Jefferson.

Thomas Jefferson University
Jefferson Digital Commons

Department of Pediatrics Faculty Papers | Department of Pediatrics

5-1-2010

An updated history of the Teratology Society.

Thomas H Shepard
University of Washington

Mason Barr
University of Michigan Medical Center

Robert L Brent
Thomas Jefferson University

Andrew Hendrickx
University of California, Davis

Devendra Kochhar
Jefferson Medical College

See next page for additional authors

Let us know how access to this document benefits you

Follow this and additional works at: http://jdc.jefferson.edu/pedsfp

Part of the Bioethics and Medical Ethics Commons

Recommended Citation

Shepard, Thomas H; Barr, Mason; Brent, Robert L; Hendrickx, Andrew; Kochhar, Devendra; Oakley, Godfrey; Scott, William J; and Rogers, John M, "An updated history of the Teratology Society." (2010). *Department of Pediatrics Faculty Papers.* Paper 32.
http://jdc.jefferson.edu/pedsfp/32

This Article is brought to you for free and open access by the Jefferson Digital Commons. The Jefferson Digital Commons is a service of Thomas Jefferson University's Academic & Instructional Support & Resources Department (AISR). The Commons is a showcase for Jefferson books and journals, peer-reviewed scholarly publications, unique historical collections from the University archives, and teaching tools. The Jefferson Digital Commons allows researchers and interested readers anywhere in the world to learn about and keep up to date with Jefferson scholarship. This article has been accepted for inclusion in Department of Pediatrics Faculty Papers by an authorized administrator of the Jefferson Digital Commons. For more information, please contact: JeffersonDigitalCommons@jefferson.edu.

Authors
Thomas H Shepard, Mason Barr, Robert L Brent, Andrew Hendrickx, Devendra Kochhar, Godfrey Oakley, William J Scott, and John M Rogers

This article is available at Jefferson Digital Commons: http://jdc.jefferson.edu/pedsfp/32

As submitted to

Birth Defects Research (Part A): Clinical and Molecular Teratology

And later published as:

"An Updated History of the Teratology Society"

Volume 88, Issue 5, May 2010, Pages 263-285

DOI: 10.1002/bdra.20669

Thomas H. Shepard,1 Mason Barr, Jr.,2 Robert L. Brent,3 Andrew Hendrickx,4 Devendra Kochhar,5 Godfrey Oakley,6 William J. Scott Jr.,7 and John M. Rogers8

Reprinted from Teratology, 62:301–316, 2000 with updates to 2010 by John M. Rogers

1Department of Pediatrics, University of Washington, Seattle, Washington
2Department of Pediatrics, University of Michigan Medical Center, Ann Arbor, Michigan
3DuPont Hospital for Children, Wilmington, Delaware
4University of California, Davis, California
5Department of Pathology, Anatomy and Cell Biology, Jefferson Medical College, Philadelphia, Pennsylvania
6Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, Georgia
7Children's Hospital Research Foundation, Cincinnati, Ohio
8Office of Research and Development, U.S. Environmental Protection Agency, Research Triangle Park, NC, 27711

Received 1 March 2010; Accepted 2 March 2010

BACKGROUND: The 49-year history of the Teratology Society is reviewed. An abbreviated history is outlined in table form, with listings of the Warkany Lectures, the Continuing Education Courses, and officers of the society. The original article was updated to include the years 2000 to 2010. METHODS: A year-by-year description of the events is given, including the scientific and social content of the annual meetings and changes in the business of the society, in many cases using comments from the past presidents. The valuable and unique diversity of the members is discussed and illustrated, presenting the disciplines and main research areas of the presidents.

The number of submitted abstracts and the various categories are tabulated, averaging the number and type over successive periods. A significant increase in the number of abstracts dealing with epidemiology and developmental biology is evident. The society's development is compared to that of a human, and the question was asked by Shephard et al. (2000): Have we reached the maturational stage of old age or senescence, or is the society still maturing gracefully? This question needs further discussion by all the members. By 2010, many positive changes are happening to revitalize the society.

RESULTS: During the past 50 years, we have developed the scientific basis to prevent birth defects caused by rubella, alcoholism, and folate deficiency, as well as other prenatal exposures. We are now taking advantage of advances in many fields to begin shaping the Teratology Society of the 21st century.

CONCLUSIONS: We must now engage in political battles to obtain the resources needed to conduct further research and to implement prevention programs, as well as to provide care and rehabilitation for persons with birth defects. Birth Defects Research (Part A) 88:263–285, 2010.

INTRODUCTION

A history should record and honor the past, help plan for the future, and entertain the reader. In 1998, Philip Mirkes, the president of the Teratology Society, asked the authors to write a history of the Teratology Society to coincide with the year 2000. For the 50th annual meeting of the society in 2010, the original history article was updated by John Rogers. Table 1 presents the society's presidents, meeting places, and key changes in the society's function. Table 2 lists all the officers with their places of work. Table 3 outlines the Warkany Lectures, and Table 4 lists the education courses. A year-by-year description of events detailing the activities for each year is given, but this begins in 1967–1968, since Wilson and Warkany (1985) previously covered the preceding years. In these accounts, we have asked the past presidents to assist and provide interesting and amusing anecdotes. A section on the diversity of the society has been included, because we believe that one of our unique and valuable assets is the contribution of many scientific disciplines, from molecular genetics to epidemiology and dysmorphology in the study of teratology. The scientific methods used in the yearly abstracts have been classified and counted to give some idea of how the society's research techniques, and approaches have changed over the past 40 years. Last, we attempted to compare the society's life with that of a human and asked the question, is the Teratology Society in its middle age, old age or, worse, senescence? We believe that the society should be proud of its past, but we should not be mired in nostalgia. In other, words, it is proper to look back but not to stare.

YEAR-BY-YEAR ACCOUNT OF THE PAST 42 YEARS OF THE TERATOLOGY SOCIETY

Former presidents were asked to contribute scientific and social highlights and other pertinent information about their year in office. Sadly, some did not respond, requiring us to describe their year and, in general, these accounts lack full details compared with those from the respondents. Affiliations and descriptions of presidents before 2000 have not been changed from the Shepard et al. (2000) article. Many of these affiliations are no longer accurate, and a number of these past presidents have died since 2000. Thanks to Dr. Bill Slikker for passing along comments that he gathered from past presidents in 2002.

1961 to 1967

The Teratology Society was founded by Drs. Josef Warkany, James G. Wilson, and F. Clarke Fraser (Fig. 1). For the period of 1961 to 1967, refer to The History of Organized Teratology in North America, by James G. Wilson and Joseph Warkany (Teratology 1985;31:285–296).

1966 to 1967

Meredith N. Runner, Ph.D., was president. That year, the Board of Regents at the University of Colorado established the Institute for Developmental Biology with Dr. Runner as director.

1967 to 1968

The annual meeting was held at The Inn at Buckhill Falls, in the Poconos in Pennsylvania, May 15 to 17, 1969. The Buckhill resort is an elegant old resort, which was frequented by many of the members of Philadelphia high society spring through fall during the early years of the nineteenth century.

The society had fewer committees and had not yet attained national recognition. The financial obligations were minuscule compared with the cost of planning a meeting and governing the society in the 1990s. There were no outside donors who supported the society, nor was there a professional organization that helped administer the society's activities and annual meeting. We believe that the members of the Teratology Society in 1999 would find it humorous to discover the cost of running the meeting in 1968, as well as the cost of attending the meeting. The cost of a room at Buckhill Falls was $32.50 per day, which included two meals, a large breakfast, and a banquet-like dinner. The registration fee for the meeting was $5.00, and the Society Membership dues were in the range of $15 to $20, which included a subscription to the journal. These increased costs, adjusted for a 4- to 5-fold inflation, would not be excessive.

A trio from the Curtis Institute of Music played chamber music at the banquet meeting. It cost $50 to have these wonderful young students perform. There were a few symposia and speakers from other countries. Felix Beck and John Lloyd were invited to the meeting and talked about the mechanism of Trypan blue teratogenesis. This was the first time that Bob Brent met Dr. Lloyd in person, and they have been colleagues ever since. Dr. Warkany chaired the first session. Dr. Wilson also chaired a session and presented some papers. An immunology symposium was held because interest in immunology was exploding during the 1960s. Presenters at that symposium included A.M. Silverstein from Johns Hopkins, who studied fetal immunogenesis and congenital infections, primarily in sheep. Jonathan Lanman, who did some of his work at the Rockefeller Institute, presented his papers on maternal-fetal immunologic relationships. Some might recall that these studies demonstrated that immunization of the mother with paternal skin did not harm the fetus. Drs. Jim Wilson, Felix Beck, John Lloyd, Ron Jensh, and David Gunberg participated in a symposium on Trypan blue. Clarke Fraser chaired the last session, and the meeting ended at noon on Friday, on the third day. One of the delightful aspects of the meeting at Buckhill Falls was the manner in which guests were seated for their meals. Most tables were set for eight people. The seating was based on your position in the dining room waiting line, so there was a great opportunity for the students, the middle-aged faculty members, and the senior faculty members to sit together on a random basis at every meal, which was a beneficial situation. At many meetings, everyone departs from the meeting site to dine, and there is never an opportunity to sit with the likes of Dr. Warkany, Dr. Wilson, or Dr. Fraser, unless the meeting site has a dining room seating arrangement similar to that of The Inn at Buckhill Falls. One of the momentous occurrences during the year was the fact that the journal Teratology was created. In

fact, the meeting of the Teratology Society was the first meeting at which the program was recorded for perpetuity in the journal. Harold Kalter, the first editor is probably one of the most meticulous writers in the society. He is a stickler for accuracy and clarity, and he brought the qualities of good writing and good grammar to the journal to start with high standards. From the standpoint of research activities of the membership, it was not difficult to obtain support from the National Institutes of Health (NIH). We jested about the fact that in the early days, all you had to do was drop your pen on a NIH research application blank, and you had a reasonable chance to have the application approved and funded—a slight exaggeration, of course. Many projects were funded that would not be approved during the 1990s, but that resulted in interesting and important findings. Obviously, times have changed drastically, and it is now extremely difficult to obtain funding for research, especially in the area of teratology. We experienced ups and downs of funding for research. Teratology research suffered during the periods of limited funding, but it was important to develop a feeling of optimism—namely, that one had to persist in the attempt to obtain research support. The president, Robert L. Brent, is the distinguished Louis and Bess Stein Professor and Chairman Emeritus of the Department of Pediatrics at Jefferson Medical College and is the head of the Laboratory of Clinical and Environmental Teratology at the du Pont Hospital for Children. Among many honors, he was recently elected as a member of the Institute of Medicine of the National Academy of Science.

1968 to 1969

The annual meeting was held at Crystal Mountain, Washington, a ski resort near Mt. Rainier. The most memorable event of the meeting was a salmon barbecue at the top of the ski lift with Mt. Rainier in its full glory. The after-dinner speaker was the famous salmon biologist Loren Donaldson. The disadvantages of the site were the travel distance from the airport and mediocre food services. The program was highlighted by Dennis New's presentation of a whole-embryo culture technique that was eventually adopted by many teratology laboratories (New, 1967). J.D. Biggers gave another lecture on isoenzymes. Symposia on thalidomide and cleft lip and palate were held. It is of interest that the same graduate student (Alan Fantel) projected every slide. The council decided to add a second meeting to its activities.

The president, Thomas H. Shepard, is a teratologist in the Department of Pediatrics at the University of Washington. In addition to training many teratologists, his primary research interests are retinoic acid excess and the effects of nutrients on development, including deficiency of riboflavin, pyridoxine, and iron. The metabolism of glucose by the embryo has also been a subject of his studies with associates. His book A Catalog of Teratogenic Agents (Johns Hopkins University Press, 1998) is in its ninth edition.

1969 to 1970

The meeting was held in late May at the Statler Hilton Hotel on the bank of the Severn River in Annapolis, Maryland. Room charges were $16 to $18 per night, and the facilities were excellent. A small problem developed when we attempted to turn on the slide projector and elevator music filled the meeting room. One of the restaurants in Annapolis featured deli sandwiches named for famous people. The least appetizing was a corned beef on rye called the Spiro Agnew. Invited speakers were Victor McKusick, Philip Fialkow, George Todaro, and Charles Lowe. Bruce Beckwith described what is now known as the Di George syndrome, and another paper reported limb defects in the chick after exposure to Texas sand. The society hired a lawyer to incorporate

the society so that donors could receive a tax exemption. The key feature of the meeting was the spirit generated by Joe Warkany and Virginia Apgar. They gave a sparkle to the meeting and, as Robert Warwick Miller, the president that year, points out, Virginia Apgar now appears on a postage stamp. The president spoke on Teratology in 1970: The National Scene, which now reads like a message in a time capsule (Teratology 1970;3:223–228). Among the newsworthy subjects were monosodium glutamate, defoliants in Vietnam, fallout from nuclear weapons test, the first vaccinations to prevent rubella, the establishment of registries for congenital malformations, and the most prestigious award in pediatrics, received by Dr. Warkany for outstanding contributions in the off-beat subject of teratology. Robert Miller, the president, is a pediatrician who has contributed significant information on the association between congenital defects and various forms of cancer. He works at the National Cancer Institute in Bethesda, Maryland.

1970 to 1971

The annual meeting was held in historic Williamsburg, Virginia, at the Williamsburg Conference Center. The time of year was early May, which allowed the members to explore the old building and houses without much of a crowd. A symposium was organized by Chester Swinyard on the subject of environmental influences on the development of the central nervous system. Two sessions were devoted to the pathogenesis of cleft palate in animals and humans. Fifty-eight papers were presented from the platform. There were no concurrent meetings, and it was necessary to present 10 papers by title only. Jan Langman, the president, was professor and chairman of anatomy at the University of Virginia. He died in 1981. His textbook Medical Embryology (Lippincott, Williams & Wilkins) is now in its seventh edition and is now authored by Thomas W. Sadler.

1971 to 1972

The annual meeting was held at Brown's Lake Resort in Burlington, Wisconsin. The best remembered aspect of the services was the farmer-sized meals offered. Samuel Pruzansky gave the presidential address on interdisciplinary research, drawing on his experience, using a multifaceted approach to the treatment of craniofacial anomalies at the University of Illinois. The Brown's Lake Resort was close to a Playboy Club Resort, but the two facilities could not have been more different. Brown's Lake was run like a children's summer camp, with lots of highstarch food and a milk and cookies snack before bedtime. Dr. Pruzansky died in 1984 (Slavkin, 1984). David W. Smith organized a symposium on osteochondrodysplasia. Invited speakers were Albert Dorfman, Department of Pediatrics, Pritzker School of Medicine, and J.M. Rice from the National Cancer Institute, Bethesda, Maryland. Fifty-five papers were presented from the platform, and 19 papers were read by title. Only two papers dealt with epidemiology of congenital defects.

1972 to 1973

The meeting took place at Gray Rocks, St. Jovite, Quebec, with more than 400 attending. One symposium addressed the possible role of potato blight as a cause of neural tube defects (a hypothesis disproved later). A lecture was given on male sexual development. A new rule designating a nonsmoking section in the meeting hall was put into order. An amusing event occurred when the hotel management laid out female nightgowns in the rooms of male members

with double gender names. Jan Langman, a future (male) president, told of his surprise when, on entering his room, he saw a long purple night dress on the other bed. The front desk had assumed Jan was a woman's name. Eugene (Jean) Perrin was disappointed. Daphne Trasler, the president, is well known for her work in mouse genetics, particularly in studying the pathogenesis of inherited defects. She worked at McGill University until her retirement in 1995. 1973 to 1974 The annual meeting was held on the campus of the University of British Columbia in Vancouver, Canada. The accommodations in dormitories provided a spectacular view of the Strait of Georgia. Many of the tennis players and bathers were disappointed because it rained every day—and we mean rained. Fifty-two papers were presented from the platform and 48 were read by title. There were no concurrent meetings or poster sessions. Guest speakers were Kenneth Jones and Louis Honore, who spoke on fetal alcohol syndrome and placental morphology with spontaneous abortions, respectively. A symposium titled Have We Forgotten Thalidomide? Was presented. James Miller, the president, was a geneticist at the University of British Columbia. He contributed substantially to the field of mouse genetic abnormalities. He was retired, and he died on November 27, 1999, in Vancouver. 1974 to 1975 The meeting was held in Pocono Manor, Pennsylvania, in a rustic setting. The opening lecture by Joe Warkany was on the first 15 years of the society. Symposia

1974 to 1975

The meeting was held in Pocono Manor, Pennsylvania, in a rustic setting. The opening lecture by Joe Warkany was on the first 15 years of the society. Symposia included developmental pharmacology, organized by Tom Shellenberger, and preclinical testing for teratogenicity, organized by James G. Wilson. The practice of concurrent meeting sessions was initiated. E. Marshall Johnson, the president, was head of the Department of Anatomy at Jefferson Medical College and has trained many teratologists who are active in the society. He is especially interested in the development of simple teratogen test systems.

1975 to 1976

The meeting was held at the Highlands Inn, Carmel, California. The location was beautiful but somewhat distant from large airports. Symposia were on the subjects of immunologic aspects of teratology and postnatal manifestations of prenatal or perinatal insult. Papers on facial clefts in domestic animals, the quaking gene and copper, and the parental age of Down syndrome patients were given, among others. The use of poster sessions was initiated. No major changes in the function of the society were recorded. Lucille S. Hurley, the president, brought a number of her graduate students, who wore T-shirts announcing that they were the Hurley's Raiders. Dr. Hurley, who died in 1989, was an internationally known nutritionist, who among other activities was editor of Journal of Nutrition (Keen and Finley, 1989).

1976 to 1977

The annual meeting was held in Reston, Virginia, close to the Washington, D.C., airport. Symposia were given on teratogens, perspectives in teratology, and postnatal defects, chaired by Robert W. Miller, Josef Warkany, and Richard Hoar, respectively. Josef Warkany lectured on ''terathanasia,'' the ''natural'' elimination of congenital defects during prenatal life. Many of the past and future presidents chaired sessions including: Dr. Robert Brent, Dr. Robert Miller, Dr. Tom Shepard, Dr. F.C. Fraser, Dr. E.V. Perrin, Dr. L. Hurley, Dr. J. Langman, and Dr. Josef

Warkany—quite a list of the leaders in the field at the time. Also the tradition was started at the meeting of giving each president an engraved silver bowl. We gave 17 bowls at that meeting to all of the past presidents. An amusing banquet speaker was Father Brian, a Franciscan monk, and there had never been, nor has there been since, such hilarious laughter at a teratology meeting. An art show was held, showing etchings by Josef Warkany and woodcarvings by James Wilson. Robert L. Brent was appointed the second editor-in-chief of the journal Teratology. The president, John L. Sever, was chief of the Infectious Disease Branch, National Institutes of Neurologic Diseases and Stroke, NIH. He is currently professor of pediatrics at the Children's National Medical Center, George Washington University Medical Center, Washington, D.C. He has contributed significantly to the field of infectious diseases, especially during prenatal life and, for the past 10 years, has concentrated on research on human immunodeficiency virus in pregnant women and children.

1977 to 1978

The annual meeting was held on Mackinac Island, Michigan, in the venerable Grand Hotel. There were many interesting aspects to this meeting. The hotel, which is of wood construction, has the longest veranda in the world—the full width of the hotel. There are two presidential suites, where presidents of the United States have vacationed. You could reach the hotel by several routes, but the most interesting was by hydroplane. It was the only teratology meeting that had a unique odor because there were no motorized vehicles and the horses pulling the carriages were not housebroken. The food delivery was true pageantry with fully uniformed waiters marching into the dining hall in grand style. One hundred and twenty-three papers were presented, including 19 by title. Symposia were given on ethical issues in teratology, molecular teratology, and polybrominated biphenyls. These were among the first symposia, if not the first, on ethics and molecular biology. Eugene V. Perrin, the president, is a professor of pathology at Wayne State University; his interests lie mainly in the descriptive aspects of human congenital defects and environmental and pharmacologic care of families in which there are such damaged children. Among his many interests are birdwatching and unusual hats. The birdwatching has contributed to many early awakenings of other recruited members. His other interests are civil liberties and choral singing and conducting.

1978 to 1979

The meeting was held at the Sugar Loaf Mountain Resort in Cedar, Michigan. The setting was delightful but difficult to reach. The registration fee was $15. One hundred twenty-four abstracts were submitted. Four invited speakers were Bruce M. Carlson, University of Michigan (limb anomalies from the perspective of a developmental biologist); Lynnwood B. Clemens, Michigan State University (sex differentiation of behavior in laboratory animals: dysfunction in the absence of congenital malformation); David W. Smith, University of Washington (biomechanical effects in morphogenesis); and K. Lemone Yielding, University of Alabama (DNA repair and co-teratogenic mechanisms). James V. Neel gave an address at the banquet titled Is it possible to monitor for changing mutation rates? The council initiated the Young Investigator Awards. Allan R. Beaudoin, the president, is now professor emeritus in the Department of Cell and Developmental Biology at the University of Michigan. His major research focus is the study of mechanisms of action of chemical teratogens.

1979 to 1980

The twentieth annual meeting was held at Wentworthby- the-Sea in Portsmouth, New Hampshire. One hundred eighty-one papers were submitted, of which 24 were read by title. Four poster sessions were held. A joint session on fetal alcohol syndrome was given by our society with the Behavioral Teratology Society. Four guest speakers included Paul D. McClean (evolution of brain patterns), John H. Grossman (infections as teratogens), Allen Mitchell (epidemiology), and Peter S. Spencer (neurocellular response to toxins). A New England clam bake was held on the beach.

Richard M. Hoar, the president, trained as an anatomist and has worked in the Department of Anatomy at the University of Cincinnati and at Roche Pharmaceuticals. His research has involved endocrines, pregnancy, and birth defects in guinea pigs, as well as developing the care, maintenance, and reproductive data surrounding the use of ferrets in reproductive toxicology.

1980 to 1981

The annual meeting took place on the campus of Stanford University. The dormitories proved to be hot and somewhat inconvenient to the older members, especially at night in the common bathrooms. However, ample icecold wine and soft drinks were made available toassuage the discomfort. One hundred seventy papers were given, and 28 were given by title. Four colloquia were given covering the subjects of ethanol, women in the workplace, radiation, and the regulatory aspects of teratology. An interesting visit to the Stanford Linear Accelerator was arranged. A famous lawyer, Mr. J. J. Butler presented a ringing accusation of bendectin as a human teratogen, using his courtroom style. His presentation was followed by stunned silence, with the exception of one commenter, Tom Shepard, who announced that he did not believe a word of it. His comment was encouraged by a jab in the ribs by Joe Warkany who, under his breath, said ‘‘get up there and say something.’’ Chester Swinyard, the president, was trained as an anatomist but was noted especially for his major contributions to physical rehabilitation of children with congenital musculoskeletal defects. He formed the first Public Affairs Committee. Dr. Swinyard died in 1997 (Fraser, 1998).

1981 to 1982

The annual meeting was held at the resort in French Lick, Indiana—a long bus ride from the airport in Louisville or Indianapolis. Highlights of the meeting included a symposium chaired by Harold Kalter honoring the eightieth birthday of Dr. Warkany. Speakers included Drs. Wilson, Benirschke, Miller, and a former colleague, Eberhard Passarge, from Essen, Germany. A second symposium, titled Prevention of Congenital Malformations. How Are We Doing?, was chaired by Dr. Warkany. This symposium included a presentation by Richard Smithells of England, describing the preventive effects of maternal vitamin supplementation for neural tube defects, the forerunner of folic acid supplementation to rescue susceptible embryos from this fate. A total of 157 abstracts were submitted. At this meeting, there was a change in the manner of electing officers, with the choice of one candidate from two nominees suggested by a nomination committee. The president, William J. Scott, Jr., is a professor of pediatrics at the Children’s Hospital Research Foundation, Cincinnati, Ohio. He continues a longstanding interest in the mechanisms of limb malformations. He has helped train many of the society’s active members.

1982 to 1983

The twenty-third annual meeting was held at the Sands Hotel in Atlantic City, New Jersey. The facilities for scientific proceedings and social gathering were elegant and ample. The boardwalk and the casinos provided excellent opportunities for leisure activities, although a few members found them somewhat distracting. Approximately 100 papers were presented in concurrent sessions, and there were 91 additional presentations as posters; some of those were sponsored by the Behavioral Teratology Society. A symposium on advances in prenatal diagnosis was chaired by Laird Jackson, and another on the role of expert witness chaired by Marshall Johnson. An outstanding talk by Ralph Brinster introduced the members to the relatively new method of inserting foreign genes into mice to generate transgenic animals. The idea for starting an educational refresher course during our annual meetings was brought to the president, Devendra M. Kochhar, by Narsingh Agnish. They proposed it, the Education Committee was formed, and the first course was given at the Annual Meeting the following year. Narsingh Agnish's involvement in this activity continued for many years. Devendra M. Kochhar, the president, is an embryologist at Jefferson Medical College. He initiated and popularized the use of retinoic acid as a teratogen, and he has devoted his efforts to understand biologic and pharmacologic mechanisms of action of retinoids and their nuclear receptors in producing birth defects.

1983 to 1984

The annual meeting was held at the Boca Raton Hotel in Boca Raton, Florida. A symposium honoring James Wilson was presented by his students. Bob Brent, Jim Wilson's first graduate student, gave Dr. Wilson's biography to introduce the symposium. A symposium on postnatal function after prenatal insult was chaired by Casimer Grabowski. A joint symposium sponsored by the Teratology Society and the David Smith Workshop on Malformations and Morphogenesis, chaired by Godfrey Oakley, reviewed the safety of bendectin. Elements in hazard and risk estimation for bendectin were given in a session chaired by John L. Sever. There was an overwhelming response to the inaugural refresher course in teratology, requiring the Education Committee to run two sessions to accommodate the many participants. The facilities at the Boca Raton Club were superb. It was the last bargain meeting that we had. A room cost $75 for both occupants. So for $37.50 you had a room and two banquet-type meals per day. Donations were received from 47 organizations for the 1984 meeting of the society. This excellent response plus savings garnered by hiring and working with two representatives from RSC Associates, who helped in negotiating with the Boca Raton Country Club concerning all meeting costs, resulted in our being able to return a substantial amount of revenue to the society to be used for future meetings. The International Federation of Teratology Societies (IFTS), which was spear-headed by Chester Swinyard, came into being. Dr Robert E. Staples, the president, was the first chairman of IFTS from 1983 to 1985. Robert E. Staples, the president, has been active in animal testing of chemicals for teratogenicity and was associated with Merck and the Dupont Company. He also was the first head of teratology at the National Institute of Environmental Health. He is currently a private consultant.

1984 to 1985

The annual meeting was held at Callaway Gardens, a country club in Pine Mountain, Georgia, with a humidity of 100%. Callaway Gardens is the United States answer to Puerto Rico's rain forest. One hundred forty-two abstracts were submitted. The first Warkany Lecture was given by

Bengt Ka¨lle´n, who discussed malformation registries. Dr. Warkany was present to award one of his etchings to the speaker. The structure for the public affairs committee was revised, and vitamin A and retinoic acid were chosen for the first topic and statement. A symposium was held on potential developmental toxicants, with a new focus on providing clinical teratology information. From the 1984–1985 president, Godfrey Oakley Jr., in 2003: ''On science issues, the 1980s were a time of exciting epidemiologic research into whether or not one or more vitamins could prevent spina bifida. I was a skeptic as were many others in the society. We are a tough bunch to convince. Given that it was vitamin A deficiency in pigs in the early 1930s that first showed the mammalian placenta was not a perfect protector of the embryo/fetus, it is curious that more intense effort was not put into finding vitamin deficiency as a cause of human birth defects. Fortunately, Dick Smithells got on the idea in the mid 1960s and did not let go. Of historical note is that folate deficiency in humans was first identified in the early 1930s by an obstetrician in India named Lucy Wills, who showed that yeast would cure the macrocytic anemia that killed so many Indian women. No U.S. body would support a randomized controlled trial, but the U.K. MRC did and, of course, I learned of the results of that study early at the 1991 meeting of the Teratology Society. ''As I said in my Warkany lecture, there are three great human teratogens so far: alcohol, rubella, and folate deficiency. The 1980s were the years of important research on the issue of vitamins and birth defects with the extraordinary findings of the MRC study in 1991 giving us the possibility of making very serious birth defects disappear through population-based programs of folic acid fortification of foods. The Teratology Society policy statements were helpful in the policy discussions that led to FDA requiring that 'enriched' grains be fortified with folic acid. Now, more than 40 countries have followed the lead. I spend a great deal of my time now trying to assist those trying to make folic acid fortification a reality in other countries. It is a current tragic irony that the country that paid for the MRC trial—the United Kingdom— has yet to fortify. The citizens of the U.K. have yet to have the benefit of population-wide consumption of a folic acid-fortified flour and flour products like brea. It would be my dream that by 2010, 90% of 250,000 annual folic acid-preventable birth defects are prevented around the world—a goal that I think is achievable if we help the world understand how cheap it is to do this good work and how effective it is in improving the lives of children. As Dick Smithells once said, it may be that a great by-product of doing this prevention will be to have the public to understand that birth defects can be prevented, they are not due to some supranatural force or simply due to chance. Such a change in public attitude could lead to a commitment to solve the birth defects problem, as there now is commitment to solve the cancer problem. Such a change in public attitude would bring a glorious infusion of resources.'' Godfrey Oakley, the president, who trained in pediatrics and epidemiology, played a major role in establishing a congenital defects center at the Centers for Disease Control and Prevention (CDC). He is currently in the Department of Epidemiology at Emory University and is a leading advocate for the consumption of folic acid by women to prevent the occurrence of neural tube defects.

1985 to 1986

The annual meeting was held at the Boston Park Plaza Hotel. There were several symposia, including one on models of abnormal morphogenesis in honor of Clarke Fraser. Another symposium was held on thalidomide in honor of the twenty-fifth anniversary of the discovery of this tragic human teratogen. The speakers included Joseph Warkany, Widikund Lenz, Frances Kelsey, and a graduate student from McGill who was considered to have limb defects caused by thalidomide. The Public Affairs Committee held a workshop on the new Teratology Information

Services in honor of the late Sergio Fabro, who had established the Reprotox information system. A total of 190 abstracts were submitted. The second annual Warkany Lecture was given on the subject of insertional mutagenesis, by Philip Leder, M.D., chairman of the Department of Genetics at Harvard Medical School. A harbor cruise was the entertainment one evening. This was the first meeting for which an independent broker had negotiated room rates for the society. Unfortunately, it was also clear that the apparently ''low'' rates were higher because of his fee. A full-time fundraiser helped significantly to increase donations. Lewis B. Holmes, the president, is a teratologist and geneticist in the Pediatric Service at the Massachusetts General Hospital in Boston. His interests are in the epidemiology of congenital malformations and limb defects and in identifying human teratogens. He is the current editor of Teratology.

1986 to 1987

The annual meeting was held at Las Palmas Resort, Rancho Mirage, near Palm Springs, California. The weather was warm, even in the evenings, and the support facilities were excellent. The symposia were on diabetic embryopathy, the yolk sac, and the influence on chemical disposition on developmental toxicity. Also addressed was the subject of the influence of scientific societies on regulatory and legislative process. The Warkany Lecture was given on the placenta by Kurt Benirschke, using the title You Need a Sympathetic Pathologist: The Borderland of Embryology and Pathology Revisited. No major changes in policy or procedures were recorded. One member ''lost'' his trunks in the spa and was awarded them the next day by several ladies as he was presenting a paper from the platform. The Behavioral Teratology Society held its 11th annual meeting concurrently and put on a symposium entitled Social Behavior as an Endpoint of Toxic Insult. Carole Kimmel gave an update on federal regulation, and Ken Jones gave a talk on craniofacial malformations as a window to prenatal brain development.

The president, Andrew Hendrickx, is an expert in subhuman primate embryology at the University of California at Davis. His laboratory has published many important teratology studies, using nonhuman primates as subjects.

1987 to 1988

The annual meeting was held at a beautiful grand old hotel, The Breakers, in Palm Beach, Florida. The hotel staff provided excellent service, and the food was tasty. A total of 201 abstracts were submitted, of which three were read by title. The Warkany Lecture was presented by past president Dr. Thomas Shepard and was titled Borderlines Between Human Embryology, Teratology and Medicine. Symposia were held on teratology in the 1990s, developmental biology and teratology, and educational perspectives in clinical teratology. Cas Grabowski's son, Bob, and his jazz band provided the musical entertainment for the meeting. Casimer T. Grabowski, the president, has been a professor emeritus of biology since 1992 at the University of Miami. His work on the physiologic changes in chick embryos after teratogenic exposures led to important concepts of teratogenesis in mammals. Dr. Grabowski is an excellent wood craftsman, and he presented the society with a gavel, which is handed down each year to the next president. Dr. Grabowski died on December 16, 2007 (Daston and Rogers, 2008)

1988 to 1989

The annual meeting was held at the Jefferson Sheraton Hotel in Richmond, Virginia. This site was a last-minute choice after plans in Philadelphia were canceled, because the costs were too high. The hotel facilities and service were of good quality. An excursion on a dinner boat was memorable for the ferocious thunderstorm that occurred during the trip. The staircase in the hotel had inspired the one featured in the film Gone with the Wind, and our president decoratively descended these stairs into the reception meeting. The International Federation of Teratology Societies presented a draft of the International Conference on Harmonization for Teratology Testing in Animals, which was a benchmark for interaction of regulators, scientists, and the pharmaceutical industry. Symposia were held on assisted reproduction, regulatory issues, valproic acid, low lead exposure, computer use, biostatistics of segment II studies, threshold concepts in risk evaluation, and regulation of therapeutically useful human teratogens. The Public Affairs Committee presented a draft of a position paper on two retinoids, etretinate and isotretinoin. The Wilson Lunch for Students was initiated, and a line item of budget $10,000 was approved for Student Travel Awards. The Student Affairs Committee was made a standing committee. An agreement was signed by the president, Mildred Christian, for archiving and preserving the society's records at the College of Physicians of Philadelphia. A new position, vice-president– elect, was approved to give the president 2 years of experience before holding office as president. Mildred S. Christian, an officer in Primedica-Argus in Horsham, Pennsylvania, has contributed widely to the field of animal testing of drugs and other chemicals. Dr. Christian died on March 26, 2009 (Diener, 2009; Diener and Hoberman, 2009). A Special Issue on Developmental and Reproductive Toxicity Study designs for Pharmaceuticals published in Birth Defects Research Part B (2009;86:417– 469) was dedicated to Dr. Christian by the authors.

1989 to 1990

The annual meeting was held at the majestic Empress Hotel in Victoria, British Columbia. Members were able to watch whales or tour the city in off-hours, but the travel expenses were high for those from the eastern United States. Dave Kochhar gave the Warkany Lecture on the role of retinoic acid as a morphogen and teratogen. Symposia included the role of homeobox genes in normal development and the mimicking of homeobox mutations to produce congenital limb and spinal cord defects. Another subject was the gene regulation of programmed cell death. A review of the effect of cocaine as a human teratogen was presented. The after-dinner speaker was a professional comedian who posed as a Soviet bureaucrat with a background in developmental toxicology. The council met twice at 6-month intervals, and a newsletter was initiated. Ernest F. Zimmerman, the president, is a pharmacologist at the University of Cincinnati, with special interests in the genesis of facial clefts.

1990 to 1991

The annual meeting was held in Boca Raton, Florida, and it rained every day. The Wiley-Liss symposium, Organizational Control in the Embryo: Potential Targets for Developmental Toxicants, gave excellent examples of the importance of molecular and cellular biology in the understanding of birth defects. Two other symposia, sponsored by the Teratology Society, Neurobehavioral Teratology Society, and the International Federation of Teratology Societies, were on improving approaches to the characterization of developmental neurotoxicity and international regulatory concerns. Another symposium was entitled Where Is the War to Prevent Birth Defects? Preimplantation factors that lead to birth defects were also addressed. A record

number of abstracts was submitted. During Carole A. Kimmel's presidency, the practice of appointing a separate program chairman and election of both a vice president and president-elect was initiated. A long-range plan (blueprint) for the society was developed. The meeting was held in conjunction with the International Federation of Teratology Societies under the chairmanship of Takashi Tanimura. Society members were active in public meetings regarding Accutane, and a campaign to reduce neural tube defects by the use of folic acid was beginning. Richard K. Miller chaired a group to help make a long-range plan for the society during the next 10 years. Dr. Kimmel has had a leadership role in improving regulatory aspects in the government and is a senior scientist at the Environmental Protection Agency.

1991 to 1992

This year was marked by the passing of Dr. Josef Warkany— viewed as one of the fathers of modern teratology and one of the three founders of the Teratology Society (Brent, 1982; Wertelecki, 1989; Kalter, 1993; Cohen, 1994; Miller, 1995).

The annual meeting was held at the Boca Raton Hotel and Club in Florida. The services and hospitality were appreciated. A musical black-tie event featured the internationall renowned Leslie Holmes, wife of past president Dr. Lewis Holmes. Dr. Robert L. Brent gave the Warkany Lecture. Symposia were held on newer techniques for measuring development, cardiac development, and U.S. Food and Drug Administration classification of drugs. Nicolas Wald from London gave a keynote address on the sentinel study demonstrating that folic acid administration reduced the recurrence of neural tube defects. Mason Barr detailed the syndrome associated with angiotensin converting enzyme inhibitor fetopathology. Keynote speeches were given by Arthur A. Levin and Robert Areci on retinoid receptors and embryonic signaling, respectively. It was announced by Dr. Godrey Oakley during the 1992 meeting by that there was finally proof that folate supplementation reduced the incidence of neural tube defects, based on international investigations led by Dr. Nicholas Wald and colleagues. The society voted to change the meeting venue for the 1992 meeting from Snowbird, Utah, because a new Utah abortion law placed members of the society in Utah (who provide abortion counseling as part of their Teratology Counseling) at risk for being prosecuted for patient counseling that is permitted in the rest of the United States. To enhance the productivity and energize the society in the public arena, a number of ad hoc committees were formed to address issues of human research and the use of animals in teratology research. Committees were formed to link with other organizations - OTIS, American College of Obstetricians and Gynecologists. A committee was developed to provide a slide set for the membership to use for spreading the word about birth defects research to the public. The secondary benefit of these ad hoc committees was to bring more of the membership into the operations of the society's mission and goals. Richard K. Miller, the president that year, is a toxicologist at the University of Rochester. His special interest is the role of the placenta in teratogenesis.

1992 to 1993

The annual meeting was held under bright sun in Tucson, Arizona. You could use the tennis courts only from 5:00 to 6:00 AM or from 9:00 to 11:00 PM; otherwise, you could fry an egg on the court surface. The president, Dr. Barr, introduced the meeting with a short slide show pointing out that teratology is not the study of turtles, terrorists, pterodactyls, or terra firma, but of birth defects, which is also done by the National Enquirer. Use of the word teratology is still

being debated by the society. Symposia were held on women's rights in teratology and genetics, environmental risks, and folic acid in the prevention of neural tube defects. There were 187 (24% of members) abstracts offered by 785 members of the society. The Josef Warkany Art Exhibition was held at the annual meeting, where 20 originals of his more than 80 works were displayed for the membership. Mason Barr, Jr., the president, is a pediatrician and perinatal pathologist at the University of Michigan. He continues a long productive experience in detecting, describing, and treating human fetal and infant congenital defects.

1993 to 1994

The annual meeting was held at the Hotel El Conquistador in Puerto Rico, and the site had a spectacular view of the Caribbean. A near-record number of abstracts (204) were submitted. Symposia were held on antisense DNA techniques, endocrine endpoints, dysmorphology and deafness, morphogenesis of the face and brain, the pregastrulation embryo, reproductive testing of biochemical agents, animal care and use, public affairs and the American Medical Association, and an update on hereditary malformations. The banquet was addressed by the Honorable Pedro Rossello, M.D., Governor of Puerto Rico. The president, James W. Hanson, a pediatric geneticist with special training in dysmorphology and epidemiology, is active in Washington, D.C., at the clinical epidemiology branch of the National Cancer Institute.

1994 to 1995

The annual meeting was held at the Marriott Hotel in Newport Beach, California. The support facilities were excellent, and 176 abstracts were submitted. The membership numbered 816. Symposia were held on advances in imaging, interface between research and public educationwith acquired immunodeficiency syndrome as a model, and limb dysmorphogenesis. Through the use of concurrent sessions and poster presentation, all abstracts were presented. During this year, a continuing increase in abstracts drawing on molecular genetics was evident.The renegotiation of our contract with Wiley-Liss for publication of Teratology was successfully completed. The Teratology Society Code of Ethics was invoked for the first—and thankfully only—time to expel a member for conduct that was detrimental to the interests of the society. This demonstrated the society's commitment to the principled conduct of science. A determined effort was made to open the governance of the society to input from and participation by its membership. John DeSesso, the president, works for the Mitretek Corporation of McLean, Virginia. His main interests are in the areas of animal models and mechanisms of teratogenicity.

1995 to 1996

The annual meeting was held at Keystone, Colorado, at more than 10,000 feet high in the Rocky Mountains, west of Denver. The surroundings were spectacular, but some members had mild altitude illness, while one or two had severe symptoms. Our quota of occupied rooms was missed, and as a result the Society developed a debt that could be paid only by a return visit, which occurred in 1999. The number of abstracts dropped by 25% to 151. Symposia were held on brain development, molecular teratology, and the therapeutics of teratogens and hormonal effects on development. The Wilson Award dinner was held at Timber Ridge, a gondola ride up from the meeting level. Kathleen Sulik, the president that year, is a professor of anatomy and developmental biology at the University of North Carolina. She is known especially for her effective scanning electron microscopy to explain the pathogenesis of teratogenic events.

1996 to 1997

The 37th annual meeting was held in conjunction with the Neurobehavioral Teratology Society, the Behavioral Toxicology Society, and the 10th meeting of the Organization of Teratology Information Services at the Breakers in Palm Beach, Florida. The hotel lived up to its expected elegant services and hospitality. Symposia were held on molecular mechanisms of development, heart development, congenital infections and teratogenesis, teratogenic hazards, and risks and dietary prevention of birth defects. Godfrey Oakley gave the Warkany Lecture on preventing birth defects, Rubella, Alcohol and Folic Acid are Better Models Than Thalidomide, Valproic Acid and Accutane. Of the 145 abstracts submitted, 14 were on epidemiology and 13 dealt with molecular genetics of development. Membership was 798. Jose F. Cordero, the president, is a pediatrician epidemiologist who works for the CDC. He is currently leading the program for varicella vaccination in the United States.

1997 to 1998

The meeting was held on a peninsula projecting into Mission Bay, California, adjacent to San Diego. The site was a virtual botanical garden with numerous lagoons and a variety of birds. The Princess Resort provided excellent meeting facilities. The palm trees wrapped with lights looked like giant banded chromosomes at night. A symposium on thalidomide examined the pros and cons of its reintroduction for treatment of certain desperate disorders. Other symposia addressed genetic susceptibility, gene mapping, arsenic, and the teratologist's role in legal matters. The society hired a new professional management group, the Associated Development Group. Twenty members representing different segments of the Society drew up a strategic planning initiative at a separate 3-day meeting. A new mission statement was formulated. The discussion about changing the name of the Society was tabled and referred back to a committee chaired by David Beckman. Topics addressed by the long-range group included financial management, cost of attending the meetings and partnering with other societies. The Clarke Fraser Young Investigator Award was initiated and presented by Fraser to Edward Lammer. Philip E. Mirkes, the president, was trained in developmental biology and is research professor of pediatrics at the University of Washington, Seattle. His work has been with the metabolism of cyclophosphamide, heat shock proteins, and the cascade of events leading to cell death.

1998 to 1999

The last years of the century saw the Teratology Society become more modern in the conduct of its business. The 1999 meeting in Keystone, Colorado, was the first annual meeting for which electronic abstract submission was the norm, and this was the first full year that the society used a professional management group, which continues to this day. Nancy Dieter, the first executive secretary of the society under the management with Associated Development Group, left for another position. Nancy had done much of the initial work in transferring the society from its old self-run business office to a more efficient arrangement at Associated Development Group. Among Nancy's most visible accomplishments was the publication of the newsletter in a more professional format. While this format was very popular, it was costly, in part because of frequent last minute changes and additions. Nancy was replaced by Tonia Masson, who recognized that the society needed to get costs under control. Tonia put in place a firm schedule for the newsletter, with no tolerance for late submissions or later changes. In addition, Tonia and

Secretary Bob Seegmiller worked on an electronic version of the newsletter, which was planned to replace some or all of the printed newsletters. Perhaps the greatest challenge for the Society this year was the annual meeting at Keystone Resort in Colorado. The site for the meeting had been forced on the Society to fulfill a financial obligation. That financial obligation had been incurred 3 years earlier, when attendance fell short of a guarantee. Some members did not plan to attend because they had been uncomfortable or ill at high altitude at the previous Keystone meeting. Finally, the timing of the meeting included the July 4 holiday weekend, another condition forced on the society. Some members found it unacceptable to be away from home on the holiday. Because the society still needed to make a guarantee to the resort, there was a possibility of another financial shortfall. The ending was happy, however. Although the total number of abstracts was 40% lower than usual, skillful management by the program chair, George Daston, and by the meeting planner, Clarissa Russel Wilson, resulted in the meeting at least breaking even and perhaps making a little money. Symposia were held on oxidative stress, apoptosis and abnormal development, skeletal development, and postmarketing surveillance of drugs for teratogenic effects. Of more importance, the scientific sessions were of high quality, and attendees were more than satisfied with their decisions to attend the meeting. As an added bonus, the annual business meeting, for which 90-minutes had been allowed, took only 50-minutes, thanks to the efficient use of time by committee chairs and officers who gave reports. It is likely that this year was the first time in the history of the society than an Annual Business Meeting took less time than allotted. At the banquet, a slide show of baby pictures of various members entertained the guests. At the meeting, Mineo Yasuda, co-president of the International Federation of Teratology Societies announced that the sixth meeting of the Organization would be held in Shimane, Japan, July 12 to 14, 2000. The president, Anthony Scialli, is an obstetrician trained in pharmacology. He is editor-in-chief of Reproductive Toxicology and an author of Reproductive Effects of Chemical, Physical and Biologic Agents, Reprotox (Johns Hopkins Press, 1995). This above book is maintained on an updated database with TERIS (Teratogenic Information Service) and Shepard's Catalog of Teratogenic Agents by Micromedex (Denver, Colorado).

1999 to 2000

The 2000 annual meeting was held at The Breakers Hotel in Palm Beach, Florida. We had little choice in site selection; we had failed to fill our room block during the 1997 meeting, because of overly optimistic forecasting on our part, and the hotel presented us with the choice of either paying a substantial financial penalty or holding another meeting at the facility. Fortunately, the society was able to occupy almost 2000 room-nights, which was in line with attendance during the 1995 to 1998 period, and fulfilled our obligation to the hotel. The entertainment at the meeting was provided by Ed Carney's band, Three Penny Swing, who were able to travel from Michigan to Florida thanks to a generous contribution from WIL Laboratories. Past president Bill Scott gave the Warkany Lecture, titled Alteration of Pattern Formation as a Mechanism of Teratogenesis. The meeting program was diverse, with sessions ranging from molecular mechanisms to toxicokinetics, clinical teratology, and epidemiology. Most of the council's and professional staff's activities during the year were directed toward fulfilling the key elements of the society's strategic plan, particularly in the areas of annual meeting planning, fundraising, and continuous improvement of the journal. These areas of focus were important in encouraging greater participation in the society, but also, and more pragmatically, in putting the society on an even financial keel. Annual meeting planning was put in the hands of our professional staff, who have guided us ever since in choosing sites that allowed us to lower our overall costs and

(usually) to offer the possibility of lower cost housing near the host hotel. This has provided us the opportunity to lower the meeting registration fee while increasing the percentage of revenue that goes to the society. Fundraising was highly successful during the year, such that government grants and corporate contributions, both in the form of sustaining membership and support for the annual meeting, topped $110,000. We had 29 corporate members in 1999 to 2000. Many of these companies no longer exist because of heavy merger and acquisition activity in the ensuing decade. The Society received two R13 grants from the NIH that year, one to support student travel and another to support a satellite meeting on the then-new subject of genomics. Sons, the publisher of the journal. The existing contract with the publisher was not due to expire until the end of 2002, but because the relationship between the society and Wiley was not good, both parties thought it best to start the negotiations early for a contract renewal. Although the final contract was not signed until the summer of 2002, the critical changes to the contract were decided in 2000, including the decision to publish three journals and Wiley's agreement to improve the quality of the journals and to share revenue in a meaningful way. Another important conclusion of the strategic planning meeting was that the society needed to do more to project its identity and purpose. One way to address this was to make changes to the logo. After much discussion, and even an on-line survey, the collective decision was made to modify the existing logo of an embryo in a circle to include the words Birth Defects Research. George P. Daston, the president, is a Research Fellow at the Procter and Gamble Company, with interests in mechanisms of abnormal development, product safety, and public health.

2000 to 2001

The meeting was held in the beautiful city of Montreal. A key focus of the meeting was emerging technologies that promised to have a major effect on detecting and understanding birth defects and developmental toxicity. Starting with the continuing education course titled Principles of Teratology: Application of New Technologies Towards Understanding Abnormal Development and continuing to the last session of the annual meeting, entitled Using Genomics to Understand Birth Defects, new technologies and discoveries were featured. In addition to the Teratology Society's 41st annual meeting and those of our sister societies NBTS and OTIS, there followed a satellite meeting titled Genomics, Proteomics, Bioinformatics, and Developmental Toxicology in the 21st Century. This workshop was organized by past president Philip Mirkes, at the request of the current president, Robert Kavlock. Earlier in the annual meeting Dr. Mirkes had delivered the Warkany Lecture, titled To Die or Not To Die, on the topic of programmed cell death in the embryo. This was the first year that the Society submitted a grant application to the NIH for support of student travel to the meeting. Dr. Ida Smoak served as the principal investigator for the grant. During the year, we were able to maintain a sound business plan that helped to re-establish the financial foundation of the society. Dr. Robert J. Kavlock, the president, is Director of the National Center for Computational Toxicology, part of the United States Environmental Protection Agency in Research Triangle Park, North Carolina. His current research interests are aimed at using new technologies to transform toxicologic risk assessment.

2001 to 2002

The 42nd annual meeting was held in Scottsdale, Arizona. Highlights included an outstanding education course on integrative risk assessment, the Warkany Lecture by Ken Jones, and a special address by Jose Cordero, Director of the CDC's new National Center on Birth Defects and Developmental Disabilities. Our second strategic planning session was held in Nashville,

Tennessee, in March 2002. Six areas were identified as being most important for the society's future, and plans were developed to enhance each. The areas of focus were the annual meeting, scientific issues related topublic policy, the Web site, the journal, our educational activities, management of our society, and communication with our members. A number of changes were implemented to relaunch Teratology as a new three-part journal: Birth Defects Research. Phil Mirkes was named editor of Part A, Clinical and Molecular Teratology; George Daston was chosen as editor of Part B, Developmental and Reproductive Toxicology; and Rocky Tuan was selected as editor of Part C, Embryo Today—Reviews. Dr. Jan Friedman, the president, is Professor of Medical Genetics at the University of British Columbia. His research bridges clinical genetics and basic science, with interests in neurofibromatosis, teratogenic risks from medications used during pregnancy, and the application of advanced genomic technologies to identify causes of mental retardation.

2002 to 2003

The Annual Meeting was held in downtown Philadelphia. Dr. Patricia Rodier presented the Josef Warkany Lecture to the society, titled Autism as a Birth Defect. Dr. Rodier's studies demonstrated that the autism spectrum of disorders could be studied like other birth defects and might be prevented. Dr. Ann Streissguth was the 2003 Decade of Behavior Distinguished Lecturer and presented a 30-year perspective on fetal alcohol syndrome research. A social highlight of the meeting was a tour of the Mutter Medical Museum, which displayed display historical materials and curiosities from over 150 years of medicine. Thanks to the efforts of many including Barbara Abbott, George Daston, Jan Friedman, Richard K. Miller, Phil Mirkes, and Rocky Taun, among others, the first issues of the society's new three-part journal, Birth Defects Research, were published. For the fourth year since its inception in 2000, the James G. Wilson Publication Award, recognizing the authors of the best paper published in Birth Defect Research, was presented by the society. For the second year, many students enjoyed the society's Sunrise Minicourse. The Teratology Society's March of Dimes Symposium provided a forum for the review of the recent literature describing an increased incidence of malformations in children born to mothers who used assisted reproductive technologies. Dr. William Slikker, Jr., the president, is Director of the National Center for Toxicological Research (FDA), in Jefferson, Arkansas. His research interests include developmental toxicity and childhood obesity. He has also been the force behind the annual Teratology Society volleyball game, which was held for the 22nd time at the meeting in 2003.

2003 to 2004

The 44th annual meeting was held in beautiful Vancouver, Canada, on June 26 to July 1, 2004. On Saturday and Sunday, the education course was title Signaling Pathways and Tissue Interactions in Organ-System Development,'' and it was well attended. Also on Sunday, both the March of Dimes Symposium on RNA Interference (RNAi) Approaches to the Study of Normal and Abnormal Development and the Maternal-Fetal Medicine Symposium on Teratogenic Implication of Maternal Disease and its Treatment were held. On Monday, the progress of the National Children's Study was presented. Dr. Carl Keen (University of California–Davis) was the Josef Warkany lecturer, and Dr. Louisa Tang (Baylor College of Medicine) was the James G. Wilson Publication awardee. Special lecturer Dr. Judith Hall (University of British Columbia), discussed fetal determinants of long-term health. The Student Plenary Session showcased our student members. The Environmental Protection Agency (EPA) presented a symposium on

Computational Systems Biology and Implications for Developmental Toxicology From Molecules to Systems. The mini-course on Tuesday was titled Epidemiology: The Basics. On Tuesday, the Public Affairs Committee (NBTS/TS Joint) Symposium presented Birth Defects and Other Adverse Pregnancy Outcomes Due to Maternal Obesity, and the concurrent NBTS/TS Joint Symposium presented Neurohavioral Outcomes of Common Exposures.On Wednesday, the SPERI/TS Joint Symposium on Epidemiology of Miscarriage was presented. Platform and poster sessions throughout the meeting also presented state-of-the-art approaches and data on Mechanisms of Abnormal Development, Clinical Teratology and Epidemiology and Genomics/Molecular Biology and were well and enthusiastically attended. The 10 exhibitors were also well received. On Thursday, the Wiley-Liss Symposium on The Role of Neural Crest Cells was presented. The topics in this meeting presaged and introduced new directions, interests, and science now coming to fruition in the 21st century. Society members continue to be in the forefront of research in developmental biology and toxicology at the population, individual, organ, cell, and molecular levels. Dr. Rochelle W. Tyl, the president, is a Distinguished Fellow and Director of Developmental and Reproductive Toxicology at Research Triangle Institute International, Research Triangle Park, North Carolina. Her research interests include risk assessments for reproductive, developmental, and neurotoxicity, and mechanisms of abnormal development.

2004 to 2005

The 45th annual meeting of the society was held on the shore of the Gulf of Mexico in sunny St. Petersburg Beach, Florida. The meeting program was a balanced mix of cutting-edge basic knowledge and technologies, clinical presentations,toxicity testing, and clinical presentations. Past president Tony Scialli presented the Warkany Lecture. The continuing education course was on basic research and potential clinical applications of stem cells. Other sessions covered use of preclinical data by clinicians, testing for effects on the developing central nervous system and immune systems, as well as a session focused on emerging ‘‘-omics’’ technologies and gene regulatory elements in development. During the meeting, there was a wonderful dinner and tour at the Salvador Dali Museum in Tampa. Dr. Kenneth Lyons Jones, the president is Professor of Pediatrics at the University of California–San Diego. His interests are in the area of clinical teratology and dysmorphology.

2005 to 2006

The meeting at the Loews Ventana Canyon Resort, Tucson, AZ marked the second time that our annual meeting had been held at this beautiful desert site. Placed at the foot of a steeply rising mountain, temperatures could soar above 100 degrees in mid day, walks in the early mornings and evenings would reveal the gorgeous desert flora and fauna, particularly the unique Seguaro cactus. The annual meeting kicked off with a continuing education course on vertebrate embryology, with excellent lectures by many of the leaders of the society. Past president George Daston presented the Warkany Lecture, which was a forward-looking talk on how the still-emerging sciences of genomics and bioinformatics can be used to more efficiently evaluate the potential developmental risk of chemicals. The first Robert L.Brent Lecture was presented by John Rogers, who spoke about the developmental toxicity of methanol. The meeting included a session that provided an update by speakers from around the world on efforts toward international harmonization of terminology in developmental toxicology, an excellent session on endocrine disrupting chemicals and their effects in humans and animals, a roundtable on

communicating teratogenic risk, an update on the National Children's Study by past president Carole Kimmel, the March of Dimes Symposium
on myogenesis, and sessions on emerging infections and their potential impact on pregnancy. After a session on pediatric safety evaluation and a rare diseases symposium, the Wiley-Liss symposium on microRNAs in development brought attendees up to date on this exciting new biology. The meeting ended with a session on thyroid hormone and brain development. Melissa S. Tassinari, the president, was a developmental toxicologist and risk scientist at Pfizer Central Research. She is currently working on similar topics for the U.S. Food and Drug Administration.

2006 to 2007

It was enjoyable to have the annual meeting in the center of a big city again. Pittsburgh had a lot to offer, including a beautiful riverside setting, numerous restaurants, lots of places to walk, and the Pittsburgh Pirates. A great feature of the meeting was the Mentor Corps booth that was set up to video senior members of the society and their students as they reminisced about their lives in the Teratology Society. The Warkany Lecture was delivered by Ann Streissguth, who presented an excellent update on fetal alcohol spectrum disorders and public health, a theme that was a focus of the meeting. Past president Ken Jones, one of the original describers of the fetal alcohol syndrome, presented the Robert L. Brent Lecture, titled Alcohol and Pregnancy: What Have We Learned in 30 Years? The Teratology Society, the Neurobehavioral Teratology Society, and the Organization of Teratogen Information Services then held a joint symposium on fetal alcohol spectrum disorders. The March of Dimes Symposium was on epigenetics and developmental programming of metabolism, an area of rapidly growing concern. Another burgeoning scientific advance was covered in a symposium on the application of high information-content technologies in reproductive and developmental toxicology. Personalized nutrition and medicine was also featured in a symposium. Our third strategic planning session was held during this year, a great effort by all who participated. The report from this session was included in the program for the 2008 meeting. Elaine Faustman, the president, is a professor of Environmental and Occupational Health Sciences at the University of Washington. Her research interests include developmental toxicology, risk assessment methodologies, molecular mechanisms of metals, and pesticides.

2007 to 2008

The 48th annual meeting was held on the shores of Monterey Bay, California. Despite huge fires raging nearby, the climate was ideal with the exception of occasional ash in the air. Many attendees made time to visit the fabulous Monterey Aquarium. For the first time, the Teratology Society offered Continuing Medical Education for sessions during the meeting. The meeting program issue of Birth Defects Research, Part A, included a report from the 2007 Teratology Society Strategic Planning Session, which provided a strong vision and direction for the next 5 years. The meeting kicked off with a continuing education course on central nervous system functional teratology. The Warkany Lecture was given Dr. Richard Finnell, who spoke about genetic susceptibility to teratogens.
There were interesting sessions on hypoxia and on vascular disruption in the etiology of birth defects, two related topics with a long history in teratology. A symposium on embryonic stem cells brought attendees up to date on this exciting new area, both in terms of possibilities for therapeutics and the basic underlying biology of stem cells. There was a special and well-attended evening session on teaching embryology/teratology in the 21st century.

The final session of the meeting explored the biology of left-right patterning during development and relationships to human malformation syndromes. Phil Mirkes, who did a fantastic job of launching Birth Defects Research, Part A: Clinical and Molecular Teratology, completed his 5-year term and was replaced by the new editor, Diana Juriloff.
Thomas Knudsen, the president, is a research scientist at the Environmental Protection Agency. His research takes a systems biology approach to modeling normal and abnormal development using cutting edge technologies.

2008 to 2009

The annual meeting was held in Rio Mar, Puerto Rico, on the shore of the Caribbean Sea. The theme of the meeting was Gene-Environment Interactions: Impact on Maternal and Child Health. The meeting started off with a fascinating pair of courses—the first time that two separate, but related, courses were offered at the annual meeting. The morning course was Epigenetic Mechanisms, and the afternoon course was Adult Disease Outcomes of Developmental Programming. The Warkany Lecture was given by Jan Friedman, whose talk was titled Clinical Teratology: In Bed with the Devil? A new feature of the meeting this year was a box lunch session, during which we enjoyed a box lunch while hearing the Robert L. Brent Lecture by Gideon Koren, who spoke on the use of natural products in pregnancy. Other sessions in the meeting included a lecture on fetal origins of adult disease, maternal obesity and pregnancy, gene-environment interactions in neurodevelopment and autism, effects of diet on pregnancy outcome, and a session on global issues in maternal and child health. There was also the interesting and well-attended Pregnancy Registry Workshop cosponsored by the Teratology Society and the Organization for Teratology Information Services. The meeting wrapped up with a cutting-edge Wiley-Blackwell symposium on gene regulatory networks in developmental biology and computational toxicology.
Christina Chambers, the president, is an Associate Professor of Pediatrics at the University of California–San Diego School of Medicine. Her research interests include the safety of medications during pregnancy.

2009 to 2010

The 50th Annual Meeting of the Teratology Society! The meeting is being held in Louisville, Kentucky, near the birthplace of the society in Cincinatti, Ohio. For this special occasion, a number of celebratory events are featured in addition to a diverse and exciting scientific program.
The continuing education courses are on prenatal and postnatal drug disposition. The Warkany Lecture will be given Diana Juriloff, the editor of Birth Defects Research, Part A. A session on the history of the Teratology Society and a look back at the thalidomide tragedy 50 years later will be the features of the historical focus of the meeting. However, the newest breakthroughs and concepts are also prominent in the program, including a session on the pros and cons of supplementing the food supply with vitamin B12, and a closing session on applying advances in the -omics technologies to regulatory approaches to preventing birth defects.
Barbara Hales, the president, is a Professor of Pharmacology and Therapeutics at McGill University, Montreal, Quebec, Canada. Her research interests include mechanisms of teratogenesis, male-mediated developmental toxicity, and epigenetics.

2010 to 2011

The 2011 annual meeting will be held at the Loews Coronado Bay Resort in Coronado, California, June 25 to 29. John Rogers, who will be president, is a developmental toxicologist at the Environmental Protection Agency in Research Triangle Park, North Carolina.

2011 to 2012

The 2012 annual meeting will be held at the Marriott Baltimore Waterfront. John Graham, who will be president, is a clinical geneticist and pediatrician at the University of California–Los Angeles.

NUMBER AND TYPE OF ABSTRACTS SUBMITTED TO THE ANNUAL MEETING

A review and classification of all the abstracts submitted to the annual meetings before 2000 was performed. The type of abstract for each of the first 39 years was expressed as the percentage of total annual submissions. In some cases, an abstract was placed in two categories. For example, an animal study with a null mutation would appear under animal studies and developmental biology; in the case of an epidemiology paper studying a mutation, it would appear under both epidemiology and developmental biology. From 2000 to 2009, the numbers of abstracts were averaged and, with the numbers in Table 5, used to create Figure 1, showing the average numbers of published abstacts for each decade. The main body of work defied classification; it included studies of effects of agents on animals, mechanism studies, and neurobehavioral studies. There were many excellent pharmacologic articles. During the early periods, there were many articles dealing with cleft lip and palate that may have reflected the influence of Clarke Fraser on his students and associates. Table 5 gives the mean 6 SE for the total number of abstracts and the percentage of types of abstracts. The average total abstracts increased significantly from 1961–1969 to 1970–1979 and from 1971–1979 to 1980–1989, but remained much the same in 1990–1999 (Table 5). The ratio between abstracts submitted and the total membership ranged between 0.18 to 0.24, with no obvious change over time. Joe Warkany and Clarke Fraser used to tell us that if you had good results you did not need statistics. The animal studies included mammalian species, whereas chick and whole-embryo culture studies were excluded in the tabulation. No significant differences were found. The epidemiologic studies did not change much until the last period, when a significant increase to 10% was noted. This increase can be explained in part by participation from members of the Organization for Teratology Information Services group, especially the San Diego and Toronto groups. Active participation from the surveillance groups at the CDC and the State of California continued to be important. Charlotte Ferencz and her group in Baltimore contributed valuable articles on the epidemiology of congenital heart disease. The dysmorphology abstracts included new syndromes and case reports with descriptive aspects important for generating epidemiologic studies. No significant changes were noted over the four periods.

The developmental biology abstracts were difficult to count, because of changes in the field and increased identification of developmental genes and other products of molecular genetics. What might have been developmental biology during the 1960s could perhaps now be described as descriptive biology, which laid the basics for later discoveries. One might say that the new agents we study now are developmental genes and growth factors, somewhat replacing the prior emphasis on drugs, chemicals, and other environmental agents. The marked increase to 13% for developmental abstracts was seen during the 1990 to 1999; in fact, at the 1998 and 1999 meetings, the percentage

of such abstracts were 35% and 20%, respectively. Whole-embryo culture was introduced during the late 1960s by Dennis New of Cambridge University. Within several years, he developed a method for culturing embryos in rotating gassed bottles (1967), and several laboratories began using it to study isolated mouse and rat embryos during active embryogenesis from the presomite to late somite stages. The main use has been for the study of mechanisms including determination of toxic dose levels.
Table 5 shows that the percentage of abstracts using the whole-embryo culture averaged 3% during the 1970s, rising to 8% in the 1980s and 10% during the 1990s.

DIVERSITY OF MEMBERSHIP

One of the many factors in the success, important contributions, and perpetuation of the Teratology Society is the professional diversity of the membership. The society could not have achieved a more perfect balance than the credentials held by the three senior founding members (Fig. 1). Josef Warkany was an M.D., a superb clinician, and a very good basic scientist. James Wilson was an embryologist with a Ph.D. degree and was an impeccable investigator with unquestionable integrity. Clarke Fraser was a geneticist with both M.D. and Ph.D. degrees. Thanks to Clarke, the founding members had two Ph.D. degrees and two M.D. degrees among them. We were in perfect balance from the inception of the society, at least in regard to the degrees held by the three senior founding members. Is this diversity an important part of our society? Our membership consists of the following:1. Basic scientists at universities, research institutes, and government laboratories working in the fields of experimental teratology, embryology, toxicology, pharmacology, anatomy, cell biology, physiology, psychology, and molecular biology 2. Basic scientists in industry working in the abovementioned fields 3. Basic scientists and clinicians working in research, regulatory affairs, or administration at the NIH, Environmental Protection Agency, the Occupational Safety and Health Administration, the U.S. Food and Drug Administration, and the CDC 4. Physician-scientists, physician-clinicians, and adjunct clinicians, which includes pediatricians, obstetricians, pathologists, clinical geneticists, clinical teratologists or dysmorphologists, genetic counselors, and teratology Counselors tables have been updated to 2010 to the extent possible, as have been the year-by-year 5. Epidemiologists and statisticians who may be basic scientists or clinically trained (Have we maintained this diversity? It is difficult to say, based on the original earned degree of the members, since medical trainees frequently take up basic science, and sometimes a Ph.D.-trained person deals largely with clinical analysis such as epidemiology.

In terms of the interests of the presidents, 23 have been from the basic sciences [Ph.D.], 12 have had medical training, four have had MD-Ph.D. degrees, and one had dental training. The total number of disciplines and main research areas of the presidents are given in Table 6.) Twenty of 40 presidents primarily involved in embryology, which is taken to include experimental teratology (Thought has been given to rotating the type of members of the council and officers in hope of increasing versatility. We suggest that this idea be studied. However, classification of individuals may be indistinct, and the availability of good candidates in each category might be limited at times.) We doubt that anyone would argue against diversity, which provides a wide range of expertise necessary to uphold the responsibilities of the Teratology Society to the scientific community and the public. The interchange between disciplines has been highly educational to the membership. One of the greatest assets of the Teratology Society is the scientific and clinical diversity of its membership. It is in the best interests of the society to perpetuate this diversity.

ANTHROPOMORPHIC ANALYSIS OF THE SOCIETY

Comparing the progression of the Teratology Society to human developmental stages might be derided by a few members, but it serves as a framework for discussion. If this section produces controversy, we hope the result will become a constructive influence on the society. Other societies seem to have a birth, childhood, adolescence, adulthood, middle age, old age, and senescence. Because we are a society based on the study of growth and development, there is some merit to this approach. Table 5 charts our membership output of abstracts and the types of scientific techniques used in the annual meeting abstracts. Conception of the Teratology Society occurred in 1959 during a walk on the beach in Florida. The discussion followed a number of birth defects meetings (i.e., courtship) which were sponsored by the NIH, the National Foundation (March of Dimes), the Association for Aid to Crippled Children, and Oak Ridge National Laboratory; these events are detailed by Wilson and Warkany (1985). The Society founders were Joseph Warkany, a pediatrician trained in Vienna; James G. Wilson, a reproductive biologist and anatomist; and F. Clarke Fraser, a geneticist trained in medicine (Fig. 1). These three young scientists decided that a more organized approach to birth defects was needed and that the best course was to have a society with annual meetings. The first meeting (birth) occurred in 1961 in Cincinnati, Ohio. The first seven meetings have been fully detailed by Wilson and Warkany (1985). Rapid growth and a relatively low profile in facing societal challenges characterized the early years. Guidelines for teratology testing were developed during this time. During the adolescent years, some rebellion was registered, such as initiation of a membership vote for officers rather than appointment and some members suggesting that the decision on bendectin teratogenicity was still in question (Brent, 1985; Brown et al., 1985; Holmes, 1985). The college or early adult years might be illustrated by the postgraduate educational courses. These began in 1984 and were expansions of earlier workshops that concentrated on animal drug testing (Wilson and Warkany, 1985). The courses were organized by the Education Committee, and Narsingh Agnish and Hoffman-La Roche were strong supporters. The list of titles and organizers is given in Table 4. The early years of adulthood were characterized by the birth of new societies, which might be interpreted as offspring. These affiliated groups include the Neurobehavioral Teratology Society and the Organization for Teratology Information Services and, more loosely, the David Smith (Dysmorphology) Workshops. The dates of birth for these three groups were 1977, 1983, and 1987, respectively. One might extend this analogy to include subsequent societies of teratology in Japan, Europe, Australia, and South Korea as cousins to our society. The Japanese Teratology Society held its first meeting in 1961 under the management of Hideo Nishimura, whose extensive career included many contributions to teratology and our society. Dr. Nishimura was awarded high honors from the Japanese government, including the Purple Ribbon Prize and the Second Order of Merit with the Sacred Treasure. F. Clarke Fraser, one of the founders of our Society, is an Officer of the Order of Canada, and Marshall Edwards, the first president of the Australian Teratology Society in 1980, is an officer of the Order of Australia. Both Jim Wilson and Josef Warkany received awards from various societies, but the United States does not bother with many similar national honors for scientific achievements. Josef Warkany received the Howland Award, the highest award in pediatrics. The accomplishments of Warkany and Wilson have been detailed (Brent, 1982, 1989). Tuchmann-Duplessis was the first president of the European Teratology Society in 1971 and among other awards is a member of Le College de

France. Three members of the Teratology Society have been elected to the Institute of Medicine of the National Academy of Sciences (Drs. M. Bernfield, R.L. Brent, and B.A. Schwetz). With maturation, our society took more responsibility for a societal role by formation of a public affairs committee in 1981, which produced statements that had an effect outside the society itself. This includes repudiation of the Delany Clause, which excluded agents producing animal cancer from human consumption; we voted that no similar application be applied to animal teratogens (Staples, 1974). We took stands on vitamin A and retinoic acid (Teratology Society, 1987), folic acid (Oakley et al., 1983, 1995), and the reintroduction of thalidomide (Friedman and Kimmel, 1999). These position papers have been used by other scientific societies and regulatory branches of government. The membership continued to play important roles in federal agencies such as the U.S. Food and Drug Administration, CDC, National Institutes of Child and Human Development, Environmental Protection Agency, and National Institute of Environmental Health. Some of the presidents who played an important role in molding the society are shown in Figure 2.

Over the last several years, the society has adopted a code of ethics as well as guidelines for the ethical publication and presentation of scientific information and data (Teratology Society, 1999a). The criteria for membership are also available (Teratology Society, 1999b). We now face the difficult part of this comparison (Table 7). Are we beyond middle age into old age or, even worse, into senescence? Are we still growing, or is the increase in number of members only an accumulation of middle age fat? Do we have arteriosclerosis of our systems? Ineffective committees? Are we looking (staring) backward as in these very printed words, or are we evolving into the future (electronic communications, unraveling the interplay of teratogens on the developmental genome, advanced epidemiology using genetic markers and other techniques). To address these examples, we are communicating by electronic means, including our Web site (http://www.teratology.org). Birth defects (errors in prenatal human development) are the leading cause of mortality and are a major cause of disabilities in children. As teratologists, no matter how we practice our discipline, we can be proud of our calling and of the progress that has been made toward improving the health of children throughout the world. We have learned that birth defects can be prevented. We have the scientific basis to completely prevent birth defects caused by rubella virus, by in utero exposure to alcohol, and by folate deficiency. Consider the mortality, morbidity, and disability that just these three etiologic agents have caused mankind. It is a remarkable scientific achievement to have developed, since 1941, the tools with which we can prevent such important and serious defects. We should not rest on our laurels. We need to be at the forefront in leading the war on birth defects. The war on birth defects will seek to identify the causes of birth defects and to provide excellent care for persons with birth defects including reducing discrimination against them. We must proceed with wisdom maturity until this job is done. We must engage in the political battle to obtain the resources needed to conduct the research, and then to implement the prevention programs and to provide care for persons with birth defects. In the same way that teratologists, years ago, showed that the mammalian uterus did not protect from environmental insults, we must find ways to use new kinds of information, especially the avalanche of information from the Human Genome Project, to identify the factors that cause birth defects and then to design and implement prevention programs. The first 40 years of modern teratology and the Teratology Society provided us with strong shoulders to stand upon. We, as past presidents of the society have many mature years before old age and senescence set in. During these years, remarkable improvement will be made for human beings, because we worked to solve the birth defects challenge.

UPDATES TO THE ORIGINAL PUBLICATION

With few exceptions, the text of the original article was left intact. All of the tables have been updated to 2010 to the extent possible, as have been the year-by-year

Devendra Kochhar's present address: 28797 Xenon Way, Bonita Springs, FL*Correspondence to: John M. Rogers, MD-67, U.S. Environmental Protection Agency, Research Triangle Park, NC, 27711. E-mail: rogers.john@epa.gov. Published online 27 April 2010 in Wiley InterScience (www.interscience. wiley.com).
DOI: 10.1002/bdra.20669