Lewis, AAVS Education Director
& Nicole Green, AAVS Programs Coordinator

Since its inception in 1990, Animalearn, AAVS's education division, has accomplished much for animals who are used in education. Legislatively, Animalearn was instrumental in the passing of the 1992 Pennsylvania Students' Choice Policy and is currently supporting efforts to pass dissection choice policies in New Jersey and Massachusetts. In addition, Animalearn has assisted thousands of teachers, students, and activists to find alternatives to dissection through its loan program, The Science Bank. Animalearn not only loans out alternatives but, in special cases, donates them as well. In an effort to ban dissection in South Africa, Animalearn generously donated alternatives to the Humane Education Trust, specifically for this purpose. Animalearn representatives travel worldwide to educate the public about alternatives to dissection and vivisection and other important animal issues such as animal experimentation, product testing, and animal rights. And with Animalearn's National Network of Humane Educators, we help those who seek animal-friendly people or groups by giving them the contact information of individuals in the Network, so they can combine efforts to save animals.

Through the years, Animalearn has been working to foster an awareness of and respect for animals used in education and to eliminate their use through the employment of alternative methods. Dedicated to assisting educators and students find non-animal methods to teach and study science, in 1996 Animalearn developed a free program whereby educators and students could borrow alternatives. Animalearn's The Science Bank was established to lend new and innovative life science software and education products that would enable educators and students to try out the most cutting edge products, thereby saving animals and improving teaching methodologies.

Recently, we established the Humane Educator Pack and the Student Advocate Pack, which feature The Science Bank brochure and other dissection-related materials. Along with the Humane Packs, Animalearn offers educators and students other wonderful resources, including our Teacher, Kid, and Student Advocate Kits, which contain fact sheets on everything from animal experimentation to animals in agriculture. Additional elementary kits include the Frog Fact Files and the Rat Pack. These kits were created because frogs and rats are commonly used animals in education. Through our humane educational materials, Animalearn hopes to make a difference for all animals used in education.

In a never-ending quest to reach more and more people with the message of eliminating the use of animals in education, Animalearn developed two websites geared towards educators and students. Animalearn's *www.Animalearn.org* is focused on meeting the needs of teachers, professors, and other educators regarding the replacement of animals used in education. The site offers online access to the new and innovative science software and education products found in The Science Bank, testimonials from professors and teachers who use alternatives, and information on other Animalearn educational products. Animalearn also developed *www.HumaneStudent.org* as a student-focused website to give students and activists information on animals used in education, students' rights, and conscientious objection.

Today, Animalearn continues to be a resource for both educators and students. Animalearn serves educators by providing them with the latest alternative information by hosting workshops and exhibiting at national science teachers' conferences, including the National Science Teachers Association and the National Association of Biology Teachers. We also speak to teachers, department chairs, principals, and professors about alternative methods and, if necessary, provide them with technical assistance for The Science Bank alternatives.

Animalearn helps students by supporting a student's right to refuse to dissect or vivisect an animal. We also provide students with moral and technical support and, when appropriate, active participation in the development of student conscientious objection policies by going to schools and meeting with professors and department chairs. Realizing that students are often the best catalysts for change, we also provide students with supporting documentation to assist them as they make their case for educational modification. Countless student advocates from schools throughout the country have consulted with Animalearn to make their colleges and universities more humane. Bryn Mawr College, Vassar College, Cornell University, University of South Florida, University of Illinois, University of Pittsburgh are just some of the campuses that have benefited from Animalearn's assistance.

For more information about how Animalearn can help you eliminate the use of animals in education, and more, call (800) 729-2287, e-mail us at *info@animalearn.org*, or find us on the web at *www.Animalearn.org* or *www.HumaneStudent.org*. ■

What the Heck is a Digital Frog?

By Celia Clark, President, Digital Frog International, Inc.

This is probably the most common question heard by Digital Frog International (DFI) employees—especially when they're wearing one of the company's funky T-shirts. The answer is twofold: Digital Frog is both a ground breaking product and a small educational software company based in a converted barn surrounded by dogs, bogs, and frogs.

The Digital Frog, an interactive CD-ROM for biology students, was the brainchild of two twenty-something university students; they felt strongly that there had to be a better way to learn anatomy than cutting up Kermit. Supported by small investments from family and friends, they put their university careers on hold and set out to make their vision a reality. And they did. Digital Frog International was established in 1995, and shortly thereafter the first version of The Digital Frog was released. This unique software won a top educational award and attracted the attention of Jerry Pournelle of *Byte* magazine, even before it was finished.

Animal rights groups embraced this new alternative to dissection wholeheartedly, but biology teachers were more reluctant to embrace multimedia technology. Those innovative and forward-thinking teachers who braved this new technology, however, were delighted with the results.

Considering the public outcry over the use of animals for scientific experiments and research, it's hardly a wonder that these same protests are being heard in schools throughout North America. Students with ethical and moral objections to wet lab dissections have become more and more vocal about their concerns. The Digital Frog co-starred in a public service announcement with Alicia Silverstone, urging U.S. students to exercise their right to not dissect animals. California, New York, Pennsylvania, Rhode Island, Florida, and Illinois have now legislated students' right to not dissect, and several more states are proposing such laws.

The use of frogs in schools for dissection purposes is making a negative, and lasting, ecological impact. Frogs cannot be easily bred in captivity; as a result, massive cullings of wild frogs occur every year. According to F. Barbara Orlans, Ph.D., a Senior Research Fellow at the Institute of Ethics at Georgetown University, approximately 3.2 million frogs are destroyed for dissection every year. In an article published in *The Science Teacher*, Orlans states, "Environmentalists are concerned that the whole population of native frogs in the United States is becoming so seriously depleted by the large scale trade in frogs that some species are threatened with extinction."

The Digital Frog 2, our company's newest, updated CD-ROM, has attracted a lot of attention, including that of Nancy Harrison, a respected pathologist from San Diego, CA, and the president of Doctors for Kindness to Animals, a small charitable organization that promotes alternatives to classroom dissection. (See sidebar page 6.)

"The Digital Frog 2 is my favorite program, and it's my favorite program for several reasons," Harrison says. "First, the dissection module is well done. The student enacts the major steps of a wet lab dissection. Then a movie shows those steps, and the movies are large and clear. Second, the anatomy and physiology info is superb. It's thorough, nearly a small textbook, and exquisitely well expressed. Last, The Digital Frog 2 also includes an ecology/biology section that shows real living frogs in context, not just in a dissection tray."

DFI would like to see wet lab (traditional) dissection as an optional extra for those students who 'opt in' rather than forcing students to 'opt out,' a vision shared by the Alberta SPCA. In their February 2002 issue of *AnimalWise*, they listed 12 reasons for teachers to initiate an 'opt-in' dissection policy for their schools.

There is no concrete evidence that students need to take part in a wet lab dissection as a means to learn anatomy—quite the opposite has been shown in studies. Research conducted by Christine Youngblut, Ph.D., at George Mason University in 2001 found that The Digital Frog 2 was more effective than wet lab dissection for students to learn anatomy and took approximately 44 percent less time. This is not, however, an easy message to get across to teachers.

While more and more teachers are beginning to accept multimedia as a legitimate dissection alternative, there are still many who resist simulations, often as a result of previous experiences with competitive products. Many biology teachers maintain the belief that there is no substitute for a wet lab dissection and that hands-on dissection is the best way for students to learn.

DFI has found that the most effective way of converting the die-hard wet lab enthusiasts is to have them take some time to actually play with the software. At various trade shows attended by DFI, some teachers who are reluctant to explore dissection alternatives do take the time to sit down and explore The Digital Frog 2, if only out of curiosity. Nine times out of 10, they are impressed with the program's overall look and feel, the realistic dissection module, and the thoroughness of the anatomy section. DFIers are left with a sense of satisfaction when these teachers admit that The Digital Frog 2 would be a good solution for students who refuse to participate in the wet lab dissection. This is often the first step towards a teacher's overall acceptance of CD-ROMs as a dissection replacement.

"The reason The Digital Frog 2 is good is because the computer can do something that paper books and wet dissections can't," Harrison explained in a recent presentation to science teachers from across the U.S. "After it guides you through the dissection, it quickly takes you over to anatomy and expertly, elegantly guides you through the living state of the dissected structures. And then the biology of the living frog brings it all home, it shows how what you've dissected works in real life, which was our point, presumably, to begin with. Now for me, it was far too long before I linked all these different fields of study. I mastered anatomy and physiology and so on. But those categorical distinctions are artificial; they're man-made. Real life doesn't function in categories like that. The Digital Frog 2 emphasizes how the individual parts function in the living animal." ■

For more information on The Digital Frog 2, visit www.digitalfrog.com. There you can download a demo or request a DemoWare CD. Digital Frog is also available through Animalearn's free alternatives to dissection loan program, The Science Bank.

DIGITAL FROG INTERNATIONAL

"Though this may be play to you,
'tis death to us."
Sir Roger L'Estrange

A Medical School Physician Professor's Case Against Vivisection in Medical Education

By Lawrence A. Hansen, M.D.,
University of California San Diego Medical School

Vivisection

Doctors taking the Hippocratic Oath upon graduating from Medical School vow to place their patients' welfare above all other considerations. While such a lofty and selfless aspiration is unreachable for most physicians in everyday practice, it can, like the stars above, inspire us and give us guidance. Some medical educators are, therefore, resistant to animal rights arguments about eliminating vivisection from medical school curricula, because they believe any possible human benefit deriving from such exercises trumps concern about animal suffering. The burden of proof, therefore, falls upon physician opponents of animal vivisection to convince both medical school faculty and medical students that the replacement of vivisection with other modalities will not compromise education and, ultimately, patient care.

Most terminal animal laboratory teaching exercises are found in physiology and pharmacology courses during the first two basic science years of medical school. These courses are usually taught by Ph.D. faculty who routinely use animals for research. For these educators, animal use in teaching differs little from animal use in research where, they believe, the suffering imposed upon the animals is a perhaps regrettable but necessary price to be paid for the knowledge gained, which could eventually benefit humans.

Unlike animal research, however, vivisection teaching exercises generate no new knowledge. In fact, if everything doesn't go just as predicted during the vivisections, their teaching value is lost. Since no new knowledge derives from these vivisections, they can be ethically justified only if they provide otherwise unobtainable educational benefits. But studies comparing students' objectively-measured mastery of physiology and pharmacology have repeatedly shown no educational advantage for animal vivisection over alternative instructional methods.

Perhaps reflecting this failure to identify any superiority for vivisection over non-lethal alternatives has been a trend away from animal laboratory exercises in medical education. As recently as 1985, 63 percent of U.S. medical school physiology courses used, and typically required participation in, animal vivisection, most often of dogs. By 2001, this percentage had dropped to 18 percent, and 82 percent of these were theoretically optional rather than required. The decline in animal vivisection in pharmacology has been even more dramatic, from 50 percent of courses using vivisection in 1985 to five percent in 2001. Of this remaining five percent, all were optional instead of required.

We physician medical school faculty members opposed to vivisection cite these changes as an argument against continuing such laboratories in the minority of departments where they persist. We reason that if vivisection is not used in the majority of medical schools producing graduates qualified to practice medicine (including such prestigious institutions as Harvard, Yale, Stanford, and the Mayo Clinic), it cannot be necessary to continue using it in any schools. Once the necessity has been removed from a necessary evil, all that persists is the evil.

Many medical school physiology and pharmacology departments have now substituted sophisticated computer simulation programs for live animal laboratory exercises. These simulations can be repeated as often as needed until the medical students grasp the underlying physiologic or pharmacologic principles being demonstrated. This is one clear advantage computer simulations have over live animal laboratory exercises, since the latter can be performed only once, ending with the animal's life.

Even the staunchest opponent of vivisection in teaching must grant, however, that no matter how life-like simulators may be, replete with ersatz human torsos and faux veins for injecting drugs, they cannot replicate the awe-inspiring 'Gee whiz' effect of an opened, living, breathing dog or pig. Physiology in action with expanding lungs, a beating heart, and blood-spurting arteries is profoundly impressive. But vivisection is not the only, and certainly not the best way for medical students to experience this thrill. Mandatory clinical clerkships include general surgery and obstetrical and gynecologic surgery, which place the students in the operating room under the supervision of physicians. Here they will experience the same thrilling awe that vivisection provides, but their attention will be focused on how to preserve the miraculous life they witness, rather than on ending it.

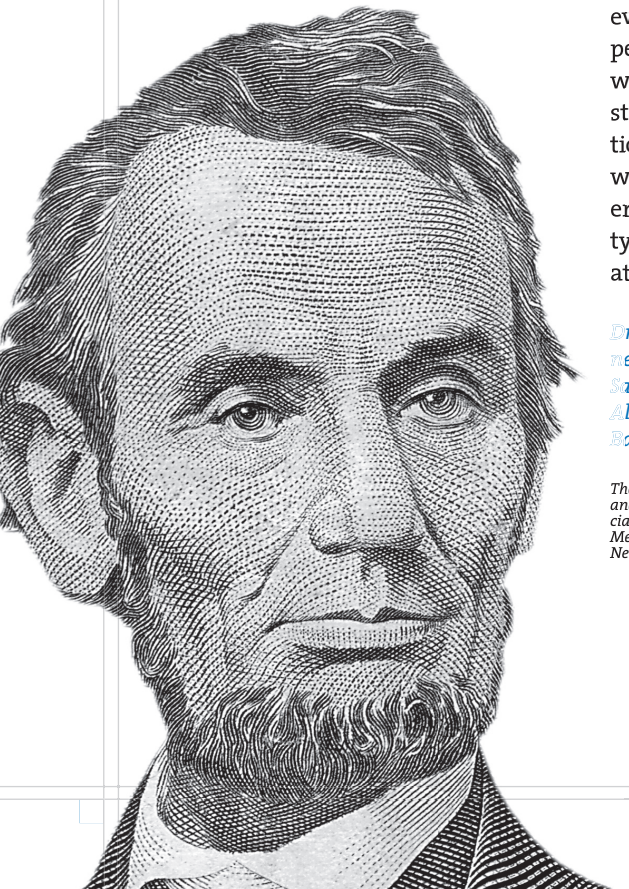
Since most persisting physiology and pharmacology vivisection teaching laboratories are optional, they could be ended if medical students simply opted not to participate in them. To paraphrase an anti-war slogan from the 1960s, "What if they gave a dog lab...and nobody came?" But students are often concerned and conflicted about opting out of these vivisections. While many of them are instinctively opposed to hurting animals, their first priority is to become competent physicians. They fear that they might miss out on a crucial component of their education if they don't do the vivisections. To allay these fears, often stoked by advocates of vivisection in physiology and pharmacology departments, the University of California Medical School physician faculty members opposed to vivisection have enlisted the aid of physicians practicing in the community (see sidebar page 6). These veteran doctors can assure the medical students that developing clinical competence does not require vivisection, and bears no relation to what a student does or does not do on one day of his or her first year of medical school.

The case against vivisection in clinical surgery clerkships is less obvious than the preceding arguments opposing live animal laboratory exercises in physiology and pharmacology. Surgery clerkships with vivisections fell from 38 percent to 17 percent in 1994 but have not since continued to decline. At first blush, practicing surgery on animals before performing it on people seems ethically unassailable, at least from the human's point of view. But, in fact, interns and residents committed to becoming surgeons acquire their technical skills by operating on patients under the supervision of experienced surgeons over the course of five- to seven-year residency training programs. No one becomes a surgeon without this prolonged post-M.D. apprenticeship. While vivisecting a dog or pig during the third year of medical school may provide the flavor of what human surgery is like, it is not how surgeons are trained, and can certainly be forgone by the great majority of medical students without surgical aspirations.

The intimacy of the doctor-patient relationship demands more of a physician than knowledge and technical skill. The key to caring for a patient is caring

Many medical school physiology and pharmacology departments have now substituted sophisticated computer simulation programs for live animal laboratory exercises.

about the patient, which requires empathy. Teaching medical students to suppress their natural empathy for the animals they are instructed to vivisect runs contrary to the highest motivation students have for entering medicine in the first place, the desire to relieve suffering, not to cause it. Physicians, of course, cannot be immobilized by their empathy: they must develop a capacity for objectivity in the midst of emotionally charged circumstances. Some vivisection proponents go so far as to celebrate the tough-minded obliteration of empathy necessary to vivisect a dog you would, under other circumstances, play with or pet. They equate treating a dog as a 'physiologic preparation' with developing a capacity for objectivity. But this mistakes a vice for a virtue, as described in the Tibetan Buddhist concept of the near enemy. All virtues have cousin vices, termed 'near enemies,' which superficially resemble them but are really distinctly different if not opposite in nature. Jealousy looks like love but is not, just as apathy resembles equanimity but is not. So too, the callousness required for vivisection appears similar to the scientific virtue of objectivity but is actually the vice of indifference to the suffering of others.



It is humbling for a physician to admit it, but probably the best definition of empathy comes from a lawyer, not a doctor. The lawyer was Abraham Lincoln. Once, when discussing a fellow politician's lukewarm enthusiasm for outlawing slavery, Lincoln remarked that some men feel the lash pretty well when it is applied to their own backs but feel nothing when seeing it applied to the backs of others. Empathy is the ability to feel the lash applied to another's back. Students' capacity for empathy should be encouraged, strengthened, and reinforced by their medical education, not destroyed by it.

Enlightened Buddhist insights about the near enemies of virtue and Lincolnesque empathy for the suffering of others are probably too much to expect of medical students being told to vivisect by their revered professors. It is more realistic for physician faculty members opposed to vivisection to hope for the attitude of John Updike's Harry (Rabbit) Angstrom. Harry once recalled that when he was a boy, he sometimes saw other kids amusing themselves by using a magnifying lens to burn ants. Harry, although hardly a paragon of virtue, never participated in this recreation because, even as a child, he recognized that people were cruel enough without working at it. We hope that medical students, once informed that vivisection is unnecessary in their education, will conclude that it represents another example of people working at cruelty and decide, like Harry, not to work at it with them. ■

Dr. Hansen is professor of pathology and the neurosciences at the University of California San Diego. He is also the Director of the Alzheimer's Disease Research Center Brain Bank.

The opinions expressed in this article are my own, and should not be interpreted as expressing any official positions by the University of California San Diego Medical School or its Departments of Pathology and the Neurosciences.

Doctors Against Dog Labs

Medical school faculty aren't the only doctors opposed to dog vivisection laboratories. Regular doctors in private practice also oppose wasting animals' lives for repetitive teaching exercises. Some local doctors who were especially troubled by unnecessary vivisection set out to discover if their medical peers would join them in trying to end the University of California San Diego (UCSD) dog vivisection laboratories.

These doctors against dog labs wrote a petition expressing the simple sentiment that killing dogs is not necessary to teach physiology and pharmacology, nor is it a necessary step to becoming a good doctor. Would surgeons and emergency room doctors, internists, and pediatricians sign this petition? Yes, indeed!

Many mature physicians expressed surprise that such archaic labs were still in existence. Some medical senior practitioners had been so unimpressed by dog labs that now, years later, they had to strain to remember if they'd even participated. Other physicians retold horror stories of dogs surfacing from inadequate anesthesia midway through vivisection. Others remembered that their dogs died prematurely, just part way into the 'demonstration.' Many younger physicians, graduates of schools that no longer vivisect, were incredulous upon hearing the descriptions of dog labs.

Nearly every doctor who was asked, in every specialty, from hospitals all over town, readily signed the petition. Only a few—a very few—doctors felt the one-day teaching labs during the first year of medical school had

significant value. Nearly all felt that their practice of medicine was neither significantly enhanced by dog labs nor diminished by eliminating them.

The web site *www.doctorsagainstdoglabs.com* was launched to support medical students (and pre-med students) in San Diego and across the United States, to show them that practicing physicians find no need to kill dogs to learn medicine. We take care of human beings all day, every day, and we are better judges of essential training experience than are Ph.D. or M.D. ivory-tower academics.

The fact is that most U.S. med schools no longer kill any animals at all; and if most don't, then it cannot be necessary. So how do any justify it? Our advice to pre-meds is to study hard and avoid applying to the few remaining schools that urge students to kill animals. Our advice to medical students facing the decision to vivisect is to choose compassion over callousness.

Dr. Nancy L. Harrison, M.D. is a 1986 graduate of the University of Oklahoma College of Medicine and completed her UCSD Pathology Residency in 1991. She is currently working in a general pathology private practice in the San Diego area.

KILLING DOGS IS NOT NECESSARY TO BECOMING A GOOD DOCTOR.

Conscientious Objection:

Spurring Personal Experience into Action

"If you want to study the rat's brain, study psychology. If you want to study the human brain, study philosophy." I still remember this overwhelming (but unfortunately true in most cases) sentence that my brother said to me when I was studying biology. During my biology studies, I had a serious crisis between what I thought science should be and what I found in my practices, which should have been called necrology.

Useless practices that included surgery on animals were performed even though we had not been trained in sutures and stitches; therefore, the experiments turned out to be traumatic experiences for students and a painful waste of animals' lives. We were not offered any alternatives, so objection meant failing the exam. I must confess I was scared; I couldn't pretend nothing was going to happen to the animals, but I had no specific alternative resources to show to my professors. I was completely lost and did not know what to do until I realized that I could be of some help by attending the practices without performing experiments on the animals, and writing a report detailing the procedures being conducted at my university. But watching innocent mice and rats being slaughtered for useless experiments became futile, especially after spending a whole week trying to rescue a rat that I had already named Enriqueta.

The professor knew I was completely against these practices, and was keeping an eye on me all the time, though I tried to sneak out to Enriqueta's cage to open it and run away with her. Nobody expected the rats to be killed that day, and I shouted when the professor took Enriqueta as the first one and decapitated her. I couldn't believe my eyes; I couldn't believe anyone could be so cold-blooded and cruel. I felt my heart stopping and suddenly beating with more strength than ever. I stared at him and swore to myself that from now on I was going to try to work to stop any animal testing.

I have no words to describe how I felt when I had been watching a sweet, healthy, funny, and curious rat, and suddenly there were only the remains of a dead body with no head and blood all over the table.

I felt I had to find a more scientific, accurate, and compassionate way to become a scientist, so I went to ADDA's (a Spanish animal rights organization) headquarters with the report of the experiments, which turned out to be the first report ever made by a Spanish student. We used the report to press the Catalonian government to change the law to protect laboratory animals in a more effective way. During that time, I became involved in InterNICHE, an international organization dedicated to promoting humane education, and started spreading the message that alternatives were available and to let students know that they had the right to conscientious objection. It is a matter not only of animal rights but also of civil rights, since it is possible nowadays to have rigorous education and training without hurting any animal and at the same time becoming better scientists because we also incorporate ethics, empathy, and compassion in all the knowledge we acquire during our studies.

I couldn't save her life, but I will carry Enriqueta forever in my heart because she was the trigger I needed—my inspiration—and I still think of her, especially while talking to media or participating in a conference at a university. Thank you, Enriqueta, for making a difference in my life and hopefully in other animals' and students' lives as well. ■

Núria Querol is a biologist and medical student at the Vall d'Hebrón Hospital in Barcelona, Spain. Ms. Querol is also the Spanish National Contact for InterNICHE and the head of the International Relationships Office in Fundación Altarriba, Spain. She is also a member of the Official Inventory of Spanish Scientists Committed to Alternatives to Animal Experiments that is accepted by the European Commission of the European Union. Additionally, Ms. Querol is the founder of the Spanish Group for the Study of Violence towards Humans and Animals.

Compassion and Intellect: The Goals

The freedom to learn is truly a gift. Learning itself is a challenge and a responsibility. And the process of learning is a shared experience between the student and the teacher. Those choosing to pursue learning in the life sciences, and the health professions in particular, must do so with a combination of motivations. They must respect and seek to promote life. They must be willing to master what is necessary and willing to learn throughout their entire careers. And they must seek to maximize in themselves both compassion and intellect.

By Lara Rasmussen, D.V.M., Director, Surgery and Clinical Skills, College of Veterinary Medicine, Western University of Health Sciences

Philosophical perspective as a professor

The teacher's role in learning is one involving knowledge and experience distinct from that of the students. Teachers don't know it all; they hopefully just know more through their own learning and experience. This role deserves acknowledgement and respect when it is not abused. The student's role in the learning experience is one of willingness, curiosity, and questioning. The traditional view of the student as inferior to the teacher perhaps fails to acknowledge the student as an intelligent being in his/her own right, with the need to question and accept knowledge and experiences in his/her own way.

The issue of the harmful use of animals in education often draws a sharp line between the teacher and the student. So an understanding of both parties by both parties must be part of the equation. As I have made the transition from being primarily the student to the newest period in my professional life as the teacher, I have tried to understand why we make the choices we do. For example, the teacher carries a responsibility that is unique and perhaps missing from a student's load; the teacher is responsible for future generations of graduates. Students, on the other hand, have the responsibility to make their learning experiences the best they can be within the guidelines of their lifestyles and morals. It disturbs me to see teachers abuse the power of the answer to the inquiring "Why" question with "Because I said so." It equally disturbs me to see students follow unquestioningly or oppose flatly without the benefit of educational experience and knowledge. Both parties must be inclined to balance intellect and compassion, and respect the abilities and motivations of each other. These issues must force everyone to be creative, tolerant, and progressive.

Evolution of my philosophy

My current philosophy stems from my past experiences and my vision for the future. I have completed an undergraduate career in the life sciences after having fought for my freedom to learn without killing. I have completed a professional program and received a Doctor of Veterinary Medicine degree after having fought for my freedom to learn without harming or killing. I have completed an internship, graduate degree, and surgical residency, providing my transition to the perspective of the teacher. I have participated in the successful education of veterinary students and veterinary technicians without the harmful use of animals. And I have participated in the development of a new College of Veterinary Medicine with innovative vision for veterinary medical education.

My experiences as a student exposed me to teachers who are now my role models, both positive and negative. I saw those who were true scientists and forward thinkers. I saw those who abused their power and failed their responsibilities as scientists and educators. As a student, my world was smaller. I focused on making myself the best I could be. And having been raised with the ethic that to harm others was not okay, I endeavored to practice that behavior in my daily life, without question extending that courtesy to animals. I had the vision of accomplishing both of these student goals; some teachers around me did not.

The issue of the harmful use of animals in education often draws a sharp line between the teacher and the student.

As a teacher, my world got bigger. I experienced the result of poorly educated graduates. I saw the animals suffer, and at times, the graduates suffer as well. I embraced my responsibility to adequately educate future generations. Since I was starting from the perspective that I *could* accomplish both this excellent education and the non-harmful use or participation of animals in education, I was not hindered by the pessimism so many educators appear to thrive on with regard to this issue. From my perspective, based on experience and educational data, I feel the most appropriate stance is that we can better educate our students without the harmful use of animals. I will not make substitutions; I will not 'get by' without the harmful use. I choose non-harmful use and participation of animals in veterinary medical education because it is educationally sound to do so.

Western University of Health Sciences College of Veterinary Medicine (westernu-cvm) (www.westernu.edu/cvm)

Discovery requires looking. In the College of Veterinary Medicine at Western University of Health Sciences, we are looking for the best way to educate future veterinarians. This includes an education in the medical sciences, clinical skills (examinations, diagnostic procedures, surgery), professional skills (communication, finance, problem solving), veterinary issues, and moral development.

Years One and Two

Given our commitment to student-centered, lifelong learning, Problem-Based Learning (PBL) will serve as our primary educational methodology in the first two years of the curriculum. The design of the Veterinary Issues course and the Clinical Skills Curriculum follows this student-centered learning design as well. The goals of these first two years are to provide the student with a solid grounding in the basic sciences, an introductory level of competence in the clinical sciences and clinical skills, proficiency in professional and life skills, and an understanding of the profession as a whole.

Year Three

The third year of the curriculum begins the transition into applied veterinary medicine. Students will participate as apprentices in 11 different areas of veterinary medicine ranging from small animal clinical practice to population health and production practice to veterinary and environmental public health practice. The group dynamic will carry over into these experiences, with three students spending multiples of two-week blocks in these various arenas emphasizing primary care within a 60-mile radius of campus. For the clinical medicine rotations, students will spend half their time directly interacting with clients, patients, and the »

management of cases. For the remainder of the time, students will work within their group to satisfy learning objectives set by campus faculty, research current cases using evidence-based medicine principles, and develop their own required junior case report or research project presentations. For the non-clinical rotations, students will be based on campus and participate in appropriate field trip experiences, presentations, projects, and exercises. Given the interactive nature of these third year experiences, successful participation and progress is required in the first two years of the PBL, Vet Issues course, and Clinical Skills Curriculum. The goals of this third year are to prepare the student in primary care veterinary medicine, to introduce the student to the scope of veterinary professional responsibility, to fine-tune veterinary clinical skills, and to make the transition to the practice of veterinary medicine.

Year Four

The fourth year is designed to allow the students the freedom to make decisions based on their career goals and their freedom to travel. In conjunction with the curriculum committee, students will design their fourth year program with eight four-week rotations in a variety of arenas appropriate to their future aspirations. They may choose to complete this year in the immediate area, or they may choose rotations around the country in other veterinary teaching hospitals, private practices, or governmental organizations. They may also elect to travel internationally to rotations at other veterinary schools or governmental or non-governmental organizations. The goals of this fourth year are to prepare the student in secondary and tertiary care veterinary medicine, to allow career exploration and development, to allow further development in career areas of interest, and to increase professional responsibility and independence.

Each component of our curricular plan impacts the others, so it is difficult to isolate how we will teach each discipline or skill or concept precisely. I will give an overview of our approach to clinical skills education as an example of a piece of our curriculum.

Learning a clinical skill requires repetition and gradual development, much like learning to ride a bike or fly a plane. Our approach will be to develop a list of skills for the various species that will require predetermined levels of mastery for successful completion (the majority of these skills will be completed in the first two years of school.) First, we will evaluate a skill and 'break it down' into its basic component parts. (For example: IV catheter placement requires anatomy knowledge, animal restraint abilities, fine tactile perceptions, adeptness with catheter handling, etc.) We will provide learning tools (i.e. any device or experience facilitating learning of a skill) that will successfully address these basic parts of each skill. Then we will begin to assemble the parts of the simple skills, providing learning tools for these more complex experiences. We will progress to a compilation of simple skills into complex skills with still more learning tools for these experiences. All training begins in a safe environment (for all parties) and progresses to more 'dangerous,' stressful, 'real-life' environments with less and less support. Throughout this training experience, students do not move along until they are adept at the lower levels. This model allows an individual approach to training; those students with extensive pre-school experience 'check off' their lists rapidly and move on to more complex or specialized endeavors. Those students with little experience are provided the means and the time to train themselves to the required level.

The learning tools will range through inanimate and animate models, computer simulations, play-acting/real-time simulations, cadaver exercises, healthy animal volunteers (non-invasive procedures), and animals in need of care. Appropriate levels of mastery are verified to maintain the quality of the graduate.

Where we are going

WesternU-CVM as an educational institution will continue to learn and grow with each subsequent year of graduates. We are committed to evaluating our students and making curricular adjustments in all areas of professional development, not just the development of knowledge. Our ethical motivations are with honest intent, although implementation will be a daily challenge. No one at WesternU-CVM intends to shrink from that challenge but, rather, use it as an impetus for positive, progressive, innovative change. People supporting WesternU-CVM will see their contributions making distinct changes to the veterinary profession and its impact on the non-human animal world. Students attending and graduating from WesternU-CVM will be the vehicles of this inspiring change. ■

Lara Marie Rasmussen received her Doctor of Veterinary Medicine degree from UC Davis in 1993. Some years later, she received Diplomate status in the American College of Veterinary Surgeons. In 1999, she was recruited to develop and direct the surgery and clinical skills program at Western University of Health Sciences, College of Veterinary Medicine, the new veterinary school in Southern California.

CONSCIENTIOUS OBJECTION:

Students Making a Difference in Veterinary Education

At the beginning of my second week of vet school, I was asked to do something appalling: kill a healthy 2-month-old pig in order to learn a basic principle of renal physiology. My professor offered no alternate lab than the one where 40 pigs would be killed; he bluntly stated that educational material obtained from the lab would show up on our physiology midterm exam.

After class let out, I visited the Dean of Students in a state of shock. Was I so naïve to expect that any animals in my education would be treated humanely and would survive the experience? The Dean offered no solutions and told me that this was just the first of many 'terminal labs' in the freshman curriculum. In total, we first-year students were expected to kill over 100 animals: 80 pigs, six rabbits, and many rats. Indeed, I should be 'glad' that pigs had replaced dogs as the lab animal for our physiology course; all previous Illinois classes had killed dozens of dogs each year.

I began talking with other students about these labs and found that I wasn't alone in questioning the ethics of killing animals in order to train future veterinarians. In total, almost a quarter of us boycotted the physiology labs. We notified the professors well in advance in hopes that fewer animals were ordered for each lab. The professors silently accepted our rejection of the labs but offered no alternate way to learn the material presented in the afternoon sessions.

The subject of the terminal animal labs became more heated as the months went on; we debated this 'rite of passage' passionately in lecture halls and privately in the Dean's office, but to no avail: our professors continued to deny us alternatives. Many students felt pressured to participate in the labs, only because there was no other option. At this point, eight determined students from three class years collaborated in searching for alternatives that met the learning objectives of the six physiology laboratories. We felt strongly that the use of live animals in the labs was unnecessary and inhumane because alternatives are being used successfully at other veterinary schools.

Several months of research resulted in an impressive submission to the faculty: over 200 alternatives that would meet the learning objectives to the six terminal physiology laboratories, 28 journal articles proving the equal or superior efficacy of alternatives as compared to terminal labs, and letters in support from humane education organizations. Members of The Association of Veterinarians for Animal Rights (AVAR) wrote letters directly to the Illinois administration on our behalf.

Our controversy at The University of Illinois was eventually aired in the public forum, with a sensational front-page article in *The Chicago Tribune*. My classmate Carrie Gustavson stated, "It's ironic that here we are, we want to learn how to heal, and one of the first experiences of vet school here is killing."

A week after the *Tribune* article was published, the Illinois administration turned about-face. In a memo to the school, the Dean announced the suspension of the controversial animal experiments. The faculty quickly implemented an Animal Usage Policy, which, for the first time, officially allowed for student nonparticipation in laboratories "that conclude with the death or euthanasia of animals for obtaining the knowledge and skills acquired in the laboratory." Persistence and public compassion ruled that terminal laboratories are no longer a standard of modern veterinary education.

There is no evidence supporting continued animal usage in the physiology curriculum on anything more than anecdotal evidence ('this is how it's always been done'). Students no longer blindly follow protocol and accept the bad with the good in embracing this profession. Within the last decade, the majority of veterinary schools have begun to offer non-terminal methods of training students without forfeiting essential hands-on experience. AVAR has a tabulated comparison of alternatives offered by schools of veterinary medicine and veterinary technology at *www.avar.org*.

With the elimination of the terminal physiology labs, an additional aspect of the freshman veterinary curriculum has come under scrutiny recently: the source of cadavers for the anatomy laboratories. Most anatomy cadavers are acquired from Class B animal dealers, shelters, biological supply companies, and the greyhound racing industry. There are extensive ethical and educational arguments why these are »

unacceptable industries to support. As an alternative, Educational Memorial Programs (EMPs) are being instituted at several veterinary schools, including Texas A&M, Tufts, and the University of Wisconsin. Veterinary EMPs are modeled after human donation programs associated with medical schools; all donated animals have died from natural causes or were euthanized for medical reasons. Grieving pet owners are appeased, knowing their deceased companion animal is supporting the academic training and moral development of the veterinary students. Please visit *www.educationalmemorial.org* to learn more about instituting an EMP.

I encourage all students to voice concerns about the treatment of animals in your education. Do your research and present your arguments scientifically and professionally. Talk with your classmates, professors, administrators, and legislators. You will learn a lot about expressing yourself in a political world, you will hopefully avoid disillusionment in your pursuits, and you will definitely make a difference for the animals. ■

Linnaea Stull graduated with honors from the University of Illinois in May 2002. She is thriving in her internship at a progressive California veterinary hospital.

Veterinary Students Learn Lessons in Survival

Most people agree that students training to become veterinarians should learn proper surgical and anesthetic techniques by performing routine procedures on live patients. However, should students perform surgeries on healthy animals who will then be euthanized following the lesson?

Third year students at the University of Pennsylvania School of Veterinary Medicine (Penn) in Philadelphia, PA had the option of taking a surgical laboratory course that required the euthanasia of two dogs and one cat. Students would perform one 'survival' surgery on the animals and then follow up with a terminal surgery, in which the animals were euthanized while under general anesthesia. However, that has now changed.

Thanks to the efforts of Dr. Dorothy Brown, Assistant Professor of Surgery and a Diplomate of the American College of Veterinary Surgeons, who recently took over teaching the course, Penn students who take the Small Animal Surgery/Medicine/Anesthesia Laboratory no longer routinely euthanize their patients. Dr. Brown felt the course needed to be changed, and she began surveying both past students who had taken the course and those who had not, in order to find out how prepared they were for 'real world' surgery/anesthesia and the most common surgical procedures they performed. She soon realized that skills in orthopedic surgery were rarely required, compared to the need for soft tissue surgery skills. As the orthopedic procedures were those causing the need for euthanasia in the terminal labs (because of the increased discomfort and need for long-term analgesic therapy with supportive care/physical therapy), Dr. Brown decided to teach students using orthopedic models.

She states, "The procedures now performed on the live animal [are] only the more common and useful soft tissue procedures."..."These procedures should have no negative long-term effects on the well-being of the animal, so all procedures could become [non-terminal] with the option to adopt the animal. Improving the course for students and animals alike was my goal, and this is the route that allowed me to get there."

The 2002 spring semester was groundbreaking, since it was the first time the course did not include terminal surgery, and now students at the University of Pennsylvania's Small Animal Veterinary Hospital will no longer have to perform any terminal surgeries whether they are in an elective or core course. Dr. Brown states, "Prior to last year [two] dogs and [one] cat were used and euthanized by each group of [three] students who elected to take the course."..."On average this meant 40 dogs and 20 cats per year. As the course is likely to run this year, each student will recover [one] dog and [one] cat, and will spay [one] dog from the [Pennsylvania] SPCA."

Penn has joined other veterinary schools such as Tufts University School of Veterinary Medicine in making their curriculum more humane and focusing on students' needs. According to Dr. Brown, "My impression is that the students found the course to be a valuable learning experience."..."All of the dogs and cats used in the course were ultimately adopted."

The American Anti-Vivisection Society applauds Dr. Brown and the University of Pennsylvania in their progress to help animals and instill a sense of compassion and responsibility within their students.

For surveys of Veterinary Medical Schools and Veterinary Technician Schools and their use of animals, visit the Association of Veterinarians for Animal Rights at http://www.avar.org. ■

Science Fairs
No Fun for Animals

By Crystal Miller-Spiegel, AAVS Outreach Director

Most of us are familiar with science fairs—school-based competitions in which students conduct projects, display posters describing their work and their findings, and may end up being awarded prizes for their efforts. These fairs have dated back to the 1940s and have included some particularly cruel treatment of animals by adolescents and teenagers. In fact, in 1969, the rules of the Westinghouse Science Talent Search were changed to prohibit high school students from conducting projects that harm vertebrate animals, following an incident that involved the blinding of five sparrows and the subsequent death of three of them.

Rules and regulations regarding the use of animals in science fairs have become stricter in recent years, but they do not prohibit students from using animal experiments as the basis for their project. Since 1998, Intel® has sponsored what is considered the most prestigious science competition in the U.S., the Intel® Science Talent Search (formerly run by Westinghouse). This fair does not allow students to experiment directly on animals but will allow them to work in conjunction with research facilities that are conducting animal experiments. Students may not have physical contact with the animal(s), but they can utilize harvested specimens of tissue, blood, etc. The animal(s) cannot be killed specifically for the student's project, only for the purpose of the research institution. Nearly 2000 students enter this competition each year, which results in only 40 finalists competing for prizes such as a $100,000 scholarship.

Intel® also sponsors the International Science and Engineering Fair (ISEF), which is affiliated with 500 science fairs throughout the world, resulting in approximately 1200 finalists annually. Prizes include full scholarships to major universities and international travel awards.

Rules regarding the use of animals in ISEF projects set the standards for many science fairs, and they allow the use of animals in various experiments, except for protocols specifically designed to kill animals (e.g., lethal dose tests). The ISEF rules for animal experiments cover—in many cases in vague terms—areas such as alternatives, procurement, housing, care, experimental conditions, and euthanasia. Unfortunately, ISEF's definition of a replacement alternative is not one that replaces the use of living beings but one that utilizes an invertebrate or 'lower life form.' The ISEF Rules also read, "Research on animals involving anesthetics, drugs, thermal procedures, physical stress, organisms pathogenic for humans or other vertebrates, ionizing radiation, carcinogens, mutagens, tumors, or surgical procedures must be directly supervised by a Qualified Scientist or Designated Supervisor within a hospital, school, or clinical/research institution." Not only is the use of these procedures extremely troubling and unnecessary, but students are not required to undergo training before performing such serious and life-threatening procedures. Also, such vagueness of the rules could lead to serious consequences for the animals involved and the students who are responsible for their lives.

The statement of Science Service, the organization that oversees the Intel® fairs, reads, "We believe prohibition of animal based research projects at the Intel ISEF and affiliated fairs will eliminate these established guidelines governing animal use."..."If animal research projects at Intel ISEF are eliminated, unregulated and unsupervised animal research at the secondary and lower level will increase. Students will proceed with experimentation without rules or guidelines undoubtedly resulting in the proliferation of inhumane science projects and classroom activities." However, if ISEF rules set the standard, then it seems logical that no animal use would be conducted if ISEF did not warrant it.

This year's ISEF was held in Louisville, Kentucky and featured approximately 1,050 finalists. Projects that involved the use of non-human vertebrates totaled 49 (4.7%). Though many of the projects sought ultimately to help animals, such as providing environmental enrichment to river otters or studying and, hopefully, remedying stereotypical behavior of captive pandas in China, many resulted in the death of several animals. In one project sponsored by the National Institutes of Health, a student analyzed the locomotion of three cats from a local shelter, whose spinal cords had previously been [intentionally] injured when they were placed on a treadmill. Another student monitored 24 rats in an operant chamber after they had been injected with cocaine in order to understand the mechanisms of cocaine abuse. In a study to determine the effects of creatine (a supplement used by body builders) on muscle mass, a student used 16 six-week-old mice, who later had their gastroc-plantaris muscles removed and were euthanized. In order to study types of serotonin in the brain that affects feeding behaviors, a student used 12 rats who were injected with two types of serotonin. Two of the 12 died due to an overdose of anesthesia, and the remaining 10 were euthanized at the end of the study. Another student studied the effects of radiofrequency radiation (microwave radiation) on the ability to reach a submerged platform within an opaque water maze of 12 mice who were exposed to 2500 MHz and 12 mice who were not exposed to radiation. This student was awarded a cash prize of $3000 from the U.S. Air Force and an $8000 scholarship from the U.S. Navy/Marine Corps.

Instead of allowing students to develop their own projects and think 'outside the box,' science fairs continue to encourage the grooming of students to become clones of biomedical researchers who routinely use animals. For most projects involving biomedical research, students join ongoing projects and are essentially handed a research question to explore. Converting students to conduct old-fashioned methods of scientific inquiry that lack creativity, rather than encouraging them to find new ways of exploring scientific questions, is detrimental to students and the future of science. Luckily, the numbers of finalists at each year's ISEF who use vertebrates continues to decline, and more awards are being given to more humane and progressive projects. ■

By George K. Russell, Professor of Biology,
Adelphi University

BIOLOGY

Alternatives in the Teaching of Biology at the University Level : An Ongoing Success Story

By now it is as well known that a rat will sicken and die without certain minerals and vitamins as it is that he will die if given no food at all. Would anyone learn anything by poking out the eyes in order to prove that without them animals can't see?...Taught by such methods, biology not only fails to promote reverence for life, but encourages the tendency to blaspheme it. Instead of increasing empathy it destroys it. Instead of enlarging our sympathy it hardens the heart. [1] ***JOSEPH WOOD KRUTCH***

PERSONAL REFLECTIONS

As an undergraduate biology student in the late 1950s, I made acquaintance with an instrument long since relegated to science museums and scrap heaps, that singular device known as the smoked-drum kymograph. As students of physiology, we learned to pith frogs and make nerve-muscle preparations, to perform a wide variety of experimental procedures for the study of nerve impulse conduction, single and multiple muscle contractions, basic heart function, the effects of various poisons, and the like. At the time, I was less aware than later of the consequences this type of study had on me, but it surely did occur to me that gains in knowledge accruing from these studies were accompanied by a gradual loss of feeling. Frogs, for me, had been quite special creatures in my youth, and I had spent an inordinate amount of time seeking them out in their natural habitat, watching tadpoles metamorphose into adults, and pursuing as best I could an amateur's interest and love for the frog's natural history. Later, however, whatever initial misgivings I may have had regarding our laboratory studies gradually diminished, and the frog became a sort of object to be manipulated, a thing rather than a living organism.

When, several years later, I was asked as a beginning faculty member to oversee a laboratory exercise in which a rat was to be killed as a source of liver enzymes, I seriously questioned the necessity of this procedure and declined to carry out the protocol. I was able to locate a plant source of comparable enzymes that easily met the scientific requirements of the class exercise. Many of the students seemed much relieved by this simple substitution, and an unexpectedly long conversation with them revealed sensitivities and a sense of caring I had not appreciated. I thought long and hard about this experience with the result that some months later I prepared a brief article, "Vivisection and the True Aims of Education in Biology"[2] that was subsequently published in the *American Biology Teacher*. In this article, I put forward several arguments against killing animals in an undergraduate teaching situation. In the first instance, I questioned the necessity of killing a rat, as mentioned above. Quite obviously, it was possible to find an alternative enzyme source that obviated the need to destroy a living animal. It seemed to me altogether likely that many other humane alternatives could be found for the study of a wide assortment of biological processes, and I listed a few in the article. In addition, the laboratory manual I had been given used the phrase "sacrifice the rat," and I realized, with some astonishment, that I had been using the word "sacrifice" in this way for several years with little or no reflection on its deeper meanings. In the article, I commented on what I presumed to be subtle but nonetheless real effects on the emotional life of the students.

My own thoughts found confirmation in the work of other scientists and humane educators, and I was soon linked to a community of like-minded individuals dedicated to the search for responsible, pedagogically sound alternatives. More detailed aspects of this common effort lie well beyond the scope of this paper, but one further aspect is germane. In 1978, I completed work on a university-level

manual, *Laboratory Investigations in Human Physiology* [3] published by the Macmillan Company. In this book, I took all those procedures and experimental designs we had used as physiology students at the university and devised alternative methods employing the students themselves as test subjects. Muscle function, EKG studies and other measures of heart function, nerve and sensory processes, digestive functions, various principles of exercise physiology, respiratory physiology, circadian rhythms, and other basic aspects of physiology were treated, and suitable protocols were provided. The book remained in print for over 10 years, and many thousands of copies were sold in several English-speaking countries around the world. Letters from science faculty members and students who used the manual convinced me that it was entirely possible to teach 'hands-on' physiology, at least at an introductory college level, in a meaningful and ethically responsible manner.

ALTERNATIVES IN THE CLASSROOM AND TEACHING LABORATORY

As a long-standing university instructor, I strongly endorse the need to provide meaningful laboratory experiences for undergraduate students (and others), and several basic principles of pedagogy lie at the heart of this commitment. Students learn best from 'hands-on' experience and the opportunity to work directly with biological materials. 'Learning by doing' is a principle each of us knows from life experience. True inquiry-based laboratory study gives students an understanding of the scientific process and serves to enrich the more didactic material of the classroom or lecture hall. And increasingly, humane alternatives are being developed to teach fundamental concepts of biology in secondary schools and universities.

Basic principles of physiology, including cardiac and pulmonary function, muscle action and elements of exercise physiology, galvanic skin responses, and numerous other processes can be investigated using the students themselves as experimental subjects. At least one manufacturer of physiology apparatus for instructional purposes has established an on-line user site for the sharing of experience and the collection of useful ideas and innovations. Cell cultures, computer simulations and video/CD ROM materials, as well as numerous other alternatives can be adopted for a wide variety of classroom and laboratory exercises.

But 'hands-on' laboratory work and inquiry-based study do not imply the absolute need for invasive studies and vivisection. It is clear to me that students can have meaningful laboratory experiences with the wide range of humane alternatives that exist or can be developed by an imaginative teacher. To be sure, certain invasive procedures, such as the nerve action potential, cannot easily be replicated with hands-on alternatives, and in this instance a film or video presentation will necessarily serve as a valid alternative. As regards alternatives to dissection, these are comprised, for the most part, of films and computer simulations, models and other visual materials; and here the student may forego direct hands-on experience out of conviction.

When, several years later, I was asked as a beginning faculty member to oversee a laboratory exercise in which a rat was to be killed as a source of liver enzymes, I seriously questioned the necessity of this procedure and declined to carry out the protocol.

DISSECTION IN THE BIOLOGY CURRICULUM

Many American students are familiar with the traditional sequence of dissections ranging from the earthworm, grasshopper, crayfish, and perch to the fetal pig or cat. Largely unknown is the fact that this approach dates from educational reforms instituted by Darwin's contemporary, Thomas Henry Huxley, in the 19th century in Great Britain. Lost altogether is Huxley's insistence that such studies be prefaced by direct acquaintance with these life forms as living creatures; live specimens of representative phyla were to be included in classroom study, and students were directed, wherever possible, to seek out and observe living earthworms in the soil, crayfish in ditches and streams, and fishes in local waterways. With reference to animal dissection in the high school biology curriculum, I have written the following:

> In dissection, it is quite often the case that the animal, a frog for example, is studied as a model of something else, usually human anatomy or physiology. The frog is not being investigated for its own sake, but rather as a cheap and readily accessible subject for learning about how the human body is supposed to work. But most students, I believe, genuinely wish to study the animal for itself, to learn more about its life activities, to see the creature in its natural environment, and to learn its manner of growth, reproduction, food preferences, and so on. The frog dissection is fundamentally disappointing to them because they do not learn much about frogs or human beings, and what they do learn is not connected with the life of the animal. The earthworm, grasshopper, and crayfish dissections are somewhat different in that the aim here is to learn about these specific animals, but I have rarely heard of a biology class where the students investigated the living animals in conjunction with the classroom dissections. To put it briefly, very few student dissectors ever learn what a grasshopper is really like, and few will wish to undertake a closer study of these animals after they leave the classroom. [4]

It is difficult if not impossible to obtain reliable data on just how many animals are dissected each year in American schools and colleges, but F. Barbara Orlans has estimated that some six million vertebrate animals are dissected yearly in high schools alone, with additional unknown numbers used in colleges, middle, and elementary schools. Comparable numbers of invertebrates are probably used as well. Objections by students to animal dissection, especially at the secondary school level, have increased substantially in recent years, and arguments against this form of study have been enumerated.

ETHICAL CONSIDERATIONS IN THE BIOLOGY CURRICULUM

There is, I believe, a pressing need to evaluate the extent to which science curricula in the United States are committed to an examination of the ethical dimensions of their course content. Current developments in reproductive biology, gene transfer, animal cloning, and other related studies have probably led to the beginnings of such an awareness, but I also know from personal experience that most science teaching at my own university and other institutions focuses chiefly on the scientific aspects of the material at hand with little or no regard for ethical context. In my experience, ethical questions are sometimes relegated to a single course in the curriculum, possibly a class in bioethics, or, more likely, omitted *altogether*.

This article is adapted from a plenary lecture at the Third World Congress on Alternatives and Animal Use in the Life Sciences in Bologna, Italy in September 1999.

To take up such matters in courses on psychology or biology without full consideration of the ethical context is to teach, de facto, a lesson in ethics. The implicit message for the student, in brief, is that ethical concerns simply do not count or matter. If we never question with our students whether or not a given line of experimentation is suitable or justifiable, we should not be surprised by their inability to form ethical judgements about this issue or any other one, and we should not be surprised by their uncritical acceptance of every new scientific methodology that comes along. Taught by such methods, students cannot address the ethicist's fundamental concern regarding what science can do and whether science ought to do it. Taught in this way, students may well conclude that the procedures employed in their laboratory courses, no matter how these may injure or destroy animal life, are fully justifiable because the procedure is 'scientific' and they are 'just doing science.' But in order to address this problem it will not suffice, I think, to require students to take an ethics course somewhere in their curriculum. Such matters must be fully integrated into the fabric of their program of study at several levels, and questions of ethics must be considered regularly. Significantly, there is perhaps no better point of approach in this regard for the student and teacher than a consideration of animal use, and alternative procedures, within the biology curriculum itself. Every teacher in the life sciences will have ample opportunity to raise such matters with pupils, and the teacher will likely discover that these conversations can provide the framework for a new ethos regarding our relations to the animal world. May I hope that many teachers will avail themselves of this challenge?

TOWARD THE FUTURE

1 Increasingly, biology instructors must be made aware of the enormous variety of alternative procedures that exist, both to invasive animal study and animal dissection. This large corpus of alternatives constitutes an on-going success story but only a partial success. Alternatives will become more widely used when they are more generally known and understood. And there is a real need for the evaluation of the many existing alternatives, so that interested instructors can intelligently select procedures suited to their particular teaching requirements.

2 As suggested above, there is a fundamental need for the inclusion of ethical considerations within the context of science teaching at all levels of instruction. Biology cannot be taught in an ethical vacuum.

3 Finally, there is a genuine need to redirect some considerable portion of the biology curriculum, at all levels of schooling from primary to undergraduate, from the highly analytical approach that characterizes so much of contemporary instruction to a more experiential participation in the natural processes that surround and support us as human beings. As I have written elsewhere, "An overly analytical approach, especially one in which animals are harmed or killed, tends to alienate the student and sever the affinities that make real learning possible. Taught by these methods, students learn the mechanics of life, but they do not establish the kind of caring, participatory relationship with the natural world, which…is the point of it all. Biology is, after all, the study of life." [4] Perhaps in the future many of the invasive and harmful procedures used so widely today will be relegated, together with my old kymograph, to the scrap heap and the science museum. Then we will gratefully note that the phrase "humane education" has become a redundancy. ■

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George Russell is a Professor of Biology at Adelphi University in Garden City, New York. He is also the author of Laboratory Investigations in Human Physiology *(Macmillan, 1978) and founding Editor of* ORION *magazine.*

CONSCIENTIOUS OBJECTION:

Working to Overcome the Bureaucracy

As an animal lover with a belief in protecting the environment, biology seemed like a natural choice of study for me. In my early studies at the University of South Florida (USF), I was told I would have to participate in dissections. A vegetarian since 15 and a long-time animal-rights activist, I ran to my professor, panicked, begging for some alternative. But luckily, I didn't need to worry — he told me alternatives were just fine, and I used them and completed the class with an A. I had no idea that soon I would meet a significant amount of opposition due to my moral beliefs.

Upon entering my senior year, a course required was Animal Physiology, which required the killing as well as dissection of live animals. When I inquired about alternatives, one professor who taught the class slammed the door in my face and said he would not discuss them. The class's only other professor, whom I knew from previously studying under him, told me over the phone he would speak to me about it but wasn't sure "you could be a biologist without dissecting animals." In the meantime, I contacted AAVS and was armed with computer alternatives that completely mimicked everything we would do in class, along with information that many undergraduate, medical, and veterinary schools, including Ivy League Colleges, had computer alternatives—proving I could becoming a biologist without killing animals.

However, when I called the professor back to schedule a time to meet, he said he had decided he would not meet with me.

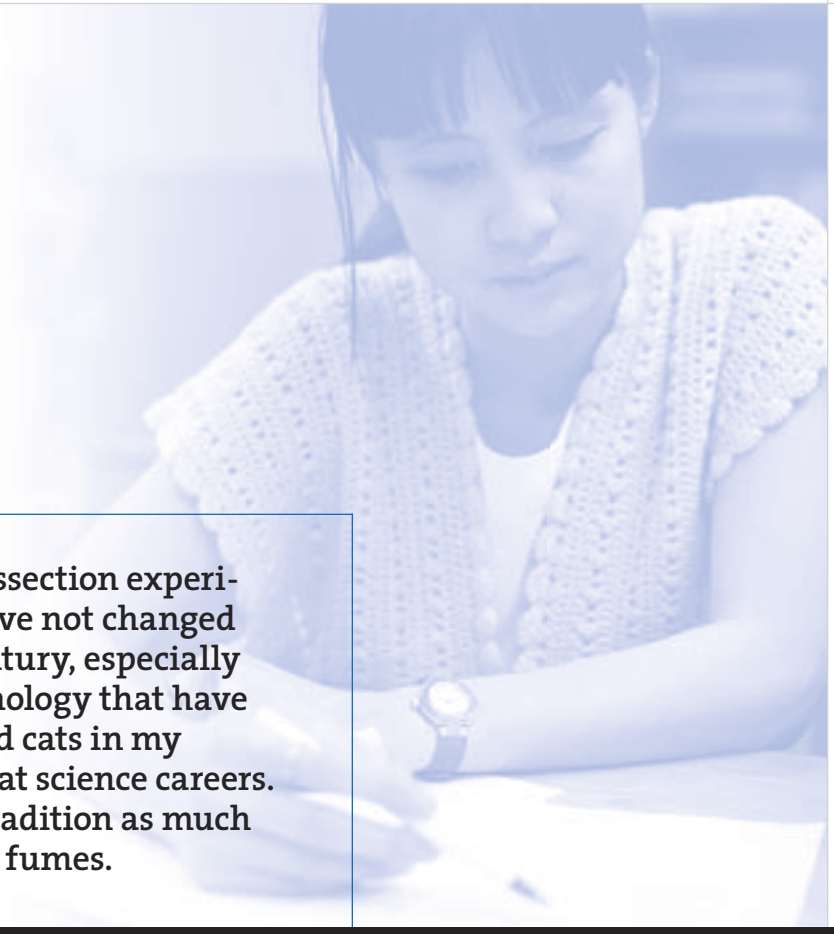
I later received USF's new policy on undergraduate dissection, which stated that it was up to the professor to decide whether the alternatives were feasible. However, my professor had made a decision without even taking the time to view the alternatives I had provided. The head of the Biology Department told me that I would have to pursue a microbiology course of study, effectively adding another year to my graduation date and making me pursue a field I was not interested in.

Between a rock and a hard place, I contacted a wonderful animal-rights attorney who represented me pro-bono. Shortly after my attorney issued a letter to the school, USF responded by saying that it had created a plant physiology class, which would serve as an option for me to graduate with a biology degree. I would not have to dissect or kill animals, but the victory was bittersweet. Not only does the University continue to look callously on an animal's life and the moral beliefs of a student, but students who want to study animals without hurting them are prevented from doing so.

My attorney reassured me that when my generation is in charge, we will be the ones to make change. In the meantime, a local animal rights group has extended its protests of USF's Animal Medical Labs to the undergraduate buildings. We also handed 1,000 student signatures to the Dean of USF asking for computer or model alternatives to dissection. As draining as this experience was, it opened my eyes to the difficulty that students face, and I hope to work at the governmental level to make changes, so that no student will have to feel threatened because of his or her moral belief that animals are sentient beings, as deserving of rights as we are.

Stacy De-Lin is a senior majoring in biology at the University of South Florida. She hopes to start her career in the animal protection field or environmental biology.

High School Dissection: revolution But Not Yet revolution



By Jonathan Balcombe, Ph.D.

When I reflect on my high school dissection experiences, I am surprised that things have not changed more in the intervening quarter century, especially given the marked advances in technology that have occurred. We dissected fetal pigs and cats in my advanced class for students aiming at science careers. Dissection then, as now, reeked of tradition as much as the halls reeked of formaldehyde fumes.

Nowhere is this progress more apparent than in the number and diversity of alternatives now available to students. The online NORINA database, launched in 1994, lists over 3,000 audiovisual materials for learning without harming.

As one who had grown up living with cats, catching snakes (then releasing them), and rescuing insects from swimming pools, I never felt comfortable with dissection. But like legions of high school students who love animals, I lacked the fortitude to question my teacher about it. After all, she was in charge, she obviously thought that cutting up dead animals was the best way for us to learn biology, and she would be divvying out the grades at the end of term. The first time I witnessed a student questioning a classroom exercise involving animals was in an undergraduate entomology course when someone protested our instruction to behead adult locusts with scissors. That student was I. (My protest led to the somewhat less disturbing option of anesthetizing the animal with ether before proceeding with the dissection).

Unquestionably, things have progressed since the late 1970s. At that time, computers were only beginning to appear in schools, there were no alternatives to dissections, and no organizations were known to offer support to students who thought it wrong to study animals by harming them. But as the animal rights movement gathered momentum, moral objections to dissection have gained legitimacy. Today, countless pro-animal organizations are campaigning for reforms in life science teaching. In support of those seeking knowledge without carnage, there are now books, scientific papers, brochures, laws and policies, humane alternative learning materials (hereafter 'alternatives'), databases for alternatives, and even alternatives loan programs.

The Alternatives

Nowhere is this progress more apparent than in the number and diversity of alternatives now available to students. The forthcoming 2nd edition of the InterNICHE (International Network for Humane Education) book *from Guinea Pig to Computer Mouse* (Jukes and Chiuia in press) details 500 products in over 20 disciplines where harmful animal use is being replaced by modern teaching tools »

and approaches. The Ethical Science Coalition's (ESEC) Resource Room contains more than 400 books, 200 videos, and dozens of models and computer programs available for use. The online NORINA database, launched in 1994, lists over 3,000 audiovisual materials for learning without harming.

Which of these alternatives are the best? No rigorous scientific survey has been done, so one is left guessing that usage patterns are the best indicator of quality. Hopefully, the best alternatives will tend to outsell their competitors, and more of them will find their way into classrooms. Administrators of the loan programs at the American Anti-Vivisection Society (AAVS) and The Humane Society of the United States (HSUS) report that the materials listed below receive the highest praise from borrowers.

Dissection provides unique experiences, to be sure, such as the feel and texture of tissues and organs—though even these are distorted and discolored by the preservation process. However, alternatives also present learning opportunities that dissections cannot, such as animations and simulated fly-throughs of body systems, the immediate linking of gross with fine anatomy (e.g., histology), built-in quizzes, contextual lessons (e.g., Digital Frog's ecology and diversity components), and intrinsic repeatability (a dead animal can be dissected only once).

Alternatives need not be high-tech computer-based tools to be effective. The Great American Bullfrog has been around for decades, and it remains a commercially successful learning resource. This hand-painted, oversize plastic model includes over 150 labeled structures (about 100 more than were covered in frog dissections at my school!). To those who would shun alternatives that require no disk drive, note that while computers have evolved remarkably since the Great American Bullfrog's appearance, bullfrog anatomy has not.

Easy access to alternatives is important if they are going to be used. Fortunately, there are many ways to investigate, obtain, and implement alternatives today. Loan programs include Animalearn's The Science Bank, The HSUS's Humane Education Loan Program (HELP), and those of ESEC and the National Anti-Vivisection Society (NAVS), who also operate the Dissection Hotline (1-800-922-FROG). Borrowers are about evenly divided between teachers and students. Beyond North America, the International Network for Humane Education

WHICH ALTERNATIVES ARE THE BEST?

The following materials receive the highest praise from borrowers:

DIGITAL FROG 2
CD-ROM, DIGITAL FROG INTERNATIONAL. INCLUDES SECTIONS ON FROG ECOLOGY AND DIVERSITY AND A COMPREHENSIVE STUDENT TEACHER WORKBOOK.

NEOTEK SERIES
(HUMAN, CAT, FROG, FETAL PIG, ETC.), CD-ROM WITH 3-D VIEWING GLASSES.

VERTEBRATE DISSECTION GUIDES
(DOGFISH, FROG, PIGEON, RAT), CD-ROM, PORTSMOUTH UNIVERSITY MEDIA DEVELOPMENT CENTRE (UK). COVERS PHYSIOLOGY, HISTOLOGY, AND ANATOMY.

DISSECTIONWORKS
(FROG, FETAL PIG, EARTHWORM, CRAYFISH, PERCH), CD-ROM.
FACILITATES A COMPARATIVE APPROACH RARELY TAKEN AT THE MIDDLE/HIGH SCHOOL LEVEL.

GREAT AMERICAN BULLFROG
PLASTIC MODEL, DENOYER-GEPPERT SCIENCE COMPANY.

BIOCAM CHARTS
(12 SPECIES, INCLUDING FETAL PIG, FROG, EARTHWORM), BIOCAM.

DRYLAB SERIES
(6 SPECIES), CD-ROM, DUNCAN SOFTWARE.

(InterNICHE) has an active alternatives loan program, and the recently established European Research Center for Alternatives (EURCA) is exploring new mechanisms for effective dissemination of alternatives information to instructors.

These programs are publicized in a variety of ways: advertisements in several National Science Teachers Association publications, in the National Association of Biology Teachers periodical *The American Biology Teacher*, as well as in conference programs of these two associations, where they are displayed for teachers to view and purchase. Further advertising is done on teacher websites and, soon, on student websites. Currently, use of these programs is modest, ranging from about 30 to 100 borrowers per year. However, each loan puts at least one and usually several previously unseen learning tools in a science classroom, which facilitates awareness of these materials.

But despite the progress described above, its pace still resembles evolution more than revolution. Ask a biology teacher whether a CD-ROM provides the same educational experience as does a dissection, and most will probably say it does not.

The Resistance

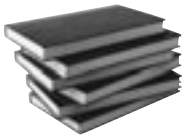
But despite the progress described above, its pace still resembles evolution more than revolution. Ask a biology teacher whether a CD-ROM provides the same educational experience as does a dissection, and most will probably say it does not. And they would be right. Ask them whether dissection provides a better educational experience than a good CD-ROM, and I suspect most would say that it does. And they would be wrong. As I have shown elsewhere (Balcombe 2000, 2001), there is ample evidence from published scientific studies that students acquire at least as much knowledge using alternatives as they do dissecting once-living creatures.

But can you fault biology teachers for clinging to a belief that dissection is superior? Their own professional association, the National Association of Biology Teachers (NABT), states "…no alternative can substitute for the actual experience of dissection or other use of animals," and "urges teachers to be aware of the limitations of alternatives." Clearly, these statements are meant to imply that dissection is a better learning method, and as such, they violate scientific evidence to the contrary. One must therefore conclude that the NABT's stance on dissection and alternatives is political, not scientific. One likely factor is that the sale of preserved specimens continues to be a profitable enterprise for the companies that supply schools with educational materials for biology and that these companies pay handsome fees for their large exhibits at NABT conventions. Another factor may be a tacit unwillingness to concede any scientific point to a movement whose broader goals threaten the status quo: what we eat, what we wear, and how we advance medicine, for example.

Looking Ahead

I believe that current such resistance to alternatives will be overcome with continued exposure to alternatives. The training of all future biology teachers should include a module on dissection alternatives. In the meantime, while the evolution of biology education away from the barbaric practice of killing, cutting, and discarding animals is a slow one, all indications are that change is moving in the right direction. The breadth and sophistication of alternatives availability grows steadily. More states and school boards are adopting laws requiring humane alternatives to be made available. (Most recently, in April 2002, the nation's sixth largest school board—Clark County, Nevada—ratified such a policy in response to the efforts of one conscientiously-objecting student, a decision affecting 244,000 students.) More students are growing up with an awareness of animal issues, and requesting alternatives when faced with dissections. And more teachers are recognizing the advantages offered by alternatives.

A basic ethical principle asserts that if we have a choice between two effective ways of achieving something—one that causes pain, suffering, and death and the other that does not—then ethical conduct dictates using the latter method. Dissection and alternatives present just such a choice. As more and more students object conscientiously, as more states and school boards pass laws requiring schools to make alternatives available to students who request them, as more teachers adopt alternatives, and as newer and better alternatives are developed, the future looks brighter for humane biology teaching, and dimmer for the business of killing to teach. ■



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Jonathan Balcombe received his Ph.D. in ethology from the University of Tennessee. He worked eight years for The Humane Society of the United States, and is currently a research coordinator with Immersion Medical, a medical simulation company. He is the author of The Use of Animals in Higher Education: Problems, Alternatives, and Recommendations (2000).

Powerful Policies: Legally Making a Difference for Animals in Education

Today, student choice laws exist for students below the university level in California, Florida, Illinois, New York, Pennsylvania, and Rhode Island, while other states with informal policies include Louisiana, Maine, and Maryland. Legislation is pending in Delaware, Massachusetts, New Jersey, and Vermont. These laws typically require the school to notify students and/or their parents at the beginning of the course when animal dissection is part of that class. They allow a student to choose humane alternatives, and the laws require that students who choose to opt out of dissecting not be penalized for doing so.

While countries such as Argentina, Norway, and Switzerland have banned dissection for secondary students, students in the U.S. have had to constantly fight their teachers and/or school boards or use the legal system in order to be given an alternative to dissection. And what they are doing is making a difference for animals used in education!

Jenifer Graham was the first high school student to use the legal system to fight dissection. Her case led to the creation of the first students' choice law in the U.S., which was passed in 1988 in California. Recently, Nevada student Laurie Wolff requested that the Clark County school board use alternatives to animal dissection. After reviewing several alternatives, the board drafted a students' choice amendment for the students of Clark County. So while students may have to face legal battles, individuals can and do make a difference!

What students need to know is that they have the right to have their beliefs respected, regardless of whether or not a state law has been passed. According to the First Amendment of the Constitution, which guarantees people freedom of religion, students have the right not to harm an animal for an educational lesson if it compromises their ethical or religious beliefs.

If a student is required to dissect, and he or she ethically refuses to do so, there are many things that the student can do make his or her opinion heard. First, talk to other students and see if they feel the same way you do. Also, explain your feelings to your parents; it helps to have as much support as possible if you plan to confront the teacher and/or school board. Your next step is to educate the school board and science teachers about the validity of alternatives. Animalearn can help by sending information about The Science Bank, our alternatives to dissection loan program, and other dissection-related materials that will help your teachers and the board understand why other schools and states have recognized the necessity of instituting students' choice policies. ■

For more information on ordering alternatives for your class or advice on implementing a students' choice policy at your school, please call us at (800)729-2287 or e-mail info@animalearn.org.

NON-DISSECTION BASED BIOLOGY: Hunterdon Central Regional High School

INTRODUCTION

Hunterdon Central Regional High School (HCRHS), located in New Jersey, is home to approximately 2500 students. HCRHS currently operates under a block scheduling system: four blocks per day.

Sophomores are required to enroll in a semester biology course. In the past, all biology courses involved the dissection of a fetal pig to accompany the Human Systems Unit. Students selected either Honors Biology, College Prep (CP) Biology, or Lab Biology. As of the 2001-2002 school year, students can also select from Honors Biology Non-Dissection, CP Biology Non-Dissection, and Lab Biology Non-Dissection.

BACKGROUND

My name is Bonnie Berenger. I have been a science teacher at Hunterdon Central High School for over five years. Throughout the years, I had noticed an increase in the number of students who opposed the fetal pig dissection. After I discussed this situation with my supervisor, he decided to collect some data to determine if there was a need to incorporate a non-dissection curriculum.

During the 2000-01 school year, freshmen at Hunterdon Central High School were surveyed to ascertain whether or not they would enroll in a non-dissection biology class if given the chance. The results of the survey supported the establishment of a non-dissection-based biology course.

With the help of Animalearn, several dissection simulation CDs were sampled by a group of teachers. The "DryLab Plus Fetal Pig" CD best met the requirements of the HCRHS curriculum. This program was consequently implemented into the non-dissection curriculum.

The photographs in the program were snapshots taken after an actual dissection. Students moved the cursor over the photographs and identified the various structures of the fetal pig. The program also allowed students an option to perform an actual dissection.

IMPLEMENTATION

During the 2001-2002 school year, 31 biology classes were scheduled. Of these, four were non-dissection classes: one Honors Biology, two CP Biology, and one Lab Biology class.

The Human Systems unit is approximately two weeks long. In addition to lectures, videos, work with human plastic models, and labs, students interacted with the fetal pig dissection simulation program. They were each given a packet of questions to answer and diagrams to complete. They used the simulation, their notes, help of group members, and various textbooks to assist them. They also took a computer quiz on the various diagrams. At the end of the unit, students were given individual tests.

CONCLUSIONS

Before beginning the Human Systems unit, all students were given a Pre-Test. The same test was administered by the Science Supervisor at the end of the unit. The same procedure was applied to dissection-based biology classes. The purpose was to assess whether students' comprehension of the material was commensurate in both courses. Not surprisingly, average scores were virtually identical.

NEXT STEPS

As long as there is student support, non-dissection biology classes will continue at Hunterdon Central. The number of students who request the class determines how many classes will be offered. They are given the choice of taking either a dissection based or non-dissection based biology course.

Studies will continue to track student assessment. These results will be published in various science education publications.

PERSONAL REFLECTION

I am very fortunate to work with an encouraging supervisor who supports my opposition to animal dissection. As teachers, our job is not only to teach the school's curriculum but also to foster and practice an appreciation for all kingdoms of life. ■

STUDENT FEEDBACK

"I am glad that this school offers a non-dissection class, and I feel that it is taught very well."

"This semester I enjoyed Biology for many reasons. Some of my favorite things were the group projects and notes and the non-dissection!"

"I especially liked this class because it's a non-dissection class, and I honestly think I learned just as much, if not more, from the computer program."

"Biology ND [Non-Dissection] is a great class because of the variation of learning tools. I liked not having to...dissect a pig."

"I appreciate the fact that there is even the option of taking a non-dissection class, and the alternative to teaching the anatomy unit was much easier to learn than the real thing could have ever been."

"I would not have been able to handle the dissection of a pig, so this class was perfect. I hope we get a ND [Non-Dissection] Anatomy next."

"What I liked about this course was the computer activity. I liked it because it was not only fun, but it seemed to help me understand the human and pig body. With you explaining it and the program, I felt I knew it like the back of my hand."

MediaWatch

The spring and summer of 2002 have been busy for animal advocacy organizations and biomedical research giants. In February, at the request of several pro-animal research groups, the United States Department of Agriculture (USDA) removed detailed documents concerning the use of animals in research from its website. These particular documents included facility annual reports and USDA inspection reports that contain information regarding specific assays, species and number of non-human animals used, pain and distress, and any Animal Welfare Act (AWA) violations.

While USDA was removing explicit reports from its website, the agency was simultaneously criticizing Johns Hopkins University and the University of California at San Francisco for egregious deficiencies in the care of animals at those institutions. These facilities are "the cream of the crop" in the U.S., yet in 1999 and 2000, USDA audits revealed that animal use reports were incomplete or faulty. Biomedical research groups, such as the National Association of Biomedical Research (NABR), continue their attempts to pressure federal regulatory agencies to conceal the nature of research and animal use from the public.

The following are excerpts from articles that covered the many areas in which AAVS endeavors to protect non-human animals. In addition, the Alternatives Research & Development Foundation's Executive Director John McArdle and AAVS Outreach Director Crystal Miller-Spiegel have continued to educate the public through interviews and Op-Ed's (editorials) in internationally circulated publications about important issues involving animals.

Animal Groups Ask USDA to Restore Annual Reports

Animal protection groups have asked the U.S. Department of Agriculture to resume posting Animal Welfare Act inspection reports and annual reports on the USDA Animal and Plant Health Inspection Service Web site. USDA discontinued the practice Feb. 28 at the urging of biomedical research groups who claimed the reports contain sensitive information that could help animal activists target researchers....

"These reports flag problematic issues that need to be addressed immediately, either across or within institutions. These reports are also vital for public accountability," The Humane Society of the United States told USDA Secretary Ann Veneman in a May 24 letter co-signed by the American Anti-Vivisection Society and eight other animal welfare groups.

The groups asked USDA to start posting the reports again as soon as possible. "The availability of these reports is important to our day-to-day work on behalf of animals used in biomedical research," they said. Together, the organizations have over 8 million members. ■

Medical Research Law & Policy Report
July 17, 2002

Cream of the Crop Institutions?

Animal-rights advocates say the problems at [Johns] Hopkins [University] and [the University of] California [at San Francisco] demand that the government look hard at other universities. "They're supposed to be the cream of the crop," says John E. McArdle, Director of the Alternatives Research & Development Foundation, which promotes reducing the use of animals in laboratory studies. "If they're having problems, what's going on at the other institutions?" ■

Chronicle of Higher Education
June 28, 2002

Assenting Opinion

The American Anti-Vivisection Society could not agree more with Christopher Heyde's Op-Ed regarding the ongoing and overlooked abuses of animals in what many consider prestigious research institutions. It is unthinkable that Congress would allow the passage of an amendment excluding the most widely used species from legal protection, despite current

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investigations into documented abuses of these same species at schools such as the University of North Carolina-Chapel Hill and Johns Hopkins University. If these animals were covered by a legal authority such as the U.S. Department of Agriculture (USDA), the repercussions of such abuse would be far greater than simply providing a response to their funding source, the National Institutes of Health. The USDA can impose fines and confiscate animals, and it provides the only opportunity for inspections of facilities by an outside, unaffiliated authority.

The National Association for Biomedical Research and similar interest groups are far more threatened by animal advocates who conduct their work through legal means (as we have been doing since 1883) than by individuals who threaten violence and who are in no way affiliated with national animal advocacy organizations. Painting all animal advocates as potential 'terrorists' may increase donations and create a panic within the biomedical research community, but is does not eliminate the need for public accountability. ■

Crystal Miller-Spiegel,
AAVS Outreach Director
Submitted to *Washington Times*
August 2, 2002

AAVS Outreach Director, Candidly Speaking

In response to "Debate Over Whether to Defend Animal Tests" by Sheryl Gay Stolberg (7/23/02), the vast majority of animal advocacy organizations conduct their business through entirely legal means in local communities and/or on the state and federal level. Unfortunately, biomedical lobbyists and interest groups are taking advantage of a society already on edge, and attempting to paint with one broad stroke anyone who works to advance the welfare of non-human animals used in laboratories as 'terrorists' (or potential terrorists). Frightening researchers to hide behind locked doors and maintaining secrets about research protocols is not the answer; and in fact, it will likely backfire, resulting in diminishing public trust in scientific research. Billions of taxpayer and consumer dollars fund animal research each year, and citizens deserve to know how their money is being spent. Esteemed organizations that continually work within the law and have working relationships with government agencies should also not be shut out.

A report from Americans for Medical Progress regarding a recent conference illustrates exactly why biomedical interest and lobbying groups want to hide research protocols and laboratory inspection reports: "…the overwhelming message was much more insidiously threatening: the animal rights movement's leadership is maturing and their organizations are focusing an increasing amount of their resources and energies not on protests and violent actions but on tools of policy development, litigation, legislation, and education…."

Simply because legal means and an evolving social ethic regarding the treatment of animals are threatening to biomedical groups does not mean that advocates for animals are threatening to the public, scientists, or institutions. ■

Crystal Miller-Spiegel,
AAVS Outreach Director
Submitted to the *New York Times*
July 23, 2002

AAVS Outreach Director Outspoken About Primate Research

...but those who oppose animal experimentation say researchers, in focusing on accumulating enough rhesus macaques for their work, are ignoring the possibility of moving away entirely from such research.

Interview with Crystal Miller-Spiegel, AAVS Outreach Director
Wall Street Journal
May 14, 2002

ALTERNATIVES TO LAB ANIMALS — A DIFFERENT PERSPECTIVE

Chris Mondics' recent articles on a single extreme animal rights campaign and the utility of modern alternatives may adequately serve the fundraising and propaganda needs of organizations such as the National Association for Biomedical Research (NABR), but it does a disservice to the thousands of animal advocates and organizations working within the system to replace the use of laboratory animals with more suitable alternatives.

NABR spokesperson Frankie Trull's lukewarm support for alternatives is disingenuous at best. Her organization and its allies are responsible for eliminating the only legal requirement to consider alternatives for 95 percent of the animals used in biomedical research, testing, and education. NABR has also systematically refused to support every major attempt to improve the lives of laboratory animals and has withdrawn from the bipartisan coalition seeking increased funding for critical federal oversight of animal research facilities.

Playing the terrorist card and demonizing animal advocacy groups may increase donations and create a panic within the biomedical research community, but is does not eliminate the need for public accountability nor diminish the extraordinary record of non-animal alternatives. Such ignominious activities not only prove to be a great disservice to the cause of good science but also raise serious questions about what NABR and others have to hide.

Next month, scientists, regulatory officials, and animal advocates from around the world will convene in New Orleans for the 4th World Congress on Alternatives where they will participate in four days of cutting-edge presentations in all fields of biomedical research. Alternatives represent the future of good science. If not, why are the largest breeders of laboratory animals and organizations, including Huntingdon Life Sciences (HLS), becoming so invested in the development and use of non-animal methods?

Animal-based testing companies such as HLS are scientific dinosaurs who, like their saurian brethren, will become extinct in the near future—not due to threats but because their animal testing services are no longer needed. The day will come when the use of animals is the rare alternative and non-animal methods the norm.

At a time when corporate accountability is under scrutiny and the value of reasonable government regulation is undisputed, the *Inquirer* should think twice about inflaming divisions between the competing interests associated with the use of laboratory animals which have cast this issue as a political hot potato. Rather, the real story is the thousands of scientists worldwide in companies such as Proctor & Gamble, Colgate-Palmolive, and Gillette cooperating with animal welfare advocates and ensuring progress in safety testing, while systematically eliminating animal suffering. ■

John McArdle, Ph.D., AAVS Science Advisor
Submitted to *The Philadelphia Inquirer*
July 16, 2002

Don't want to kill animals in your classrooms?
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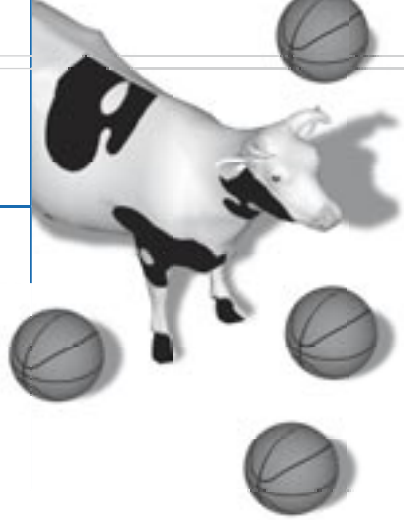


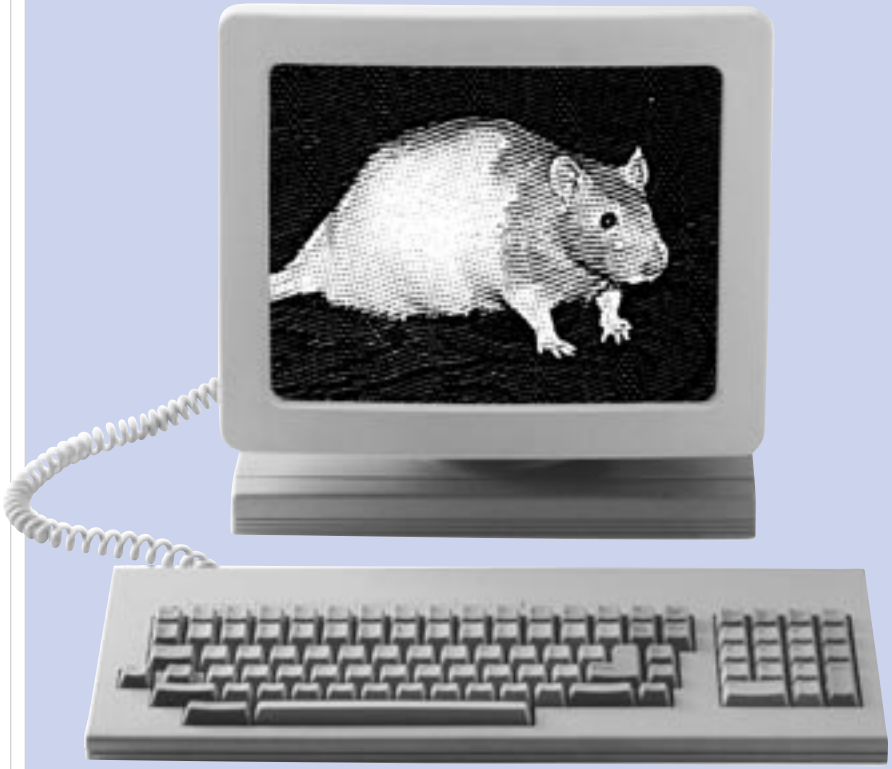
NCAA Scores One for Cows

It is estimated that it takes an entire cow to make just four basketballs.

In May, the National Collegiate Athletic Association (NCAA) announced that it will no longer use real leather basketballs for tournament games, including the Final Four Championships. Instead, it will use balls made of composite leather, a synthetic leather-like material. NCAA officials say that the fake leather basketballs look the same, play the same (or better), are less expensive, and last longer.

The composite balls are being used by a large number of college teams. The NCAA estimates that 82 percent of Division I men's and women's basketball programs are already using composite balls. Additionally, 58 of the 64 teams in the first round of the NCAA Championships, including National Champion Maryland, as well as Duke and Connecticut, played with the synthetic basketballs during the regular season. Maryland coach Gary Williams gives the synthetic balls high praise: "They've come so far with that composite ball. It just seems to have a better feel than the leather. There's not a lot of things that are done for the players, but if the players had their choice, they would pick the composite ball. At least our players would."

Obviously, animal advocates are elated with the NCAA announcement. Its decision is especially appreciated since it is estimated that it takes an entire cow to make just four basketballs. However, although they have enjoyed popularity in the NCAA, composite balls have not yet been adopted by the National Basketball Association (NBA), despite appeals from animal advocates. ■



VIRTUAL RAT REALITY

A team of biologists, mathematicians, and physicists at the Department of Energy's Pacific Northwest National Laboratory (PNNL) in Seattle joined together to develop a virtual model of the rat respiratory system. The three-dimensional model was created using data collected from lung casts and nuclear magnetic resonance spectrometry conducted on deceased rats.

Using the virtual model, scientists will be able to study the effects of low doses of drugs and/or pollution on healthy lungs and as they move through the respiratory tract. The creators will also work to alter the model to mimic the dynamics of diseased lungs, giving insight to how diseases such as emphysema and asthma manifest.

Scientists hope to couple the virtual rat with PNNL's cellular study projects to give a complete model, enabling researchers to view the impact of various substances and chemicals on the respiratory system as a whole and on individual cells. Creators also say that the technology used to create the virtual rat will be applied to the development of a virtual human lung. ■

Purdue Study Exposes GMO Ecological Risks

Researchers at Purdue University have published findings from their study on the repercussions of introducing genetically modified organisms (GMOs) into wild populations in the scientific journal *Transgene Research*. William Muir, Professor of Animal Sciences, and Richard Howard, Professor of Biology, examined the risks of introducing GMOs using computer modeling and statistical analyses and found that this practice poses a greater risk of extinction of natural species than originally believed. The research was funded by the U.S. Department of Agriculture's Biotechnology Risk Assessment Program.

Muir and Howard identified three scenarios in which the introduction of GMOs could result in the extinction of a natural population: 1) the release of larger animals, which would have a higher success in mating but also a shorter life expectancy, could drive a wild population extinct in 40 generations; 2) introduction of animals who have been genetically modified to increase the size of the male, helping the male to mate more often and live longer but also making him less fertile, could lead to a wild population becoming extinct in just 20 generations; and 3) while an introduced gene could spread through a particular popula-

tion, it may not reduce the population's size.

Study findings showed that the most significant risks occur when an introduced gene increases the viability of the adult through, for example, an improved immune response or resistance to a particular disease or pathogen. "It's somewhat counterintuitive that increasing the health of the adult could hurt the overall population, but that is what we found if they had reduced fertility," said Howard. The scientists admit that the aforementioned risk factors manifest due to the unpredictability of genetic tinkering involved in genetically modifying animals or plants. Howard explains that "most genetic modification involves one gene with a major effect," which is difficult to prepare for and predict.

Because of the unpredictability of GMOs, it is necessary to conduct an accurate assessment of the possible risk factors that could affect natural populations. To do this, scientists need to construct a facility that replicates the natural environment. Muir says that some companies are considering such a project. "It's going to cost millions of dollars to build elaborate testing facilities that are as close to a natural setting as possible," he said. "But nobody said this is going to be easy. What's at stake is important enough to spend that kind of money." ■

SECONDHAND SMOKE LINKED TO FELINE LYMPHOMA

Dr. Anthony Moore and the researchers at Tufts University and the University of Massachusetts have recently disclosed the results of their study in the *American Journal of Epidemiology* that links secondhand smoke exposure to feline lymphoma. Researchers found that cats who live in households with smokers have a significantly higher risk of developing cancer.

The study consisted of 180 cats who were treated at Tufts Veterinary Hospital between 1993 and 2000. Researchers found that cats exposed to secondhand smoke had more than twice the risk of developing lymphoma than felines living in smoke-free homes. They also found that cats who lived in smoking households for five years had three times the chance of developing lymphoma, and that risk increased fourfold for those living with two smokers.

Dr. Bernadine Cruz, a veterinarian in Laguna Hills, California, concurs with the study's results: "We do know that the environmental stresses put on our bodies, that often cats and dogs will endure similar stresses, and they're almost magnified because their lifespans are so condensed."

Dr. Moore and his research team hope that these findings will inspire others to investigate the connection between smoking and lymphoma in humans. Many believe that there is a link, and some studies have indeed suggested that this is true of children who live with smokers. ■

VIRTUALITY FINDS LIFE IN THE CAVE

Scientists at the University of Calgary have announced the opening of their new facility, which gives researchers the opportunity to get inside three-dimensional virtual models of cells, tissue, and even whole organisms. The CAVE, as it is called, is a two and a half meter cubic room where scientists use Java (a common computer programming language) 3-D technology to project realistic images on the walls, floor, and ceiling. The images are then viewed through special glasses and manipulated by pulling a hand-held trigger that allows researchers to zoom in and out on the images and/or rotate them on the walls of the darkened room.

The $6 million facility, which was designed by Fakespace Systems Inc. of Ontario, offers a viable alternative to using animals in education, training, and research. Developers of this technology say that it could also be utilized in research investigating complex genetic disorders such as diabetes, Alzheimer's disease, and cancer. Additionally, researchers using the system can see something as small as DNA fragments, study how diseases manifest, and even inject computerized chemicals and/or drugs into virtual cells to observe the reaction of such an introduction.

Christoph Sensen, professor of biochemistry and molecular biology, who leads the CAVE project, says that this technology gives scientists an 'up-close and personal' look at biological functions and diseases: "It's like being inside a television and playing with the little people." Professor Sensen says that the CAVE is also a valuable teaching tool in medical schools, negating the 'need' for using animals.

Researchers also believe that the CAVE can be utilized to perform experiments without using any traditional laboratory equipment, including animals. And, because scientists can inject computer-generated drugs into a diseased virtual cell, the CAVE could be used to determine if a drug will be effective. "It's basically a model we can use in advance of testing on animals or humans," said Sensen. "This will speed up the product development, and it will also make many experiments unnecessary."

As promising as the CAVE technology is, it is not new. However, its massive memory capabilities make the CAVE the most advanced technology of its kind. With the enormous amount of information scientists are extruding from human genome projects and other research studies, this system will be valuable in quickly organizing this data as a widely usable educational and research tool. ■

ARDF UPDATE

One of the primary approaches the Alternatives Research & Development Foundation (ARDF) utilizes to promote the development and adoption of alternative methods is to provide direct support through our Alternatives Research Grant Program to the individuals creating these new techniques. This year the ARDF selected six projects for funding, covering the fields of basic research and education. These proposals once again indicate that the only real limitation on the use of non-animal alternatives is the imagination of the investigators and educators. ARDF is pleased to announce the following recipients of the 2002 Alternatives Research Grant Program:

DR. JAMES H-C WANG / Department of Orthopedic Surgery at the University of Pittsburgh; Pittsburgh, Pennsylvania

PROJECT: A NOVEL ALTERNATIVE APPROACH TO STUDY BIOLOGICAL MECHANISMS FOR TENDINITIS

Dr. Wang has developed a novel six-well *in vitro* model system that allows direct cyclic mechanical stretching of human tendon cells that can be used to study the cellular and mechanical mechanisms associated with tendinitis without using animals or their cells and tissues.

Tendinitis is a common problem both in occupational and athletic settings. The Bureau of Labor Statistics indicates that it accounts for 48 percent of reported occupational illnesses. Tendinitis represents 30 to 50 percent of all sports injuries. The etiology of tendinitis, however, is unknown, but it is believed to result from repetitive mechanical loading on tendons, resulting in inflammation, pain, and, ultimately, tendon degradation. Many studies have been conducted to address the biological mechanisms of tendinitis, often using animals such as horses and rabbits. This has involved injection of bacterial collagenase or cell activation factors into achilles and patellar tendons. Rats have been used to induce tendon degeneration by subjecting them to repetitive mechanical loading *in vivo*. All of these studies use large numbers of animals who undergo painful and distressful experimental procedures.

Dr. Wang and his associates have developed a unique approach to studying the biological mechanisms of tendinitis that utilizes no animals, no animal-derived cells, and no animal serum in the cultures. His device will be used to determine the effect of cyclic mechanical stretching and stretch-induced prostoglandin, a known inflammatory mediator in tendons, on the DNA and collagen synthesis of human tendon fibroblasts. When completed, the proposed studies will shed new light on the origin of tendintis and develop new strategies to prevent and treat it more effectively. Furthermore, the knowledge gained from this approach should increase the awareness of the biomedical research community towards using *in vitro* models instead of animals or animal tissues and cells to investigate biomedical problems such as inflammatory connective tissue disorder.

DR. CHARLES S. REDDY / College of Veterinary Medicine at the University of Missouri; Columbia, Missouri

PROJECT: THE USE OF HUMAN EMBRYONIC PALATED MESENCHYMAL CELL LINE IN CLEFT PALATE RESEARCH

Cleft palate (CP), the etiology of which has a significant environmental component, and whose incidence is increasing, is a relatively common malformation in human beings. Although animal studies have identified a large number of chemical agents capable of inducing CP, their relevance to human CP is questionable. Substances such as mycotoxins (SAD), dioxin (TCDD), and the stress hormone glucocorticoid represent groups of such compounds that induce CP by reducing palated shelf size secondary to a reduction in palatal mesenchymal (PM) cell numbers resulting from the inhibition of DNA synthesis, cell cycle, and certain cell-cycle genes. The proposed experiments will establish the suitability of human embryonic PM (HEPM) cells to replace the use of animals, their tissues, and cells in CP research.

The hypothesis that such CP-inducing agents disrupt proliferation and cell cycle by a dysregualtion (up or down) of cell cycle regulatory genes in HEPM cells will be tested. Concentration of the toxicants inhibiting DNA synthesis by 50 percent in HEPM cells will be determined using flow-cytometry and microarray technology to identify the stages of the cell cycle affected and the cell cycle genes where expression is altered. These results should serve as the basis for subsequent studies in which the functional significance of the affected genes will be tested in HEPM cells using gene overexpression or gene disruption. Successful testing of this hypothesis will establish the suitability of HEPM cells for use in future identification of CP-inducing agents in exploring mechanisms of action of such agents and in the development of interventions (such as gene therapy) for the prevention of CP and other birth defects from multiple environmental etiologies. This will drastically reduce the use of animals, their tissues, and cells while increasing the human relevance of CP research.

DR. EMAD T. ABOUD / College of Medicine at the University of Arkansas for Medical Sciences; Little Rock, Arkansas

PROJECT: AN ALTERNATIVE TO ANIMALS FOR SURGICAL TRAINING: A CADAVERIC-BASED LIFELIKE MODEL

This project further refines and improves Dr. Aboud's existing method to provide

effective surgical training that reliably mimics the characteristics of the human vascular tree. Many methods are currently available to train surgeons in specific procedures, including the use of cadavers and mannequins, but none of these simulate the living human in terms of the ability to bleed for practice of vascular suturing, repair, and anastomosis.

Dr. Aboud has developed a new approach using human cadavers with their vessels connected to colored liquid reservoirs and use of a pump to provide pulsating pressure. This method provides conditions that simulate live surgery experiences. The current grant will be used to identify liquids that better mimic the viscosity and appearance of blood to accurately represent and facilitate coagulation and homeostasis, and decrease oozing from sectional tissues; test chemicals that can reduce the stiffness of embalmed cadaveric tissues and apply the treatment to the whole cadaver to widen its range of applications in surgical training; develop a new design for the pulsating pump; and expand the use of the model as well as the distribution of educational information about this method through neurovascular training courses, videotaping procedures using this concept, and distributing them to other schools.

DR. CHARLES W. HEWITT / Robert Wood Johnson Medical School, University of Medicine & Dentistry of New Jersey; Camden, New Jersey

PROJECT: *IN VITRO* BURN INJURY MODEL USING BIOENGINEERED HUMAN LIVING SKIN EQUIVALENTS

Dr. Hewitt and his colleagues received a continuation grant for their ongoing studies on this topic, which was originally initiated in response to concerns regarding the use of animals in burn research—one of the areas of investigation routinely cited in defense of the 'necessity' of using intact laboratory animals. These researchers have developed a series of experiments involving a three-dimensional 'human' tissue culture model. In particular, bioengineered skin constructs were successfully used in a burn model to further studies on complete surgical reconstruction and cosmetic restoration for burn patients. The long-term objective of this research is to refine and further validate the utility of the model: (1) analyzing the transition from inflammatory response to wound repair; (2) show how various inflammatory cells contribute to the effects of thermal injury in the artificial skin; (3) study various pathways involved in differentiation and repair; (4) compare thermally injured artificial skin with injured human skin; (5) examine humanized artificial skin; and (6) introduce new cell types into the existing model. Ultimately, this model could be utilized as a test system for topical and systemic agents to inhibit (or limit) tissue injury and inflammatory damage in response to burns. This is an exciting example of the alternatives approach replacing the use of animals, providing equivalent information, and resulting in a direct benefit to seriously injured human patients.

DR. CAROL REINISCH / Marine Biological Laboratory; Woods Hole, Massachusetts

PROJECT: REGULATION OF P53 GENE FAMILY EXPRESSION IN CLAM LEUKEMIA CELLS

Dr. Reinisch's project addresses the need for non-mammalian models in cancer research. The National Cancer Institute (NCI) recently released their Scientific Priorities for Cancer Research. Dr. Richard Klausner determined that one of the primary goals of the NCI in 2002 would be to "identify and characterize gene variations involved in molecular pathways important in cancer." To achieve that goal, the NCI is dedicating new funds to vertebrate animal model systems. Until meaningful data are generated in alternative systems, such as that proposed by Dr. Reinisch, the number of vertebrate animals used to achieve the stated goals will continue to increase.

By developing serum free cell culture techniques coupled with molecular probe technology, she will define p53 gene family expression in leukemia cells *in vitro*. The information obtained will contribute to the understanding of p53 gene-mediated cellular processes occurring during leukemogenesis. In addition, this information will contribute to an overall phylogenetic scheme for this important and diverse gene family.

Dr. Reinisch's model has the potential to become a paradigm of genetic interactions, proving that invertebrate cell lines and molecular probes can resolve central issues to any species including humans. For this type of work, cell lines make the use of intact animals totally unnecessary.

DR. KATHERINE RALLS / Smithsonian Institution, Department of Conservation Biology; Washington, DC

PROJECT: DOGS, SCATS, AND DNA: A NON-INVASIVE APPROACH FOR CARNIVORE FIELD STUDIES

Dr. Ralls received additional support for her work involving an application of the alternatives approach to issues involving wildlife research. To conserve endangered species and manage wildlife populations effectively, basic information such as population density, survival, reproductive rates, social structure, and areas used by individual animals is needed. Traditional biologists gathered such information by capturing and radio-collaring individual animals, which were then monitored by radiotelemetry. To do this, the animals must be captured (sometimes using padded leg-hold traps), restrained, and fitted with radio-collars. Although this is done under chemical restraint, some animals may not survive the experience or adapt well to the collars.

In Dr. Ralls' work, specially trained dogs are used to locate feces from the San Joaquin kit foxes. They do so with 100 percent accuracy. Compared to live-trapping, using search dogs to locate scats is a more accurate method of determining the presence of foxes in an area. The dogs find fox scats in areas where live-trapping was unsuccessful. Analysis of DNA in the scat can identify species, gender, individuals, and, potentially, information of population size, sex ratio, home range, distribution, paternity, and kinship—all without the use of invasive methods. If successful, this approach could be applied to a wide variety of carnivore field projects as well as other species. ■

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Did you know that we rely almost entirely on the generosity of our members and friends for financial support? We are always looking for ways to make giving more convenient and efficient. Please feel free to contact me if you have any questions about how you can help. And, as always, thank you for all that you do on behalf of the animals!

Best Regards,

Sara Chenoweth
Assistant Director of Development & Member Services

Tributes

In memory of my baby, Bonus. When you left, it was as if part of my soul was torn from me. I miss you so.
Jacqueline Schmidt, Coloma, MI

In loving memory of Ruth Furman—a true champion for all animals!
Melissa Furman, Roslyn Heights, NY

In memory of Judy Combs.
Suzanne Hoyle, Wendell, MA

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