

50 Years of the Institute for Laboratory Animal Research (ILAR): 1953-2003

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Abstract

The history of the Institute for Laboratory Animal Research (ILAR) begins, as does all of laboratory animal science, with the ancient philosophers, anatomists, and physiologists whose work presaged the use of animals in biomedical research and the institutions that arose due to this use. Modern laboratory animal science and medicine began in the late 1940s and early 1950s as five Chicago-area institutions hired veterinarians to manage their animal facilities. Each of these men became instrumental in the founding of the organizations that collectively make up the laboratory animal science and medicine organizations. Nathan Brewer, one of the “Chicago five,” was particularly influential in the founding of ILAR. His boss at the University of Chicago, Dr. Paul Weiss, a member of the National Academy of Sciences (NAS), asked him to help establish a committee with the stated purpose of preparing recommendations to the NAS to develop an office to obtain information on sources of supply for research animals. This office became ILAR, and Brewer was chairman of its first report on the diseases of laboratory animals. He was also a founding diplomat and first president of the American College of Laboratory Animal Medicine. This history recognizes the thoughtful and energetic contributions of scientists and veterinarians to ILAR. It provides a 50-year overview of the programs and reports of ILAR and highlights examples where these reports have been adopted by scientists and federal agencies and incorporated into national laws and policies governing the use of animals in research both in the United States and in other countries.

Key Words: animal science; animal science organizations; animals for research; international activities; laboratory animal; laboratory animal medicine

Origins

A complete history, including the origins of the Institute for Laboratory Animal Research (ILAR¹)—and that of laboratory animal science as a whole—would perhaps begin in 300 BC with Aristotle, whose dissections

and exquisite drawings of cadavers clearly demonstrated individual differences among animals (Singer 1922). It would continue, during this same period, with Erasistratus, who likely was the first person to experiment on live animals and describe the function of the trachea and lungs. It would include Galen (130-200 AD), who extended the dissection-based studies of Aristotle and Erasistratus with a novel scientific discipline that utilized rigorous, controlled methodology (Brewer 1999; Loew and Cohen 2002; Wilson 1959).

During the ensuing Dark Ages, religion prevented dissection and the acquisition of knowledge about the natural world. Little advance was made in most scientific disciplines, and dogma replaced science (Loew and Cohen 2002). Emerging from this suppression in the 16th century, the great anatomist Vesalius demonstrated the correspondence of anatomy and physiology—form and function—and in 1628, Sir William Harvey published his work on the circulation of blood. In the mid- to late-1800s, François Magendie and Claude Bernard’s studies of animals placed France in the forefront of experimental physiology and medicine, and Louis Pasteur identified pathogenic organisms in animals (e.g., anthrax, rabies) that were causative agents of disease in animals and humans.

ciation for Laboratory Animal Science; ABLAM, American Board of Laboratory Animal Medicine; ACLAM, American College of Laboratory Animal Medicine; ACP, Animal Care Panel; AFR, Animals for Research; AHA, American Humane Association; AMGS, Animal Models and Genetic Stocks; AVMA, American Veterinary Medical Association; AWA, Animal Welfare Act; CAR, Committee on Animal Resources; CDC, Centers for Disease Control and Prevention; CIOMS, Council for International Organizations of Medical Sciences; DHHS, Department of Health and Human Services; *Guide, Guide for the Care and Use of Laboratory Animals*; IACUC, institutional animal care and use committee; IAR, Institute of Animal Resources; ICLA, International Committee on Laboratory Animals; ICLAS, International Council of Laboratory Animal Science; ICSU, International Council of Scientific Unions; ILAR, Institute for Laboratory Animal Research (formerly Institute of Laboratory Animal Resources); IOM, Institute of Medicine; IRAC, Interagency Research Animal Committee; LAMESH, *Laboratory Animal Medical Subject Headings*; MESH, *Medical Subject Headings*; NCI, National Cancer Institute; NIH, National Institutes of Health; NIOSH, National Institute for Occupational Safety and Health; NRC, National Research Council; NSMR, National Society for Medical Research; OMB, Office of Management and Budget; PHS, US Public Health Service; PRIM&R, Public Responsibility in Medicine and Research; RSPCA, Royal Society for the Prevention of Cruelty to Animals; SCAW, Scientists Center for Animal Welfare; UNESCO, United Nations Educational, Scientific, and Cultural Organization; USDA, US Department of Agriculture.

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¹Abbreviations used in this article: AAALAC, American Association for the Accreditation of Laboratory Animal Care; AALAS, American Asso-

On the Origin of Species by Means of Natural Selection, or the Preservation of Favored Races in the Struggle for Life—commonly known as *The Origin of Species* (Darwin 1856)—forever changed the place of animals in society. Its publication caused people to rethink the relationship between animals and humans. The view of the French philosopher René Descartes, that animals were merely machines with no ability to feel pain, began to decline. People increasingly recognized that animals and humans might have a common mechanism for pain perception and that scientists could use animals to increase the understanding of human physiology and anatomy (Loew 1982, 1996).

While major advances in physiology and medicine were being made in Europe in the 1800s, America was developing an intellectual and facilities infrastructure in science. At the height of the Civil War, Abraham Lincoln proposed that eminent scientists establish an “academy” of scientists to provide advice to the federal government on matters of science and technology. This proposal led Congress in 1863 to establish the National Academy of Sciences, the pre-eminent science organization in the world. In 1916, the Academy was expanded to include an administrative arm, the National Research Council (NRC¹). The National Academy of Engineering (1964) and the Institute of Medicine (IOM¹) (1970) rounded out what is now collectively called The National Academies (<http://www.national-academies.org>). Being elected to “The Academy” is one of the highest honors to which a scientist can aspire, and ILAR’s current chairman, Peter Ward, is an illustrious member of the IOM. In July 1953, the Institute of Animal Resources was organized within the NRC (Hill 1980) to fulfill Lincoln’s vision regarding issues dealing with the use of animals in biomedical research, education, and testing.

Rise of Animal Protection Organizations

In England, members of the Royal Society for the Protection of Cruelty to Animals (RSPCA¹) recognized value in the relationship between humans and animals. In 1822, Richard Martin (“Humanity Dick,” a former Member of Parliament) sponsored the world’s first anticruelty bill to provide some protection for horses, cattle, and sheep. Martin founded the RSPCA in 1824, and it soon gained popularity and respect throughout England (Loew and Cohen 2002; RSPCA website: <http://www.rspca.org.uk/>). Not surprisingly, RSPCA members were receptive to publication of *The Origin of Species*. One group of members led by Frances Power Cobbe lobbied the British Parliament to ban the use of animals in research. The resulting compromise led to the Cruelty to Animals Act of 1876, the world’s first law governing the use of animals in research, and spurred the antivivisection movement (Loew 1996; RSPCA website: <http://www.rspca.org.uk/>).

Henry Bergh, US Ambassador to Russia during the Civil War, founded the American Society for the Prevention of Cruelty to Animals in 1860, and George Angell founded

the Massachusetts SPCA, both modeled after the RSPCA (Loew 1996). Thus, by the end of the 19th century, animal protection organizations had also been established in the United States for the protection of livestock, pets, and research animals.

Role of Veterinarians

Experimentation and biological exploration continued into the early decades of the 20th century, with great leaps in the understanding of the causes of disease. In 1912, Alexis Carrell received the Nobel Prize in biology for his pioneering work in surgery. Perhaps most importantly, however, the award recognized the many animal scientists who had previously worked toward the development of this method. Needless to say, those early “laboratory animal veterinarians” and the others who developed and managed their animal colonies were important members of these research teams (Loew and Cohen 2002). Harvard University and The Johns Hopkins University were the first institutions to have animal facilities in the 1880s, and The Mayo Clinic was the first institution in which a veterinarian managed an animal facility. Simon D. Brimhall was the first veterinarian at Mayo, beginning in 1915. He was succeeded by veterinarians J. G. Hardenberg, in 1922, and Carl F. Schlotthauer, in 1927 (Brewer 1999).

Soon thereafter, the world was at war and priorities changed from biology to bullets. Little advancement was made in biology until the end of World War II, when individuals involved with research centers became increasingly cognizant of the role of animals in medical research and of their proper care and use. In 1945, young Nathan Brewer was recruited to the University of Chicago by Anton J. Carlson (a physician, scholar of many languages, and member of the National Academy of Sciences) to establish and manage its laboratory animal facilities (Brewer 1999). Brewer became broadly involved in animal care issues, which included serving on the Transportation Committee of the American Humane Association (AHA¹) and drafting the first regulations promoted by the AHA on the transport of animals (Brewer 1999). Over the next 4 years, four other Chicago-area institutions also hired veterinarians to develop and manage animal facilities. These “Chicago 5” veterinarians, together with others at The Mayo Clinic, the National Institutes of Health (NIH¹), and the New York State Board of Health (Table 1), provided the impetus for the founding and development of laboratory animal medicine and science as we know it today.

The expansion of the use of animals in research, and consequently the number of animal facilities, was met by objections of antivivisectionists. To counter these activists, a group of prominent research institutions belonging to the Association of American Medical Colleges established the National Society for Medical Research (NSMR¹) in 1946. With a mission to educate the people about medical research and to provide legal council for scientists “besieged” by

Table 1 Early veterinarians in laboratory animal medicine

Year	First veterinarians	Institution
1915	Simon Brimhall	The Mayo Clinic
1919	Charles A. Griffin ¹	New York State Board of Health
1922	J. G. Hardenbergh	The Mayo Clinic
1922	Karl F. Meyer ^{1,2}	University of California, San Francisco
1927	Carl Schlotthauer	The Mayo Clinic
1945	Nathan Brewer ³	University of Chicago
1946	A. R. Rosenberg	Northwestern University
1946	Robert Litt	University of Illinois
1947	W. T. S. Thorp	National Institutes of Health
1948	Ellihu Bond ³	University of Illinois
1949	Bennett Cohen ³	Northwestern University
1949	W. F. Schroeder ³	Hektoen Institute of Medical Research
1949	Robert Flynn ³	Argonne National Laboratory
c1950	Benjamin Fremming ⁴	US Air Force

¹Member of the National Academy of Sciences.

²Authored first English article on all known diseases of laboratory animals.

³“Chicago 5” veterinarians. See text.

⁴Founding diplomat and president of ACLAM, member of ILAR Council, and Chairman of the ILAR Committee on Nonhuman Primates (1954-1958).

antivivisectionists, the NSMR was busy from the beginning. Ironically, one of the first besieged veterinary clients was Nathan Brewer (Loew and Cohen 2002). Ultimately, the NSMR merged with the Association for Biomedical Research (founded in 1979) to become the National Association for Biomedical Research, with Edward Melby its first president (Loew and Cohen 2002).

The veterinarians at the five Chicago-area institutions faced similar challenges in their positions and often talked among themselves. Their talks led to discussions that encompassed a wider circle of people interested in laboratory animal care. In 1950, approximately 75 people from the United States and Canada attended a meeting at the University of Chicago (Brewer 1999). This meeting resulted in the formation of the Animal Care Panel (ACP¹, changed to the American Association for Laboratory Animal Science, AALAS¹) in 1967, with Nathan Brewer, Chairman; Charlie Slanetz, Vice President; and Bennett Cohen, Secretary.

Role of Nonveterinary Scientists

Although the role of veterinarians in developing laboratory animal science and medicine disciplines was indeed prominent, many other individuals also played essential roles. The

scientists listed in Table 2 maintained colonies of research animals to support their work, published seminal articles and books on diseases of laboratory animals, hired the first “laboratory animal” veterinarians, and received national recognition for their research. Many were elected to the National Academy of Sciences. A chapter could be (indeed, has been) devoted to each of them, as well as to each of many others who are omitted from this necessarily brief review. More information about these key individuals is provided by Brewer (1999), Loew and Cohen (2002), and Wolffe (1999).

Perhaps the most influential scientist in the formation of ILAR was Paul Weiss. While a Professor of Biology at the University of Chicago and Chairman of the NRC Division of Biology and Agriculture, his pioneering studies of neural organization and embryology earned him the prestigious Presidential National Medal of Science and election to the National Academy of Sciences (Brewer 1999; NAS 1997). Concurrent with the growing number of animal research facilities (his own, under the able management of Nathan Brewer) and impressed with the opportunities and challenges these facilities presented to laboratory animal science, Weiss convened a Conference on Animal Procurements on July 10, 1952. Geneticist Clarence Cook Little (founder of Jackson Memorial Laboratory) chaired the meeting (Hill 1980), which resulted in a request to the NRC to establish a Committee on Animal Resources (CAR¹) for the purpose of recommending a long-term procurement and supply mechanism of animals for biological, medical, and agricultural research. In November 1952, the CAR recommended formation of the Institute of Animal Resources (IAR¹) within the NRC. In July 1953, the IAR was formally

Table 2 Key pioneers in developing and improving animal models of disease

Philip Armstrong ¹	Cornell University
Anton Carlson ^{1,2}	University of Chicago
L. R. Christensen	New York University
C. N. W. Cumming	Carworth Farms
Paul Day	University of Arkansas
Harry Herrlein	Rockland Farms
George Jay	National Institutes of Health
George Kidder	Amherst College
Walter Landauer	University of Connecticut
Raymond Randall	US Army/Walter Reed Inst. of Research
E. S. Russell	Jackson Laboratory
Victor Schwentker	The West Foundation
Charles Slanetz	Columbia University
Sewell Wright ^{1,3}	University of Chicago
Paul A. Weiss ^{1,4}	University of Chicago

¹Member of the National Academy of Sciences (NAS).

²Member of the NAS, first president of the National Society for Medical Research. Recruited Nathan Brewer to the University of Chicago.

³Pioneered studies in genetics and biology of the guinea pig.

⁴Received National Medal of Science for work in embryology and neural organization and credited with formation of ILAR at the NAS.

established under the NRC Division of Biology and Agriculture (Hill 1980; Loew and Cohen 2002; Wolfle 1999). T. C. Byerly was Chairman of IAR for the first year and was succeeded by Dale Jenkins. Past ILAR Council Chairmen are listed in Table 3, and ILAR Directors are listed in Table 4.

In 1954, Orson Eaton, a geneticist from the Bureau of Animal Industry, was hired as the first IAR Director. During these early years, the members of the IAR advisory committee represented the leadership in their respective disciplines. The first authoring committee of IAR was the Subcommittee on Health Standards, appointed in 1954 and chaired by Nathan Brewer. It produced IAR's first report, *Parasitic and Infectious Diseases of Laboratory Animals* (NRC 1956). This report was a landmark because it provided the first comprehensive information on laboratory animal diseases since Karl F. Meyer's extensive work approximately 30 years earlier (Table 2).

IAR's first report also called for a "system of accreditation and certification of laboratory breeders . . ." and for "the elimination of certain diseases in animal colonies" for accreditation and certification to succeed. It made an immediate impact, and the National Cancer Institute (NCI¹) asked the newly renamed Institute of Laboratory Animal Resources (ILAR) to develop minimum standards for the commercial production of randombred and inbred mice. A conference on Animal Standards and Accreditation, chaired by ILAR's first chairman, T. C. Byerly, initiated the development of the requested standards. Concurrent with the work of the committee was the assignment of George Wolff of NCI to ILAR for the purpose of gathering information on a wide range of genetic, disease, and management issues from commercial and academic institutions. Together, these activities led to the development of the standards by which NCI implemented the first accreditation of commercial mouse breeding facilities (Wolff and Hill 1996; Wolfle 1999).

Table 3 Chairmen of Institute for Laboratory Animal Research (ILAR) Council

1953-54	T.C. Byerly
1954-59	Dale W. Jenkins
1959-62	George E. Jay, Jr.
1962-66	Bennett J. Cohen
1966-69	Howard A. Schneider
1969-72	Thomas B. Clarkson
1972-75	Cluff E. Hopla
1975-78	Edward C. Melby, Jr.
1978-81	Nicolas B. Bottiglieri
1981-87	Franklin M. Loew
1987-93	Steven P. Pakes
1993-99	John L. VandeBerg
2000-Present	Peter A. Ward

Table 4 Directors of the Institute for Laboratory Animal Research (ILAR)

1954-55	Orson N. Eaton
1955-65	Berton Hill
1965-75	Robert Yager
1975-87	Earl Wayne Grogan
1988-97	Thomas L. Wolfle
1997-2000	Ralph B. Dell
2000-Present	Joanne Zurlo

Animals for Research

Nonhuman Primates

During the 1950s and -60s, under the guidance of ILAR Director Berton Hill, ILAR focused on the availability of nonhuman primates for research and international standards for the acquisition, transportation, and use of research animals. Reports from this time led to the establishment of domestic rhesus monkey breeding programs and influenced the establishment of the NIH-sponsored National Primate Research Centers program.

ILAR joined with many international research organizations and European countries to promote standards for laboratory animal care, health, and quality. As a result, a new organization was formed in 1956 to oversee these activities. This organization was the International Committee on Laboratory Animals (ICLA¹), renamed the International Council of Laboratory Animal Science (ICLAS¹) in 1979. ILAR Council Chairman Steven Pakes later became the ICLAS Secretary General in 1995 and President in 1999. ICLAS and ILAR's participation in the organization are described in more detail below.

Rodents

As an ongoing effort to focus on the quality of research rodents, ILAR provided the first of a continuing series of laboratory animal supply catalogs in 1954. In 1957, an NCI-sponsored series of surveys of inbred and hybrid mouse producers was initiated. Berton Hill described the overwhelming response to the surveys as "an unparalleled treasury of data on producers, users, and characteristics" (Hill 1980). These data, updated regularly, were used to develop the *Animals for Research* publications, which continue today as a valuable database maintained by ILAR for the research community.

Largely as a result of *Animals for Research* (NRC 1979a), ILAR gained a reputation as a reliable source of information on a wide variety of research resource topics. Throughout the 1980s, ILAR responded to many questions regarding the availability of biological resources and the most appropriate models for the study of specific diseases.

These questions motivated ILAR Council to establish an Animal Models and Genetic Stocks (AMGS¹) committee, chaired by John VandeBerg and later renamed Animal Resources Information Committee (ARIC¹). The committee began a process that has continued to the present, to expand *Animals for Research* and to facilitate access to information about genetically modified animals. This information is currently included in ILAR's Animal Models and Genetic Stocks database, discussed below.

Laboratory Animal Medicine and Disease-free Animals (or Gnotobiotics)

Woven throughout this documentation, although not always part of ILAR's history per se, are vignettes about people and events that have affected ILAR and generally forged the way for the laboratory animal science and medicine discipline. For example, during the 1952 annual meeting of the American Veterinary Medical Association (AVMA¹), Nathan Brewer, Mark Morris, and others organized a separate meeting of 34 veterinarians who were engaged in the practice of laboratory animal medicine. This meeting resulted in the founding of the Committee on the Medical Care of Laboratory Animals. Then in 1956, the group led by Nathan Brewer and Robert Flynn called another meeting in Chicago to develop a petition to seek AVMA recognition of laboratory animal medicine as a specialty (Loew and Cohen 2002; Wolfle, 1999).

In 1957, the American Board of Laboratory Animal Medicine (ABLAM¹) was incorporated with Nathan Brewer as President—an important landmark heralded in the new *IAR Newsletter* (IAR 1957). In 1961, ABLAM was changed to the American College of Laboratory Animal Medicine (ACLAM¹). Devoted to encourage training and education, ACLAM bestows diplomat status to veterinarians who qualify through education and examination. To date, ACLAM has more than 600 diplomat members.

In 1959, ILAR began working with NIH, the Office of Naval Research, the Lobund Institute of the University of Notre Dame, Charles Griffin of the New York State Board of Health (a pioneer in the concept of “disease-free” animals) (Loew and Cohen 2002), and commercial rat and mouse breeders for the purpose of developing germ-free technology (NRC 1959). Groups of scientists studied and verified the efficacy of flexible film isolators, cesarean section derivation, and methods of shipping germ-free animals. The meetings led to the first attempt by commercial breeders to produce germ-free animals and the formation of the Association for Applied Gnotobiotics (NRC 1960).

During its first decade, ILAR's reports and conferences aided and stimulated the growth of the laboratory animal science discipline. By the early 1960s, the ACP was well established, the AVMA recognized laboratory animal medicine as a specialty, the gnotobiotic organization was vigorously addressing the quality of research animals, and

accreditation of animal care and use programs was a concept whose time had come. As these organizations grew and more veterinarians were added to the staff of research laboratories, the issues with which they were confronted were numerous and complex. ILAR's reports continued to provide guidance in numerous areas. An important report at this time was the *Proceedings of the Symposium on Research Animal Housing* (NRC 1963).

Guide for the Care and Use of Laboratory Animals (Guide¹)

Also during the early 1960s, the ACP published the first *Guide for Laboratory Animal Facilities and Care*, with the assistance of a grant from NIH (ACP 1963; Miller and Clark 1999; Mulder 2002). Ben Cohen was Chairman of the authoring committee, President-elect of ACLAM, and Chairman of ILAR; and many of the authors were very involved with ILAR. ILAR endorsed the publication, gave it the imprimatur of the National Academy of Sciences (NRC 1965a), and has authored each of the subsequent editions. In 1972, it was given its present title, *Guide for the Care and Use of Laboratory Animals* (the *Guide*¹). NIH published all editions through the Government Printing Office until the current (7th) edition, which the National Academy Press published (NRC 1996).

The *Guide* is unquestionably the most influential document in the field. Approximately 500,000 copies have been distributed internationally since the first edition, and translations are currently available in Arabic, two versions of Chinese, French, Japanese, Korean, Portuguese, Russian, Spanish, and Taiwanese; and an Indonesian version has recently been submitted for review. Beginning with the first edition, the document has provided research institutions with a yardstick for assessing their animal care programs and facilities. Equally important has been its impact on the federal government because it is the document of reference for the *Public Health Service Policy on Humane Care and Use of Animals* (OLAW 2000).

With each revision of the Animal Welfare Act (AWA¹) (CFR 1985), the US Department of Agriculture (USDA¹) has consulted with ILAR formally and informally for recommendations, which has influenced the “performance” tone in the resulting USDA regulations. Such performance standards are not heartily endorsed by many critics of animal research who believe they are too “permissive.” Yet from early editions, the *Guide* has wisely used language to “encourage investigators to seek new and better methods of laboratory care and apply professional judgment in the interpretation of these recommendations.” The language was intended to provide readers with an understanding of endpoints and goals, but not to define or require ways to achieve them. This language is currently referred to as performance standards, which are used widely throughout the industry. This approach has contributed to major advance-

ments in knowledge (see Clark et al. 1997 for a review of the 1996 *Guide*).

One might ask:

1. What proof exists that the *Guide*'s influence is warranted?
2. Have institutions interpreted it the same way?

In 1965, the ACP leaders, many of whom had participated in the writing of two editions of the *Guide* and other ILAR reports, sought to validate the utility of the documents and formalize the accreditation process begun by Brewer's "Diseases" report and NCI 10 years earlier (NRC 1965; Wolfle 1999). This endeavor and numerous meetings and discussions among members of the ACP, ABLAM, and ILAR ensued until 1965, when the American Association for the Accreditation of Laboratory Animal Care (AAALAC¹) was born. The later, renamed Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC International, to reflect its international scope) uses the *Guide* and other published documents as the basis for evaluating research institutions. AAALAC accreditation is regarded as the gold standard of excellence for laboratory animal facilities and programs (see Miller and Clark 1999 for a review of the history of AAALAC).

Training in Laboratory Animal Medicine

During the late 1950s, as institutions began using more and more animals in research, the increased demand for veterinarians exceeded supply. The ACP provided some, but not enough, of the training for these veterinarians. In 1959, Tom Clarkson of Wake Forest University's Bowman Gray School of Medicine sought to meet these needs through establishment of an NIH-funded program for postgraduate training of veterinarians in laboratory animal medicine (Moreland 1999). The next year two other programs were added: at the University of California, Los Angeles, initiated by ILAR Chairman Ben Cohen; and at Brooks Air Force Base, San Antonio, Texas, initiated by Col. Robert Hummer. In total, seven programs were established by 1968 and included another military-sponsored program initiated by Robert Whitney at the US Army's Edgewood Arsenal in Maryland (Moreland 1999). Throughout this time, ILAR worked both on the forefront and in the background to facilitate the essential training veterinarians would need in the future.

At the request of NIH, ILAR convened a 1965 Workshop on Graduate Education in Laboratory Animal Medicine, which was attended by many individuals now considered the pioneers of the industry. Under the able guidance of Robert Yager (Bert Hill's successor as ILAR Director), the workshop resulted in publication of the *Guide to Postdoctoral Training in Laboratory Animal Medicine*, which was revised in 1971 and 1978 as *Laboratory Animal Medicine: Guidelines for Education and Training* (NRC

1979). These publications served for more than 2 decades as the standard for training and education of veterinarians in laboratory animal medicine.

In 1965, Bert Hill left ILAR to become Director General of Charles River France and was succeeded by Robert Yager, the former director of the animal facilities at Walter Reed Army Institute of Research and member of ILAR's 1952 Committee on Animal Resources (Loew and Cohen 2002). Howard Schneider succeeded Ben Cohen as ILAR Chairman, and the *ILAR Newsletter* was renamed *ILAR News* and was redesigned. At this time, the NIH Laboratory Aids Branch (developed by William T. S. Thorp in 1949) became the first government agency to receive AAALAC accreditation (Gay et al. 1999), and C. Max Lang and Fritz Gluckstein teamed with other ILAR committee members to apply *Index Medicus* to veterinary and animal terms. The effort resulted in the development of *Laboratory Animal Medical Subject Headings* (LAMESH), an outgrowth of the National Library of Medicine's *Medical Subject Headings* (MESH¹), which became widely used in referencing and retrieving veterinary literature (NRC 1972).

ILAR Activities: 1970-2003

The decade of the 1970s was also eventful at ILAR. Ed Melby succeeded Cluf Hopla as Chairman, and Earl Wayne Grogan succeeded Bob Yager as Director. More than 15 major studies were conducted with the assistance of more than 100 volunteer committee members. These studies included Care and Use of the Nude Mouse, Conservation of Nonhuman Primates, a new edition of the *Guide*, and the Laboratory Animal Management reports on birds, rodents, and cats. Other committees were working with the Inter-agency Research Animal Committee's *National Primate Plan* (IRAC 1978). The committees and the ILAR staff managed these projects as well as publishing the quarterly *ILAR News* and responding to many requests for information about sources of animal models and a myriad of other issues.

During the 1980s, ILAR studies and reports mirrored the new searches for sophisticated models of disease, as reflected in such reports as *Marine Invertebrates* (NRC 1981) and *The Future of Animals, Cells, and Models* (NRC 1982). Chairman Frank Loew, Director Earl Wayne Grogan, and the ILAR Council and committee members worked closely with the Registry of Comparative Pathology at the Armed Forces Institute of Pathology to develop an exhibit on Animal Models of Human Disease, which was shown at scientific meetings. Another in a series of *National Surveys of Laboratory Animal Facilities and Resources* (NRC 1980) was completed, which, combined with previous similar surveys, provided the only national perspective on the care and use of research animals.

Toward the end of the 1980s, many changes occurred at ILAR. Steven Pakes succeeded Frank Loew, and Earl Wayne Grogan retired after 12 years as Director to be suc-

ceeded by Thomas Wolfe. ILAR was urged in new directions by its parent division, the Commission on Life Sciences, which provided a critical and vital external and internal assessment of ILAR's mission and opened up broad opportunities. One such charge from this review was to strengthen ILAR by adding more working scientists on the ILAR Council and authoring committees. These additions included members of the Academy, scientists in diverse fields of animal use, and philosophers. Their contributions were enormous. Conversely, the Academy became entangled in legal issues (regarding public access to committee deliberations) surrounding the 1996 revision of the *Guide*, which ultimately ascended to the Supreme Court for resolution.

In the midst of these changes, a new genre of studies was evolving. Other organizations were convening meetings and publishing valuable proceedings that addressed many of the topics traditionally contained in ILAR reports. Most notable were those of the Scientists Center for Animal Welfare (SCAW¹), Public Responsibility In Medicine and Research (PRIM&R¹), Association of Primate Veterinarians, AALAS, AVMA, and ACLAM. With few exceptions, these reports sought to clarify and garner consensus for "best practices" by which to implement policies, standards, and regulations developed by ILAR, the Public Health Service (PHS¹), the USDA, and others. These activities encouraged sponsors to seek reports from ILAR with an increasingly greater focus on emerging issues that were not likely to be a topic for other organizations, and for recommendations regarding federal policies affecting biological sciences for which the imprimatur of the Academy was deemed important.

Toward the end of the 1980s, committees of volunteers were working on several reports that exemplified this transition. One report focused on *Animal Models of Thrombosis and Hemorrhagic Diseases* (NRC 1975), and two on unique laboratory animals, immunodeficient rodents (NRC 1989a), and amphibians (NRC 1984). ILAR Council prepared and published *Important Laboratory Animal Resources: Selection Criteria and Funding Mechanisms for their Preservation* (NRC 1990) in recognition that many colonies of unique animal models were being disbanded for reasons such as lack of funding, changes in research focus, or death of investigators. The publication included recommended strategies by which the NIH and other sponsors of animal models could address the issue. *Education and Training in the Care and Use of Laboratory Animals* (NRC 1991a) and *Recognition and Alleviation of Pain and Distress in Laboratory Animals* (NRC 1992a) were prepared in response to AWA regulations that required each institution to address these subjects. The report on pain was notable for its treatment of distress as an entity often existing in the absence of pain. The report has been widely used, although some revision is needed (see below). In the background of these activities was an important multiyear project undertaken by a committee chaired by Russell Lindsey. The monumental two-volume *Infectious Diseases of Rats and Mice* (NRC

1991b,c) was released to an eager scientific audience 35 years after Nathan Brewer's first "Diseases" report.

Human Health Issues and Transgenics

ILAR was extensively involved in human health issues in the 1990s. Concern for the health and safety of persons who worked with nonhuman primates was first brought into strong focus by the 1967 deaths of workers exposed to African monkeys in Germany (Held 1967). The cause was identified as Marburg virus (Martini 1969), which is similar to but antigenically different from Ebola. No human deaths in the United States had occurred from either Marburg or Ebola; however, B virus (Cercopithecine herpesvirus 1) in macaque monkeys resulted in the deaths of several workers in the United States. As a result of the Marburg deaths, the Centers for Disease Control and Prevention (CDC¹) and others prepared many warnings about the danger of these "emerging viruses" (CDC 1990a,b).

After numerous workshops and guidelines issued by the CDC, the National Institute for Occupational Safety and Health (NIOSH¹), and the NIH, the IOM released *Emerging Infections: Microbial Threats to Health in the United States* (IOM 1992). For laboratory animal workers, this study was important because some of the most troublesome of these agents (e.g., Ebola, Marburg, B virus, and perhaps HIV) were thought to be associated with the importation of monkeys and chimpanzees and their altered habitat (increasingly lost and invaded by humans). Also at this time, several institutions were using or studying the use of baboon and chimpanzee organs for transplantation into humans. These activities led to another report by the IOM on xenotransplantation (IOM 1996). About this time (1995), the newly renamed *ILAR Journal* also devoted an issue to xenotransplantation (NRC 1995). Physician Ralph Dell, at ILAR on sabbatical from Columbia University, was alerted to the risk to humans of receiving nonhuman organ transplants. His involvement with the IOM Xenotransplantation Committee helped to broaden the report to include a significant and timely section on the risk of introducing disease into humans from these procedures (IOM 1996).

In 1993, John VandeBerg, Scientific Director of the Southwest Foundation for Biomedical Research in San Antonio and the previous Chairman of ILAR's Animal Models and Genetic Stocks Committee, succeeded Steven Pakes as Chairman. Geneticist VandeBerg's appointment began an increased presence of scientists on ILAR Council and its working committees. Under his leadership, and at a time when transgenic technology was coming to the forefront, ILAR focused intensely on rodent models. Three distinctly different rodent reports were produced, which mirrored the increased importance of these animals in research. One report developed a standardized nomenclature for transgenic animals (NRC 1992) at a time when confusion existed about the source and type of transgene used in the animals reported in the literature. Through cooperative efforts of the

Jackson Laboratory and Michael Festing's (Medical Research Council, England) *International Index of Laboratory Animals* (Festing 1993), the nomenclature report had the effect of reducing unnecessary repetition of studies (due to lack of knowledge about the transgenic animals used) and enabled the cataloging of transgenic animal sources in Jackson Laboratory's Transgenic/Targeted Mutation Database, TBASE (<http://tbase.jax.org/>). VandeBerg also served as Issue Editor of a large, two-volume *ILAR Journal* issue devoted to Comparative Gene Mapping.

Impact on PHS Policy and AWA Regulations

PHS Policy requires funded institutions to comply with the *Guide* and also stipulates that institutions have an occupational health and safety program, which early editions of the *Guide* mentioned only briefly. In 1997, the National Academy Press released ILAR's report *Occupational Health and Safety in the Care and Use of Laboratory Animals* (NRC 1997a). Chaired by Emmett Barkley of Howard Hughes Medical Institute, the report brought together for the first time comprehensive guidance on occupational health and safety for use by laboratory animal scientists and their institutions.

Also in 1997, ILAR released a report chaired by Dani Bolognesi of Duke University, which assessed the need for chimpanzees in research and provided cost-effective, humane recommendations (NRC 1997b). Principally sponsored by NIH, the committee endorsed an unwritten agreement in government and among many scientists that chimpanzees were not to be euthanized as a method of population control. It provided recommendations that charged NIH with developing sanctuaries for animals no longer needed in breeding or research. In 1998, H.R. 4777, the Postresearch Chimpanzee Act, was introduced into the House of Representatives to require DHHS/NIH to provide a system of sanctuaries. In 2002, NIH awarded a grant to Chimp Haven of Louisiana to develop facilities for this purpose. This event was one in a long series of ILAR reports that have been incorporated into federal policy, adopted by research institutions, or otherwise had broad impact on biomedical science.

The AWA regulations stipulate that institutions that utilize nonhuman primates must develop programs to ensure their psychological well-being. At the request of several federal agencies, an ILAR committee chaired by Irwin Bernstein of Duke University held public meetings and received many written comments from the public in the course of producing the comprehensive report titled *The Psychological Well-being of Nonhuman Primates* (NRC 1998a). Shortly after the release of this report, a notice appeared in the Federal Register (Federal Register/ Vol. 64, No. 135/ Thursday, July 15, 1999/ Proposed Rules/ pages 38145-38150) that the USDA intended to adopt a policy on psychological well-being of nonhuman primates. In response, ILAR prepared a Letter Report, *Response to USDA/*

APHIS/Animal Care's Draft Policy on Environment Enhancement for Nonhuman Primates (NRC 1999b), which provided a list of respected organizations that had endorsed or adopted ILAR's report as being scientifically based and state of the art. The letter provided a line-by-line assessment of USDA's proposed policy and detailed how it differed from the ILAR report. It urged USDA to adopt the ILAR report for its own use.

Building on the psychological well-being and occupational health reports, a new report was recently published on Occupational Health and Safety in the Care and Use of Nonhuman Primates (NRC 2003). This study, originating from a request from the NIH, the National Institute of Occupational Safety and Health (NIOSH¹), and the National Center for Infectious Diseases at CDC, reviews engineering controls and personal protective equipment with the goal of recommending practices that will reduce the risk of exposure of persons who work with nonhuman primates to non-infectious and infectious hazards (particularly B virus).

Biomedical Models and Resources: Current Needs and Future Opportunities (NRC 1998b), chaired by Muriel Davison, Jackson Laboratory, had the goal of assessing the opportunities and needs for animal model development consistent with available resources. It provided NIH with a list of recommendations by which to evaluate and prioritize requests for support of different models. In its recommendation, the committee urged giving greater attention to the importance of in vitro and nonmammalian systems. To the extent that many in vivo models are selected and funded, the study assisted in replacing the use of some higher mammals with lower organisms and in reducing the variability inherent in mammals through the use of simpler systems. Each of these goals also achieves a humane endpoint.

When ILAR Director Ralph Dell succeeded Thomas Wolfle in 1997, his experience as a pediatrician, mathematician, and Chairman of the Columbia University Animal Care and Use Committee was very pertinent. Problems he dealt with at Columbia University led him to a study of enormous importance to all research facilities because it involved the NIH, the Department of Health and Human Services (DHHS¹), and the Office of Management and Budget (OMB¹). At issue were the types of research animal-related services and facilities institutions could charge against their indirect cost pool. Dell, VandeBerg, and Committee Chairman Charles McPherson from North Carolina State University had numerous meetings with these government offices, and an appointed committee ultimately authored a report, *Strategies That Influence Cost Containment in Animal Research Facilities* (NRC 1998c). As a result of the information provided by the DHHS and OMB, institutions received significant relief from the use of their indirect cost pools.

The terms *pain* and *distress* are used in the AWA regulations, which stipulate that annual reporting requirements by research institutions categorize animal use by the degree of pain or distress involved. Proposed rules to add a definition of distress to the AWA led to another timely ILAR

workshop report, *Definition of Pain and Distress and Reporting Requirements for Laboratory Animals: Proceedings of the Workshop held June 22, 2000* (NRC 2000a). The workshop was conducted to provide a discussion of the definitions of pain and distress to facilitate more accurate identification of pain and distress by investigators and USDA inspectors. The workshop provided the USDA, participants, and readers of the report with a science-based view of the issues. Participants generally agreed that the definition of distress from the 1992 ILAR report titled *Recognition and Alleviation of Pain and Distress* is still the most accurate, although much of the information contained in this report is in need of updating.

ILAR has published few volumes dedicated solely to the humane use of animals because each study integrates a cost-benefit analysis (cost to the animal vs. benefit to society) as an important element of the conclusions and recommendations. A few such reports, however, do seem to address this topic directly. The brochure *Principles and Guidelines for the Use of Animals in Precollege Education* (NRC 1989b) stresses the importance of the use of animals in medical research and provides guidelines to increase teachers' and students' understanding of their responsibilities in selecting and using animals or other biological models in school classes and science fairs. It has been widely used in the United States by biology and science teachers and sponsors of major science fairs.

Another timely topic of interest relates to the methods of producing monoclonal antibodies. In vivo production, much criticized by animal protectionists but important to investigators, led to a legal action against NIH with a goal of disallowing NIH funding of in vivo production. ILAR's NIH-sponsored study, *Monoclonal Antibody Production* (NRC 1999a), provided recommendations in six broad areas, which were useful to investigators, regulators, and protectionists alike. In response, NIH developed guidelines from the recommendations, which urged in vitro use where practical but did not totally ban in vivo use.

ILAR in the 21st Century

In 2000, Ralph Dell transitioned to Associate Director, and Joanne Zurlo, a toxicologist from Johns Hopkins University who had been associated with the Center for Alternatives to Animal Testing, became Director. Peter Ward, a physician and pathologist from the University of Michigan, succeeded VandeBerg as Chairman. This new, 21st century leadership has introduced new ideas and plans for ILAR. One of the first decisions was to refocus the activities of Council according to the following areas: international activities, web site activities and information resources, and *ILAR Journal*. More focus is being placed on bringing ILAR's reports and activities to the greater attention of the scientific community. Thus, ILAR is investing effort into increasing visibility through its core activities.

ILAR Core Activities

International Activities

ILAR has had a long history of interest in international laboratory animal science. Historically, this interest has sought to assist young investigators in developing countries through dissemination of reports (some translated into foreign languages to increase their usefulness) and participation in international meetings that support young investigators. In 1988, ILAR became the US national member of ICLAS, with support from member agencies of the Interagency Research Animal Committee (IRAC¹). This membership affords a conduit for US investigators to develop and conduct an active international program in laboratory animal science. One goal of the US membership in ICLAS was to streamline ICLAS management and programs to better represent US scientists in the international community. The major international efforts of ILAR, which are described briefly below, include translations of reports, support of ICLAS, international workshops, observer status at the Council of Europe, and other planned activities.

Report Translations

ILAR's most longstanding international effort has been to have our seminal publication, the *Guide*, translated into as many languages as possible. The *Guide* is used as the standard for laboratory animal care by the US PHS and by AAALAC International in their accreditation of animal facilities throughout the world. The *Guide* has been translated into 10 languages (see above).

Another ILAR report, *Occupational Health and Safety in the Care and Use of Research Animals*, was recently published in Japanese and is now being translated into Korean. Translation of ILAR reports is carefully monitored, and each translation is reviewed for its faithfulness to the English version before permission is granted for its publication.

ICLAS

ILAR supports the activities of ICLAS through its participation as the US representative. ICLAS is an international scientific organization dedicated to advancing human and animal health by promoting the ethical care and use of laboratory animals in research worldwide. ICLAS was established in 1956 under the auspices of the United Nations Educational, Scientific, and Cultural Organization (UNESCO¹), and it interacts in an official capacity with the World Health Organization (WHO¹), the International Council of Scientific Unions (ICSU¹), the Council for International Organizations of Medical Sciences (CIOMS¹), and the World Veterinary Association (WVA¹). ICLAS sponsors meetings throughout the world, but it focuses particularly on third world countries, where animal care conditions are in need of improvement. Through ICLAS, ILAR

provides guidance in the field of laboratory animal science to scientists in developing countries. Traditionally, ICLAS President and former ILAR Council Chairman Dr. Steven Pakes has made yearly presentations on the progress of ICLAS activities to ILAR Council.

International Workshops

ILAR has sponsored international meetings initially with scientists from the United States and Japan and, more recently, on a more comprehensive international basis. The two most recent reports from US-Japan meetings are *Microbial and Phenotypic Definition of Rats and Mice* (NRC 1999b) and *Microbial Status and Genetic Evaluation of Mice and Rats* (NRC 2000b). In April 2002, ILAR sponsored an international meeting titled *International Perspectives—The Future of Nonhuman Primate Resources*. This conference brought together participants from six continents to address international strategies and practices for providing nonhuman primates needed for biomedical research while ensuring appropriate conservation practices. The proceedings from this meeting are in press.

By promoting the harmonization of methods for the care and use of animals, ILAR hopes to improve the quality of information exchange among countries and ultimately reduce the number of animals used. The purpose of the meetings has been to bring together scientists and veterinarians to develop stronger ties between countries, to exchange perspectives about laboratory animal science, to explore future directions for research in this field, and to create opportunities for exchanges of scientists and students. ILAR is planning another international meeting for 2003 that will address changes in laboratory animal regulations throughout the world, focusing on the need to base regulations on sound science.

Observer Status at the Council of Europe

In 1999, ILAR was granted observer status to the Council of Europe in the preparation of guidelines for the protection of live animals used for experimental and other scientific purposes. The goal of the Council of Europe is to harmonize guidelines throughout Europe, and it is desirable to have these guidelines harmonized with regulations and guidelines in the United States. Because the *Guide* provides the basis for many of the current US guidelines, it has been useful and efficient for ILAR to be an observer to this process and have the opportunity to comment.

Future Activities

In all likelihood, ILAR will become more involved in international activities in the future. The need for greater international involvement arises from a common desire to harmonize guidelines and standards for laboratory animal care across the world with the goals of improving animal welfare, conserving animal resources, and improving scien-

tific interchange through detailed characterization of the animals used in research.

ILAR Web Site and Information Resources

Animal Models and Genetic Stocks Information Program

As author of the *Guide for the Care and Use of Laboratory Animals*, ILAR is in a position to assist biomedical researchers, veterinarians, and institutional animal care and use committees (IACUCs¹) in interpreting guidelines for the humane care and use of animals, and fulfilling requirements of the AWA and PHS Policy regarding reduction of pain and distress and identification of alternative methodologies. For more than 40 years, ILAR has conducted a program to provide such information. That program, the Animal Models and Genetic Stocks Information Program, offers assistance in locating sources of animals, selecting appropriate animal models, using standardized nomenclature, and understanding the importance of the use of animals in biomedical and behavioral research and testing. It includes two databases: (1) Animals for Research (AFR¹) contains commercially available and investigator-held colonies of animals for research; and (2) International Laboratory Code Registry is a registry of codes used with standardized nomenclature of rodents and rabbits to identify institutions that maintain breeding colonies. The databases have been incorporated into ILAR's web pages and are available to investigators worldwide.

Although the AFR database has been a useful resource, it has become impractical to try to maintain an exhaustive list of animal models. This is especially true in the area of genetically modified animals. ILAR Council members decided that limited resources would be used more efficiently by developing a web-based search engine that would enable investigators to search through all available sources of animal strains and models. To that end, a search engine has been implemented, which has the capability of searching all of the commercial and private animal breeders, laboratory animal repositories, and animal resource databases that are linked to ILAR's site, as well as the ILAR web site. Current activities are focused on expanding this list of linked web sites and partnering with these organizations to provide high-level search capabilities.

More recently, ILAR has emphasized its web site (<http://www.national-academies.org/ilar>) as a source of information on the care and use of laboratory animals. The entire web site has been revamped to make it more user-friendly, components have been added for different constituencies, and a comprehensive search engine has been developed to facilitate user interactions.

Other Information Resources

Other aspects of ILAR's information program are focused on the ability to interact with scientists and veterinarians at

national meetings. ILAR maintains an exhibit and/or presents lectures at these national meetings to enhance its outreach programs and increase the visibility of its programs and publications. ILAR has routinely traveled to the national meetings of the Society for Neuroscience, Experimental Biology, the American Association for Laboratory Animal Science, the Society of Toxicology, the Scientists Center for Animal Welfare, and Public Responsibility in Medicine and Research.

ILAR Journal

Mission

ILAR Journal is ILAR's quarterly, peer-reviewed publication, which provides thoughtful and timely information for all those who use, care for, and oversee the use of laboratory animals. Its readership includes more than 3,500 investigators in biomedical and related research, institutional officials, veterinarians, and members of IACUCs. It is produced by a full-time Managing Editor, who is a member of ILAR staff, with oversight by the five-member *ILAR Journal* Editorial Board (a subcommittee of ILAR Council listed in each *Journal* issue). The Editorial Board plans each issue around a chosen theme and carefully solicits authors who can best present a balanced view of the topic. Each article undergoes a rigorous peer review.

The goal of *ILAR Journal* is to provide a unique repository of timely, high-quality information on new developments in biomedical research that involve the use of laboratory animals. These developments may include (but are not limited to) information on animal models of human disease, humane care and use of laboratory animals, animal care and use committee issues, ethical issues, and changes in federal and international regulations affecting animal research. The broad target audience includes investigative scientists, veterinarians, animal care staff, government regulators, institutional administrators, students—in fact, everyone involved with the care and use of animals in biomedical research.

The specific aims of the *ILAR Journal* are

- To be the premier US periodical resource for investigators, IACUC members, and veterinarians involved in writing and/or reviewing protocols for laboratory animal research that must comply with national, and sometimes international, regulations and policies.
- To be one of the primary international resources for scientists on the numerous spontaneous and experimentally produced animal models of human diseases.
- To be a major resource for veterinarians on diseases of laboratory animals and characterization and care of animal models, especially newly emerging genetically modified animals.
- To increase the quality of protocol review by IACUCs by providing a peer-reviewed resource on issues facing

the committee. The publication of information written for scientists on animal models, animal diseases, and federal rules and regulations allows cross-fertilization of ideas among bench scientists, veterinarians, animal facility personnel, and IACUC members.

- To disseminate this information by providing a publication at minimal cost to all members of the international biomedical community.
- To provide an easily accessible mechanism for members of the scientific community to provide input to the National Research Council on issues that could directly affect the use of animals in biomedical research.

Issue Topics

ILAR Journal issues cover a wide range of topics to accommodate readers' diverse backgrounds and interests. The issues published since 2000 reflect this broad diversity. They are listed below, beginning with the most recent.

Volume 44

Physiological Research Outside the Laboratory (ILAR 2003d)

Behavioral Research Outside the Laboratory (ILAR 2003b)

Animal Models of Stroke and Rehabilitation (ILAR 2003a)

Occupational Health and Safety in Biomedical Research (ILAR 2003c)

Volume 43

Experimental Design and Statistics in Biomedical Research (ILAR 2002b)

Proceedings of the June 2001 ICLAS/CCAC International Symposium on Regulatory Testing and Animal Welfare (ILAR 2002e)

Advanced Physiological Monitoring in Rodents (ILAR 2002a)

Mouse Models of Human Disease (ILAR 2002d)

Implications of Human-Animal Interactions and Bonds in the Laboratory (ILAR 2002c)

Volume 42

Fish Models in Biomedical Research (ILAR 2001b)

Impact of Noninvasive Technology on Animal Research (ILAR 2001c)

Animal Models of Hepatitis (ILAR 2001a)

Laboratory Animal Allergy (ILAR 2001d)

Volume 41

Cryobiology of Embryos, Germ Cells, and Ovaries (ILAR 2000a)

Mouse Behavioral Models in Biomedical Research (ILAR 2000c)

Humane Endpoints for Animals Used in Biomedical Research and Testing (ILAR 2000b)

The Squirrel Monkey in Biomedical and Behavioral Research (2000d)

Future issues, in various stages of production or planning, include the following topics:

When Rats and Mice Cannot Answer the Question: Non-traditional Animal Models for Laboratory Research; Nonhuman Primate and Other Animal Models in the Study of Women's Health; Animal Models of Diabetes; Animal Models for Biodefense and Emerging Diseases; Care and Welfare of Animal with Implants; Environmental Estrogens and Endocrine Disrupting Agents; Strategies for Development and Validation of Animal Models; Animal Models of Obesity; and other topics to be announced.

Conclusion

This history has been organized in an effort to capture the expansiveness of ILAR's activities. It could have been organized by presenting each milestone under the banner of the numerous government and foundation sponsors who have supported ILAR from the beginning and who are acknowledged in the Preface of each published report. Indeed, the activities that comprise ILAR's history would not have occurred without these sponsors, and the future history of ILAR will certainly be directed by their needs and support.

Nevertheless, this history of ILAR and its role in the evolution of laboratory animal science is still incomplete because hundreds of volunteers and many staff members who have contributed to ILAR's Council, authoring committees, workshops, and public meetings are not identified herein. The sum of their profound contributions represents the growth and outreach of ILAR and they, like the sponsors, have been essential to the life of ILAR.

Much of this report is taken from earlier and more complete histories. Readers wishing more information are referred to the early editions of the *ILAR Newsletter*, *ILAR News*, and the key resources listed below.

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