HISTORY OF THE SOCIETY FOR RISK ANALYSIS THROUGH THE YEAR 2000

Authors:

Paul F. Deisler, Jr.
2001 Mountain View Road
Austin, Texas 78703
Office Phone: 512-480-9810
E-mail: sinprisa@earthlink.net

Richard C. Schwing
Sustainable Visions, Inc.
2335 Scotch Pine Drive
West Bloomfield, MI 48323
Office Phone: 248-851-9519
E-mail: sustainablevisions@earthlink.net

DEDICATION

The authors and SRA Historians, Paul F. Deisler, Jr., and Richard C. Schwing, dedicate this history to the memory of Jeanne X. Kasperson, for a time the third Historian. Through her vast knowledge of the risk literature, based on her own extensive professional work, she provided us with invaluable starting points. But for her untimely and deeply regretted death in mid-2002, Jeanne would have been able to do her part in, and add her wisdom to, the writing of this history based on her long and deep knowledge of the Society for Risk Analysis and its field. Had this been possible, this history would have been a much richer and better one.

CONTENTS PAGE

ABSTRACT

By early 1979 Robert B. Cumming, then a scientist in the Biology Division of Oak Ridge National Laboratory (ORNL), had recognized the growing need for risk researchers and practitioners to have a journal in which to publish their work. He contacted colleagues in the United States, Europe, and elsewhere and found a similar interest among them. Aided by Robert G. Tardiff, then with the National Academy of Sciences (NAS), he called together a Steering Group (SG) to organize and found a journal. At its first meeting at the NAS in Washington, D.C., on October 1, 1979, the SG decided that to provide ownership of the journal and to assure scientific editorial policy control, a scientific society should be formed devoted to risk. Thus, from the desire to found what became *Risk Analysis: An International Journal,* the impulse to found what became the Society for Risk Analysis (SRA) arose. The Certificate of Incorporation of the new Society was dated August 28, 1980, a date that can be taken as the formal birth date of the Society for Risk Analysis. Its first business meeting, at which the SRA's first elected set of officers and councilors was installed, took place at the NAS on June 1, 1981.

This history provides an idea of some of the ongoing developments and ferment prevalent in the many fields of risk analysis through the year 2000 as background to its main theme, the history of the Society for Risk Analysis and its ways of communicating with its members and others. Within that time period, the SRA established an international membership, organizational units (chapters and sections) in the United States and elsewhere, specialty groups to satisfy the interests of particular types of risk analysts, links to other societies, and a variety of ways of communicating and sharing knowledge with its many audiences. It had its share of successes and some failures, the former outweighing the latter and the latter teaching valuable lessons. Among its successes was the establishment of two major sections, SRA-Japan and SRA-Europe, two very active and strong SRA organizations. A glance at the Contents of this history will give the reader an idea of the scope of its coverage. Reading this history, the authors hope, will give the reader a sound understanding of the Society for Risk Analysis, of its past, and of some of the challenges it faced as it entered the third millennium.

1. INTRODUCTION

On behalf of the Society for Risk Analysis (SRA) Council during the December 1999 Annual Meeting of the Society, SRA Executive Secretary Richard Burk asked us, Paul Deisler and Richard Schwing, both long-time Society members, if we would undertake to write a history of the Society from its inception. The Society had existed for nearly 20 years and it seemed to the Council that it would be a good idea to capture individuals' recollections before they became unobtainable, as well as to review what documentation might be found, and so to prepare a history before much more time passed. Each of us said "I'll do it if he will" and so we became Co-Historians for the Society.

Sanguine at first about what could be accomplished in a given length of time, we now know much better. Merely gathering enough relevant information to begin to outline the history took many months, whether in the form of written records, interviews, answers to specific questions, or written submissions requested of knowledgeable Society members. Written records proved, in some cases, extraordinarily hard to find despite diligent and extended efforts; in some cases, especially of early records, written records did not exist and information of any kind was particularly difficult to obtain. Also, the time each Co-Historian could devote to the effort had to compete with the time each had to devote to other activities and projects. Nevertheless, by the fall of 2000 enough information had been accumulated to make possible the development of a tentative outline of the history and the writing of a first draft of the events leading up to and including the founding of the Society. Now, finally, with the large amount of additional important information obtained in the first half of 2001 and in the spring of 2002, bolstered by published work and answers to further questions asked of particular members, a history of the Society for Risk Analysis through the year 2000 has been completed and is presented for interested readers. Listings of references and other sources are given at the end of this history. Among them special mention must be made of *A Social and Programmatic History of Risk Research* by Dominic Golding[1] in which he gives a brief but very useful description of the formation and history of the Society up to the end of its first decade of active existence as a society. This new history amplifies that period and continues through the year 2000.

We begin the story of the Society for Risk Analysis with a description of the atmosphere prevailing, particularly in the United States, in the years before and during the formation of the Society, an atmosphere which gave incentive for forming both a society devoted to risk analysis and, in particular, a journal dedicated to publishing work in the field. We then describe the events leading to the actual foundation of the journal, *Risk Analysis: An International Journal,* and to the formation of the Society for Risk Analysis itself. Next we continue with a chronological history of the Society since its first annual meeting, in 1981, at which its first elected officers were installed. This portion of the chronological history, from 1981 through 2000, begins with the start-up period, 1981-1985, a period of many difficulties and teething problems, covering the first four presidencies. Next we include a description of relevant external developments and trends in the risk world over the period from 1981 through 2000, as background to the further

development of the Society, itself a part of that history. The rest of the chronological history, 1985 through 2000, proceeds via accounts of significant developments during that time span. Examples of some of these developments are significant organizational changes and why they were made, the development of chapters (with specific examples of some chapters), the development of specialty groups (again with specific examples of some groups), attempts to establish international links and to establish SRA sections outside of North America, the founding of SRA-Europe and SRA-Japan, the question of what role the Society can or should play in public risk policy, and a variety of other, particular topics. Omitted from this portion of the report and occupying a separate portion of its own is the history of the Society's communications with members and with the world at large and the history of its educational efforts. This second portion of the report covers the history, development, and changing content of the Society's annual meetings, journal, special courses, and workshops as the risk world external to the Society changed; it also describes the development of two other significant means of communication: its newsletter and its Web site.

The chronological history focuses most heavily on the early years when much that is familiar in the Society today was either put in place or initiated. We hope and believe that the history we have written covers the essentials, though we know there is always more to tell about a period covering more than 20 years in the life of such a diversified organization as the Society for Risk Analysis. We hope our readers will be receptive to the informal style of this account. One reason for adopting an informal style is that so many (almost all) of the people mentioned have doctorates that we decided generally not to use the title "Dr." in mentioning each but to use, simply, their names without a title. Having used their names, where appropriate we have at times referred to them only by their surnames or their given names. In any case, we trust that readers will find this history informative, possibly instructive, and even interesting. Certainly, we have had much pleasure from the work, lengthy as it has been, of researching and writing this history.

The authors are very grateful to all who contributed their recollections and materials to this effort, for the support of the Council and the Secretariat, and to the staff members at SRA Headquarters for their searches of active records in the office and of archived records in the warehouse (very dusty work). Without all of this valuable material this would be a slim history, indeed.

2. SOURCES UTILIZED IN COMPILING THE HISTORY

Numerous written sources have been used in compiling this history: the published literature; minutes of meetings of the original, organizing Steering Group, the Council, and the Executive Committee; back issues of the RISK *newsletter*; back issues of *Risk Analysis: An International Journal*; files of correspondence, miscellaneous notes, e-mails, memos, and tables; and miscellaneous documents such as annual meeting programs and membership directories. Many of these materials came from the files of the Secretariat in McLean, Virginia, the Society's headquarters, but others came from the private files of the authors and from files contributed by individual members. In addition, sources

include written notes submitted by individuals on their recollections of periods in the history of the Society as well as telephone interviews and conversations with several individuals.

All sources are listed at the end of this history, each under its appropriate classification. In the text, reference is made to all published articles; reference is made to other materials only when there is some special reason for it, as in the case of attribution to a particular person. The rest of the sources have been combed for significant, usable, historical materials therein but are not cited specifically. All materials from files have been placed for long-term safekeeping and further reference in an Historians' Archive kept at SRA's headquarters in McLean, Virginia. Mentioned in Section 1 and well worth repeating, the authors' gratitude to all who helped to secure for them the sources of information used in this work is very great.

3. EVENTS LEADING TO THE FORMATION OF THE SOCIETY FOR RISK ANALYSIS

Before recounting the events of the formation of the of the Society for Risk Analysis some of the history of risk, in particular in the time period immediately before and embracing the period of the formation of the Society, is necessary to make clear why the Society was formed. We begin with a few examples of early recognition of risk and attempts to deal with it and then move on to more recent times, culminating in the times during which the Society was formed. That last era will be seen to have encompassed turbulent and sometimes frenzied times, times in which a ferment of ideas and activities in risk analysis occurred. Looking back, in 1983 Jeanne Kasperson and Robert Kates referred to risk analysis as "an unruly adolescent field."[(2)] It was all of that, but much was also accomplished in that period.

3.1. Background: The Atmosphere of the Era

The recognition of risk and of the need to manage it are at least as old as the insurance pools formed by groups of Phoenician ship owners in ancient times. In ancient Rome it was considered a virtual sentence of death to be sent to the cinnabar mines in Spain, there to die of mercury poisoning. In this instance, the risk was recognized and "risk management" consisted of sending the most unloved of all to work in the mines: criminals, slaves, and men from the lowest economic and social classes. The Romans also began construction of the Cloaca Maxima—the "big sewer"—in the sixth century BCE (later enclosed with an arched ceiling in the third century BCE and many times expanded), at first to drain swampy lands. It then became a storm water runoff sewer and, finally, a general septic sewer, to the benefit of Roman citizens' health but to the detriment of the purity of the Tiber River into which the Cloaca flowed. Some other Roman cities followed suit. The ancient Greeks as well as the Romans were well aware that the same lead that made for better plumbing, ships, architecture, and jewelry also poisoned miners, contaminated wine, and tainted water supplies. This might be considered an early, though not too deliberate, application of the risk versus benefit idea.

Leaping ahead, in the mid-sixteenth century Agricola, a physician with a deep knowledge of mining, wrote of the environmental toll taken by European mining operations and warned of adverse health effects, attributing the latter to dusts, stagnant air, and gases in the mines. In the same period Philippus Aureolus Theophrastus von Hohenheim-Paracelsus, known more simply as Paracelsus, first defined dose response (and a kind of hormesis), laying the foundation for modern toxicology when he wrote: "All substances are poisons; there is none which is not a poison. The right dose differentiates a poison from a remedy." And in 1700 Bernardo Ramazzini wrote on the diseases of occupation, becoming the father of occupational medicine. Others were to follow these last three; examples are Percival Pott, in England, who in the late 1800s linked scrotal cancer in chimney sweeps to exposure to soot, a result often cited as a first, real, epidemiologic finding, and Charles Thackrah who, in the early 1899s, was the first to practice industrial medicine in the English-speaking world. The reading public was also made aware of some of these types of risks in the novels of Dickens and Zola with their graphical depictions of the horrors of the Industrial Revolution.

In still more recent times it was Rachel Carson's seminal, dramatic 1962 book S*ilent Spring* which brought to the general public an initial, sharp awareness of the environment and of the hidden dangers inherent in a technological society.[3] This awareness—fueled by environmental events in the sixties, by Garratt Hardin's 1968 paper *Tragedy of the Commons*[4], by widely publicized, new scientific information obtained using ever more sophisticated scientific analytical techniques, and by the celebration of the first Earth Day in 1970 and further sharpened by the environmental movement—led to a major surge in the 1970s of environmental and environmental-health legislation with its consequent flood of regulation. It also led to a rapid increase in interest in the subject now broadly called risk analysis.

Perhaps the first systematic study of risk as a contemporary societal problem was articulated in a seminal paper in 1969 in *Science* by Dr. Chauncey Starr, of the Electric Power Research Institute (EPRI) in Palo Alto, California, in which he provided the basis for approaching risk issues systematically, stimulating interest in the general set of risk problems.[5] Later, in 1980, Starr and Chris Whipple published a paper which brought together much of what was then known about several aspects of risk, including relationships between actual and perceived risk.[6]

The 1970s saw the passage of many environmental laws and the formation of federal (and state) agencies, including the Occupational Safety and Health Administration (OSHA), the U.S. Environmental Protection Agency (U.S. EPA)—and shortly after its inception, the formation of the Cancer Assessment Group within the U.S. EPA—and the Office of Technology Assessment (OTA), a bipartisan office (now defunct as of 1995) of the U.S. Congress. The development and passage of the legislation was strongly spurred by environmental organizations such as the Natural Resources Defense Council (NRDC), the Sierra Club, and the Environmental Defense Fund (EDF), among others. These organizations and other environmental organizations continue to this day to play important and significant roles in defining environmental legislation and regulation at all levels of government.

In the 1970s heavy emphasis was placed on risks of cancer related to exposure to synthetic chemicals in the work place and in the general environment. In 1972 the International Agency for Research on Cancer (IARC) at Lyons, France (an agency of the World Health Organization of the United Nations, established in 1965) began publishing its influential series of bulletins on the carcinogenicity of individual substances, now numbering over 800. IARC developed and used a classification system for defining the degree of human carcinogenic potential a substance might have. Here in the United States the National Cancer Institute (NCI) carried out a very large program of testing many chemicals for their carcinogenic potential using bioassays at relatively high dosages (compared to the usual environmental dose levels). The intention was to determine which chemicals showed carcinogenic potential in the test animals, if only at the highest doses (the maximum tolerated dose was usually selected as the highest dose to be tested). Both the NCI and IARC found many chemicals to cause cancer in animals and, therefore, possibly but not certainly in humans, especially under the conditions of NCI bioassays. This fact, coupled with other results, caught the interest of the environmental movement and the popular press. The public reporting of these high-dose animal results was not always done with care, as was also true from time to time with results of epidemiological studies and other types of studies, adding fuel to the public fear of cancer. News stories were published so frequently on the discoveries of actual or potential carcinogenic action that the phrase "carcinogen of the week" was coined. The public reporting of single-cell, in vitro, preliminary screening test methods that often did not demonstrate carcinogenic action, itself, but rather a tendency toward mutagenic activity of a particular kind also added to the public furor. For example, of the single-cell, screening tests, the Ames Test for mutagenicity—developed in 1971 by Dr. Bruce Ames of the University of California at Berkeley and useful as a pre-animal-testing screening tool in the hands of experts in the field—was so easy to carry out that scientific amateurs could use it. In the later 1970s and early 1980s high school students in their science projects and others of no more scientific sophistication tested foods, household products, and other common items, the results being proclaimed by the public press as demonstrating many to be "carcinogens" dangerous to human beings without regard to the nature and limitations of the test. Such inadequate, often overblown reporting added to the ferment of the times with its informal lists of "carcinogens." Other large lists of supposed carcinogens were published and cancer soon became not only a serious disease but also a social and political issue that drew the attention of government.

Many studies of cancer risk, its assessment, and its management were begun in the 1970s and early 1980s as a result of the high interest in the risks of cancer, and many influential documents on the subject were published. Two of these documents had particular effect on risk analysis: a set of cancer risk assessment guidelines published by the U.S. EPA in 1976,[7] a significant indication of the Agency's interest in the by then highly publicized subject, and the OTA's 1981 report *Assessment of Technologies for Determining Cancer Risks from the Environment*.[8] The study which produced this latter publication also resulted in support by the OTA of a major, influential study by Sir Richard Doll and Richard Peto, also published in 1981, on the causes of cancer in the United States.[9] The Office of Science and Technology Policy (OSTP), advisors to the

President of the United States, also engaged in the lively debate over the ways to assess the risks of cancer.

Industry could not ignore the issue of cancer risk. As a result, the 1970s saw the founding by members of the chemical industry, in 1975, of the Chemical Industry Institute of Toxicology (CIIT), devoted to the experimental and theoretical study of the toxicology of commonly used, nonproprietary chemicals and to human health risk assessment based on such studies. Proprietary chemicals, such as pharmaceutical drugs or pesticides, were already subject to required testing but common chemicals in general were not. This organization has had large influence on toxicological scientific methodology and on the scientific basis of risk assessment; it has also, through its postdoctoral program, contributed to the pool of scientists in the field. The CIIT, now renamed "CIIT-Centers for Health Research," continues its work to the present day, supported by the American Chemistry Council, with which it is now associated, and others. Also in the 1970s, industrial trade associations increased their studies of cancer risk. The American Petroleum Institute carried out many toxicological and epidemiological studies, for example, and that Institute was not alone in its efforts.

A ferment developed among governmental agencies on the subject of cancer risk. In 1977 the Interagency Regulatory Liaison Group (IRLG) was formed; member agencies were the U.S. EPA, OSHA, the Food and Drug Administration (FDA), the Consumer Product Safety Commission (CPSC), and the Food Safety and Quality Service (FSQS) of the U.S. Department of Agriculture (USDA). Each of the agencies had developed its own way of assessing risks, and the purpose of the IRLG was to develop a common policy on assessing and managing cancer risks applicable to all the agencies. OSHA was the first agency to publish a "cancer policy",[10] a massive document. Other agencies soon followed with their own versions, adapted to their needs; among these were the U.S. EPA and the CPSC. The IRLG's proposals and the individual agency cancer policies bestirred a high level of controversy. OSHA's proposed Cancer Policy,[10] finally published in 1977, in particular aroused strong opposition by a broad segment of the process industry because of its unscientific nature. This opposition resulted not only in the founding of the American Industrial Health Council (AIHC), but also in further strengthening of support by industry of research in toxicology, risk analysis, and risk-based regulatory policy. The AIHC, now disbanded (in 2000), was an organization devoted to regulatory risk science policy (not cancer risk policy alone). The AIHC interacted with policy makers in many of the agencies named here as well as others. With all of these activities going on, there were also innumerable lawsuits, mostly against various agencies by environmental organizations, labor unions, or industrial associations. These suits were very influential in shaping risk analysis and regulatory policy.

The events among governmental agencies came on top of preexisting interests in the analysis of risks of a variety of types for regulatory purposes among agencies such as the FDA, the National Transportation Safety Board, the CPSC, the Nuclear Regulatory Commission (NRC), and other agencies having longstanding responsibilities in such areas as food, drugs, cosmetics, highway safety, nuclear risks in general, technological risks of various kinds, and plant safety risks, as well as the legal and insurance aspects of

risks. Thus while cancer risks might have been the most publicized risks throughout the 1970s and early 1980s, there was much activity in other risk areas as well.

A consequence of these developments was the appearance of a substantial number of risk analysts and experts in government, in national laboratories, in academia, in industry, and within consultancies as well as much work in the field, by the mid- to late 1970s, in a variety of institutions. This led to the establishment of particular centers and to the publication of significant books and studies, some of which follow.

Joseph Coates, Program Manager and Officer of Exploratory Research and Problem Assessment at the National Science Foundation (NSF), sponsored Edward W. Lawless at Midwest Research Institute in a study titled *Unstructured Technology Assessments—Case Histories of Public Alarm Over Technology*[11] in 1972 and 1973. This unique study compiled 45 "social shocks" that inspired major news stories. Between 1979 and the end of 1980, risk studies sponsored by the Technology Assessment and Risk Analysis (TARA) program of the NSF were underway at Clark University, the University of California, Los Angeles (UCLA), the National Academy of Sciences, Boston University, the University of Maryland (College Park), SRI International, J. H. Wiggins Company, and New York University (reference Table 2.3 in Krimsky and Golding[12]).

The books *Of Acceptable Risk* by William Lowrance[13] and *An Anatomy of Risk* by William Rowe,[14] published in 1976 and 1977, respectively, were attracting considerable attention and praise. Furthermore, the public was keenly aware of Three Mile Island, of air pollution and, even then, of global warming. The public was also becoming aware of and, in some cases, alarmed at risks of toxic substances and radiation since these risks were heavily and frequently featured in the media of the day.

In contrast to the growing awareness of technology hazards, one of the earliest clusters of risk professionals grew out of a concern for natural hazards. Gilbert White and his team of graduate students (Ian Burton, Kenneth Hewitt, and Robert Kates) working at the University of Chicago, emphasized hazards and floods in the geographer's tradition to study the relationship between humans and their environment. Subsequent work at Clark University which naturally falls under the rubric of risk analysis led geographers Robert Kates and Roger Kasperson to collaborate with physicist Christopher Hohenemser to organize, in 1972, perhaps the first risk center, the Hazard Assessment Group in the Center for Technology, Environment, and Development (CENTED). Many meetings and influential publications have emerged from these efforts, covering many types of risks and aspects of risks in addition to those of natural hazards.

The broadly based, multidisciplinary community of risk researchers was reaching a "critical mass" and risk experts began to gather together. For an early example, there was an exceptionally good multidisciplinary conference at Asilomar, California, in 1975, organized by UCLA Engineering Professor David Okrent. In late 1978 Richard Schwing and Walter Albers, both at General Motors, undertook to organize and host a symposium on risk. With the advice of Lester Lave, Howard Raiffa, and Paul Slovic, they were able

to assemble approximately 100 known risk analysts in 1979 to hear and discuss the papers of 16 authors. The proceedings of that meeting were published by Plenum Press in 1980 and they were well received. Some in the field even used this volume, *Societal Risk Assessment, How Safe is Safe Enough?*,[15] as a text since it included perspectives from many of the disciplines ranging from anthropology to nuclear physics. Another meeting in 1981, given as a second example, was organized as Selected Symposium 65 of the American Association for the Advancement of Science, whose wide-ranging papers were published under the title *Risk in a Technological Society*, edited by Christoph Hohenemser and Jeanne X. Kasperson.[16] This collection of papers gives a sampling of the many trends of thought from the mid- to late 1970s up to 1980. It also illustrates the interests of diverse segments of society, bringing together as it did authors from government, industry, universities, and public interest groups. Everyone was getting into the act.

Despite the rapid developments described above, individuals involved in risk analysis were having their difficulties. Many groundbreakers in the field of risk analysis realized that they were taking an intellectual path outside of the disciplines encountered during their formal training. In "The Role of Theory in Risk Studies" in the 1992 volume *Social Theories of Risk*,[12] Sheldon Krimsky traces his intellectual path, a path that paralleled the paths of many in the yet-to-be-established field. Applying tools foreign to their formal disciplines led many to feel isolated from their disciplines. Many of the risk analysts and practitioners of the time did excellent work in assessing and managing risks and on risk analytical methods, but they suffered from a particular and growing frustration, the difficulty of finding journals that would publish their work and the associated difficulty of risk practitioners not being able to be in contact with each others' work. Most journals of the day, particularly those devoted to such human health-related areas as mutagenesis and carcinogenesis, preferred to publish papers dealing strictly with their subject disciplines and rarely looked favorably on papers dealing with risks in those areas because of their necessarily interdisciplinary nature. At best, some journals might publish some papers to the extent that they might be peripherally interested in risk problems. Such papers would usually be found buried among other papers dealing with the specialty of the journal. Another outlet was reports of limited distribution, often not available in libraries. Although there was a journal, *Foresight, Journal of Risk Management*, published in the United Kingdom, it was technically oriented rather than scientifically oriented. The world of risk analysts and practitioners clearly needed a broad, scientific outlet of its own. The climate of the times was ripe for the appearance of a journal devoted to risk analysis in its broadest sense.

3.2. Formative Steps: The Establishment of the Journal and the Society

Robert B. Cumming, a member of the Environmental Mutagens Society and a scientist in the Biology Division of Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, was acutely aware of the problem of publication and began to talk to other scientific risk experts of his acquaintance about the need for a journal devoted to publishing papers on risk assessment. He soon decided, in early 1979, that he should see what interest there might be in such a publication, a decision that started him on an

involved and strenuous odyssey. At the beginning he did not think of starting a society, only of possibly founding a journal, and in trying to determine the amount of interest in such a journal he contacted many people in the United States and abroad, personally and by correspondence. The end of his efforts was the establishment of both a journal and a scientific society.

Cumming had been a participant at the Asilomar conference (mentioned in Section 3.1) and other meetings. He found support for the idea of founding a journal during a five-week trip to Europe, beginning in January 1979, where he lectured at 11 laboratories in five countries. His last lecture was at the University of Stockholm where he had the opportunity, over a period of five days, of visiting and speaking with Professor Lars Ehrenberg, a biochemical geneticist at the University of Stockholm, on the question of founding a risk journal.

The two men were already known to each other through their publications and correspondence: Professor Ehrenberg had published a paper in the late 1970s on rates of mutations using a version of the multiple-hit theory and citing a 1965 paper by Cumming.

It was during these conversations between Cumming and Ehrenberg in early to mid-February 1979 that the idea of proceeding to found a broad, international risk assessment journal was first conceived and defined. At the time, no thought was given to establishing a corresponding scientific society.

As a result of these conversations, many important points regarding the new journal were discussed.[17] Among these was a tentative, working title, *International Journal of Risk Assessment*, though they also considered, at the suggestion of a colleague, naming the journal *International Journal of Risk Research*, leaving the ultimate name to be resolved later. Also, considering the character of the journal, tentative subjects of interest for papers were considered, such as the probability of damage to life, health, and the environment (the latter in a very wide sense); the determination of whether there is a risk or not; quantification of the risk; and the application of assessments to such things as cost-benefit evaluations, administrative actions, political factors, and so on. No discipline was to be omitted if relevant to the assessment of risk or to the management of many types of risk. They gave full recognition to the fact that the subject they were talking about was truly multi- and inter-disciplinary and that there would be problems of readers understanding the papers published if steps were not taken to ensure maximum clarity across disciplinary barriers. In later correspondence the proposed contents of the journal were further extended and broadened. The two men also concluded that much would be gained by having what they called “bifocal editing,” meaning that both sides of the Atlantic Ocean would be represented. The format of the journal was discussed but was left for later development.

Cumming and Ehrenberg then decided that, as a first step, they would each devote concerted time and effort to determining just how much interest there might be in having such a journal. Professor Ehrenberg was to contact colleagues throughout Europe while

Dr. Cumming was to sound out individuals in the Western Hemisphere, the two to keep in touch with each other.

Cumming, over the next several months, made contact with individuals separately or at meetings throughout the United States, starting in March 1979 at a meeting of the Environmental Mutagens Society at New Orleans, Louisiana, where he found strong support, and at meetings elsewhere in the United States. All in all he spoke with 40 to 50 U.S. scientists and with representatives of no less than four federal agencies.[18] Ehrenberg told Cumming he had spoken to a similar number of scientists in Europe with similar results: virtually unanimous support.

Among those Cumming spoke to was Robert Tardiff, then executive director of the Board on Toxicology and Environmental Health Hazards of the Assembly of Life Sciences of the National Research Council, National Academy of Sciences (NAS). Tardiff showed great interest in Cumming's proposal and supplied names of other possible interested scientists.[19] Cumming also spoke to many at meetings in Vancouver, British Columbia, Canada; Concepción, Chile; Argentina; and Brazil, receiving strong, positive support for the idea everywhere. Joseph Rodricks, then with the FDA in Washington, D.C., recalls a day in 1979 when Cumming spoke to him at length in Rodricks' office. "I got quite excited about it and eager to help him move it along," recalls Rodricks.[20] When Cumming visited Lawrence Livermore National Laboratory in California in the summer of 1979, he spoke to Morton Mendelsohn, the director of biomedical and bioenvironmental research at the Laboratory, who, on hearing the story of the high level of support, advised Cumming that it was time to stop talking and to start acting.[18] Mendelsohn suggested that Cumming and Ehrenberg convene an ad hoc committee of manageable size to work out the details of what should be done.

Cumming proceeded to act on this advice and, with the assistance of Bob Tardiff, contacted interested individuals. At Cumming's request, a letter[21] dated September 10, 1979, was sent by Tardiff to invite the addressees to the first "Organizational Meeting for Risk Assessment Journal." These and others eventually formed the Steering Group (SG), as shown in Table I, which includes information on these individuals. The intention was to have an ad hoc committee with geographic balance and representation, to the extent possible, from different disciplines and sectors. In the event, the membership was primarily from the Washington, D.C., area with some from Oak Ridge, Tennessee, representing almost exclusively various governmental agencies (see Table I). As shown in Table I, there was only a sprinkling of people from Europe, Japan, universities, and private organizations. The list in Table I was compiled from the minutes of the SG meetings and from other, separate lists of attendees in the archives. The list cannot be guaranteed either to be complete or that all listed remained on the SG for the duration of the SG. Many on the list could not attend the meetings but, nonetheless, contributed greatly to the discussions outside of the meetings. Thus, attendance is not a direct measure of contribution.

Response to invitations to join in the effort was very good, an agenda was sent out, and the group met for the first time on October 1, 1979, at the NAS, a suitable locale

for founding an instrument of scientific communication. It met as the Ad Hoc Committee on the Formation of a New Journal in the Area of Risk Analysis. There were 11 members at the first meeting; Cumming became the chair and Tardiff became the secretary of the new committee. This was the first of five organizational meetings, all held at the NAS. Table II lists the meetings, their dates, and the varying names under which the ad hoc group operated. For convenience we have adopted "Steering Group" or SG for the name of the ad hoc committee. The SG membership, Table I, also shows the attendance at each of the five meetings.

Reflecting on the composition of the Steering Group later, in October 1980, Cumming wrote: "The Steering Group was merely a mechanism to provide a working nucleus for getting things started. It is hoped that the strong United States flavor of the Society, which was occasioned by the necessity of starting it somewhere, will quickly become very much more international, as was the initial intent of the Steering Group."[(22)] From its conception, the scope of the Society was conceived to be international.

At the first meeting of the SG on October 1, 1979, the concept of establishing a journal was taken as a premise; it was not debated and the work of organizing it was begun. Items such as the meaning of the term "risk," the intended audience, and the primary focus of the journal as a scholarly publication were taken up in addition to the structure of the journal and other organizational items. With respect to risk, it was proposed that human health and safety should be the main focus of the journal, with emphasis on the methodology of assessing risks. The journal should not be a repository for data such as actuarial data. It was not resolved whether such things as psychological perceptions of risk should be included as subject matter for publication. (Later, the coverage of the journal was extended to all aspects of any type of risk.) A tentative format or structure for the journal was decided on and it was thought that a quarterly journal of about 100 pages would be desirable.

Much attention was paid to the organization of the governing body of the journal. Who, or what kind of entity, should own the journal? It was agreed that incorporation was necessary, that control of the journal by a governing body was essential, and that those present and those invited but not present could serve as the ad hoc organizing committee. Alternative organizations considered for governing the journal were the publisher (not yet selected), a not-for-profit entity whose purpose would be to be the owner, and a scientific society devoted to risk analysis. There was concern about the possibility of the scientific risk community losing control if the journal were to be owned by a publisher. Most agreed with the suggestion of Gary Flamm that the formation of a society would be the best plan. A subcommittee chaired by Tardiff was formed to obtain and study the constitutions of other societies, a subcommittee chaired by Flamm was formed to deliberate on the forming of a society, and a subcommittee chaired by Cumming was formed to examine the financial side of publication. Cumming would serve on all three subcommittees. **So it was that, on October 1, 1979, the idea of having a Society for Risk Analysis was first accepted by the SG.**

The three subcommittees began work and, at the second meeting of the SG on December 4, 1979, the subcommittees chaired by Flamm and Tardiff were amalgamated as a Planning Group to work together toward a common objective and to develop a Constitution and Bylaws (which would contain, among other things, the statement of purpose of the journal). **It was at this meeting, on December 4, 1979, that the ultimate name for the Society was chosen: Society for Risk Analysis**. The name for the journal, at this point, became *Journal for Risk Analysis*. The membership of the Society was to be broadly based, to include those in the biomedical and physical sciences, engineering, and the social sciences. Following the meeting, work continued on a constitution, the first effort being to mark up a copy of the Constitution and Bylaws of the Society of Toxicology to fit the new Society.[23]

By the third meeting, on February 11, 1980, a draft of a Constitution and Bylaws was available for comment and two main functions of the society were defined: (1) development of conferences and workshops and (2) publication of technical findings and evaluations. Two permanent committees were then established: the Committee on Conferences and Workshops (Chair: Tardiff) and the Committee on Publications (Chair: Cumming), both to be included in the draft Bylaws. The Committee on Conferences and Workshops would, as a first act, develop a workshop to provide the first material for publication in the new journal; the Committee's broader function would be to develop policy regarding the short- and long-term direction of the Society with respect to conferences and workshops. The definition of the final Society was becoming clearer.

The fourth meeting, on May 12, 1980, saw the beginning of regular organizational form and activities. A slate of pro tem SG officers was elected; the society's name, Society for Risk Analysis (SRA), was confirmed; the Committee on Publications (also called the Publications Committee) reported on what it had learned of various publishers and was then instructed to select a publisher for the journal; and it was decided that initial, regular dues should be in the range of $25-$30 annually. The slate of interim SG officers elected was as follows: Chair, Robert Cumming; Secretary, Robert Tardiff; Treasurer, Gordon Newell; and Advertising, George Flanagan. Vincent Covello was to assist Cumming with membership, informally, by providing resources for building and maintaining the mailing list. Cumming also became the Interim Editor of the new journal, to be called, for the time being, *Risk Analysis*, and Oak Ridge National Laboratory offered to serve as the initial editorial center. At this meeting, too, final changes were made to the Constitution and Bylaws and incorporation was targeted for mid-summer 1980. Whether the Constitution and Bylaws was formally adopted at this meeting is not definitely known. However, it may have been adopted at this time since an information bulletin dated October 1980[22] refers to the Constitution and includes a copy of it as an appendix, and the next (or fifth) meeting of the SG did not occur until many months later. Many of the principals embodied in the Articles of Incorporation, which set forth the basic purposes and system of governance of the Society, are also embodied in the Constitution. The fifth, formal meeting of the SG would not take place until well after incorporation—in fact, not until just after the SRA had at its first annual meeting, selected its first set of permanent officers and councilors, and settled into the work of being an ongoing society.

In pursuing its course toward incorporation, the SG received informal help from two individuals in particular, both of whom continued to serve the SRA over the years: Peter Barton Hutt, an attorney with the firm of Covington and Burling in Washington, D.C., well known for his interest in and writings on risk, and Richard Burk, president of the Society and Association Services Corporation (SASC), now known within the SRA as the Secretariat. Burk served at the time as executive secretary to the Environmental Mutagen Society and was introduced to the SG by Alexander Hollaender, a member and the founder of that society. Burk was later to become the executive secretary for the SRA as well, a position he occupies to this day.

As the end of the summer of 1980 drew into sight, the SG was ready to incorporate the Society. A new, interim set of officers had been named for purposes of incorporation and **Articles of Incorporation of the Society for Risk Analysis** had been prepared for submission to the Office of the Recorder of Deeds, Corporation Division, at Sixth and D Streets, in Washington, D.C. The Articles were signed (and notarized) on August 11, 1980, by the incorporators named in the Articles: Dr. Gordon W. Newell, Dr. Robert G. Tardiff, Dr. W. Gary Flamm, and Dr. Alexander Hollaender (see Table III for further detail). The interim officers of the Society, also listed in the Articles, were President, Dr. Robert B. Cumming; Vice President, Dr. Joseph Rodricks; Secretary, Dr. Robert G. Tardiff; and Treasurer, Dr. Gordon W. Newell (see Table III for further information). The interim officers would serve until the first election. However, it had also been agreed that Rodricks, as vice president within this interim set of officers, would not automatically succeed to the presidency as later vice presidents would to make it possible for the first, complete slate of officers (and councilors) to be elected in a contested election and installed as called for by the Constitution. Moreover, the SG would continue to act as the Council of the Society, pending that same election.

The Certificate of Incorporation was dated **August 28, 1980**. That date is **the formal birth date of the Society for Risk Analysis**.

By October 1980[22] it had been decided to hold the first annual meeting of the Society on June 2, 1981, at the NAS during a June 1-3 workshop on the analysis of real versus perceived risks. Chaired by Norton Nelson of the Institute of Environmental Medicine at New York University's Medical Center, the workshop was to be sponsored jointly by the Society and the Board on Toxicology and Environmental Health Hazards of the NAS. By this time the final name of the journal had also been set—*Risk Analysis: An International Journal*, with Robert Cumming as its editor-in-chief and with an initial editorial structure. The Journal's editorial policy was still evolving but the selection of a publisher, Plenum, had been made and preliminary forms such as "Instructions for Contributors" had been made available. A preliminary list of contents of Volume 1, Number 1 of the Journal had also been prepared. The first volume was published in the spring of 1981. By this time, Cumming had also started the Society's newsletter, the **RISK** *newsletter*, and was both its editor and publisher. The first issue published was dated March 1, 1981.

After incorporation, members of the SG continued as planned to help the interim officers in the organization of the Society as the occasion arose. Rodricks recalls,[24] for example, an informal meeting of several members of the SG, including Cumming, which took place at the meeting "Healthrisk Analysis, Third Life Sciences Symposium." The group discussed matters of organization and governance of the Society at that meeting which took place in Gatlinburg, Tennessee, October 27-30, 1980, and was sponsored by Oak Ridge National Laboratory.

In the Articles of Incorporation, the SRA was defined as a not-for-profit organization and its basic system of governance was set forth. Its technical and scientific purposes were defined as being to:

- promote the acquisition and utilization of knowledge in risk analysis and facilitate the exchange of information among its members as well as other interested professionals;

- foster and promote knowledge and understanding of risk analysis techniques and their applications;

- communicate and interact among individuals engaged in risk analysis;

- apply risk analysis techniques to assess the hazards and risks to which individuals and populations are exposed;

- disseminate risk analysis information and concepts to all interested individuals;

- advance the state-of-the-art in all aspects of risk analysis; and

- integrate and interact with the various disciplines involved in risk analysis.

The basic system of governance set forth in the Articles of Incorporation, much the same as in the first Constitution discussed earlier, included the following, among other items: (1) the Society is to be governed by elected persons having the following titles: President, President-elect, Secretary, Treasurer, the immediate Past President, and nine Councilors—fourteen persons in all, (2) the first four named in (1) are Officers of the Society having powers and authorities set forth in the Articles of Incorporation, (3) Councilors are to be elected for three-year, staggered terms and three new Councilors are to be elected each year, (4) a Nominating Committee will prepare slates of nominees for each election, and (5) there are three classes of members: Active, Honorary, and Student (these were soon expanded to include Retired as a class). The Constitution also established certain constitutionally required committees (described further on) and that the President would serve as Chair of the Council. The Council has as its members all Officers and Councilors.

This highly democratic system of governance provides not only continuity but also a valuable learning period for both the president and the councilors. It also prevents entrenchment of any person or set of people in the governance of the Society. The 20-

year pattern thus established, with some deviations, can be observed clearly in Table IV-A and Table IV-B. Otherwise the pattern has unfolded as first conceived.

With this act of incorporation, the SRA was in business. The next months were spent in many organizational activities. Some of the major ones were implementing the publishing agreement with Plenum; obtaining certification of tax-exempt status from the Internal Revenue Service; building membership; preparing a ballot for the first election, to take place by mail, the winners to occupy their positions at the first, annual, organizational meeting of members; and to prepare for that first meeting. Here is what resulted:

- The agreement with Plenum provided for the Society to have control over editorial structure and policy and to have ownership of copyrights for published material. Both the Society and Plenum would help to market the Journal, and copies of the Journal would be supplied to individual members at reasonable cost to keep dues low (subscriptions to be automatic for dues-paying members). Plenum would also be the publisher of future proceedings, books, or monographs, with such publications offered to Society members at a discount. The leadership of the Society was satisfied that the arrangement allowed for those things they deemed necessary for the kind of journal envisioned by the founders.

- The original Constitution, written shortly before tax-exempt status was obtained from the IRS, contemplated obtaining a 501(c)(3) designation under the IRS code, the status usually obtained for a scientific, educational society like the SRA. In actual fact the status obtained on May 15, 1981, was for a 501(c)(6) organization, one suited to trade associations that, among other things, lobby for their membership. At the time this was done, it was quicker and simpler to obtain the 501(c)(6) status. It was intended at the time to reconsider and possibly modify the status later on.

- Membership had been built by written and telephonic solicitation by volunteers to a total of 300 members by March 1981. This effort continued. Dues were set at $30 per year for regular members and $10 for student members. Robert Cumming, personally, was now keeping the computerized and growing membership list.

- A ballot was prepared in the spring of 1981 and copies were mailed to the members. Even at this early time in the history of the SRA, the Society made every effort to create bonds with individuals in other countries via individual members of the SG who had ties to researchers and practitioners outside the United States. Although it did not prove possible when the first Council was elected to obtain outside-the-United States participation on the Council, the Journal staff succeeded in getting Professor Timothy O'Riordan of the University of East Anglia in the United Kingdom to serve as an Associate Editor, a post he would hold for many years.

These were not all the activities of the Society before its first annual meeting. For example, Ray Waller of Los Alamos Scientific Laboratory (LASL) chaired an organizing committee with members from the SRA, the LASL, and the Nuclear Regulatory

Commission (NRC) that organized a spring 1982 risk conference, jointly sponsored by SRA and NRC, to be held in the Washington, D.C., area. The **RISK** *newsletter*, with its first issue in March of 1981, began to keep the early membership informed of significant events and to attract new members. This first issue of the **RISK** *newsletter*, published in time to advertise the first annual meeting, also contained notices of other organizations' meetings and workshops of likely interest to members and other matters of interest, including the fact that anyone joining the Society before the second annual meeting would be a charter member. A membership application form was included. Thus the Society had already begun to carry out its defined functions even before its first elected officers and councilors were in place.

Finally, the first annual meeting and organizational meeting took place as planned on June 2, 1981, at NAS in Washington, D.C., in conjunction with the June 1-3 joint workshop on the analysis of real versus perceived risks. As mentioned earlier, the general chairman of the workshop was Norton Nelson. An organizing committee for the entire meeting was chaired by Robert Tardiff and included W. Gary Flamm of FDA, Vincent T. Covello of NSF, and Joseph Rodricks (by then with Clements Associates in Washington, D.C.). Serving as co-chairs for the workshop itself were Covello and Waller. Richard Burk of SASC provided much help and guidance to the organizers.

The organizers of the workshop strove to achieve diversity of risk topics, in keeping with the fundamental thrust of the Society. They included sessions with papers on voluntary and involuntary risks (and how these are perceived), on both low and high probability of exposure and of occurrence or consequence, and on both low and high catastrophic potential. This first combination of a workshop and a meeting was a success, organizationally and scientifically, and its scientific product was made available to a wide audience when the proceedings were edited for publication. Attendees of the workshop received complimentary copies of the proceedings, *The Analysis of Actual Versus Perceived Risk*, published in 1983 by Plenum Press and edited by Vincent Covello, W. Gary Flamm, Joseph Rodricks, Ray Waller, and Robert Tardiff. It was to become the first of nine volumes constituting the series *Advances in Risk Analysis*. Titles, editors, and dates of publication of the nine-volume series are to be found in Table V. This first meeting was also a financial success.

The results of the mail ballot were announced at the business meeting portion of the overall meeting[25] with 50 members in attendance, and the first elected officers and councilors of the SRA were installed then and there with Robert B. Cumming as president and Chris G. Whipple as president-elect. Table IV-A and Table IV-B give the names of all officers and councilors elected and installed that day. The table also contains the names of all officers and councilors elected and installed from 1981 through the 1999-2000 term.

At the meeting it was announced that the total, dues-paying membership had risen to 443; that the total number of registrants for the workshop was about 220 (of whom 45 attended by invitation); that there was a net balance in the Society's treasury of over $4,000 (not including income and expenses for the workshop, which was itself a financial

and scientific success); and that good financial support for the workshop had been obtained from the Sloan Foundation, the NRC, and the Office of Pesticides and Toxic Substances of the U.S. EPA. Here, a precedent had been set of obtaining financial sponsors for the meetings, a precedent followed to this day. Organizations that finally cosponsored the workshop with the Society were the NAS (as mentioned earlier) and the World Health Organization; the final name of the workshop was the "International Workshop on the Analysis of Actual versus Perceived Risks" in keeping with its sponsorship and true nature. The new president announced that plans for the second annual meeting were already under development.

During the first annual meeting a number of issues were raised, many of which have a contemporary flavor, such as a need to modify the new Constitution, under-representation of a particular discipline at the annual meeting (in this case, behavioral scientists), and the question of corporate membership with its pros and cons. One of the cons expressed was that the Society might become an "industrial tool if this form of membership were implemented without adequate safeguards." Another important issue raised by members was what the policy would be about association with other organizations. The response expressed the policy that has been followed ever since: "attempts would be made to dovetail SRA meetings with those of other disciplines in order to foster areas of mutual interest and that ad hoc relationships would be developed with sponsoring groups for purposes of exploring the scientific content of subjects in risk analysis."[25] Concern was raised that too close an association with organizations of narrower scope might defeat the Society's multidisciplinary goals.

The first annual meeting of the Society for Risk Analysis was a resounding success. It had made a good beginning in keeping to the description of the Society and its purposes found in the Articles of Incorporation and in Article 2 of the then-existent Constitution. In the attachment to his October 1980 letter[22] Cumming summarized the vision of the Society as of that time: "The Society will attempt to facilitate communication among those concerned with various aspects of risk analysis, risk perception and acceptability and risk management. Its scope will be broad, including health risks, engineering risks, mathematical and stochastic processes involved in risk analysis, the social, psychological, economic and philosophical aspects of risk, and the governmental and regulatory implications of risk analysis" and, further, "The purpose of the Society . . . is to promote communication among disciplines involved in dealing with risk; the many geographic areas, worldwide, concerned with risk problems; and the various institutions and interest groups who have a need to deal with risk in one or more of its many aspects. The Society will also strive to become an unbiased focal point for the many diverse elements of the risk analysis-management community." This was a good vision with which to start the Society on its way. The Society has continued to be faithful to this vision throughout its existence.

With the installation of the newly elected officers and Council members, Cumming faced a continuation of his hard work. He continued, as president, to lead the newly born SRA, to edit its journal, and to write, edit, and publish its newsletter, all at the same time. He served as president until the second annual meeting, which took place on

June 15-17, 1982, at the Hyatt-Regency Hotel in Arlington, Virginia, at which time President-elect Chris Whipple became president and Cumming remained on the Council a further year as past president.

Considering the beginnings of the SRA and its journal, it is evident that—although many worked hard to put them together despite having full-time careers to pursue (and they had strong support)—the energy, persistence, and leadership of Robert B. Cumming were what made it come together. There is only one person to whom the title "the father of the Society for Risk Analysis, of its journal, *Risk Analysis: An International Journal*, and of its newsletter, **RISK** *newsletter*" belongs and that is Dr. Robert B. Cumming.

4. CLIMATE IN THE WORLD OF RISK ANALYSIS, 1981-2000

The Society for Risk Analysis, throughout its history, has reflected the changing national and international risk analysis scene. It has done so through the services it has provided to its membership and to the larger risk community and the manner in which it has gone about providing those services as the external scene changed. Organizational changes were made primarily to better serve the broad needs of the Society's membership, incorporating the ability into its organization to react to changes in the world of risk analysis. The material in this section is designed to call to mind, and/or to provide a synopsis of, the background against which and the environment within which the Society and its members lived, acted, and reacted during the first 20 years of the Society's life.

In its earliest days, the Society developed several ways to serve its members and others by providing the means for interaction between all the different people engaged in the different fields of risk analysis such as meetings, workshops, seminars, the Journal, and the proceedings. The Society was not designed to spearhead change; it is its members, together with the rest of the risk community, who have done that. Before continuing with the history of the chronological development of the Society from its first, founding, annual meeting in June of 1981 through the year 2000, the continuing changes in the external risk analysis environment will be described as background. Many of the changes in the world of risk analysis have been made with the direct participation of members of the Society.

No attempt is made here to trace the full history of the development of the large collection of specific and specialized fields included in the term "risk analysis." That would be a separate task too great and lengthy for this history. Those interested in a broader or a more detailed history are referred to the literature on the subject. Particularly useful for its breadth of content and useful references is an article by Ortwin Renn on the accomplishments of risk analysis research over the last three decades or so, principally in the United States and Europe.[26] Also, the reports mentioned further on are excellent (but far from exhaustive) sources of additional literature for those interested in more in-depth knowledge of the accomplishments in the areas of those reports within the period.

The aspects of the 1981-2000 atmosphere that will be discussed here are those developments in risk analysis that have had especially large impacts on the development of the Society as well as some significant organizational developments external to the Society. Other areas of risk analysis are not discussed, not because they are not important but because their influence on the course of the Society, over time, has been less despite the fact that they have enjoyed continued development, expansion, and use throughout the period and that they have played some part in the activities of the SRA. Examples of some major areas not discussed are technological risks such as probabilistic risk analysis (PRA), manufacturing plant safety management, and other risk areas such as radiation risk analysis, high consequence, low probability risks, and such longstanding ones as financial risk analysis and risk management through insurance. Techniques and understandings of risk have crossed over, in many instances, from these areas to other areas of risk analysis. An example of such cross-fertilization is PRA. Originally conceived in the Rasmussen Report[27] as a way of determining safety (and risks) in the field of nuclear energy, many of the techniques developed and utilized in it—such as model-building, the development of probability distributions from combinations of data and expert opinion, and the use of Bayesian statistics—have been applied in other fields of risk analysis.

The ferment in that part of the world of risk analysis which included environmental health risks and the associated psychological, societal, and policy aspects of those risks that led, along with strong interest in technological risks, to the formation of the Society for Risk Analysis and its journal has been outlined briefly in the first portion of this history as background necessary to understanding that formation. Following the formation of the SRA, the ferment did not cease. Rather, it increased in variety, depth, and scope but, in some respects, it proceeded in a more orderly manner as a result of the learning processes that preceded it.

4.1. Developments in the World of Health and Ecological Risk Analysis in the United States

The Society and its journal, from the days of their conception, were both conceived to be international in scope. Nevertheless, despite the establishment of strong societies in Europe and Japan (SRA-Europe and SRA-Japan) the bulk of the Society's membership, by far, lies in North America, principally in the United States. The highlights covered in this brief historical section will therefore be drawn primarily from activities within the United States that have had significant impact on the development and promotion of risk analysis, here and abroad, and on the Society and its journal.

From the establishment of the Society in 1981 through the year 2000, at which point this history comes to an end, much of the Society's history involved further establishing, and then maintaining, normal operations and making organizational changes as needed to respond to events in the world of risk analysis and to the Society's own needs. The impact of external changes was in part organizational but it was felt primarily in the area of the Society's communications with its members and others: in the contents of its journal, of its annual meeting programs, of its newsletter, of its workshops and

forums and, most recently, of its Web site. These impacts are discussed in a later section of this history.

In the days of the Society's formation, there were three broad areas of the study of risk, each area with its own approaches. The approaches were most strongly influenced by the disciplines of its membership and leadership and fell into the following areas: the impact on human health, the technology causing the risk, and societal risk factors such as how individuals and society learn about, perceive, weigh, and react to the many kinds of risks to which they may be exposed and to information about risks. All of these are complex and the last area is, if anything, the most complex of all, involving human psychology (both mass and individual), cultural effects, economics, policy, the law, societal decision-making, risk communication, and many other psychological, sociological, political, historical, and philosophical factors, often difficult to quantify but all important to a full risk analysis. Each of the three areas is represented among the leadership and general membership of the Society to this day.

Later other important areas, such as ecological risk analysis, became significantly represented within the Society and organizational changes came about to accommodate them. With the addition of ecological risk analysis, the first area of risk, human health risk, was broadened to include risks involving forms of life and, therefore, all life sciences.

Before continuing, the term "risk analysis" must be clarified. The *field known as "risk analysis"* includes the fields of risk assessment and risk management, whatever the type of the risk may be, as above. *A risk analysis* is the analysis of a risk or risks of interest and will involve a risk assessment and the development of a risk management plan. An individual risk assessment may involve the assessment of only one type of risk to one type of risk taker or it may involve assessing multiple risks to one or more risk takers or types of risk takers; it may also need to consider risks caused by reducing other risks, often called "risk-versus-risk." Laying out or developing a risk management plan, in turn, can include technical ways to reduce or eliminate a risk (or several risks at once, where possible); can include ways to ameliorate, repair, or cure the effects of realized risks; can include methods for communicating about risks between experts, between experts and the public in general, between experts and affected members of the public, or with managers of various types; and usually must take into account such factors as economic costs and benefits, cultural and societal values, risk perceptions, and/or political feasibility. To carry out a single risk analysis, aspects of the two fields—risk assessment and risk management—must be employed, often including expertise in at least two and sometimes all three of the broad areas defined above. While at its heart the field of risk analysis is scientific and technological, it must also face the more difficult-to-define but very important requirements of political systems. The Society is unique in that its members recognize that risk analysis can demand the skills of scientists in all three major areas and that there must be mutual respect for one another.

4.2. Examples of Especially Influential Studies, Reports, Regulatory Initiatives, and Risk Management Efforts

In the 1970s and on toward the end of the 1980s, the analysis of human health risks, in general, and cancer risks, in particular, became the major and much-publicized foci of attention in the United States and elsewhere. As mentioned earlier in this history, the U.S. Environmental Protection Agency's (U.S. EPA) 1976 cancer risk assessment guidelines[7] was a very important, broad, early document, attempting to bring some degree of scientific orderliness to the subject. It also provided impetus to research in the area. Additionally, the Congress of the United States had long had an interest in carcinogens from a legislative standpoint. The ferment referred to earlier, particularly as related to carcinogenicity, had already given rise to several Acts dealing with the subject, such as the Toxic Substances Control Act of 1976. The Congress' interest continued and intensified and led to a request of the now-defunct Office of Technology Assessment (OTA) to make a study of cancer risks which would inform the Congress on the subject. In 1981 the study panel, chaired by Norton Nelson of New York University, produced the report *Assessment of Technologies for Determining Cancer Risks from the Environment*.[28] This study provided a strong stimulus to the development of the subject. During this study a further study[9] was commissioned which led to the best definition as of that time of the attributions of cancer to each of many causes, a subject with strong policy implications.

Although cancer was a major focus for the development of health risk analysis, risk policy, and regulation early in the period and before, other aspects of human health risk, and other risks, were not neglected during this entire period. They began to be more and more the subjects of public attention as time wore on, though less-publicized developments in these areas had been underway all along in parallel with those in cancer risk analysis and regulation.

In the United States, where the Society was born and still has the majority of its members, many, many organizations, public and private, took significant part in bringing about change and developments in risk analysis. A number, but by no means all, of these organizations are mentioned in the early sections of this history. Certain of them can be considered major, sustained drivers of change during the two decades under consideration in the area of risk, risk analysis, risk-related science policy, and risk regulation. One organization that had significant impact, particularly in the early years of the period considered, on risk research through its several research funding programs was the National Science Foundation starting in the late 1970s; Golding gives a good description of this impact.[1] Some of the significant contributions of only two major drivers will be discussed here, those of the National Academy of Sciences (NAS) and of the U.S. EPA, also referred to herein as "the Agency." The discussion of significant developments in risk analysis is centered on these contributions because they conveniently summarize and give reference, in milestone reports, to work by many institutions and individual researchers, work which affected the Society and its activities. The reader is advised again to remember that, important as these contributions have been to the development of the interests of the members of the Society, they do not cover all of the many relevant developments in all branches of risk analysis during the period.

The NAS and the U.S. EPA have played different roles as drivers of development and research in risk analysis. The NAS did not, itself, have any role in the application of its own studies. Rather it provided studies, made by panels of experts or resulting from workshops of experts, which summarized the state of knowledge in different aspects of the field of risk analysis while adding to that knowledge by bringing definition to concepts and areas previously not well defined, offering new risk analysis processes or paradigms as well as better interpretations of existing processes or paradigms, and pointing to new directions. NAS studies often address the fundamental philosophical issues of their subject matter as well as the fundamental scientific ones. These studies have been very influential in stimulating the development of risk analysis by workers in the field, including workers in academic, governmental, and private institutions, and in using risk analysis in regulation.

On the other hand, the U.S. EPA is, by definition, a regulatory agency and its interest in risk analysis is therefore in its application in regulation (though it must be remembered that much regulation exists or has existed which is not so much risk-assessment driven[1] as it is hazard-assessment driven[1]). Its interest in risk analysis—strongly accentuated by William Ruckleshaus from the time he began his second term as U.S. EPA Administrator in 1983 and followed up diligently by scientists and regulators within the Agency and elsewhere—derives from its perceived need to have methods for regulation that are supported to the extent possible by science. Regulatory support and guidance also comes from policy decisions, legal rulings and decisions, and the precedent of established practice. As a result of its interest in risk analysis as a regulatory tool, the U.S. EPA has published many reports on methods for risk analysis to be used by the Agency in its everyday regulatory work. As a driver, the U.S. EPA's role differed from that of the NAS. The Agency and its reports have advanced the cause of clarifying definitions and of stimulating much further work, as in the case of the NAS, but it has also challenged many—indeed "laid down the gauntlet" in the view of many—by its adoption of specific, general premises and "default assumptions" in proposing risk-based guidelines and regulations. Many scientists and science-policy experts have not been comfortable with these premises and assumptions and have accepted the implicit challenge to produce the scientific work needed to improve upon them. Thus, in this sense, by adopting the practical and pragmatic stance of going ahead and developing risk-based rules when clear scientific understanding was not fully sufficient, the U.S. EPA has served to further stimulate advances in the field.

4.2.1. Risk Analysis Developments Seen Through the Work of the National Academy of Sciences

The 1981 OTA document referred to above includes considerations of legislative and regulatory aspects of its subject and also includes an early paradigm for cancer risk analysis. In 1983 the NAS went well beyond the 1981 study when it published *Risk Assessment in the Federal Government*,[29] a small, red volume that became known to many as "the little red book," a takeoff on Mao Tse-tung's "little red book" but vastly different in content and aim. This landmark volume was based on a study carried out by the NAS Committee on the Institutional Means for Assessment of Risks to Public Health.

Many members of the SRA served either on the Committee or as listed sources of information to the Committee. The study has had major impact on the U.S. EPA, other agencies, and the practice of risk analysis since it provided a clear and coherent, four-stage process (a paradigm) for conducting human health risk assessments. The four stages have become extremely well known within the worldwide health risk analysis community: (1) Hazard Identification, (2) Dose Response Assessment, (3) Exposure Assessment, and (4) Risk Characterization. These four stages, plus Risk Management, constituted what were then known as the major parts of human health risk analysis. The publication provided clear definitions of many terms now common in risk analysis in general. William Ruckleshaus, practically from the first day of his appointment to a second term as U.S. EPA Administrator, embraced this study publicly in speeches, in writings, and within the Agency. It was to become a model for human health risk assessment within the U.S. EPA and elsewhere and it was to help inspire the further development and refinements of risk analysis concepts and the development of other risk paradigms.

Of the many later reports on risk analysis published by the NAS, only four will be mentioned briefly here: (1) *Improving Risk Communication* (1989),[30] (2) *Issues in Risk Assessment* (1993),[31] (3) *Science and Judgment in Risk Assessment* (1994),[32] and (4) *Understanding Risk, Informing Decisions in a Democratic Society* (1996).[33] The first report deals with an enormous problem many had observed in their practice of risk management, namely, the major difficulties inherent in intercommunicating accurately and informatively about risks among experts and interested nonexperts and with the public. It also addresses ways for communicating about risks. The second report ranges in its coverage from a critique of bioassay methods through the analysis of cancer and other human health risks and the models used, to a discussion of the very broad scope of ecological risk assessment. The third report examines the U.S. EPA's methods for analyzing, primarily, cancer risks and, secondarily, other human health risks scientifically and in a social and regulatory context; it also examines the way in which judgment enters into the analyses. The fourth report makes a deep examination of the analytical-deliberative processes used in risk analysis, among experts as well as between experts and interested nonexperts. The fourth report lays a clear groundwork for such analytical-deliberative processes as comparative risk assessment. An insightful book published in 1982, in which the role of cultural factors in understanding risk is examined and discussed, is *Risk and Culture* by Douglas and Wildawsky.[34] This book is useful background for the first, third, and fourth NAS reports named in this paragraph, summarizing much thinking and research up to the date of its publication.

These NAS reports, together with the 1983 "little red book," are signposts of progress and change in the areas of risk analysis most involved in the ferment of the period: human health risks, the communication of such risks, ecological risks, the psychologies of scientists and the public when facing risk issues, and democratic decision-making about risks and their management. The NAS has prepared many other reports dealing with particular risks which can be found on the NAS press Web site (www.nap.edu). The work of the NAS in the field of risk analysis, while stimulating much research, has not so much contributed to the ongoing ferment in the field as it has

to better definition and understanding. As a result, the ferment became somewhat less turbulent and the development became more focused than it might otherwise have been.

4.2.2. Risk Analysis Developments Seen Through the Work of the U.S. Environmental Protection Agency

The U.S. EPA has also contributed many important "driver" reports. As in the case of the NAS, they are far too numerous to discuss or even to list completely here. Some are given as examples of the wide-ranging interests of the Agency. Among the myriad reports of the Agency, those defined as "guidelines" correspond most closely to driver reports in the same sense as the NAS reports cited above. As the U.S. EPA has said, guidelines are not regulations; they are, rather, statements of how the Agency will interpret risk information in a given field of risk. They are, in fact, both practical and scholarly works.

Among other types of Agency reports, many have deep significance for the science (and the art) of risk assessment and for regulatory policy and purposes. These latter types of reports range from risk assessments for specific substances (for example, arsenic, lead) through mixtures of substances (environmental tobacco smoke, particulate matter) to such topics as place-based ecological risk analyses, as examples. These reports are generally grouped by the Agency's National Center for Environmental Assessment (NCEA) into four categories: (1) Risk Assessments (for example, dioxins), (2) Risk Assessment Guidelines (for example, *Guidelines for Neurotoxicity Risk Assessment*), (3) Risk Tools and Data Bases (for example, *Eco Stressor Identification*), and (4) Associated Programs (for example, *Global Change Research*). In addition to these, there are the many specific regulations, each of which contains large amounts of additional scientific and technical information, policy decisions, and references. These regulations cover many additional fields—including specific compounds, classes of compounds such as pesticides, pollutants in media (air, water, soil), and wetlands of various types—and they involve many sophisticated engineering models for the transport of pollutants and for the exposure of humans and/or ecosystems to them. One could go on and on. In brief, the preparation of these publications has deeply involved the scientific community, both within and without the Agency, and has also, therefore, stimulated much further research and development.

The U.S. EPA has issued many guidelines on many topics. Table VI gives a selection of risk-related guidelines relevant to the current topic and issued by the Agency within the period of interest. The first one issued, which replaced the 1976 cancer guidelines referred to earlier,[7] dealt with the most fervently debated and publicized adverse health risk of those times, cancer. The guideline was issued in 1986 after several years of internal and public debate. Since then, in 1996 the Agency issued a new proposed guideline for carcinogen risk and in 1999 it issued a further draft proposed revision for comment. The proposed new guidelines have not as yet resulted in a new final rule, so difficult and controversial is the field. However, they have often been referred to or used in assessing carcinogenic risks and the wide participation in their development has resulted in much innovative thinking.

Progressing down Table VI, it is noted that most of the guidelines consist of exclusively human health-related risk topics except for two: the guidelines for exposure assessment and for ecological risk assessment. The first-named, issued in 1992, supplants two earlier guidelines on the general subject of exposure assessment, the first of which was published in 1986.[35] Thus the importance of this stage in the risk paradigm, Exposure Assessment, was clearly recognized early in the period. The final, 1992 document, while largely devoted to human exposure to chemicals, applies as well to wildlife exposure to the same and to exposures to such stressors as biological agents, noise, or radiation.

Finally in Table VI, ecological risk assessment takes its place in the guideline document issued in 1998. The importance of ecological risk assessment was recognized by the Agency before that time in a much-used and quoted document, *Framework for Ecological Risk Assessment*,[36] prepared by the Agency's Risk Assessment Forum and issued in early 1992. The field was not a new one, however; far from it. It had been developing separately within the field of ecology both because of natural researcher interest and because of the impulse given by the need to provide better Environmental Impact Statements (see the discussion of the National Environmental Policy Act [NEPA][37] below). Glenn Suter, in his 1993 book *Ecological Risk Assessment*, gives a major description of and guide to this important field of risk assessment.[38] With the almost coincident publication of the above Framework, Suter's work was particularly timely. In his Preface Suter says: "The fact that, as of this writing, the U.S. Environmental Protection Agency has no agency guidance for ecological risk assessment is in large part due to the absence of formal assessment methods for which to provide guidance." His book filled the gap and with these two publications ecological risk assessment was placed firmly on the map of the general field of risk analysis. It was no longer known almost exclusively to ecologists.

The environmental regulations of the U.S. EPA contain and use large amounts of preexisting scientific and technological knowledge. Their development involved many scientists and technologists from the Agency and from other non-Agency institutions. In a less fervid way, the development of regulations also has contributed to further progress by pointing up problems and areas needing research or resolution. In brief, while many risk-based regulations are based on a consideration of exposure to one stressor at a time, and this kind of regulation continues to this day as a practical matter, there has been a trend toward considering targets (that is, risk takers) subject to many types of risks at once, where the risks may result from exposures to many stressors at once and where the stressors may be derived from many causes or sources. For example, the Agency has maintained a lively interest in cumulative risks from exposures at the same time or over time to more than one pesticide or to other types of chemicals, and/or via many transport pathways and means of absorption.

An example of a system of risk analysis which integrates many of the technical factors named in the last paragraph is the final Hazardous Waste Identification Rule (HWIR) issued in 1998.[39] This rule describes a multimedia transport, multirisk system

for making risk-based decisions about when a hazardous waste site may be delisted under the Resource Conservation and Recovery Act. Combining engineering calculational methods and different types of health and ecological risk assessment methods, the Rule estimates both the transport of hazardous substances from a waste site to target organisms via many pathways (air, water, soil, groundwater, and/or biota, for example) and the several and cumulative risks to targets at their locations relative to the waste site based on the targets' exposures to the stressors at their locations, considering any or all of the usual routes of exposure (respiratory, digestive, absorption through roots, cutaneous absorption, etc., . . . as applicable). If these aggregate risks are deemed sufficiently below existing safety standards for the several types of targets (human beings, fauna, flora) then the site may be delisted. This regulation is clearly a techno-scientific tour de force carried out, with many assumptions, in the face of real uncertainty in how to make such calculations. It does not involve any consideration of human or societal values. Still, it is an indicator of the Agency's desire to get to the truth about risk, and it represents a major effort to integrate health and ecological sciences, engineering techniques, and different methods of risk assessment into a single whole.

A more integrated—even holistic—field, which considers and sometimes merges health risks, ecological risks, societal risks, and societal values, expressing the results as risk rankings, is that of comparative risk assessment. The Agency had long had interest in this field, envisioning its possible use in setting environmental priorities. The Agency's Regions conducted a number of risk-ranking studies and in 1987 the Agency, itself, published a very influential report commonly called *Unfinished Business*.[40] This report details the results of a study made by Agency staff in which 31 areas of environmental regulatory interest were to be ranked, separately, according to four different types of risk: risks of cancer in humans, risks of other adverse health effects in humans, ecological risks, and welfare risks (the latter being risks to such things as public buildings and monuments, works of art, and the like, caused by environmental stressors). A major conclusion of the report was that "overall, EPA's priorities appear more closely aligned with public opinion than with our estimated risks." That is, the areas of risk on which the most time, effort, and money was being spent were not necessarily those whose risks ranked highest in the study. This important result was given much attention in the public press and the interest of risk and risk-policy researchers in the field of comparative risk was greatly stimulated by the report.

Among those especially interested in *Unfinished Business* was former Agency Administrator William Reilly. He met in person with the Agency's Science Advisory Board's (SAB) Executive Committee early in 1989 and asked the Board to review the report, to assess and compare the different environmental risks in the light of recent scientific data, and to examine strategies for reducing risks. The Board accepted the challenge represented by the request and thus was born the Reducing Risk Project. Reilly, in passing, mentioned that it would be helpful to regulators to combine at least some of the risk rankings, for example, to combine the human cancer and noncancer health risks into one ranking or to combine the ecological and welfare risk rankings into one ranking. With a smile, he also suggested that it would be even more helpful to a regulator to combine all four rankings into a single comparative risk ranking.[41] Out of this project

came another significant report generally called *Reducing Risk*.[42] In it, the possibility of ranking risks was confirmed and exemplary risk rankings were produced. It was also found possible to combine health risks of different types into a single ranking but no other combined rankings were achieved or fully attempted in this study.

The influence of this latter report was major, thanks in large part to Administrator Reilly's personal, energetic actions to publicize it and to implement its use within the Agency and elsewhere. It was widely applauded and just as widely condemned, and over two dozen entities (states, cities, regions, Native American tribes) carried out comparative risk studies involving the ranking of health risks, ecological risks, and societal risks—risks posed to societies or groups within them such as risks to quality of life and others. In many of the studies these three types of risk rankings were, in fact, combined into a single ranking, though only by introducing the consideration of human values and the perceptions of members of the public or their representatives into the necessary deliberations. Various methodologies were developed for merging rankings of unlike risks to a defined risk taker or target into one, most involving different ways of managing rank-merging groups' dynamics; an example of an analytical method for assisting such groups to plan their work or to check their results was published based on experience in an actual rank-merging effort.[43] So, interestingly enough, William Reilly's smiling suggestion of making a single, combined risk ranking did prove possible. Further, these studies confirmed and made clear the understanding that scientists also bring values with them when making scientific judgments.

In 1993 the Agency published a guidebook for comparing risks and setting priorities which was of great assistance to those planning and implementing particular studies.[44]

The difference between the last two examples, that of HWIR and that of comparative risk assessment, lies not only in the way different techniques are brought to bear but, mainly, in the involvement of the stakeholders and/or, broadly, the public in the assessment of risks in comparative risk assessment. Public involvement in risk management has long been an interest of the Agency and it at first seemed as if comparative risk assessment methods offered an ideal way to bring the public into the process of assessing the major risks affecting it. However, the initial fervor with which comparative risk assessment was embraced died down. The projects involved too much intensive effort by too many experts and others, and the studies took a long time, long enough in some instances that the terms in office of the initiators and potential users of the results ended, and they were replaced in office by less-interested successors, before a study could be completed. Also, actual instances of implementation of completed comparative risk studies were rare. Research nevertheless continues in the field and related fields. One of the most notable and prolific researchers, speakers, and writers in the comparative risk assessment field (and in many others) is a well-known member of the SRA, M. Granger Morgan, Professor and Head of the Department of Engineering and Public Policy at Carnegie Mellon University in Pittsburgh, Pennsylvania.

While interest in the specific methods of comparative risk analysis may have receded from its early, almost feverish levels, interest in involving the public in risk decision-making has not abated in the Agency. The formal interest of the Agency in public or stakeholder participation (not always the same thing) is not new, dating back at least to its statements of policy in connection with implementing several major Acts in 1979. In 1981 the Agency issued a final Policy on Public Participation involving still more specific Acts.[45] And its interest is ongoing, as evidenced in its December 28, 2000, request for comments on a new Draft Public Involvement Policy which incorporates comments made on the 1981 policy and is greatly broadened in its approach to public participation.[46] The end is not yet in sight as is illustrated in the next-described example of holistic decision-making.

Possibly the most ambitious attempt ever made to develop a framework for the comprehensive, integrated, systematic management and maximal, effective reduction of the total of aggregations of diverse risks is a study made by a special committee, the Integrated Risk Project Committee (IRP) of the Executive Committee of the U.S. EPA's SAB. This study came about as the result of a request by the Agency for the SAB to review and evaluate the earlier report, *Reducing Risk*. The overall results of this study are described in a report of the Steering Committee of the IRP titled *Toward Integrated Environmental Decision-Making*.[47] The complete reporting of the work consists of this report and the individual reports of the several committees of the SAB that participated in the study, each published separately. The cited report is not a summary of the other reports: it draws upon them, integrates them with its own considerations, and reports the conclusions of the Steering Committee of the IRP. Prominent among the results is a detailed description and explanation of an overall framework for integrated environmental decision-making. The framework, as described, is not to be instantly implemented; rather, it may well be implemented in part, over time, and to the extent reasonable and useful in any one instance of risk reduction. It encompasses, as major considerations, the following activities: problem formulation, assessment and comparison of multiple risks, cost-benefit analysis, incorporation of public values, analysis of options, and performance evaluation. The last item requires feedback at later dates on progress in total risk abatement. The framework can be applied to the setting of a standard for a single stressor or to determining how to reach optimal risk reduction of the aggregation of all risks of all types in a defined geographic region (an enormous task). Even before its publication it came into partial use within the Agency in a number of instances. At the moment it represents a framework for achieving the ultimate goal of effective, aggregated risk management. Such a goal may never be fully achieved and the framework, itself, may never be fully implemented, either. The framework remains, nonetheless, as a highly instructive tool for ensuring that opportunities to optimize aggregate risk reduction are not missed in any risk analysis.

The U.S. EPA, over the years, has produced a prodigious set of works used by risk practitioners everywhere. In making these works available, the U.S. EPA has eased the way for many, including its own analysts, but it has also raised controversy in the risk analysis community (and elsewhere) since they often provide only default methods and values, used *faute de mieux*. This controversy is a strong contributor to the ongoing

ferment in the field of risk analysis and is very constructive; spurred by the challenges it offers, new methods and data continue to emerge. Nothing is frozen in time.

4.2.3. Some Further Significant Developments not Spurred by the NAS or the U.S. EPA

The type of comparative risk assessment described above and fostered so strongly by the U.S. EPA was by no means the only type of comparative risk assessment developed which had influence in the period. The urge to compare risks for reasons of placing risks in some kind of context for the public and others or to help formulate policy led to other types of risk comparisons. An example of an attempt to place different risks in context was provided as a list by Richard Wilson in 1979.[48] In this list risks that increase the lifetime chance of death by 10^{-6} are given. For example, Wilson estimated that smoking 1.4 cigarettes or eating 100 charcoal-broiled steaks both pose this level of excess risk.

A more sophisticated, policy-development-oriented realm of comparative risk assessment was dominated by the recognition of possible economic constraints on risk abatement and emerged a few years before the Society was formed but continued well into the period of interest. Examples of early work on economic efficiency for a variety of risk-abatement efforts are papers by Zeckhauser and Shepard,[49] Schwing,[50] Bailey,[51] Graham and Vaupel,[52] and Morrall.[53]

This theme was dramatically extended at the Harvard Center for Risk Analysis by a team directed by John Graham in 1995.[54] The group performed a comprehensive review of approximately 1,200 publicly available economic analyses of life-saving interventions. The median cost-effectiveness of proposed government regulations for available data for each of five U.S. government agencies was compared. These tools are currently among those used to judge the merits of various interventions.

Many other developments occurred in risk analysis and risk-related fields in the period from 1981 to 2000 in the world at large in addition to those described above. Of these, only two further major ones will be mentioned here: the “Precautionary Principle” and “Sustainable Development” (sometimes called “Sustainability”).

The basic idea of the Precautionary Principle is far from new.[2] Old sayings such as “a stitch in time saves nine” and “an ounce of prevention is worth a pound of cure” embody the idea of preventive prudence, as does the Precautionary Principle. A more recent example is the admonition by the U.S. Supreme Court to the Occupational Safety and Health Administration (OSHA), in the 1980 landmark “benzene case”,[55] that in the workplace OSHA must first demonstrate that there is a risk and then determine the means to abate or eliminate that risk—and, in OSHA’s case, that meant to the extent feasible. The contemporary version of the Principle evolved out of German socio-legal concepts of the early 1930s and it involves the idea of “partnership between the individual, the economy and the state” to manage matters in such a way that both society and the environment, on which humans depend for survival, are improved.[56] The Principle has been elaborated for application into a set of policy principles and it has been well

received by many who are seeking ways to manage or regulate risks in a preventive way, not waiting until the often lengthy processes of full-fledged risk analysis have run their course. The Principle provides for the seeking of balance in its application. In a sense it is a form of risk management based on recognition of hazard rather than the assessment of risk. This approach would seem to do away with the need for full risk assessment (though not for a curtailed form of risk analysis), although the combination of elements of the two approaches is possible. In the "benzene case" cited earlier, the Supreme Court's findings do not require a risk assessment but only a determination that there is a risk (a hazard and the possibility of exposure), in keeping with the Principle. As another current, important example of the application of the Principle, under the Clean Air Act[57] a U.S. EPA-listed air toxic is regulated by applying the Maximum Achievable Control Technology (MACT)—also listed for different sources by the Agency—to reduce exposures from a particular source. Within eight years the residual risk is to be assessed and further reduction measures applied as possible and if needed. The application of the Precautionary Principle to Sustainability has also been proposed.

The idea that the development needed to support a growing human population and even to improve the quality of its life need not necessarily be in conflict with maintaining a healthy environment is also not new. "Stewardship," an early form of Sustainability, is a biblical concept. If nothing else, the modern concept is always present subliminally in the consciousness of most of those engaged or interested in environmental conservation but who understand the need for fulfilling human needs as well. In 1983, however, the United Nations formed the World Commission on the Environment and Development, commonly called the Brundtland Commission after its chair, Gro Harlem Brundtland. The report of the Commission, often called the Brundtland Report, was published under the title of *Our Common Future* and defined Sustainable Development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[58] During the 1990s and beyond this major, sweeping concept—which embodied, as it did, essentially all matters pertaining to human life and activities and the world's ecologies—was embraced by many different types of organizations, public and private. One of the chief promoters of the concept is the United Nations Environment Programme (UNEP). Further, in 1996 the U.S. President's Council on Sustainable Development explicitly linked what is to be sustained and what is to be developed in the phrase "mutually reinforcing goals of economic growth, environmental protection and social equity."[59] John Elkington has paraphrased this for the business community.[60] The development of tools and techniques such as environmental accounting—in which it is attempted to ensure that the costs of damage to the environment and the costs of remediation are both included in the costs of goods and services currently provided—was spurred by the concept of sustainability.

Sustainability is not, itself, a form of risk analysis. It is, however, a user of risk analytical techniques and might well employ the concepts embodied in the SAB report described in the last section on integrated environmental decision-making. Moreover, Sustainability is, itself, a major form of risk management, intended to protect future generations not only against the risk of lessening their quality of life but, ultimately, against the risk of failure to survive.

4.3. Science and Risk Analysis

So far we have spoken of developments in risk analysis, itself, of the changes in emphasis on different types and fields of risk analysis as time has passed, and on an observed trend toward more holistic risk analyses. However, risk analysis, as has already been mentioned, is a science- and technology-based activity; thus, the development of relevant science and technology (and mathematics) needs to be recognized, if only briefly. The full history of risk analysis and its relation to science and technology would require a full book of its own.

We say "based" on science and technology because risk analysis and risk assessment in particular often do not include those prime necessities of science: experimental or observational proof of its results and meaningful estimates of error. Some day, with the further development and utilization of science, they may. Alvin Weinberg, writing in 1985, called risk assessment, itself, "trans-science."[61] He distinguishes between science and trans-science as follows: "The domain of science covers phenomena that are deterministic or whose probability of occurrence can itself be stated precisely; in contrast, trans-science covers those events whose probability of occurrence is itself highly uncertain." Most human health and environmental risk assessments (and, therefore, analyses) are, even today, still trans-science despite the increasing amount of new science that has gone into them. A major challenge has been, and still remains, to bring risk assessment as fully as possible into the area of science, fully recognizing that there is already a basis in science for much that is risk assessment. There is considerable hope of risk assessment and analysis leaving the category of trans-science as the accelerating acquisition of new scientific knowledge continues.

Starting in the 17th century—in the days of Isaac Newton, others already mentioned earlier, and still others from that fruitful century not mentioned—science has undergone a steadily accelerating development and, along with it, so has technology. In recent years the rates of development in all fields of science and their associated technologies have been nothing less than explosive. At one time, not too long ago, a part per million was considered high accuracy in the chemical analysis of pollutants. Today, one part per billion is common, one part per trillion is often achieved, and for specific classes of compounds (such as the dioxins) a part per quadrillion can be measured. Those regulations of the past that were based on setting pollutant levels at the lowest analyzable level have become meaningless. And it has been thus in detection and measurement in all fields of science: more sensitivity, more precision, and more accuracy of more types of detection and measurement. Today, the detection and identification of DNA adducts and the sequencing of a genome are both nearly routine matters and the nondestructive probing of the interior workings of living creatures using supersonic sound or nuclear magnetic resonance (also called magnetic resonance imagining) are both routine medical test procedures and research tools. What one might call the forensic tools of the greatest detective story of all time, acquiring the scientific knowledge of how things work, have enabled the reporting of startling discoveries on almost a weekly basis.

Developments in the life sciences, especially in biomedicine (a major risk management field), have been phenomenal. At one point it appeared that, in the area of human health risks, accuracy of measurement of pollutant levels had far outstripped methods for detecting and assessing biological effects. This is not so any longer. Tools such as those mentioned, and others, for measuring biological effects at the cellular and even at the molecular level are now available. These and other astounding developments, such as computational chemistry and structure-activity information, have made possible revolutionary discoveries in biomedicine, toxicology, pharmacology, and ecology. There has resulted a flood of research papers from all over the world elucidating particular organic mechanisms. Many of these papers are relevant to the search for greater certainty in risk assessment.

Developments in computer-based data recording, handling, processing, transmission, and even analysis have been in many ways the most astonishing of the recent era; and they are supremely useful. The masses of data that must be acquired, stored, analyzed, and dealt with in a variety of ways in most fields of risk analysis, but especially in ecological risk analysis, would be impossible to digest and use without these advances. They also facilitate the transmission of masses of data and interpretation almost in the blink of an eye to colleagues or to any and all that might be interested.

While the vast majority of scientific and technological advances have been made without reference to their possible uses in risk analysis, some have been made specifically because of needs in that field. The needs of risk analysis have spurred developments in relevant science, technology, and mathematics. To name only some developments, there now exist better, computerized, statistical and biostatistical techniques for the analysis of data in all fields and for curve-fitting and extrapolation; exposure assessment measurement and correlational techniques; engineering models useful in assessing and planning the remediation of waste sites, including cross-media situations; biological methods for metabolizing chemically resistant pollutants in soil and water; pharmacokinetic models and methods of ever-increasing sophistication; better kinetic/probabilistic models of disease formation, particularly cancer; and greatly advanced chemical and physical analytical methods. Necessity is still clearly a mother of invention.

Despite the fact that the U.S. EPA and other agencies fund much work in-house and elsewhere related to risk analysis and the challenges their publications pose (as already described), the application of the results of that work to regulatory risk analysis sometimes seems very slow. Often discoveries, while illuminating, still do not lend themselves to immediate incorporation into regulatory risk analysis. The agencies are cautious in adopting the new until it is clear that it has a strong enough basis in science and enough generality to supplant the default assumptions now in use; the standard for change is set high. An example is the proposal to use hormesis in regulation of a variety of adverse effects in plants and animals, including humans. In a survey of the literature on the subject by Edward Calabrese and his colleagues, the authors offer the possibility of regulatory use.[62] This may come in time but as pointed out by Paul Deisler, the study by Calabrese and colleagues should be taken as encouragement to investigate the low-

dose region more deeply and concertedly than ever, using all the tools modern science affords relevant to the task.[63] Deisler says ". . . while hormesis is not yet a tool for regulation, it provides new and strong incentives for doing this work; it provides new evidence that this work is likely to be fruitful" and that regulation based on hormetic effects, when present, would be more effective and economically attractive than is presently the case, resulting in better public health protection.

Most of this section has been devoted to risks related to the life sciences. We must add that risks related to engineering and risks related to the social sciences and their assessments and analyses have also benefited hugely from the kinds of advances described and others particularly relevant to their fields. However, space does not permit the coverage, even in brief, of all types of risk analysis.

The explosion in the acquisition of scientific knowledge continues to gather force; one might even say it is threatening to become a detonation. One can therefore expect that further, major advances will be made in risk analysis when the significance of the new knowledge is understood in that context or as work continues to be done specifically to advance risk analytical methods. Risk analysis may then cease to be "trans-science."

4.4. Organizational and Related Trends External to the Society for Risk Analysis

The rapid growth in and evolution of many special fields of risk analysis during the period 1981-2000 and the similar growth in the number of public agencies, including the U.S. EPA and other employers of many types interested in risk (and that therefore employed more risk analysts), brought about growth in the number of risk analysis practitioners of many diverse kinds during the period. The number of risk consultancies ranging from one to a few individuals to major consulting corporations has also grown. This growth did not bring about a concomitantly large growth in membership in the Society, which, for the last several years, has remained in the vicinity of 2,500 members worldwide. At the same time, there was a growth in the number of scholarly societies taking an interest in risk, in the number of centers devoted to risk studies and research, and in the number of journals dedicated to publishing in the field. The increased number of societies interested in risk, each usually covering a particular area of risk analysis, and the growth in the number of related journals may account, at least in part, for the leveling off of the SRA's membership numbers.

International organizations have also promulgated the use of risk analysis through their work. Two of these are the Organisation for Economic Co-Operation and Development (OECD) and the United Nations. The OECD, with its 30-country membership and its very broad and encompassing programs, has included the use of risk analysis in its work. That the influence of the programs and work of the organizations of the United Nations has been even greater and more direct—notably through the World Health Organization (WHO), the United Nations Environment Programme (UNEP), and the International Labour Organization (ILO) and their suborganizations—in promulgating environmental consciousness among governments throughout the world and in providing concrete concepts and data must be noted in assessing the growth and expansion of risk

concepts in the areas of environmental health, ecology, and worker safety. There are other United Nations programs and organizations that contribute to these broad, risk-related areas. For example, there is the International Programme on Chemical Safety, with its special interest in risk assessment, sponsored jointly by the ILO, UNEP, and WHO. Also, the United Nations organizations work with nongovernmental organizations (NGOs) on various programs. An example of this is the programs undertaken jointly by the International Agency for Research on Cancer (IARC), an agency of WHO, and the International Life Sciences Institute (ILSI). ILSI, established in 1978 and headquartered in Washington, D.C., has as its principal interest food, its supply, its nutritive value, and its safety, worldwide, but it also has a strong interest in health risk analysis and is a contributor to advancement in that field.

Dominic Golding briefly summarizes the state of affairs with respect to the formation of new societies, journals, and risk centers during the period covered by the formation and first decade of existence of the Society for Risk Analysis.[1] He notes that the lists he presented at that time are not complete. The formation has continued since his work was published and trying to publish complete lists, now, is still well beyond the scope of this work; much has happened, as a brief survey of the Internet shows. Only some specific examples of societies, journals, and centers or institutes will be given here.

One of the things that occurred early in the period under discussion, starting just before it began, was the onset of interest in "old line" technical and scientific societies and their journals in risk matters pertaining to their fields. Societies like the American Association for the Advancement of Science, the American Institute of Chemical Engineers, the American Society of Mechanical Engineers, the Society of Toxicology, and the American Chemical Society, as a few examples, began to provide for the presentation and publication of papers and for the holding of sessions on risk-related subjects. For example, the American Chemical Society held a symposium on comparative risk assessment at its August 1991 Annual Meeting in New York whose papers were later published.[64] Who would have thought a chemical society would hold such a symposium, unless they knew that this particular society has a Division of Environmental Chemistry? In addition to this type of interest in the expanding field of risk analysis new, risk-related societies (and their journals) were formed of which we give five significant examples:

(1) A very influential society, founded in 1979, just before the Society for Risk Analysis was founded, is the Society of Environmental Toxicology and Chemistry (SETAC). SETAC publishes the journal *Environmental Chemistry and Toxicology* and has a great interest in ecological risk assessment. The society, numbering some 5,000 members and with regional organizations in the United States and Canada, has a European organization as well, SETAC Europe, headquartered in Brussels and with two specific branches: the UK Branch and the German Language Branch. Within SETAC there is the Ecological Risk Assessment Advisory Group (ERAAG) whose mission is to advance the science, use, and practice of ecological risk assessment, reduce uncertainty in assessments, and seek the harmonization of methods worldwide. Further, SETAC's journal, originally a quarterly and starting at 400 annual pages when first published in 1980, is now a monthly, publishing more than six times that many annual pages. SETAC

and SRA have, in fact, a formal link: the Saint Lawrence Chapter of the SRA (Châpitre St. Laurent) is also a chapter of SETAC (more on this chapter in a later section).

(2) The International Society of Regulatory Toxicology and Pharmacology (ISRTP) was formed in 1984. Its journal, *Regulatory Toxicology and Pharmacology*, was first published in 1981 and its articles cover the whole gamut of human health experimental and theoretical studies, human health risk analysis, regulatory policy, and related subjects. Though a relatively small society, it is very influential and its journal is widely read.

(3) The International Society of Exposure Analysis (ISEA) was formed in 1989 and its journal, *The Journal of Exposure Analysis and Environmental Epidemiology*, had its first volume published in 1990. While devoted entirely to what some may think of as one step in the risk assessment paradigm, the field itself is an intricate and highly expert one that serves not only that end but also epidemiology and, indeed, any field in which the fullest possible definition and understanding of exposures is important.

(4) The Risk Assessment & Policy Association (RAPA) was founded in 1994. In 1995 its journal, originally published as *Risk: Issues in Health and Safety*, became the official journal of RAPA with a change of name to *Risk: Health Safety and Environment* (often referred to simply as *Risk*). RAPA is as eclectic in its coverage of risk matters as is the Society for Risk Analysis, but with greater explicit emphasis on public involvement in risk assessment and management and the uses of risk assessment in legislative, regulatory, and other policy areas and in decision-making.

(5) The Association of Environmental Health Sciences is a relatively small but very active professional association formed in the early 1980s. With primary interests in underground contamination and remediation and associated matters, the association's interests cover a wide area of risk analysis. It publishes six journals, one of which has direct relevance to the work of the SRA, *Human and Ecological Risk Assessment*, though none of its journals lack some degree of relevance to the overall field of risk analysis. The aim of *Human and Ecological Risk Assessment* is to provide a framework for researchers in both human and ecological risk assessments.

In addition to the above, SRA-Europe, in liaison with SRA-Japan, has founded the first, outside-U.S., SRA-related journal, the *Journal of Risk Research*. This journal was launched in 1997 and is the official journal of SRA-Europe, complementing the SRA's *Risk Analysis: An International Journal*.

The foundation of these societies and journals is but a part of the organizational activity of the last dozen years of the period of the Society's history considered herein. They are indicative of how the broad area covered by the Society is now covered, sometimes in part, sometimes nearly completely, by other societies and their journals. They and their journals, and others not named here, form a very active part of the environment within which the Society has developed and in which it functions today. Clearly, one of the reasons for the formation of the Society for Risk Analysis and its

journal now no longer exists: there are now plenty of places to present and publish work on risk analysis.

Other new means for maintaining contact among risk researchers and practitioners are the Internet-based risk discussion groups and virtual libraries and the society and journal Web sites. These are among the innovative ways to facilitate the spread of risk information of virtually all types that have sprung up during the period.

The final development to be mentioned here is the development of centers. Golding, in his listings referred to earlier, lists only eight founded in the period 1963 through the end of the 1980s. After that, in the period 1982-1989, inclusive, he lists 11 centers. Most of these, with few exceptions, have continued to flourish throughout the period as others have been added. He is careful to make it clear that his list is not necessarily complete. Today, one has only to go to an Internet search engine and type in such words as "risk," "center," and/or "analysis," for example, to be overwhelmed with the number of centers that exist to deal with a myriad of types of risk. Some of them have been formed within governmental agencies, some are freestanding (and some of these are difficult to distinguish from consultancies), and others have been formed within universities, in the United States and in Europe. Risk has clearly become a popular subject. Most centers provide valuable and useful information, training, education, consulting, or research about risk, and their staffs are a rich source of publications in many areas of risk and risk analysis. Those associated with universities often have student interns, who gain valuable experience, or even graduate students who work on dissertations in risk analysis. These latter bring their academically acquired knowledge to the worlds of risk research and practice and to the societies representing their disciplines; they are an invaluable product of the centers and their universities. Risk analysis is not generally recognized academically as an integrated profession as are so many other professions that, in their ways, integrate several disciplines. The centers and their graduates come as close to this as can be.

The interested reader may find relatively long (but still, to the specific knowledge of the authors, not complete) lists of these means of communication and sharing of research, associations, consultants, centers, and other risk-related matter on the Internet. As an example, www.riskworld.com is one source that provides links to such information.

4.5. Summation of the Trends and Climate in the Period 1981-2000

Although it deals specifically with environmental risks, the thrust of the National Environmental Policy Act,[37] taken as a description of how risk analysis should proceed and develop and not just as the legal mandate it actually is, comes close to describing the goal toward which events in the world of risk seem to have been moving in the 20 years since the Society for Risk Analysis first began to function as a society. On rereading the Act, one is struck by the far-seeing, broad nature of the thinking contained in this very short Act. The ongoing expansion of human activities of all kinds and their many impacts on the environment is clearly recognized, as is the value of concern about leaving a sound

environment for future generations. The need for the development of methods is also emphasized. TITLE I, Sec. 102, Para. (A) calls for the utilization of a "systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision-making which may have an impact on man's environment" and Para. (B) adds, among other things, that "economic and technical considerations" shall be included. Finally, in the same section Para. (C) calls for a "detailed statement by the responsible official on the environmental impact of the proposed action," where the actions referred to are "legislation, reports or other Federal actions significantly affecting the quality of the human environment." There is much more in this Act which, scientifically and technically, was in many ways ahead of its time but which pointed the way. Although not saying so in words, the Act even presaged the now well-known concept of "sustainable development." In a way, comparing the goals in the Act with the foregoing brief account of developments in the period 1981-2000, the goals, themselves, describe the trends: pursuit of deeper understanding of risks and their causes, of a greater ability to predict what risks might be under many circumstances, of broadening the array of risks considered for assessment and management, and of integrating across fields and disciplines previously thought to be too different for such an act. In addition, the appreciation of the concept of risk has become widespread among the public, though sometimes in either exaggerated or underemphasized forms. But there is also the appreciation in the risk analysis community of what an enormous amount there is yet to know and develop. Along with these developments there is the explosive growth in scientific knowledge now taking place with its concomitant growth in technology, especially in the methods for making measurements, and the possibilities these factors have opened up to make risk analysis more solidly scientifically based.

All of this expanding activity has led to many more people entering the different fields of risk analysis, including those who seek to integrate them when necessary, and it has meant the concomitant formation of a plethora of organizations.

The trends within the period 1981-2000 should now be clear and the climate and changes in climate over that period should be clear also. Many of the events have created new opportunities to cooperate with other organizations and new challenges to learn how to reach out to the broad risk analysis community and to serve that community in keeping with the Society's original objectives. The rest of this history recounts what the SRA has done and how it has reacted and fared in this changing climate of the years 1981-2000.

5. HISTORY OF THE SOCIETY FOR RISK ANALYSIS, THE START-UP YEARS: 1981-1985

This Section and Section 6 describe two periods in the history of the Society, each containing a sequence of presidential terms: "start-up"—containing the first four presidencies (1981-1985) and the "long haul"—containing the last 16 presidencies (1985-2000). The start-up period involved getting the Society, once formed, up and going on a regular basis and solving those problems not foreseen or given sufficient priority during the formative period when other matters seemed more pressing. The start-up itself is

divided into two in the text: Part I, the most stressful part, and Part II, a part less stressful at first, in which some serious residual problems became apparent. The long haul, as the name indicates, is the story of an established institution, not without its problems or opportunities, however. Among the matters that most impacted the Society as time went by, in either period, was the changing character of the Council and, among the members of the Council, the most influential was always the president. We begin this portion of the history with a brief look at all the presidents.

5.1. The Presidents

The diversity of backgrounds of the presidents of the Society is indicated, very briefly and partially, in Table VII where there is given the highest degree each holds and the professional association each had at the time of his or her election to the position of president-elect. This information is only indicative. Each president had already accomplished much and had many experiences, and many had achieved various honors before being elected. Moreover, the nature of the highest academic degree each held by no means indicates the whole field of activity of each. Receiving a doctorate in one field was, for all of the presidents, only a starting point from which they engaged in many other activities, including the broad area of risk analysis. So, while each president came to the presidency with different histories and attainments, all were broadly and well equipped to act as president of the highly diverse Society. The diversity of the presidents, moreover, is only a partial reflection of the even greater diversity of all of the other members of each Council taken together, and of the membership of the Society as a whole.

The president, as chair of the Council, has an inherently stronger hand than anyone else in setting the agendas of Council meetings, of suggesting goals, of pressing for priorities, and of bringing up proposals. Thus, without question, each president has brought a different vision, atmosphere, and thrust to the governance of the Society despite the fact that many others have contributed to the work of the Society during any given presidency. With the installation of each new president, modified by the councilors, initiative after initiative has been taken, not always with regard to existing, ongoing efforts. The development and activities of the Society in its first 20 years of life has therefore not been a steady progression from one goal to the next in some grand order of priority. Moreover, external factors and unexpected turns of events have also prevented the history of the Society from being a smooth, wrinkle-free tale. Certain underlying necessities, problems, and themes have engaged the attention of each president and Council, however. These and other topics will be discussed by categories within the sections of this history that follow.

5.2. The Start-Up Years, 1981-1985: Part I and Part II

The start-up years are defined as spanning the presidencies of Robert Cumming (1981-1982), Chris Whipple (1982-1983), Paul Slovic (1983-1984), and Elizabeth L. Anderson (1984-1985), though the exact point at which one could say “the Society is started up” is not clearly defined. These were the years during which the many matters

pending, and the unexpected, had to be dealt with if the Society were to survive. Following these four years, the course of the Society was not smooth but the problems dealt with and the opportunities grasped were more of the type that any ongoing organization must encounter. Of these four years, the first two were the most painful. When the second two were over with, the early pain was finally reduced to a murmur.

5.3. The Start-Up Years, Part I, 1981-1983

These two years cover the presidencies of Robert Cumming and Chris Whipple. We will deal with these two presidencies as one period because the major issues that were encountered as the Society moved into the period took both of these terms to resolve. We will address these two years by topics of particular importance during the two-year period.

5.3.1. Organizational Development

The fifth and last meeting of the Steering Group (SG) took place at the National Academy of Sciences on June 3, 1981, a day after the election of the first regular slate of officers and councilors of the Society, and it was apparently called on short notice. Those present that day were Robert Cumming (Chair), Elizabeth Anderson, Vincent Covello, Timothy O'Riordan, Gordon Newell, Joseph Rodricks, Paul Slovic, and Robert Tardiff. All were SG members and all except Newell, treasurer in the time of the SG, were members of the newly elected Council of the SRA (Table IV-A and Table IV-B). As a meeting largely of the Council, its decisions had the same effect as those of any other Council meeting despite its billing as the fifth meeting of the SG.

The meeting concerned itself with organizational and transitional matters. Newell was asked to prepare an accounting of the workshop finances for possible audit and to meet as soon as possible with the new treasurer, Rom Uppuluri, to transfer responsibilities. Authorizations for expenditures of up to $500 were approved for each officer with higher sums to go before the Council. The establishment of several committees was discussed along with possible chairs: Conferences and Workshops, Constitution and Bylaws, Membership, Nominating, and Publications. O'Riordan was given responsibility for international memberships and $1,000 was to be deposited in a UK bank account for his use in recruiting members. It was agreed that the composition of each committee would be multidisciplinary. The establishment of an Awards Committee was also suggested but not accepted; the Membership Committee would discuss the matter and report. A Committee on Methodology and Terminology in Risk Analysis and a Committee on the Future of the Society for Risk Analysis were both suggested. The first of these two was rejected because a study by Professor Howard Raiffa had shown the Committee's task not to be feasible at the present time; instead, a study group was set up to examine the question and report to the Council. The second suggested committee was rejected on the grounds that it would overlap Council responsibilities. However, instead, an Executive Advisory Committee would be appointed. This meeting served as a "warm-up" meeting for the first scheduled Council meeting.

At its first scheduled meeting on July 27, 1981, the newly elected Council, in its turn, appointed most of the chairs and/or co-chairs of the constitutionally required committees, five in number at the time. These "constitutional" committees (chairs and co-chairs in parentheses) were the Committees for Publications (chair selected later), Conferences and Workshops (Chris Whipple), Nominating (Elizabeth Anderson), Membership (Gordon Newell/Tim O'Riordan), and Finance (Rom Uppuluri). The Council appointed additional committees: Constitutional Review (chair selected later), Education (Ken Solomon)—soon changed to the Special Projects and set up for the purpose of developing projects, such as peer review projects, with agencies or others needing them, and Awards (chair selected later). The Council also appointed an Advisory Committee, dropping the word "Executive" and changing it from a Board to a Committee. This latter Committee had no chair and was to consist of approximately 20 members of the Society drawn from the ranks of those who appeared on a ballot but were not elected, former members of the SG (provided they were members of the SRA), and, in time, past officers as "elder statesmen." Its members were to offer advice and counsel to the officers and the Council. It had no formal meetings of its own but its members were invited to attend Council meetings (but not vote). At this meeting, the need to have a media interface, broader sources of funding, and guidelines for determining the conditions for acceptance by the Society of special projects was discussed. The Advisory Committee was asked to consider possible broader sources of funding. By this meeting, membership had reached 525. The financial condition of the Society was in a transitional phase, seemingly less certain than had appeared to be the case at the fifth meeting of the SG on June 3, 1981. There were several bank accounts, as well as several pledges of organizational support, one of which was not certain to be fulfilled. The point was made that "when our cash flow situation becomes stabilized" earnings should be maximized by placing funds in a money market account.

Of the committee structure mentioned in the last paragraph, the constitutional committees would persist throughout the period and be filled with members, and other committees either so-designated or designated as "standing committees" would be added (and the Bylaws changed accordingly). Other committees and, sometimes, task forces would be formed and either dissolved or abandoned as issues arose and disappeared. Table VIII displays the committees and boards down through time, showing the years when they no longer existed if they ceased to exist. It is useful to examine the Table since it shows, in brief form, what committees and other bodies have existed to assist the Society to attain its objectives. The table gives evidence of an active Council that at all times addressed its most important issues. In 1981 and again in 1994 there were the fewest committees and other entities, only nine, whereas in 2000 there were 23. (Note: Table VIII does not show all ad hoc committees appointed from time to time for specific, short-term purposes; only the principal ones, having some life span, are shown).

Relevant to the Council, an important policy was adopted during Cumming's term on how future Councils would be constituted: the Council agreed that major weight should be given to obtaining balanced representation of different disciplines but that "seats by discipline" should be avoided.

Despite all the apparent progress made by the end of July 1981, Chris Whipple has remarked that the informal way in which the business of the Society was carried out at the beginning made orderly progress difficult.[65] This was so despite the fact that a constitutionally defined governing organization had been put in place. Major problems were caused by the lack of adequate, professional administrative support and the fact that all involved were part-time volunteers, each with his or her separate career to pursue. The full effectiveness of the governing organization was far from realization. What would in any case have been a normally difficult start-up was thus made more difficult, though the learning process this situation brought about was useful in the final analysis. In spite of these problems, a tremendous amount was accomplished in this early period. One can easily understand Cumming when, on being asked for the thing that stands out, even now, in his memory of his term as president, he replied: "Hard work." It was hard work by all that made so much progress possible.

The action that helped greatly to ameliorate the growing pains was the official engagement of the Society and Association Services Corporation (SASC) (now known as the Secretariat and also as Burk and Associates, Inc.) in March of 1982 and the consequent assumption of Richard Burk, Jr., of the post of executive secretary of the Society. Many of the administrative tasks, so difficult to manage by part-time volunteers, now fell to the professionals in Burk's organization, SASC. The SASC takeover of many (but not all) administrative tasks was somewhat delayed by the move of its offices from Bethesda, Maryland, to McLean, Virginia, but the SASC was soon functioning. In addition to providing record-keeping and reporting services in the administrative, financial, tax, and membership areas, Burk and his staff in the SASC became rapidly more involved, and extremely useful, in the preparations for each annual meeting and for providing, increasingly, a "corporate memory" for the Society. Burk met formally, for the first time, with the SRA Council, members of the Advisory Board I, and committee chairs on the afternoon and evening of April 7, 1982, at a session held during a conference on probabilistic risk assessment in Arlington, Virginia, at the Sheraton National Hotel. This was the formal beginning of an important relationship that continues to this day.

With these mechanisms in place, the Society was prepared to get on with its work, which concerned itself primarily with increasing membership, preparing for the next annual meeting, and getting the publications of the Society published on time. In addition there were the efforts needed to iron out administrative matters, to consider revisions to the Constitution, and to begin further efforts such as, even in this early period, education about risk.

5.3.2. Membership

Qualifications for membership in the Society were addressed during the start-up period. In effect, anyone interested could become a member. Whipple has stated his opinion that "perhaps the most important, lasting policy decision by the Council during the Society's second year was to set the establishment of a policy that there would be no qualifications for membership."[65] He explained his view and the reasons for the policy

by noting that the Society's coverage was too broad to be able to define qualifications for membership other than personal interest. He also noted, "A consequence of this policy is that the SRA has never sought to certify its members, for example, as certified risk assessors." (While there were later attempts to define qualifications for certification for risk assessors, the Society has not yet adopted any such qualifications or process).

To increase membership, early issues of the RISK *newsletter* contained membership application forms. Further, one of the practices that Burk instituted was that of making any nonmember paying full nonmember fees to attend the annual meetings a member for a year, with all the rights and privileges of any other member. This membership included one-year subscriptions to *Risk Analysis*: *An International Journal* and the RISK *newsletter*. Larger nonmember meeting attendance fees were sufficiently large to cover the special benefits at marginal cost. This was a practice Burk brought with him from the experience of the SASC in acting as headquarters staff for other small societies. This practice is part of the operating procedure of the Society to this day and it, plus the work of the officers, Council, and Membership Committee in making contacts, resulted in the membership rising rapidly in the early years of the Society's history (see Table IX for membership counts over time). By the end of 1981, membership stood at almost 600, double the number in March 1981; by mid-1982 it had reached 675.

By late 1983 a brochure had been prepared by several authors to inform members about the Society and to provide another way to promote the acquisition of new members. Authors of this brochure were Herbert Inhaber (of Oak Ridge National Laboratory and chairman of the Membership Committee at that time), Vincent Covello, Paul Slovic (president-elect at that time), and Chris Whipple. In addition to describing the formation and purposes of the SRA, the brochure described the Society's membership and the types of articles typically included in the Journal. It also contained membership application forms and the membership was requested to send names or lists of names of potential members to the Membership Committee chair.

5.3.3. The First Local Chapters

The development of local chapters was another way of spreading the benefits of the Society and of attracting new members. A major initiative in this period was the appointment of an ad hoc committee by President Cumming that met on March 24, 1982, to evaluate the feasibility of establishing a chapter of the Society in the Washington, D.C., area. Provisional chapter officers were chosen and an organizational meeting was set to take place on June 18. The provisional set of officers, all well-known and active members of the Society, was asked to take up several matters relating to local chapters and to report recommendations to the Council: procedures for developing local chapters, guidelines and requirements for local chapters, and how local chapters should relate to the larger Society. The National Capital Area Chapter was to result from this ad hoc committee's efforts.

This effort also led to the Council's first statement of guidelines for chapter formation and acceptance in 1982: (a) "those wishing to form a Local Chapter must make

their desire known to the President who will research it and, if merited, will support the request in Council" and (b) two things must be shown: (1) "Viability" and (2) "Usefulness."

At about the same time that the National Capital Area Chapter's formation began, the East Tennessee Chapter, in Oak Ridge, began its formation as well. These two chapters were to be the first two founded of many chapters (see Tables X and XI). The National Capital Area Chapter held its first meeting on November 16, 1982, at which its first set of elected officers was installed; the East Tennessee Chapter held its first meeting on April 20, 1983, installing its first set of elected officers at that time. Both chapters quickly launched their programs of seminars and other events and both continue to flourish.

At this time in history, the Society had two main poles: (1) the Washington, D.C., area, where its headquarters was and still is located, the source of many potential members from the federal agencies, and (2) Oak Ridge, Tennessee, with its Oak Ridge National Laboratory and its strong emphasis on risk analysis. Oak Ridge was also, and it would remain for many years, the hub of the Society's two main publications, the Journal and the RISK *newsletter*. It seems natural that the first two local chapters should form at these two poles.

5.3.4. Building Ties Outside the United States

The Society set out, from its inception, to be an international society. The name of its journal, *Risk Analysis: An International Journal,* attests to this. For example, the Editorial Board of the Journal in 1982 included members from outside of the United States: from Canada, France, Italy, Japan, Romania, the United Kingdom, and West Germany. One of the members of the Editorial Board was, during Whipple's term, elected to serve on the Council. This council member was Francis Fagnani of CEPN (Centre d'étude sur l'évaluation de la protection dans le domain nucléaire, Fontenay-aux-Roses, France). The founders were well aware that while risk is universal, types of risk, perceptions of risk, and the acceptability of different types of risk management might differ from one culture to another. This latter point argues for, rather than against, internationality: a major point of the Society is the enrichment and progress that would be made possible through cross-fertilization.

The founders of the Society and the early Council members themselves had individual ties to scientists interested in risk in Europe. The Council, during the start-up period, when so much else was claiming its attention, decided that the Society should begin to encourage the development of risk analysis research in other countries and contact by risk researchers there with SRA members in the United States. The results of a study made by SRA members Vincent Covello and Herbert Inhaber under the aegis of the International Division of the National Science Foundation to determine interest in health and environmental risks in a wide assortment of countries in Eastern Europe, Asia, and Latin America were used to help further this aim. Responses received during the study were published in the RISK *newsletter* in an attempt to create new contacts between

readers of the *newsletter* and individual scientists in developing countries. Formal, organizational ties were not made during this period but efforts were not far off.

5.3.5. Organizing Annual Meetings

The organization of the second annual meeting and its associated workshops was a major undertaking for a newly formed society. The meeting was scheduled for June 1982, in Arlington, Virginia. Special committees were set up to organize the annual meeting, itself, and the workshops associated with the annual meeting. At this time, President-elect Whipple served as chair of the Conferences and Workshops Committee. That Committee's duties included planning for and assuring the success of the upcoming annual meeting. It was in the spring of 1982 that Burk pointed out that plans for where to hold each meeting needed to be made years in advance so as to find suitable hotels at good rates. Today, the president-elect is automatically the chair of the Annual Meetings Committee, charged with such forward planning and arrangements, and assisted by Burk and Associates, Inc. (also called the Secretariat). The Conferences and Workshops Committee is no longer involved with organizing annual meetings and is chaired separately. The president-elect is also now charged with organizing the very next annual meeting, first setting up a special organizing committee, preferably local to the meeting, itself, with whom the president-elect can work to organize the meeting. The Nominating Committee, in its turn, was (and still is) charged with preparing a balanced ballot of two candidates for each position that would become open—to be done in time for the ballot to be mailed to the Society's members and responded to by them in plenty of time for the tally to be prepared and the winners announced at the annual meeting.

As in the case of the first annual meeting, the second annual meeting was scheduled with a workshop, this one on Low Probability/High Consequence Risk Analysis. The workshop was scheduled to take place June 15-17, in Arlington, Virginia, with the annual meeting to take place June 17 and 18, at the same location. It would include a Business Meeting and a Mini-Symposium on New Directions for Risk Analysis. Later annual meetings would all be scheduled with workshops and a business meeting as integral parts of the annual meeting. The second annual meeting turned out to be a great success, too, leaving the Society with a budget surplus. Over 200 attended the workshop.

When the 1983 Annual Meeting and its workshop were organized, President-elect Slovic chaired the Conferences and Workshops Committee. It was therefore his responsibility to see to it that the meeting took place at the selected site and that it was a success. He set up the necessary committees for this effort. This third annual meeting of the Society had an experimental aspect: holding the meeting outside of the Washington, D.C., area. Washington, D.C., was and is a hub of risk analysis activity. The organizers of the meeting were not sure how well attended a meeting in New York City, the site selected for the meeting, would be. Their concern was magnified as time went on. As Whipple has told the story, "Advance registrations were not strong and the hotel's convention manager was making nervous and threatening comments." As it turned out,

the registration desk was overwhelmed with walk-in registrants and the meeting and the experiment were both a success.

Table XII lists all the annual meetings of the SRA from 1981 through 2000, their themes, and their locations; there is further discussion of annual meetings in a later section of this history.

*5.3.6. Publications: **RISK newsletter** and **Risk Analysis: An International Journal***

A hard-to-conquer difficulty that was soon apparent was that of publishing both the *newsletter* and the Journal at the desired annual frequency (four each, per year) and on time. Quality was high and posed no difficulty.

With respect to the *newsletter* it was easily seen that the editorship, which Robert Cumming had undertaken, was a serious and distracting burden for one who was already president of the Society and editor-in-chief of the Journal in addition to pursuing his full-time scientific career. To relieve him of some of this burden, the Publications Committee sought new editors for the **RISK** *newsletter*. As a result, the editorship of the *newsletter* was transferred in late 1981 to George F. Flanagan as editor and Lorraine S. Abbott as associate editor, both at Oak Ridge National Laboratory (ORNL), with the understanding that Abbott would take over as editor when possible. At the Laboratory, Flanagan was at that time a nuclear physicist and group leader in the Engineering Physics Division and Abbott was a technical writer and editor in the fields of radiation shielding and nuclear engineering in the same division. With this larger editorial resource available, coverage steadily improved and it at first appeared that the problems with timeliness had been solved as well. Such was not to be the case. In 1983, 1984, and 1985—especially in 1984—the publication rate remained spotty. It was not until Abbott retired from ORNL to start her own full-time editing and publishing business, Tec-Com, Inc., in Oak Ridge and became the editor of the *newsletter* that resources became adequate to publish the desired four issues per year. She was the *newsletter* editor for the December 1985 issue and the desired rate of publishing four issues per year was achieved for the first time in 1986. Abbott continued as editor for many years and quality and coverage improved throughout her editorship. Coverage improved because Abbott practiced a proactive and aggressive pursuit of news items. In 1987 the desired number of issues was cut to three by the Council for economic reasons but with the expressed desire to maintain quality. A return to publishing four issues a year was not made until 1992. The last issue for which Abbott was editor was that of the fourth quarter of 1996. With the First Quarter 1997 issue, Genevieve S. Roessler, the current editor, took over the editorship. Dr. Roessler is an Associate Professor Emeritus with Department of Nuclear Engineering at the University of Florida and a radiation consultant. She now lives in Minnesota.

One of the biggest problems confronted by the first two sets of SRA officers and councilors was not the quality or quantity of submissions to the Journal, or the quality of the papers accepted or of the Journal itself, which was excellent but, rather, the difficulty of getting the Journal published quarterly and on time, as in the case of the **RISK** *newsletter*. Achieving timeliness, while continuing to maintain quality (especially in the

Journal) was vital to serving members of the scientific community, on the one hand, and to interesting them in joining the Society on the other. The problems were basically of a mechanical nature: there are many steps to take and details to deal with in going from a submission to a published paper. Also, according to Slovic, president-elect during Whipple's term as president, the publishers were becoming uneasy at the delays in receiving issues for publication. The Publications Committee, now chaired by Vincent Covello, was asked to seek solutions to these problems.

The Publications Committee set about seeking ways to relieve Cumming of the many time-consuming tasks associated with editing the Journal and to allow him to devote his time to the specific, scientific, and literary tasks of an editor. Covello and his Committee investigated the matter, making a survey of other professional societies, and discovered in detail how large and detailed a job the regular editing and publishing of a journal is. When it finally appeared that a major problem was insufficient resources, in August 1983 a request was made of ORNL to grant Cumming more time and/or resources, since the Laboratory had a strong interest in risk analysis and had exhibited support for both the Journal and the Society. Ultimately, Marda Associates of Oak Ridge was engaged to assist Cumming during his time as editor-in-chief. Later, in November 1983, the editorship-in-chief passed to Curtis C. Travis, director of the Office of Risk Analysis of ORNL, who had served with Cumming as one of two associate editors (the other was Timothy O'Riordan, mentioned earlier, who continued so to serve). Cumming, who established the high-quality Journal and to whom many thanks are owed, ended his editorship-in-chief with the December 1983 issue, having caught up substantially with the publication backlog. Travis' first issue as editor-in-chief was that of March 1984. With this new arrangement the Journal soon began to be published at the desired rate of four issues per year (increased in 1993 to six). Travis continued as editor-in-chief for many years, through publication of the December 1996 issue. Throughout that same period Cumming continued as senior editor. Further changes and editorial expansions, recorded further on, later took place.

Whipple has said he regards the solution to the problem of timeliness of publication of the Journal as one of the most significant accomplishments of the Society in its early years.

5.3.7. Adopting a Logo for the Society

Another detail, seemingly small but actually important, was taken care of—the adoption of the Society's logo. A contest was held to determine the design of the logo. The winning design was that of the current logo and the surprised winner of the $50 prize, among the many submitters, was John Holbrook. Holbrook was an illustrator at ORNL who had developed the logo earlier, working with Cumming, for the Low Probability/High Consequence Workshop of June 1982. Cumming had submitted it, on Holbrook's behalf, unbeknown to Holbrook—hence Holbrook's pleasant surprise.

5.3.8. Other Practices and Matters that Emerged During the Start-Up Period

The record of the Business Meeting in June of 1982 reveals other matters that bear mentioning since they also foretold the developing pattern of future SRA operations. Among these is the seeking of corporate sponsors for workshops, annual meetings, and other activities (following in the footsteps of the organizers of the first annual meeting's workshop), a preview of today's "Sustaining Members"; the use of at least portions of the funds from sponsors to subsidize student memberships; and the recognition, in the report of the Publications Committee, of the three major streams of disciplines within the Society, then called "Society and Behavioral Sciences," "Health and Environmental Sciences," and "Physical and Engineering Sciences."

At this same meeting an early statement of the Society's policy on controversial issues was recorded: "The Society is religiously [that is, *scrupulously*] neutral on controversial issues—it is impartial and multi-faceted, dedicated to scientific excellence dealing with risks." This was a preview of a subject that, one way or another, would occupy much thought in the future: whether (and how) the Society as a whole could participate in or, even, take positions on policy matters involving legislation or regulation or, further, litigation. This policy issue will be discussed farther on in this history.

5.3.9. Summing up the Start-Up, Part I

As Robert Cumming handed over the presidency to Chris Whipple during the Business Meeting that took place at the June 1982 Annual Meeting, he was very complimentary of the work of the SASC and of the help it was to the Society. As to the Society itself, Cumming is reported in the minutes of that meeting to have noted that he had hoped that the Society would have done better but that it had come far enough to survive and that he was not disheartened. His successor to the presidency, Whipple, was reported in the same minutes to have taken a different view, complimenting Cumming on the accomplishments of his term and stating, as reported in the minutes, that "the Society is really rolling along." He also said that the SASC deserved much credit (separately, Whipple has said that "the move of the SASC from Bethesda, Maryland, to McLean, Virginia, was one of the most significant, positive events of the early period"[(65)]). Whipple went on to say that Cumming deserved credit in particular for the way he had tapped the membership for support. Initiating a now-familiar custom, a plaque was presented to Cumming by Whipple as the presidency changed hands during the 1982 Business Meeting.

As his presidency ended, Cumming's concerns about the progress of the Society contrasted with Whipple's more optimistic view, on the same occasion, that "the Society is really rolling along." From the perspective of two decades later, a tremendous amount was accomplished and initiated in Cumming's term, things needed for the survival and success of the Society, and more was completed and initiated during Whipple's term. As Whipple handed the presidency over to his successor, Paul Slovic, in 1983, Part I of the start-up came to an end and the Society indeed appeared to be rolling along and ready for its next steps.

5.4. The Start-Up Years, Part II, 1983-1985

The start-up of the Society appeared to have been completed by the end of Chris Whipple's term and the start of Paul Slovic's. Slovic, whose skills in personal mediation had been used to good effect in helping to resolve problems connected with the Journal, remembers the two years preceding his installation as president, particularly his year as president-elect, as a very stressful time. Compared to that year his presidency, as he entered it, appeared peaceful and calm. He remembers his presidency as a period of peace during which his major preoccupation was the development of the 1984 Annual Meeting. He was determined to see to it that that annual meeting lived up to the high scientific and technical standards of the preceding two, and it did. During Slovic's term, also, Vincent Covello and Herbert Inhaber of ORNL explored ways to encourage the use of risk analysis in developing countries. Other matters of governance, with the aid of the Council and SRA Executive Secretary Richard Burk of SASC, proceeded without difficulty throughout the majority of his term.

Two start-up problems remained unsolved, however: timely publication of the RISK *newsletter* had not in fact been achieved as hoped, and a problem not fully appreciated, that of the Society's potential lack of financial stability, came to light.

Despite the change in editorship of the *newsletter* (Section *5.3.6*), the publication rate did not improve. In fact, it deteriorated. In 1982, during Whipple's presidency, three of the desired four issues had been published, whereas during Slovic's presidency and that of his successor, Elizabeth Anderson, the rate dropped to two issues published in 1983 and to only three issues in 1984 and 1985 combined. The solution to the problem, another change of editorship as described in Section *5.3.6*, was defined during Anderson's term as president and implemented successfully toward the end of her term.

The financial problem alluded to was not apparent until just before Anderson became president. There had been early difficulties in knowing what the Society's financial position was at any given moment due, as Whipple has put it, to the "shoebox" method of accounting (put all receipts and other documents in a shoebox and tot them up later) that the fledgling Society practiced. Even though the transition from volunteer bookkeeping to the professional bookkeeping and accounting of the SASC had not proceeded as rapidly as it might have, the early Society was basically solvent on a current basis. By Anderson's term the SASC had taken over the bookkeeping and accountancy functions and regular reports, useful for management control, became available. Such problems as individual members being asked to pay their dues when they had already paid them or of bills not being paid on time were greatly reduced.

By Anderson's presidency, past financial statements, while not always as detailed as later ones, indicated reasonable excesses of receipts over expenditures that, while not large, were positive and reasonably healthy. They were, however, decreasing with time. By August 31, 1984, a little more than a month before Anderson took office, a statement of that date showed an excess of only $186.92 out of receipts of $61,870.47. As Anderson has said, she found as she entered the presidency that the Society was nearly

broke (on a current basis) and that if something were not done, it soon would be broke on any basis.[66]

Anderson has said further that of the aims she had for her term in office, the one that took first priority, once it was identified, was leaving the Society in more solid financial condition at the end of her term than at its beginning. To this end, she and the Council directed much attention, initiating revenue enhancement and cost-cutting measures wherever possible. As examples of revenue enhancement steps, dues were increased for the first time (something that would have to be done periodically in the future), a special effort was made to attract additional members, and a policy was adopted that no conference or workshop would be undertaken unless a realistic, projected budget was first prepared which showed that the event would produce positive net revenue. The dues increase was agreed to with some trepidation, as it always is, since there is a concern that many members might consider the SRA as their "secondary" society, competing for dues with the societies of their primary disciplines. Cost cutting was made up of a variety of small things, all adding up, ultimately, to a useful decrease in costs. An example of one such measure is that, at the end of her term, the President's Reception was held in Anderson's own home rather in a costly hotel or other facility. Readers present at that reception may remember its charm as at least one of the authors does.

During her term, Anderson also concerned herself with the usual affairs of the Society and, in addition, starting before her term as president began, with establishing early contacts with individuals who, in time, would form SRA-Japan. The formation of SRA-Japan will be taken up more fully later. Setting a precedent that would last for a few years, the new National Capital Chapter hosted the 1985 Annual Meeting and, at that Meeting, the New England Chapter's foundation was approved by the Council. Further on the international front, the SRA also cosponsored "Risk Analysis in Developing Countries" with the International Atomic Energy Agency; UNESCO (United Nations Educational, Scientific and Cultural Organization); the Department of the Environment, India; the U.S. Environmental Protection Agency; and the Federal Environmental Assessment Review Office, Canada, at the Administrative Staff College of India in Hyderabad.

By her term's end, Anderson achieved the strengthening of the Society's financial condition that she sought and so passed the Society to her successor as president, Lester Lave, in viable condition. The final start-up problems were solved and the Society was ready to move ahead to encounter new problems and to make and grasp new opportunities.

6. HISTORY OF THE SOCIETY FOR RISK ANALYSIS, THE LONG HAUL: 1985-2000

With the start-up period essentially at an end, the Society could look up and seek opportunities to further define and expand its size and scope, including its geographical coverage, and to define itself and its purpose. Many of the required activities would take more than one presidency to accomplish; indeed, many would be ongoing. Therefore, in

this section the history will not be told presidential term by presidential term but rather by significant topics. The section begins with the setting of some very important goals.

When Lester Lave embarked on his presidency at the beginning of the "Long Haul" he found a functioning Society of over 1,000 members, worldwide, with two chapters: the National Capital Area Chapter and the East Tennessee Chapter. He had been involved in building the Society and, in his term as president-elect during Elizabeth Anderson's term as president, he had become involved in the completion of the start-up period and had developed his ideas on how to move forward after start-up. In the December 1985 issue of the **RISK** *newsletter* he published what he called "modest" goals for the Society (stated as for the next year!), including the names of members who had accepted assignments to accomplish certain tasks. In his own words, from that *newsletter*, here are the goals he set:

(1) Double the number of SRA members.

(2) Establish related organizations in Europe, Japan, and other nations.

(3) Establish at least 10 additional chapters in cities such as Boston (Joseph Fiksel), Houston (Paul Deisler), Philadelphia (Howard Kunreuther), New York (Rae Zimmerman), Palo Alto-San Francisco-Berkeley (Elisabeth Paté-Cornell, Joyce McCann, and Chris Whipple), Los Angeles (John Garrick and Toby Page), Cincinnati (unassigned), Pittsburgh (Granger Morgan), St. Louis (Raymond Boykin), and Detroit (Walter Albers and Richard Schwing).

(4) Put SRA on a more sound financial footing by increasing membership, building the number of corporate sustaining members, and attracting regular grants from government agencies (and he added: "we must also figure how to cut expenses").

(5) Increase communication with members and get more regular feedback concerning the programs we should be pursuing (and he added "we must also better utilize the good will and help of our members").

In addition to those named in goal (3), Lave assigned other goals as follows: goal (1) Paul Deisler and goal (2) for Europe, Pieter-Jan Stallen, for Japan, Elizabeth Anderson, and for other areas, R. V. Uppuluri. Goals (4) and (5) were left for the Council to deal with.

These were very ambitious goals despite their description as "modest." Lave wrote at the time, "These objectives are reasonable only because of the level of interest in SRA's mission and the superb quality of current members." He called upon all members to pitch in and help. While it would not prove possible to meet these goals in one year, by setting them Lave brought a sense of renewal to officers, councilors, and members and he set in motion the activities necessary to achieve them. Succeeding presidents and Councils worked toward these goals and achieved much. We will discuss the first four goals in subsections of this section though not in the order given by Lave, along with

other important topics that arose in the course of time. Goal (5) is so significant that an entire section is devoted to it (Section 7).

6.1. Growth in Membership and Financial Support, 1985-2000

6.1.1. Membership

Journals can and do exist without an underlying society. Also, conferences can be held without the need for a society; an important example of this is the Probabilistic Safety Assessment and Management (PSAM) meetings for which there is an ongoing secretariat but no society. To have a society of individuals having common interests, capable of accomplishing all the many things members and their disciplines need, members are needed. Members are the strength of any such society. As Lester Lave did in setting forth his goals, we begin by examining the SRA's membership growth and development.

There are now several classes of members (individual persons who are members) as well as sustaining members (corporations that make gifts in any one year to the SRA). In the beginning, there were only two classes of members: members and student members. By 1984 those members who had helped found the Society or had joined before its second annual meeting were denominated charter members and additional classes had been added: regular members (later called members without Journal subscriptions), editorial members (members of the Editorial Board of the Journal), and retired members. By 1985 the class of sustaining members had been added and by 1992 the category of Fellows had been introduced. Two classes of student members now exist: those with and those without Journal subscriptions. Within the above categories of membership, as appropriate, any who joined the SRA before its formation or within the first year of its existence are also designated "charter members."

Table IX shows the numbers of members, by years, of the SRA. To simplify the table, we have lumped classes, as follows: the category "members" includes all individual members of every classification except student members of either type; student members of both types are shown, totaled, simply as "student members"; and sustaining members are shown separately in the last column. Numbers of individual members of any type do not include members of chapters or sections who are not members of the SRA itself. Non-SRA members of chapters and sections of the SRA constitute much the larger part of the membership of those organizations so that the numbers of individuals associated with the SRA in some way are greater than the numbers in the table; but the total magnitude of the difference is not known.

The data in the table were taken from the Membership Directories except for those years in which question marks appear; no directories were issued for those years and the data shown for those years came from a variety of documents and tables found in the SRA's files. To the extent possible these latter data were selected so as to be consistent with the definitions of data from the directories.

The first three columns in the table show the numbers of individual members, the numbers of student members, and the totals of both types of members; the second four columns show the broad, geographic distributions of members and, again, the same totals; and the last column shows the numbers of sustaining members, defined as other organizations (such as corporations) that contributed financially to the SRA in any given year. With regard to accuracy and comparability, the numbers contain all who were known to be SRA members at the times when counted, though some members may have been in arrears at the time but not yet stricken from the rolls on the basis that they might yet pay their dues. For the most part the numbers shown in the Table are the numbers of members on the rolls shortly before each annual meeting. Numbers after each annual meeting would be considerably higher because of the policy to give one-year full memberships to nonmember registrants. Many of these new members, perhaps as many as 50% in some years, did not renew their memberships after the first year but others stayed on the rolls. During each year, also, other members were acquired and still others dropped off the rolls. Moreover, the annual meetings before 1991 were scheduled earlier in the year than early December, starting with the first annual meeting in June of 1981 and moving toward early December as time went on. Thus the earlier numbers represent the membership at different times of the year, the numbers after 1990 being those toward the end of the preceding year, and all numbers appear to be without the upwards "bump" due to nonmember registrations at the annual meetings. The numbers in the Membership Directories were published as though they were the numbers of members at start of the year of each Membership Directory. In terms of average membership in any given year, the numbers shown would be somewhat on the low side. Recognizing all the sources of uncertainty and inconsistency, the numbers nonetheless give an indication and understanding of the trends in SRA membership over the period.

Table IX gives a rough geographical distribution of members: United States, Canada, and Elsewhere. The last category is composed largely of SRA members in SRA-Europe and SRA-Japan with the ratio of SRA-Europe members who are SRA members to those SRA-Europe members who are not SRA members outweighing the ratio in Japan (which has a much larger proportion of Section members who are not SRA members than does SRA-Europe). The "Elsewhere" category includes SRA members from many countries, if only a small number in each. Table XIII shows the international dispersion of SRA members. From its beginnings and even in its formative stages, *Risk Analysis* has been of interest internationally. Through *Risk Analysis*, the Society has become known, widely if not always by many.

Total membership increased at a good rate during and for several years after Lave's presidency (1985-1986), reaching a nominal level of 1,730 total individual members in 1989-1990, but not doubling until about 1995. After a spurt in 1995-1996, total individual membership stayed within a range from nearly 2,400 to slightly over 2,500 for the rest of the period covered by this history. In 1997 the Council, discussing the spurt in membership, raised the question as to whether the SRA might not be growing too fast and, indeed, whether there might not be some ideal size for the Society. At that same meeting of the Council it was reported that 150 membership applications had been received via the SRA Web site, and during the two years following the spurt in growth,

growth was reported as being more modest but healthy. At the December 5, 1999, Council Meeting the numbers were reported to be still rising but at the December 3, 2000, Council Meeting a slightly less optimistic report was made. At that meeting, membership losses and gains were summarized as gaining about 400 members per year and losing about the same number; in other words, a flattening out of membership growth. Cessation of growth, if it should prove to be true, gave reason for concern in the light of the fact that the total population of individuals practicing different forms of risk analysis had grown greatly over the two decades of the Society's life. The question of an ideal size for the Society appeared to have become moot.

A closer examination of the membership numbers shows, toward the end of the period, the possible beginning of a downtrend in membership and a reason, therefore, for greater concern. The numbers tending to raise concern are those for individual membership in the United States listed opposite the years 1998, 1999, and 2000 in Table IX which are, respectively: 1,966; 1,873; and 1,792. Total individual membership numbers for the same years was 2,517; 2,456; and 2,525. The recorded decrease in U.S. membership in the last two years was more than offset by a recorded large increase in individual members elsewhere (largely Europe and Japan), thus accounting for the upswing reported for 2000 in total membership. Since histories are usually written in a time that lies in the future of the era written about, we can now say that the possibility of a downtrend in membership possibly visible in the last years of the period actually did depict the start of a downtrend. Membership numbers for 2001 and 2002 are 1,713 and 1,645 for individual U.S. members and 2,284 and 2,151 for total individual members. The upsurge in membership outside of the United States and Canada in 2000 proved to be a one-year phenomenon.

If membership was indeed starting to drop at the end of the period it was not for lack of trying to increase membership throughout the entire period, even when membership increases were consistently large from year to year. When Paul Deisler was charged by Lester Lave with increasing the membership, as mentioned already, he immediately considered different ways to fulfill this charge. One that was tried was an "every member bring in a new member" campaign. Such a campaign relies on the existence of the enthusiasm for the Society envisioned by Lave when he stated his five main goals. Disappointingly, only 2% of the membership actually responded by sending in a total of about 100 names. Of these only a handful proved to have any serious interest. From Lave's presidency onwards, successive Councils and Membership Committees tried many different ways to increase members, including the "every member bring in a new member" approach. In later years this approach was implemented by passing out cards at the business meeting lunches and asking those present to suggest as many names as they could think of. These efforts, aimed at the "captive" segment of the membership present at the lunches, elicited a higher percentage of responses, but if there was any effect on membership it was not a clearly visible one. The only direct, personal approach to nonmembers ever tried took place in 1995 when John Graham reported to the Council, at the outset of his presidency, that he had made direct contacts with some 30 individuals with great success. This type of direct, missionary work uses much individual time and effort but it could, if it could be applied on a larger scale, have significant effect. Other

actions which offered important ways to make the world aware of the SRA were joint meetings with other societies, which offered opportunities for non-SRA members to become acquainted with the SRA, and invitations to nonmembers to participate in annual meetings, conferences, workshops, and courses. The establishment of chapters (in the United States and elsewhere), sections (outside of the United States), and specialty groups, all discussed later in separate sections, offered further, important means for bringing more risk analysts of diverse types into contact with the SRA. As an individual example, an invitation to participate in a panel discussion at the 1982 Annual Meeting brought the SRA to the attention of one of the authors, Paul Deisler, and resulted in his still-continued membership.

Another major means of acquainting many members of the possibly interested public with the SRA is *Risk Analysis: An International Journal*. A membership survey conducted in 1996 pinpointed the Journal as being a major benefit to members and this led to discussion by the Executive Committee of the Council of ways to increase the circulation of the Journal. One way discussed, which is further discussed later, was to seek to make joint arrangements with other societies and/or journals for the members of each to be able to subscribe, at reduced rates, to the other's journals. The SRA's very easily found, informative, and user-friendly Web site (www.sra.org) is also a way for interested individuals to discover the SRA, to find out what it is, to register for meetings and conferences, and to join the Society (as mentioned above, some of the last-named activity has taken place). Finally, the RISK *newsletter*, designed primarily for member-readers, is often seen by nonmembers; it casts further light on the Society and its doings.

It was hoped that the establishment of chapters would increase membership in the SRA. While only the officers of a chapter must be SRA members, others may join the chapter, itself, without joining the SRA. It was hoped that these non-SRA chapter members would decide to join the main society. There is no way to determine what effect the establishment of chapters might have had on membership, but if there was some increase in SRA membership via this route, it is not noticeable in the overall statistics. A proposal to require all chapter members to be SRA members was rejected since that might jeopardize chapter membership and inhibit the implementation of SRA's mission to be a focus of communication with the risk analyst community, members or not. In 1998 a motion was passed at the June 16 Council meeting to offer a one-year, reduced-rate membership to non-SRA member chapter members. The effects of this action are not known.

While all of the above aids to increasing membership have undoubtedly had effects, the most effective single method still appears to have been one already mentioned which was introduced early in the Society's history: giving a one-year membership with corresponding Journal and *newsletter* subscriptions with each annual meeting registration of a nonmember. While a proportion of these new memberships were not renewed at the end of the year, others continued. Still, this mechanism has built into it a natural limit to growth; for this source of growth to continue, annual meetings have to become ever larger with correspondingly larger (and, one would hope, disproportionately larger) nonmember registrations to more than offset attrition. How many non-SRA members

register has been found to be affected by the location of the meeting and the effectiveness of advertising for it.

Retention of members has also been addressed by the Council over time. Among the ways to help new members come to know and appreciate the Society and, therefore, to become active in it and not leave it, are the New Member Breakfasts, attended by councilors who can discuss the Society in an informal and welcoming setting. These sessions were begun in the early 1980s and have been well attended. Holding a Member Forum at each annual meeting was tried; begun in the 1990s the sessions drew so few attendees that in 1999 it was decided not to continue the practice. Arranging for continuing members to be able to pay their SRA and chapter dues (if members of a chapter) along with their annual meeting registrations is a convenience introduced to help members stay current and on the rolls. Continual effort to maintain the quality and diversity of material published in the Journal and presented at annual meetings, conferences, and workshops were other ways to retain and attract members; and membership brochures of increasing quality have been produced and distributed repeatedly, from the earliest days of the Society. Still, with all the efforts made to attract and keep members and so, finally, to strengthen the Society, the membership trends described here have not improved.

External factors tending to keep the membership low, despite the growth in numbers of risk analysis practitioners of many kinds, are discussed in Section 4.4. Many risk analysts find, now, that their major disciplinary societies will publish papers dealing with risks in their fields. Moreover, another factor that might draw specialists away from the SRA is the formation of new societies dealing with risk analysis or related, specialized subareas, even though the SRA has developed specialty groups, as described farther on.

Yacov Haimes, writing as the immediate past president in a message in the Fourth Quarter 1998 **RISK** *newsletter*, noted that polling exiting members had uncovered no common, significant reason for their departure. Considering risk analysis practitioners as a whole, the value of the eclectic nature of the SRA may be hard to communicate since so many are fully occupied in their specialized, complex fields of risk analysis. It may indeed be that experts in specific areas of risk analysis who are also interested in all types of risks and their analysis and the possible relations and crossovers between and among them are rare birds in the population of all risk analysts. Ways need to be sought to stir, as Lester Lave put it as he became president, “the level of interest in SRA’s mission” once again.

6.1.2. Financial Support

The early financial history of the Society has already been touched on, culminating in Subsection 5.4 with the story of the struggle, during Elizabeth Anderson’s presidency, to ensure that her successor inherited a net-income solvent Society. Her successor, Lester Lave, having participated in those struggles, set putting the SRA on a sound financial footing as his fourth goal. His suggested remedies included increasing

membership, building the number of corporate sustaining members, attracting regular grants from government agencies, and finding out how to cut expenses. Implementing the last remedy was greatly helped by the steadily improving system of financial reporting and by the Council, through the treasurer in concert with the Secretariat, being able to pay better attention to the financial status of the Society. Ongoing control of costs then became possible.

All serious financial problems were by no means solved by the end of Anderson's term as president. The SRA continued from time to time to be subject to surprises. In 1992, for example, a $7,500 shortfall occurred at the same time that extraordinarily high gross revenues were overshadowed by still-higher expenses. The greatest shortfall occurred when, in 1995, gross revenue was $440,000 and expenses were $476,000, leaving a shortfall for the year of $36,000. The below-budget performance of the December 1996 Annual Meeting in Hawaii, discussed farther on, was a major cause. Fortunately the SRA had a small but sufficient reserve to meet this shortfall and continue operations.

Following these events, the Society instituted a number of measures. While it had always been the responsibility of the treasurer, on behalf of the Council and working with the Secretariat, to track and report on the financial status of the SRA, from that time forward these two, together with the president, were specifically charged with managing the Society's financial affairs, controlling costs, seeking cost-reductions where possible, and foreseeing difficulties, on behalf of the Council. It was also noted that a society of the age and size of the SRA should have a reserve of one year's operating expenses. For this reason, the goal for a reserve was set at $500,000. Later, at the end of 2000, a further problem was recognized, that of the need for a longer total term of service for the treasurer to allow for a longer learning period for each treasurer and for greater continuity of management of this very important matter. The position of treasurer-elect was established in 2001 and incorporated into the Bylaws.

In 1996 and the years thereafter net income returned to being substantial compared to expenses and no further shortfalls have been experienced through 2000. The reserve, by the end of the period, was still less than half of the goal of $500,000, however.

Ongoing sources of revenue have been, throughout the period, dues; gifts from sustaining members; grants for specific project work (discussed in Section *6.6.2.2*); annual meeting net revenues and those of conferences, workshops, and courses; the Journal; and such sources as interest on funds either deposited in banks or otherwise invested. Later in the period, grants from government agencies to perform specific projects, discussed farther on, became a source of funding. Of these sources, the most predictable has been members' dues, contributing somewhat over a third of total, gross revenues over recent years. The contribution to gross revenues of the annual meetings, while highly uncertain on a year-to-year basis, has been comparable to that of members' dues. After netting out expenses, the contribution of annual meetings is still major, second only to dues. In the next subsections, only the contributions of dues, sustaining

members, the Journal, and the annual meetings will be discussed. The rest have had only minor impact on the finances of the Society throughout the period though they are valuable to the Society in other ways.

6.1.2.1. Dues

Membership dues for the Society for Risk Analysis, at the outset, were set at $30 per year for members, including a subscription to the Journal, and $10 per year for student members, with no subscription to the Journal. Student member basic dues have always been kept well below the dues of members to encourage students to join the SRA. Member dues have been set at levels low compared to other, primary, disciplinary societies' dues with the thought in mind that the SRA, a multidisciplinary society, would in all probability be considered a secondary society by many members who would also be members of the societies of their own, primary disciplines. This philosophy has been followed throughout the period as the Council, cautiously and with careful thought, has had to raise dues from time to time. The dues and dues structures discussed here do not include special arrangements for international chapters or sections of the SRA; this area will be discussed in Section 6.3 of this history.

Starting early in the history of the SRA, succeeding Councils have elaborated the dues structure to make membership more attractive and feasible, offering reduced dues for some performing particular duties for the Society and accommodating different desires, purposes, and purses. Dues have also been raised, from time to time, always following the philosophy already mentioned and the principle that, to the extent possible, each raise would be followed by another raise only after two, three or, if possible, more years had passed. The yearly dues structure is now as follows: full members and Fellow members, $105; Editor Fellow members, Editor members, regular members (full members without a Journal subscription), and retired members, $55; student members with a Journal subscription, $50; and student members without a Journal subscription, still $10. Charter members are not a dues category; they fall within other, appropriate dues classes.

As noted earlier, dues levels have, throughout the SRA's history, been far from sufficient to defray costs. The other sources, discussed in the next subsections, have not just added more income to an already inadequate dues base; they have been crucial to developing and sustaining the Society.

6.1.2.2. Sustaining Members

As seen in Table IX, in the first few years after Lester Lave's presidency there was substantial growth in the number of sustaining members and, therefore, in the support received from them, from nine sustaining members in 1985 to 22 sustaining members, the largest number ever achieved, in 1988. After that the numbers declined, rallying twice, and then dropping to only five in 2000. The reasons for the decreases are many, for example: loss of SRA-corporate/organizational contacts through reorganization, retirement, and other changes; fluctuation in economic conditions generally or for

specific companies and organizations; changes in corporate priorities; and changes in SRA membership and committee membership. Through it all the Gifts and Grants Committee has persevered, bringing to the Society gifts, with no strings attached, which provided much useful funding. A few examples of uses of this funding are the funding of attendance at annual meetings by students, supporting the cost for bringing distinguished speakers to the annual meetings, and providing student prizes.

Table XIV demonstrates the diversity of sustaining members. While chemical and oil industries form, together, the largest single group in the list, other types of industrial corporations are present: manufacturing, foods, and tobacco, for example. Important consulting and research organizations, trade associations, and federal agencies are also present in the list, though the agencies were contributors only in the early years of the Society. Federal agencies at one time were in a position to make unrestricted grants; today grants can be obtained for specific and well-defined project work. As discussed in Section 6.6.2.2, the Society has applied for and received such grants.

The list includes only those who gave unrestricted grants or gifts to the Society over the years. It does not include the many organizations that acted as cosponsors of meetings and conferences with the Society. Some of these are mentioned in other parts of this history; in particular, the National Academy of Sciences bears special mention, again, because of its assistance in hosting the several meetings of the Steering Group and hosting and cosponsoring the workshop during which the first annual meeting took place in 1981. The list in Table XIV was pieced together from more than one type of document and the authors cannot be certain that the list, while long, is complete. We apologize to any who were missed.

Some sustaining members have been members for only one year, others for several years, and still others have contributed for many years during the period covered by this history. Together, they have made a major contribution to the development and sustenance of the Society.

6.1.2.3. Annual Meetings and Conferences

Of the other sources of income, annual meeting net revenues have contributed the most over time to the Society. They have also been highly uncertain from year to year. The low production of revenue from the 1987 Annual Meeting in Houston, while anticipated, was succeeded mostly by years wherein annual meeting revenues were strongly positive. The exceptions to this were the 1992 Annual Meeting in San Diego and the 1995 Annual Meeting in Hawaii, both already alluded to. Jim Wilson, SRA president in 1992-1993, has written, “So, I was uniquely associated with the only two money-losing Annual Meetings of the 90s.”[67] As president-elect he had chaired the Annual Meetings Committee in 1991-1992 and, later, worked with Saburo Ikeda of SRA-Japan to organize the Hawaii Meeting, a joint meeting between the two SRAs. He was a little hard on himself, as it happened; each meeting did bring in some net revenue but in each case not as much as the amount budgeted. The Houston, San Diego, and Hawaii meetings all reflect the matter of choosing the right site, from a financial viewpoint, for maximizing

attendance by busy people who are reimbursed by their employers. There are other good reasons for choosing sites, however.

In the case of the Hawaii meeting, for example, it was the opportunity for SRA to meet jointly with SRA-Japan that was the driving force for choosing the site. That meeting "lost" money only to the extent that, having budgeted $40,000 net income, net income actually generated was only $2,000; there was thus a large "loss" compared to budget but a small absolute gain. The Hawaii meeting suffered from an additional, unforeseeable problem at that particular time that would have affected the financial results of any meeting adversely: federal agencies were undergoing severe budget cutbacks. Of those relatively few attendees from federal agencies, some took leave and paid their own meeting expenses.

The impact of a low-revenue-generating annual meeting is to require that further cost-cutting measures be taken. In the case of the Houston Annual Meeting, one of the cost-cutting measures, a regrettable one, has already been mentioned: cutting the number of issues of the RISK *newsletter* from four to three annually.

Conferences, like annual meetings, need to carry their share of the financial burden of the Society. Elizabeth Anderson, president in 1984-1985, made specific note of this need. It is a difficult goal to achieve since predicting the attendance is very chancy and accounting for external factors, such as the cutbacks in federal agencies in the case of Hawaii, are not predictable. However the effort is worthwhile and has served the Society well. Conferences and other gatherings over and above the annual meetings have, by and large and with occasional exceptions, brought additional revenue to the SRA. The custom of having workshops and short courses on the Saturday and on the Sunday afternoons preceding the annual meetings, begun at the 1991 Annual Meeting, has proven sound: annual meeting attendees often can attend such events without having to miss extra time at work. Many other workshops and courses have been offered at other times throughout the history of the SRA and one should not forget that the first annual meeting, in 1981, was held during a workshop.

6.1.2.4. The Journal: Risk Analysis: An International Journal

In the early part of this history (Section 3.2) the story has already been told of the formation of the Journal and of the choice of Plenum Press as its publisher. This relationship continued, with renegotiations of publishing agreements from time to time through the December 1999 issue, including the later part of the period when Plenum Press and Kluwer Academic Press came together. The Journal was, during this long period, not an important financial contributor to the Society though it was an essential element in the Society's work; sometimes, in fact, it was a cost. After 1999, as told in Section 7.1, the publisher became Blackwell Publishers. This brought about a major change in the financial contribution of the Journal to the Society because the remuneration to the Society flowed from a profit-sharing agreement. In July of 1999 it was reported to the Council that in 2000 the Society would receive $160,000 from Journal operations, slightly in excess of predictions based on the agreement negotiations.

With this, the Journal was poised to become a major source of financial support in the future, and a major stabilizer of Society finances. The achievement of Lave's fourth goal of putting the Society on a sound financial footing may actually have been realized. Only the future will tell . . .

6.2. The Development of North American Chapters

In this section and in Section 6.3, we shall discuss SRA's organizational efforts to widen its direct contact with risk analysts throughout the world beginning, in Section 6.2, with North America. Section 6.3 deals with chapters and sections outside of North America where sections are SRA societies established within individual countries or within regions containing more than one country and chapters are organizations affiliated with such SRA societies, whether with the SRA, itself, or with SRA sections. Thus, SRA-Japan and SRA-Europe are SRA sections established, respectively, in a country and in a region containing many countries whereas the Philadelphia Chapter is a chapter of SRA and the UK Chapter is a chapter of SRA-Europe.

This section will start with an overview of chapter formation followed by the brief histories of four chapters, how chapters have fared in general and, finally, some of the measures taken by the SRA to cultivate, stay in touch with, and offer help to chapters.

6.2.1. Overview of the History of Chapter Formation

When Lester Lave took office, the two chapters described earlier were already in existence, approved at the same time in 1982: the National Capital Area Chapter and the East Tennessee Chapter. Lave's third goal, stated as he took office for the 1985-1986 presidential term, was to establish at least 10 additional chapters of the SRA. He also named a set of locations where he suggested chapters be established and he named specific people at those locations whom he asked to be responsible for their establishment.

Table X shows the currently existing chapters with their dates of approval by the Council. Table XI shows the cumulative time distribution of chapter formation. In only four years, 1986-1989, 12 chapters were established and the goal of "ten additional ones" had been achieved not too long after Lave's presidency, a testimony to the value of goal setting, to pursuing goals once set, and to those who pursued the specific goals. During the next two years the same impetus appears still to have been at work since by 1991 two more chapters had been established. The rate of formation of chapters was such that, at the October 29, 1989, Council meeting, the question came up as to whether there should be a limit on the total number of chapters. As in the case of a similar question regarding maximum membership, this question, too, soon became moot. After 1991 a lull in chapter formation followed: only three more U.S. chapters were formed by the end of the year 2000. Châpitre St. Laurent, formed in that latter period in Canada, is in an interesting class by itself and will be discussed separately (Section 6.2.2.2).

At the end of the period 1981-2000, 18 North American chapters were on the books. As discussed further below, not all of these were active and some were in trouble by the end of the year 2000.

Comparing the chapters actually established through 1991 with the ones named by Lave, allowing for the differences in the naming of the areas of the chapters, all but one that he named was established. The one not established was at St. Louis; and one additional one was founded, the Rocky Mountain Chapter. If only all goals could be so well met!

What accounts for this success? Answer: the personal touch. Lester Lave contacted the people he had named and asked them, personally, to establish chapters. He then followed the progress being made, again personally.

6.2.2. Some Histories of Individual Chapters

The authors do not offer histories of each chapter. That large task must be left to individual chapter historians or to future Historians of the SRA. In preparing to write this history the authors requested historical information from all chapters hoping that information of interest to the SRA's history would emerge; and so it did. Among the information received, three contacts sent short, interesting histories of their chapters; these, and one other whose history is known to Paul Deisler, are summarized in this section as examples of the different motivations for chapter formation and the different paths taken. Of the North American chapters, all but one are located in the United States; the one exception is located in Canada. These two sets are taken up separately.

6.2.2.1. Chapters in the United States

• The Lone Star Chapter. The establishment of the Lone Star Chapter, centered in Houston, Texas, is an example of chapter formation in Lester Lave's time and of his own investment of time to ensure that actions were taken to implement his chapter-founding goals. One of the authors of this history, Paul Deisler, remembers very well receiving a phone call from him in early 1986. Lester came straight to the point: "Why don't you establish a chapter in Houston?" Paul had recently become president-elect, he was in the middle of winding up a third-of-a-century-long career with Shell Oil Company, preparatory to retirement, and he was preparing a course to teach at the University of Houston that fall. He wasn't sure when he might have the time to organize a chapter nor was he sure that Houston, or even Texas, was enough of a hotbed of risk analysis as to be able to sustain a chapter. Nevertheless Paul said: "I'll get on it."

Paul Deisler immediately contacted Richard Burk, the executive secretary of SRA, who sent Paul the listing of SRA members in Texas (not a very long list) and a sample set of bylaws. The National Capital Area Chapter, as it was forming in 1981, had been asked by President Robert Cumming to recommend procedures for establishing chapters beyond the original requirements that a proposed chapter be accepted on the

basis of "viability and usefulness." With this background, the procedures were summarized for Deisler by Burk by telephone as follows: call a meeting of SRA members and others interested and, if enough people come who are interested in forming a chapter, write bylaws and elect interim officers. "Enough" was yet to be defined; later, it was to become 20 people, a requirement that would have prevented the Lone Star Chapter from being formed. As to tax status, the interim officers could either apply for a separate status for the chapter or adopt the SRA's (the latter path was taken). When all of this was done and a name had been chosen for the chapter, application for approval of the chapter could be made.

Deisler wrote to the somewhat more than two-dozen SRA members in Texas within a 100-mile radius of Houston. About 12 to 15 showed up for a first meeting held, through the courtesy of Frank Weir of the University of Texas School of Public Health at Houston, in one of the School's conference rooms. The organizational effort went remarkably smoothly from there on and, in July of 1986, SRA's Council approved the chapter. The choice of name, the Lone Star Chapter, might seem obvious but there was considerable debate. Names such as Houston Chapter, Gulf Coast Chapter, Texas Chapter, and others were tossed around. These were either too specific in the area covered or too inclusive; after all, more chapters might form in the future. The Bluebonnet Chapter was also considered as being generally descriptive of something Texan while not claiming all of Texas as its exclusive territory, but the final choice which met these criteria was thought to be even more Texan, the Lone Star Chapter. "Lone Star" would identify the chapter as being in Texas, but it would not claim either the entire state or any portion of the state as its territory any more than do the many Lone Star Cafes throughout the state. Room was left for future chapters in Texas: the Big D Chapter, for example, the Gulf Coast Chapter, or the Trans-Pecos Chapter. These and others have yet to appear.

Although Deisler had called the first meeting and had acted as chair of the informal, organizing group, he would not run for president of the Chapter, believing that being president of the SRA (soon to happen) and of the Chapter at the same time was inappropriate and could be seen as conflicting. The first elected president of the Lone Star Chapter was Frank Weir, who brought to the Chapter an energetic and imaginative leadership. Under his guidance, the Chapter held a successful one-day symposium, "Setting Air Toxics Standards," jointly with the Gulf Coast chapters of the American Industrial Hygiene Association, the Air Pollution Control Association, and the Society of Toxicology in March 1987 and hosted the November 1987 SRA Annual Meeting in Houston. The symposium was both a technical and a financial success. The Lone Star Chapter's share of the symposium's revenue was enough so that the Chapter had to levy no dues for several years. The Chapter was successfully launched.

The Lone Star Chapter next settled in for a few relatively quiet years, holding a few meetings each year in Houston. Meetings became less frequent and more ad hoc and the chapter went through some fallow years. These ended in 1996 when John Mikus, a consultant with TRG (The Risk Group), an environmental scientist, registered civil engineer (Texas), and certified public accountant, became president of the Chapter. With

his education and wide experience, Mikus also brought energy, dedication, and a determination to enliven the chapter. He succeeded famously. He instituted a cycle of four substantive meetings a year: one in Houston, one in San Antonio, one in Austin, and one in College Station; he brought membership up to a count of over 60; and the Chapter's newsletter became significantly better. The meetings in College Station were not continued since the number of participants there was, for some reason, too small; but the other three were continued for a short time. The Chapter soon changed to having one major meeting, billed as an Annual Conference, in one of the three cities. The last major meeting within the period covered by this history occurred in Austin in October 1999, a very excellent meeting in attendee Deisler's opinion. The last issue of the Chapter's newsletter Deisler received was dated July 12, 2000. A recent written contact with John Mikus(68) and telephone conversations at about the same time with B.C. Robison and Theodora Overfelt, all past presidents of the Chapter, made it clear that the Chapter has not entered a hiatus but that it has become dormant or inactive. During a telephone conversation in February 2003 between Paul Deisler and Stuart Cagen, a toxicologist with Shell Oil Company and a former member of the SRA and the Lone Star Chapter, Cagen relayed information he had obtained from Stephen King, Chapter president in 2000, who told Cagen he had called one meeting in that year and only six chapter members showed up to hear a very excellent speaker. After that, King said, the chapter went dormant. We have found no record or memory of elections being held beyond those at which King was elected president for 2000.

As to why the Chapter had these troubles, or why apathy seems to have set in on the heels of the successful 1999 conference, one can only speculate. Mikus wrote: "Unfortunately Texas is so spread out, the risk issues have matured in the environmental field now, and interests have apparently waned."

• The New England Chapter. Unlike Houston, the Greater Boston area was a hotbed of risk analysis with many universities, institutes, and consultancies; many SRA members; and many other professionals involved with many aspects of risk. The creation of a New England Chapter was a most natural thing. Listed among the chapters Lester Lave wanted to have formed, the New England Chapter was already well along on its path to approval by the Council early in Lave's presidency; Lester asked Joseph Fiksel, then with Arthur D. Little, Inc., in Cambridge, Massachusetts, to get the Chapter started.

The New England Chapter was ultimately created by an amalgamation of two groups, according to a personal communication by Harlee Strauss(69): the New England Chapter and the Boston Risk Assessment Group (BRAG). The New England Chapter, chaired by environmental engineer Yee Cho, was composed of Boston-based SRA members and was approved as a chapter of the SRA in February 1986. The first meeting of BRAG was convened by Dale Hattis, then of the Massachusetts Institute of Technology, also in 1986. The Chapter was oriented toward the policy side of risk analysis whereas BRAG was oriented toward the analytical, technical practitioner side. Some members of the Chapter also participated in BRAG, though most BRAG participants were not SRA members. BRAG participants came to the monthly meetings (September through June) from the Greater Boston area but some came from as far away

as Rhode Island and New Hampshire. BRAG was not a formal organization. It was an ad hoc, free-wheeling group whose interests were complementary with those of the New England Chapter.

It was natural that these two groups, with some common members and highly complementary interests, should get together. Hattis organized the first joint meeting of the two groups, which was held in December 1989 and at which presentations consisted of back-to-back talks on technical/analytical matters and corresponding talks more on the societal or policy side. This arrangement was a precursor of the meeting format of the eventual New England Chapter. The groups soon began working together and by 1991 dues were being levied. Strauss started the 10-time-yearly newsletter, *Back of the Envelope*, in September of that year, using a name suggested by Hattis. A modernized chapter started distributing its newsletter mostly by e-mail in the fall of 2000 and some 250 people receive the newsletter regularly. In her personal communication to Deisler, Strauss has noted that the culture of the New England Chapter stems more from its roots in BRAG. Interestingly, too, the presidents of the New England Chapter, 1989-1990 through 2000-2001, have all been members of both the New England Chapter and BRAG. The New England Chapter is one of the most continuously active chapters of the SRA.

Interestingly, the amalgamation of BRAG and the New England Chapter did not result in the disappearance of either identity. The Web site's home page carries both names at its top and the monthly seminars, begun by BRAG, are now hosted jointly in both names. While this dual arrangement may differ greatly from the single nature of other chapters, it apparently works.

• The Chicago Regional Chapter. The organization of the Chicago Regional Chapter took place several years after the afterglow of the Lave goals had died down at a time when successive efforts by the SRA Council and the SRA Chapters and Sections Committee had resulted in published guidelines on starting chapters.

According to Margaret McDonell of Argonne National Laboratory and acting president of the Chicago Regional Chapter in 2000, the idea to form this chapter derived from a conversation she participated in at dinner during the December 1994 Annual Meeting in Baltimore.(70) It was soon thereafter established that the critical mass of SRA members needed to form a chapter existed and in January 1995 some 20 people gathered at a first organizational meeting at Argonne National Laboratory where interim officers were elected.

The approach of the group was very orderly. At the outset, three committees were established (which still exist): a Membership Committee, a Publicity Committee, and a Program Committee. The aim was to provide a means for furthering the SRA's mission at their locality and to facilitate interaction on risk issues among governmental, industrial, academic, and other interested parties. The geographical area the organization wished to cover was defined as Illinois, southern Wisconsin to northern Indiana, and even parts of Michigan just over the state border. As in the case of the Lone Star Chapter, choosing a

name resulted from considering and rejecting proposed names. Some of the names considered were Chicago Chapter (too limiting), Midwest Chapter (too broad), and even Da Chapter, a takeoff on the joking references of the day to Mike Ditka's Bears. "Chicago Regional Chapter" proved to be just right.

This chapter, in its early stages of development, created a set of Chapter Objectives. These were to:

- Serve as the focal point for interaction of the members of the Chapter and other individuals and organizations in the Chicago region interested in risk analysis.

- Promote the scientific practice of risk analysis and to encourage research and development of new risk analysis tools and methods as related to problems in the Midwest.

- Conduct scientific and educational meetings that will encourage beneficial interaction among members of all disciplines and professions involved in the field of risk analysis.

- Act as a resource to educate the community on current issues in risk analysis.

- Act as a resource for the National SRA.

A charter was then developed and it was approved, and the chapter accepted, by the SRA Council in 1995.

The first year saw much effort to secure new members. The effort was successful and some 30 new members joined the further organizational efforts and helped define areas of critical interest to the Chapter: ecological risk, human health risk, and facility safety. Programs were organized and for a few years meetings were held either biannually or quarterly until, unexpectedly, both the then president and then president-elect of the Chapter left the region, leaving Margaret McDonell, the secretary-treasurer, as the sole chapter officer remaining. The chapter then went into a hiatus, insofar as continued activity was concerned, from which it soon began to recover under the leadership of Margaret McDonell as acting president.

The chapter has attracted many excellent speakers in its short history, among them several SRA presidents: Vincent Covello, Yacov Haimes (during his presidency), and Lester Lave. The Chapter and its members ended the year 2000 on a note of optimism because of the many activities already either planned or underway at that time and because of the enthusiasm of its members.

6.2.2.2. Chapters in Canada

In 1984, 23 SRA members were listed in Canada; by 2000, 112 were listed. In addition, one could expect there were many who were not SRA members who might be interested in forming or joining at least one chapter. While Canada is a very large

country, most of the population inhabits the southern regions and most is concentrated in the larger cities. Establishing Canadian chapters was not, therefore, deemed a total impossibility. In the 1980s, during Paul Deisler's presidency (1986-1987), some Canadian members were asked to see what they could do. The possibility of forming a chapter in Canada proved not to be live at that time.

It was not until 1995 that the possibility seemed to become real. At the December 5 Council meeting that year Richard Burk, the SRA executive secretary, reported that the Council would soon see paperwork requesting the approval of the formation of a Canadian Section. Two groups in two parts of the country were reported to be working on this possibility. An outstanding issue to be resolved between the two was which was to become the headquarters of the section and which was to become the chapter. At this time the question was raised in the Council about creating a North American Section rather than to require the Canadians to set up their own Section. No decision was reached on this last point and, in the event, the written request for approval never materialized. In 1997, too, a number of enquiries about Canadian chapters were received. Again, nothing happened.

In the meantime, possibly related to some of the above efforts and possibly independent of them (the record is not clear), the Châpitre St. Laurent, or St. Lawrence Chapter, was formed in Montreal. In 2000, Sylvain Loranger of QSAR Inc., then president of the Châpitre St. Laurent, kindly wrote a brief history of the organization at the request of Paul Deisler. The following is based on that history and others of the sources available to the authors.

- Châpitre St. Laurent (St. Lawrence Chapter).

Châpitre St. Laurent was accepted as a chapter of the SRA in May 1997. However, the Chapter was founded earlier, in 1996, as an independent entity. It took off rapidly under the guidance of its first president, Louise Houde of Hydro-Québec (1996-1997); the successive presidencies of Louis Martel of the Ministry of the Environment of Québec (1997-1999) and Sylvain Loranger (1999-2001) brought further development. The Chapter immediately, starting in 1997, began to hold a series of annual, two-day conferences, each with its own theme, meeting alternately in Montréal and Québec.

Each annual conference included oral and poster presentations covering a wide range of environmental health and environmental risk topics. The two-day sessions included workshops on special subjects as well and the most recent one, in 2000, with the theme "Quality of the Environment: Concepts and Tools," brought forth some 125 participants. One of the principal presentations described the complexity of environmental risk management and the need for multidisciplinary approaches. Other events covered a broad range of subjects: biomarkers, environmental chemistry, environmental management and regulation, and others.

Student participation in the annual conferences was significant and growing. Beginning in the third year of the existence of the Chapter, prizes have been awarded for

the best oral and poster presentations by students, and these awards are widely publicized in the proceedings and elsewhere. A fund has recently been created, as well, for student support.

From Sylvain Loranger's communication in December 2000, the Chapter is "an independent scientific and professional Québec association" which became affiliated with two international societies with interests in common with the Chapter: SRA and SETAC (the Society of Environmental Toxicology and Chemistry). One unique characteristic of the Chapter, then, is that, unlike all other North American chapters of SRA, it is not uniquely a chapter of the SRA. One similarity to the SRA itself is that dues do not cover expenses. The Chapter has sought and received much-valued support from private and governmental sources.

The Chapter brings together specialists and scientists from different sectors—academic, industrial, and governmental—and from diverse fields such as chemistry, environmental toxicology, and the evaluation and management of health and environmental risks. The objectives of the Chapter are to:

- Serve as a forum for exchange and dialogue for its members, within their areas of expertise.
- Encourage scientific research and identify research needs within the areas of interest of the Chapter.
- Promote the training of members in the different fields of interest to the Chapter and put into effect courses to that end.
- Encourage interaction and exchanges between the specialists of the Chapter through its different regular activities (for example, seminars), its permanent and ad hoc committees, its Internet site, and its annual conferences.

To further facilitate interactions, interchanges, and collaboration among members and to provide information, two tools have been developed: the Chapter's bilingual Web site (www.chapitre-saint-laurent.qc.ca) and a chat room supported by the server, UQAM.

It is evident that the Châpitre St. Laurent, as the year 2000 drew to a close, had become, in record time, a well-integrated scientific and professional body with interests parallel to the SRA. It had become, in many respects, a smaller SRA grown in the soil of Québec.

6.2.3. Have All Chapters Fared Well?

As we have seen, the Chicago Regional Chapter suffered a temporary hiatus brought about by the transfers of two key officers out of the area. This was overcome and the chapter was doing well as the period covered in this history neared its end. This event illustrates the fragility of small organizations. The Lone Star Chapter also suffered a fallow period, perhaps not quite a hiatus and not for the same reason. It came out of it and, near the end of the period covered by this history, it slipped into dormancy.

What of other chapters? Has the sailing been smooth? A fairly strong majority of chapters has fared reasonably well and some chapters have fared outstandingly well since they were founded. Many have joined the information highway in one sense or another: all but the Michigan Chapter (see below) have named contacts on the SRA's Web site, each with a listed e-mail address, and over half of the chapters have their own Web sites, some very extensive and informative, some not often updated. At the May 2, 1997, Council meeting when there were 15 chapters more than one year old, six were in "better than good" shape, five were doing generally all right, and four were "really struggling." At the Council Meeting of December 5, 1999, several chapters were reported to be in difficulty: Puget Sound (reported as Pacific Northwest), National Capital Area, Pacific Cascades, Rocky Mountain, and Michigan (reported as North Central). At the Council meeting of December 3, 2000, it was reported that the Research Triangle Chapter was trying to revitalize itself and the Council was offering it various means of support. Various chapters were reported over the period of this history to be "having problems" but they generally resolved them. Perhaps the easiest "recovery" was made by the Northern California Chapter when it was reported at the December 5, 1993, Council meeting that it was "defunct." Fortunately, the report was very, very premature: the Chapter was alive and well. In summary, although we have no statistics for the year 2000 similar to those reported in 1997, the result might not be as good as those for 1997, especially with the addition of the Lone Star Chapter's current status.

The cases of the Michigan and Puget Sound Chapters are sufficiently different from the others as to be worth describing separately and in greater detail than to just say, curtly, that they are "struggling."

Doug Kononen of General Motors organized the Michigan Chapter with several of his colleagues. It was approved by the Council in 1991 and at the outset had a number of years with healthy and enthusiastic participation.(71) The core of the membership was from industry in the Detroit area and from academia in East Lansing and Ann Arbor, along with some members from state and local governments. Meetings were held in all three communities. Chapter member John Nelson pointed out that layoffs, downsizing, and cutbacks hit the region, necessitating the departure of too many members to greener pastures.(72) Not enough were left with the combination of time and willingness to do the administrative tasks needed to organize meetings or programs so the Chapter, while still in being and on the books, is listed currently as inactive. Nelson wrote: "Hopefully, the Chapter will be revived someday by those who can afford the time and effort to support it."

The Puget Sound Chapter, approved by the Council in 1997 and centered in Seattle, has coverage in the Pacific Northwest as its aim. It is not listed as inactive although it apparently has not yet attained even the level of initial, short-term activity of the Michigan Chapter. In a personal communication, Chapter Contact Elaine Faustman wrote: "Although we are 'officially on the books' we are not nor ever have been active so there really is no history for our Chapter, only the potential for future activities if someone chooses."(73) No further information was forthcoming as to who founded the Chapter or why it remains inactive.

Thus, of the 18 North American chapters, 3 were not functioning as chapters as of the end of 2000. One can only hope that for these chapters someone willing will step in and bring the leadership needed to bring them all to life.

There is not space enough to tell of all the excellent work and progress made by those chapters that have been active at some time during the period. Many were energetically pursuing, as of the end of 2000, their general mission of bringing the SRA and its mission to different geographical areas and to the risk analysts and others within those areas who may not be able to get to such events as the SRA's annual meetings. They have been doing this through their own meetings and seminars, their newsletters and Web sites, and major conferences or symposia such as one the Lone Star Chapter organized with chapters of other societies in its first year of life.

In general, then, the story of SRA chapters is one of accomplishment, despite instances of gloom. The Council of the SRA is well aware of the difficulties of organizing and maintaining chapters and it has developed methods to assist in both endeavors. The history of some of these is given in the next subsection.

6.2.4. Measures Taken by the Society to Support Chapters

From the earliest days of the SRA the leadership has concerned itself with its chapters: with requirements for becoming a chapter, with providing aid to local groups in the formation of chapters, with encouraging chapters in their missions as representatives of the SRA locally, with providing support to existing chapters, and with the relationship of the SRA, itself, to its chapters. The earliest criteria for approval of chapter status were defined in 1982 and have already been quoted in Section 5.3.3: "Viability" and "Usefulness." These were not just qualities on which the approval or rejection of applications to form chapters were to be judged. They were requirements chapters had to demonstrate they could meet. Successive efforts by the Chapters and Sections Committee, first established by Lester Lave in 1985 at the start of his presidency under the name of the Local Chapters Committee, led to more and more detailed and complete instructions. In 1987 a simple set of chapter formation guidelines was published[(74)]:

1. Form an ad hoc steering committee of 6-10 persons.
2. Send a petition with at least 20 signatures to the Secretariat.
3. Prepare a constitution and by-laws; mail draft to Secretariat for submission to SRA Council.
4. In the meantime, prepare a slate of candidates for local offices and run your election.

Application of Item 2, had it existed at the time, would have prevented the formation of the Lone Star Chapter and it did prevent the formation of a chapter, attempted by Yacov Haimes, in the Charlottesville, Virginia, area in 1995.

Not included in these early guidelines was the requirement, already established, that officers of chapters must be SRA members, a requirement not always observed. The Council, through the Secretariat and the Chapters and Sections Committee, has sometimes had to raise this point with chapters. Additional instructions have been written over time and in 1998 the Chapters and Sections Committee, chaired by Charles A. Menzie, issued a handbook for chapters and chapter presidents. Still one of the most helpful things a group forming a chapter can do for itself is to make early contact with the Secretariat and the Chapters and Sections Committee to obtain other useful advice such as whether to establish its own IRS tax status or adopt that of the SRA, how to establish a chapter bank account, and how to become covered under the SRA's liability insurance. Looking to the future and to clarify their roles to all chapters, the Council adopted a mission statement for chapters at its meeting of December 10, 1996. This statement is shown in Table XV together with a set of possible chapter activities.

Some formal supports for existing chapters that were developed are establishing a speakers' bureau and developing a packet of information called a "tool box" containing suggestions for ongoing chapters' programs and activities. An attempt to establish a speakers' bureau was made in the early 1990s. For unknown reasons the attempt failed but the idea was revived in 1995. A bureau was started in 1996 with a small, approved budget, later increased, and chapters began to use its services more and more.

In the latter half of the 1980s Chapter Breakfasts at the annual meetings were begun. These were established as informal meetings to build and maintain personal contacts with and between chapters, for the exchange of ideas, and for the Chapters and Sections Committee, and therefore the Council, to learn what chapters needed and were doing. Although not every chapter had a representative present at these meetings, they have proven themselves a useful way to keep in touch over time. Another way for contact to be maintained with the membership at large is the section on chapter news included, for many years, in the **RISK** *newsletter*. Finally, a further, very effective and desirable way to maintain contact is for officers to visit chapters, giving talks and providing a direct connection to the Council and to current activities and trends. Although occasional visits were made earlier, it was not until the presidency of Rae Zimmerman that a deliberate effort was begun to visit chapters. In May of 1997 it was proposed to make four to eight such visits in the coming year. Yacov Haimes, during his presidency (1997-1998), made several visits with good results. An old farming adage has it that "the best fertilizer for any farm is the farmer's footprints."

The SRA Council has clearly come a long way in developing and implementing ways to assist chapters to form, to offer them attractive program possibilities, to assist them in times of trouble, to keep in touch with them on a two-way basis, and to maintain their feeling of being part of an important, scientific enterprise, the SRA.

6.3. The Development of Sections and Chapters Outside of North America

We have seen in Section 5.3.4 that from its inception the SRA had roots outside of the United States, particularly, at first, in Europe, and that it considered itself and its

journal to be international in scope. Confirming this early, international intent, Lester Lave's second stated goal was: "Establish related organizations in Europe, Japan, and other nations" (Section 6). This goal was stated in 1985 when efforts to establish SRA-Europe and SRA-Japan were underway but not completed. Other efforts made down through time have resulted, over the period in question, in only extremely modest success compared to that of the establishment of SRA-Europe and SRA-Japan.

We start our brief account of SRA organizational efforts outside of North America with SRA-Europe, established first, then on to SRA-Japan, established next, and finally to an account of various efforts elsewhere and, to the best of our knowledge, where these efforts had lead by the end of the year 2000.

6.3.1. SRA-Europe

One of its early members and a past president of SRA-Europe, Marc Poumadère has published a history of the first 10 years of the Section.(75) In this history we will cover points of interest from the point of view of the SRA's own history, partly from the article by Poumadère and partly from other sources. For the many other interesting and significant parts of the early history of the Section the reader is referred to Poumadère's article.

Maintaining early, personal links between SRA member scientists and their colleagues in Europe in a more formal way, SRA councilors had been elected from among European SRA members, starting with the first elected Council (1981-1982). In 1985, Pieter Jan Stallen, then with TNO in the Netherlands, was elected to the Council for a two-year term (1985-1986 and 1986-1987). According to Ortwin Renn of Germany, Stallen had been working, starting in 1985, with a small core group consisting of himself, Renn, and Ola Swenson of Sweden to set up a European chapter of the SRA.(76) The group sought European financial support and it was aware of the existence of another group attempting to set up a risk network at the same time. The other group received the support and succeeded in setting up the Safety Network.

When Stallen joined the SRA Council in 1985, then, he did so with a strong desire to found a chapter of the SRA in Europe. He received encouragement from the SRA presidents who served during his term, Lester Lave (as we have seen) and Paul Deisler, and the SRA Council. During Deisler's term of office as president the Council authorized a grant of $4,000 to Stallen for the express purposes of defraying his mailing, travel, and related expenses so he could pursue his organizational efforts rapidly. This action by the Council was taken not without dissent since there was concern that it might establish a precedent and, at the time, the SRA was still struggling, as we have seen, to improve its own financial position. Nevertheless, the grant was made and Stallen was able to proceed with his efforts, assisted by still others. Deisler, recently retired from the Shell Oil Company, still had contacts in Royal Dutch Shell, among them W.F. Tordoir of the Shell Internationale Petroleum Maatschppij's medical organization in The Hague. Tordoir was able to lend personal support to Stallen, joining the advisory committee Stallen established and helping him to secure industrial funding for the fledgling organization.

Thus the young organization secured sustaining members from its earliest days. A later request for an additional $2,000 was not met by SRA's Council, though a smaller loan was offered. The advisory committee Stallen set up to assist in the development of an SRA chapter in Europe consisted of some 26 members, named in Poumadère's article, from 11 Western European nations. Soon the necessary application for chapter status was prepared and submitted along with proposed bylaws, and in 1987 the SRA Council approved the application of the European organization not as a chapter but as SRA-Europe, an SRA section. This change in nomenclature came about when Ola Swenson, Stallen's successor on the SRA Council, objected to the idea that an organization covering all of Europe would be merely a "chapter." The SRA Council agreed and a first definition of the difference between a chapter and a section was achieved in practice. The new organization's highest governing body was established, the Executive Committee chaired by SRA-Europe's president. Pieter Jan Stallen became the first president of SRA-Europe and in 1990 SRA awarded him the Outstanding Service Award for his work in founding SRA-Europe.

The new section held its first major conference in November 1988 at Laxenburg, Austria, and throughout the period of this history continued to hold annual conferences and other conferences (sometimes in concert with other organizations) in different Western and Eastern European countries. Started with only 69 European SRA members, the Section grew to some 140 members by September 1988 and to 317 in 1990. From then on membership hovered in the vicinity of 300 members, sometimes growing, sometimes diminishing. In the year 2000 it stood at somewhat over 300 members.

Smaller than the SRA itself, SRA-Europe has been enormously active in organizing conferences on many risk topics. It has established its own system of awards, as did SRA itself, and in 1996 it established its own, first chapter, the UK Chapter. Though the chapter's meetings were well attended, it became inactive about two years after its establishment for reasons similar to those of the Chicago Regional Chapter in the United States. One hopes a similar good outcome is in the offing.

In addition to these activities, after some two years of discussions, SRA-Europe's Executive Committee approved establishing it's own journal, *Journal of Risk Research*. Marc Poumadère's history of the first 10 years of SRA-Europe, referred to at the beginning of this brief account of SRA-Europe's history, appeared, appropriately enough, in Volume 1, Number 1 of the new journal in 1998. An interesting feature of this journal is that it also serves as the English-language journal of SRA-Japan.

In his article Poumadère noted that this new journal might not have been formed if *Risk Analysis: An International Journal* had added a European Editor to satisfy the needs of European authors. As Poumadère explained, risk is approached differently within different cultures, of which Europe has many, and an outlet is needed for clear expression of those views and of the corresponding research and practices. The new journal added, therefore, a significant voice to the international discussions on risk analysis, furthering the mission of the SRA itself.

The relationship between SRA and SRA-Europe was not laid down at the beginning. Rather, it has developed as issues have arisen. The first "change" in relationship came, as we have seen, even before SRA-Europe's affiliation with the SRA was approved: changing its definition from a chapter (covering a region within a country or a part of a country) to the much broader one of a section (covering a country as in Japan or many countries as in Europe). Financial matters have come in for discussion over the years, too. The Section, when first established, was composed only of SRA members; in fact, one had to be an SRA member to join SRA-Europe. The two organizations then shared the membership dues: one half to each. Both organizations thus received financial support. SRA-Europe did not have a separate secretariat, some of the duties of such an organization being performed by members with assistance from SRA's Secretariat. As far as *Risk Analysis: An International Journal* was concerned, European member subscription payments were split three ways: half to the publisher and the other half split between SRA and SRA-Europe. These arrangements have undergone further development as SRA-Europe grew and matured. Now, with its own journal, *Risk Analysis: An International Journal* has remained the "international" journal of SRA but members everywhere can subscribe to both journals at rates preferential to members. The meaning of "international journal" has become obscure.

One of the first of several changes in the relationship of the two organizations was for SRA-Europe to reach an agreement with the SRA Council that SRA-Europe could, as was already the case for SRA-Japan, accept for membership persons who would be members of SRA-Europe only. This change made it easier for Europeans to join since the dues were correspondingly less for them. This agreement came into effect toward the end of 1992. It was not until much more recently, in 1996, that another change was made: SRA-Europe established its own secretariat, in Switzerland. This function has since been moved to an organization named In Conference in Edinburgh, Scotland. A third change came about when, in 1999, SRA-Europe established its own Web site (www.sraeurope.org) linked to SRA's site. With this change and with its many parallel activities, SRA-Europe became fully capable of serving the different cultures of Europe; it became a parallel organization to SRA, promoting SRA principles and activities in its own way in Europe. The two affiliated organizations complement each other, strengthening and implementing the overall SRA vision.

In the year 2000, after more discussions between SRA and SRA-Europe, the maturing of the SRA-Europe organization became clear and the two organizations adopted a Memorandum of Understanding between them as follows:

> The Council of SRA and the Executive Committee of the European Section are very pleased to announce a new cooperative agreement. Since the establishment of SRA's European Section, it has grown and now comprises over 300 members. Accordingly, the nature of the operating relationship between the Section and the Society as a whole has had to grow as well, reflecting the changing needs of the Section as it has matured.

The SRA Council and the Executive Committee of SRA-Europe are committed to working together towards improving their working relationship. The key points of their new agreement are these:

(1) The European Section will have an elected councilor to represent them on the SRA Council. Two candidates will be nominated by the European Section and then voted on by the Society membership as a whole during its regular election process.

(2) The SRA Council will choose a representative to serve as liaison to the European Section's Executive Committee. The role of the liaison will be to help coordinate the international activities and interests of the groups.

(3) The international Secretariat and Treasurer will work together with the European Section to develop an annual budget. The purpose of the annual budget will be to provide support for Section operations and for the annual SRA meeting held in Europe that is sponsored by the European Section. The annual budget will be proposed and approved as part of the normal budget approval process by SRA Council.

(4) The European Section will establish its own Secretariat. The purpose of the European Secretariat will be to provide improved support to European members, to facilitate the operations of the Executive Committee, and to assist with annual meeting planning.

The SRA Council and the European Executive Committee intend that this agreement will improve the international coordination and cooperation needed to continue to promote the effective use of risk analysis worldwide and will serve as a model for operating relationships with future international sections of the Society.

With this memorandum both SRA and SRA-Europe took a great step forward in their joint effort to advance the SRA ideal. By the end of the year 2000 SRA-Europe had become an integrated, European SRA with close, defined ties to SRA in the United States and with fully established programs and means of communication in place to meet its region's needs. Moreover, a pattern of international cooperation had been established and its furtherance provided for. As the year 2000 came to its close, for example, SRA was deeply involved with SRA-Europe and SRA-Japan in the development of a world congress on risk analysis to take place in the year 2003 in Europe. This last project is further described in Section 7.

6.3.2. SRA-Japan

Saburo Ikeda has written a brief history of SRA-Japan.[77] Material from that source and others has been incorporated into this account of the history of SRA-Japan.

SRA-Europe was established in a region of many cultures, languages, histories, and political systems. Moreover, the region has undergone enormous changes during the lifetime of SRA-Europe. As SRA-Europe was being organized, Europe itself was divided into an eastern portion, dominated by the Soviet Union, and a western portion consisting of independent democracies, each with its own history and way of implementing the concept known as democracy. The fall of the Berlin Wall; the reunification of Germany; the splitting up of the separate states of the USSR into independent states of which most became members of the Commonwealth of Independent States (CIS) which, for the most part, act independently; the wars in the former Yugoslavia; the peaceful division of Czechoslovakia into two separate republics; the formal founding of the European Union in 1994; and many other major changes left Europe a very different place with change still in progress by the end of the year 2000. The Europeans, over the centuries and even more intensively since the end of World War II, were accustomed to finding ways to deal with each other, to form coalitions based on common interests transcending their other great differences. Thus it was possible, within this framework of European culture and tradition, to form an SRA-Europe and to develop it into a cohesive, scientific society despite apparent barriers.

The establishment of SRA-Japan was, in many ways, far easier than the establishment of SRA-Europe. Japan is a single nation with a single language and overall culture. It is ethnically, also, remarkably uniform with some exceptions. It lived in relative isolation for many centuries but it embraced all the outside world had to offer once its isolation was broken and it went on to integrate those offerings into its own culture and then to make its own contributions to world knowledge. It has had a remarkable passage through recent history, especially following World War II, one of continuous, rapid change leading to its becoming one of the world's major, developed countries. Throughout all of this, its people have built their ability to work together as many others cannot yet do. Once the idea of founding an SRA-Japan took hold, events moved rapidly and decisively.

The beginnings of SRA-Japan go back to 1984. In his brief history of SRA-Japan Ikeda recalls that he and Kazuhiko Kawamura, both at that time professors at Vanderbilt University, organized a workshop titled "Risk Management in the U.S. and Japan." The workshop took place in Japan, at Tsukuba University, in October of 1984, cosponsored by the National Science Foundation in the United States and the Japan Society for the Promotion of Sciences. Attending from the United States were several members of SRA, experts in many different areas of risk analysis, who also had strong interest in developing SRA's international presence: Elizabeth Anderson, Vincent Covello, Lester Lave, Roger Kasperson, Paul Slovic, and Curtis Travis. Slovic was the president of the Society at that time and the rest subsequently became presidents of the Society. Anderson, at the time president-elect of the SRA, recalls attending the workshop not on behalf of the SRA but as part of her work as director of the Cancer Assessment Group of the U.S. Environmental Protection Agency (U.S. EPA).[78] While there she took advantage of the opportunity to meet with and encourage Japanese leaders in the risk field, among them Ikeda, to join the SRA. She remembers in particular that debate arose as to whether an SRA-Japan was needed or if simple membership in SRA would suffice.

In November of 1984 Anderson was invited to return to Japan to lecture at several sites, including the School of Public Health in the School of Medicine at Mie University at Tsu City, Mie-Ken, and at the Institute of Occupational and Environmental Health at Kipakyushu. While on this tour she met several other Japanese scholars strongly interested in risk analysis and who continued to follow up the idea of forming an SRA organization. Thus, with Anderson's visits and those of the others named, early ties between SRA and the future leaders of SRA-Japan were formed.

In October 1987, a year after the Tsukuba workshop, a second workshop on the same topic was held at Osaka University, organized by Osaka University Professor Tomitaro Sueishi with colleague T. Morioka. Kazuhiko Kawamura of Vanderbilt University and Paul Finger Lynes of Chemical Management were the U.S. contacts for the workshop. It was at this workshop that the Japanese participants came to a consensus: Japan should have a society similar to the SRA to promote academic and practical studies in risk analysis and to promote international cooperation. Organizational work went forward rapidly from this point. The first elections were held during the inaugural meeting of SRA-Japan on June 25, 1988, with about 60 members present. The members represented several broad sectors: academia, government research institutions, and industry. Sueishi became the first president of SRA-Japan (1988-1989) and on October 30, 1988, the SRA Council formally recognized SRA-Japan as a section.

According to its original bylaws, individuals could join SRA-Japan without necessarily joining SRA; SRA-Japan declared its financial independence from SRA, and SRA-Japan recognized corporate memberships. SRA-Japan thus differed in certain respects, from the start, from its slightly older sister, SRA-Europe, in its relationship with SRA. Throughout the years of their association, relationships between SRA and SRA-Japan have been entirely friendly and cooperative as illustrated by the joint meeting of SRA and SRA-Japan in Hawaii in 1995.

The new Section lost no time in launching a full program of conferences and other activities and establishing a newsletter, published four times a year, and a journal in 1989. The journal of SRA-Japan, *Japanese Journal of Risk Analysis*, has been published once or twice a year since it was founded; it is published in Japanese, though in recent years it has published abstracts in English. The Section's activities soon caught on—by 1991 SRA-Japan's membership had swelled from its original 60 members to 240 and by September of 1999 it had reached a level of 437 members: 380 full members, 40 student members, and 17 corporate members. Of the full members, 49 were also members of SRA. Most recently, as mentioned earlier, SRA-Japan has joined with SRA-Europe in cosponsoring the European journal, *Journal of Risk Research*.

True to its avowed interest in fostering international cooperation, SRA-Japan organized the first China-Japan conference on risk assessment and management. Co-organizers were Beijing Normal University and the Department of Earth Science, National Natural Science, China. The conference took place November 23-26, 1998, in

Beijing at the China Hall of Science and Technology and was a great success. Over 90 people attended from Japan, China, South Korea, the United States, and Switzerland.

As the year 2000 neared its end, SRA, SRA-Europe, and SRA-Japan were all firmly established as three strongly affiliated, major building blocks in what was hoped might develop into a more widespread SRA presence throughout the world. Next, we shall recount the history of further efforts to spread the SRA vision.

6.3.3. Other SRA Organizational Efforts Outside of North America

Interest in spreading SRA's presence throughout the world has been a common thread through all presidencies, some more than others and some differently (more specifically) than others. Of the two presidents who followed Paul Deisler's presidency, Vincent Covello had a particular interest, pre-dating his presidency by several years, in developing countries whereas Richard Schwing's interest was more in building better ties and understanding with the two existing sections. Throughout the "long haul" period, two names in particular stand out with respect to international efforts, one an SRA president, D. Warner North (1991-1992), and one not, Vlasta Molak. We will discuss their activities in the international field chronologically, starting with Molak.

Early in his presidency, Covello (1987-1988) made the personal presidential appointment of SRA member Molak, then with NIOSH (National Institute for Occupational Safety and Health) in Cincinnati, to the position of Special Liaison for Section Development in Developing Countries. At the same time Chris Whipple (president in 1982-1983) continued as chair of the Chapters and Sections Committee. The relationship between the two positions is not clear from the record. Molak continued in her position through 1992, through her term as SRA secretary, under different titles such as International Coordinator or Chair of the Subcommittee on International Relations. She attacked her assignment with great enthusiasm and energy, making contacts in many countries. SRA-Europe, then recently formed, did not appear to be directly involved in Molak's activities, though it might have had knowledge of her mission and activities either via their representatives on the SRA Council at and following the time of her first appointment or through the many articles in the **RISK** *newsletter*. SRA-Europe did, in November 1990, hold its very successful annual conference in Kiev on "Environmental Risk Management: The European Case" jointly with the Committee for Systems Analysis of the USSR Academy of Sciences and supported by the World Health Organization Regional Office for Europe, the Economic Commission for Europe, and the Organisation for Economic Co-Operation and Development.[(79)] One hundred and twenty people participated in the conference, 90 from Eastern Europe and 30 from Western Europe, and 80 people joined SRA-Europe as a result of the conference. No involvement of SRA, itself, in the conference, or of Vlasta Molak, is mentioned in the records.

Molak, a native of Croatia, has family and other contacts in Croatia, which was a part of the now former Yugoslavia during the early days of the SRA. Molak speaks Croatian and was in a position to travel to that part of the world. Through her Croatian contacts she was able to acquire contacts in other parts of Yugoslavia and, in due course,

in other Eastern European countries, where she lectured on risk topics and made further contacts, such as in Czechoslovakia, Hungary, Poland, and parts of the former Soviet Union. Through her active membership in a Cincinnati/Kharkov sister city organization she became involved in a conference in May 1992 that began in Budapest and then traveled to Kharkov. It was to be a conference preparatory to the Rio conference of June 1992. With and through her contacts and her travels she was able to stir much interest in risk analysis and the SRA.

Her interests and contacts expanded well beyond Eastern Europe into South America (Argentina, Brazil, Venezuela), North Africa (Egypt), and Asia (Israel, the Philippines, Nepal, and Taiwan), the total number of countries from which some interest was expressed or, at least, some inquiries were received adding up to about two dozen.

In the end, nothing of any permanence came of all of Molak's efforts with the exception of Kiev, in the Ukraine, discussed briefly further on. Croatia formed an organization and, in 1995, was on the verge of submitting its application for recognition by the SRA as a chapter when the internecine wars that broke up Yugoslavia that eventually followed the death of Marshall Josip Tito, dictator of Yugoslavia, brought a halt to their activities; these have not been resumed. Among the rest of the contacts, only a group in Prague showed true interest; some 15 people had formed their own organization, adapting the SRA bylaws to their own circumstances, and it was apparently quite active. In the end the Prague group did not apply to the SRA for recognition and so they, too, failed to form an SRA chapter. Throughout the period of her international tenure, war, political upheaval, and economic turbulence were among the factors that worked against Molak's efforts. She, herself, stated by phone to Deisler in February 2003 that she had begun to feel burned out by her efforts and the difficulties she faced and was glad to stop.

In December of 1991 D. Warner North became president of the SRA, an event that almost exactly coincided with the dissolution of the USSR and the simultaneous formation of the CIS. As SRA president he was aware of several inquiries from Moscow and the Ukraine about SRA. He therefore set out to visit these two locations.[(80)] A meeting to discuss the SRA was held at the Institute of Systems Sciences (VNISI) in Moscow with Russian scientists having apparent interest in the Society. Much of the discussion was about which group of Russian scientists was actually hosting the meeting and which would be the host for an SRA chapter. North has written, "I explained I was the host, not VNISI, and that all the Russian groups wishing to associate with SRA would be equally welcome." North went on to explain that his "audience seemed quite skeptical of this apparently foreign concept." No SRA chapter resulted directly from that meeting. Later, as North explained to Deisler, a Russian scientist named Vitaly Eremenko became one of those pressing for some sort of SRA organization in Russia.

North continued his trip, going first to Kharkov, in the Ukraine, where he was met by a group Molak had come to know. The Kharkov group arranged for North to go to Kiev as well. The Ukrainian part of the trip resulted in North's meeting Naum Borodyanskiy, of Kiev, who North arranged to have come to the San Diego Annual

Meeting of the SRA along with three scientists from Moscow. Kharkov and Kiev each had some SRA members; these began the work of forming chapters. From these efforts only the Kiev Chapter was formed, approved by the SRA Council in 1992. In 1995 the Kiev Chapter was reported to have 112 members in eight Ukrainian cities and was holding monthly meetings.(81) In a conversation with Deisler during the 2003 SRA Annual Meeting, Borodyanskiy, a very active member of the Kiev Chapter, told Deisler that the Kiev Chapter is alive and active with members in several Ukrainian cities, as before. He also said that a Russian chapter in Moscow was active and he referred Deisler to Eremenko for further information. Borodyanskiy also indicated that while the Kiev Chapter is a chapter of the SRA, the orientation of the Russian chapter was more toward SRA-Europe.

After his return from his trip, North had continuing contact with Eremenko and other Russians. North encouraged them to continue their chapter-forming activities. At one point Eremenko visited the United States and, in 1995, he sent his daughter as an emissary to the United States to learn more about SRA. Unfortunately, she was not well prepared to carry out her mission so nothing came of that visit. He also created ties with SRA-Europe and served for a time as the Russian representative on its Executive Committee.

Attempts by Deisler to contact Eremenko yielded a personal communication with which he forwarded a number of abstracts of presentations made at various conferences, including some sponsored by SRA-Europe.(82) The presentations were all made in 1995 and 1996 and, while they do not tell much of the actual history of SRA in Russia, one states that a chapter existed in St. Petersburg at that time. In one of them (in May 1995) Eremenko mentions the "Russian Federation SRA Section" and speaks of "the problems of the Russian Federation Section of the SRA-Europe" having been reviewed for the Executive Committee of SRA-Europe in a submission dated April 1993. The documents Eremenko forwarded to Deisler also shed light on the difficulties of understanding between post-communist countries, including Russia, and the West. Many difficulties arose from differences in priorities as well as from the lack of receptivity by government to risk analysis as a decision-making tool (although Eremenko indicated that following 1992 some improvement in this last item was perceived). He mentioned some further difficulties of SRA in Russia: high inflation rates, deep cuts in funding of research, currency weakness (impeding subscriptions to *Risk Analysis* and other Society-related means of communication), and the absence of what he calls a "club tradition" in post-communist countries, the lack of familiarity of individuals with the concept of forming organizations where no approval by party-government *nomenclatura* was required (he notes that even such organizations as garden clubs required such approval under the USSR). While reflecting on the gap between East and West and between SRA in Russia and SRA-Europe, his documents indicate that SRA in Russia felt closer to SRA-Europe but that relations were developing, in his view, between SRA in Russia and SRA. He offered no more recent information than that discussed here on SRA in Russia.

In 1993 Eremenko met with SRA-Europe's Executive Committee to discuss the formation of a Russian chapter and it was stated that a constitutional meeting was

planned for that September. In that same year the possibility of forming a Russian Federation section was raised, but the organization was not yet deemed to be ready.[83] Later that year efforts to organize nine chapters in Russia were reported.[84] In 1995 Eremenko was described as the Organizing Chairman of SRA in the Russian Federation.[85]

As of the end of the year 2000, despite further occasional reports of continued interest in Russia, no chapters or sections have received approval by SRA or SRA-Europe. The situation in Russia remained unclear and it was not even clear from the record that Eremenko was the only person attempting some sort of organization.

The case of the Philippines is different from those just discussed. SRA member Corazón Pe Benito Claudio, president of the Technology, Risk and Development Foundation in the Philippines and a very active participant in environmental and economic affairs in the Republic of the Philippines, made contact with the SRA about forming a chapter there. Deisler remembers seeing a preliminary letter on the subject from Claudio shortly before his term as president of the SRA (1986-1987) ended. Claudio became one of Molak's contacts when Vincent Covello succeeded Deisler as president. With information supplied to her by Molak, Claudio proceeded to form a nascent chapter. Between 1988 and 1990 Molak made reports of progress to the SRA Council. In 1989 the formation and initiation of the process of registering the organization was announced and by 1990, SRA-Philippines had been organized and was registered with the Securities and Exchange Commission of the Republic of the Philippines[86] as The Society for Risk Analysis, Philippines (SRA-Philippines) to "serve as the local affiliate of the international society based in the United States."

The records do not show that actual approval as a chapter or section of the SRA was ever requested or obtained. In some reports the organization is simply stated to be a chapter, in others an affiliate, of the SRA. SRA-Philippines was a very active organization with a membership once indicated to be somewhere in the neighborhood of 60, holding meetings, publishing a newsletter (*Risk Watch*), organizing, with others, major conferences, acting as an advisor to government, and getting involved in at least one international activity. This latter activity was the organization of a course on risk issues arising from hospital and medical waste.[87] Held in the Philippines, the course attracted some 200 participants from the Philippines, Malaysia, Thailand, and Viet Nam.

The last mention found of Corazón Pe Benito Claudio or her organization was in 1995. Attempts to contact her and the Securities and Exchange Commission of the Republic of the Philippines to determine the organization's more recent status have elicited no responses. The organization, which appears to have been personally directed by its founder throughout its life, might have become an excellent, bona fide chapter or section of the SRA had it requested recognition as such and had its mode of operation conformed to the democratic ideal exemplified and promoted by the SRA. Why it did not become a chapter or section of the SRA is not known.

If nothing else, the activities just described demonstrate the existence of lively interest in risk analysis in many countries. That interest continued: throughout the latter half of the 1990s a number of additional inquiries about forming chapters or sections were received by the SRA from a number of countries. As the period covered by this history came to a close, Roger Kasperson, then president of the SRA, reported that active discussions were underway with contacts in Australia, China, India, New Zealand, and, still, Russia.(88)

6.4. Specialty Groups

Table XVI shows nine Specialty Groups[3] of which seven still existed as of the end of the year 2000. Specialty groups have been organized to give members with particular subject-matter interests an organization within the structure of the SRA to facilitate communication among them on their particular interests. These groups also serve to present their particular subject matters or specialties within the broad field of risk analysis to the rest of the Society by developing programs for the annual meetings and special conferences or any other means they choose to use. They are thus an excellent means of implementing SRA's overall goal of cross-fertilization and integration.

The first organization within the SRA that later, for a time, became a specialty group was formed as the Global Risk Analysis Topical Section[4] with D. Warner North as its contact councilor.(89) The Section, approved by the SRA Council in March 1989, did not come into being until the October Annual Meeting during which the membership approved the necessary change in the bylaws. The motivation for forming the Topical Section was not the same as that of others, described next. Rather, it was that at that time the issue of global climate change had become so important, nationally and internationally, that a group of SRA members concluded that this kind of special emphasis was needed within the SRA. The SRA Council agreed. The formation of other Specialty Groups was, at first, impelled by the concerns of members with engineering backgrounds.

Elisabeth Paté-Cornell, a past president of the SRA (1993-1994), has expressed the concerns of members with engineering backgrounds very well. Her interests when she joined the SRA lay in probabilistic safety analysis and in decision theory. She joined the SRA shortly after it was formed because she saw an opportunity to benefit from cross-fertilization between different types of risk analysts, particularly in her own areas but also in others. She has written that as an engineer "inputs from the social scientists were very valuable to us, even though they were often negative with respect to engineering risk analysis methods and sometimes had in my opinion, a political color. They certainly forced engineers to give their work a more critical look."(90) She went on to say, "Yet, I must admit that I was disappointed when I saw that many of the engineers who were active in the SRA at the beginning, started losing interest and ceased to attend the annual meeting. When I became president-elect in 1993, I tried to attract again some engineering papers for the annual meeting that I was organizing. I succeeded to some extent, but not as much as I would have liked. What I found a bit disappointing is that engineering risk analysis did not even seem to be very much valued by the SRA membership at large

while the IAPSAM [International Association for Probabilistic Safety Assessment and Management] meeting was becoming a much more attractive venue for the presentation of engineering work." Later in her communication she added, "I would like to say that the SRA has been in my opinion very successful. I also think that at this time, the Society has to make special efforts to include to a greater extent than it currently does, engineering and engineering methods."

We quote at some length from Paté-Cornell's personal communication because what she says was experienced by, and of concern to, many of the SRA members whose backgrounds were in engineering, people like Yacov Haimes (SRA president, 1997-98), John Garrick (SRA president, 1989-1990), and others, including the authors of this history. It was these types of concerns and the question of how to attract engineers interested in risk analysis to the SRA that impelled Garrick, during his term as president, to propose that the SRA should establish divisions for particular interests as is done in many other technical and scientific societies.

Garrick consulted personally with various members of the SRA before making his proposal; he also had his proposal published in the **RISK** *newsletter* for broad dissemination and to receive as much input as possible on the idea.[91] Many thought having some kind of specialty or "interest" groupings was a good idea but there were some who thought that "divisions" was too strong a term to use in a society devoted to cross-fertilization and integration among the many areas of risk analysis. In his proposal to the SRA Council on October 7, 1990, first brought to the Executive Committee meeting of July 19, 1990, Garrick defined the following initial Divisions: Engineering (Chair: Bill Gekler of PLG), Social Sciences (Steve Raynor of Oak Ridge National Laboratory [ORNL]), Health (Catherine St. Hilaire of Hershey Corporation), and Policy and Regulatory Analysis (James Wilson of the Monsanto Company). This proposal was approved by the SRA Council on October 7, 1990, and brought to the membership at the business meeting on the following day.

The 1990 Business Meeting of the SRA membership proved to be a very lively one as the group considered Garrick's proposal in depth.[92] It was, after all, a major organizational change and all wanted to be assured that it would not also change the nature and aims of the SRA. Questions arose as to the motivations for making the change, whether the Health Division would include Exposure Assessment or not, whether a division of Risk Communication should not be started, whether the Global Risk Analysis Topical Section should not be designated a Division, whether the Divisions were to be made along disciplinary or issue lines, whether "divisions" was the best designation for the new groupings, and so on. James Wilson (later president, 1992-1993) brought the discussions to a head by asking all those present who wanted to have a formal, divisional structure to stand up. No one stood up. In the end, the membership agreed that the formation of informal groups—not "divisions"—would be a good idea and that those who wanted to form such groups within the SRA should be free to do so. Any members of the SRA wishing to form such groups were invited to meet and to prepare requests for approval to the SRA Council.

Two groups met following the Business Meeting to start organizing additional groups: Exposure Assessment (led by Paul Price of the American Petroleum Institute) and Risk Communication (led by Ann Fisher of the Pennsylvania State University). Also, while the Business Meeting was in progress, some two-dozen engineers were meeting with Bill Gekler to organize an Engineering Division, laying out its boundaries and goals.

The SRA Council of October 8, 1990, approved the idea of forming more informal-sounding groups rather than divisions; these informal groups were at first called Interest Groups. Using here the current designation of Specialty Groups (adopted in 1991), at the October 8 meeting the SRA Council redesignated the Global Risk Analysis Topical Section as the Global Risk Analysis Specialty Group (Chair: Rob Coppock of the National Academy of Sciences) and approved the formation of four additional Groups: the Exposure Assessment Specialty Group (Chair: Paul Price of the American Petroleum Institute), the Risk Communication Specialty Group (Chair: Ann Fisher of the Pennsylvania State University), the Engineering[5] Specialty Group (Chair: Bill Gekler of PLG), and the Space Specialty Group (Chair: Hatice Cullingford of NASA, Houston). The last-named group was approved at the special request of newly installed SRA President Curtis Travis. Of the four divisions at first proposed, only one, Engineering, survived as the Engineering Specialty Group and one, Health, survived in part as the Exposure Assessment Specialty Group.

As seen in Table XVI, two of the early groups formed no longer exist as such, Space and Global Risk Analysis. The Space Specialty Group was included in the Engineering Specialty Group as the Aerospace Committee of the Engineering Specialty Group in 1993 when the Engineering Specialty Group reorganized itself to form nine committees. The Global Risk Analysis Specialty Group became the Global Risk Analysis Specialty Program in 1993; it apparently expired some time subsequent to that change. As shown in the table, the rate of formation of specialty groups decreased in the second half of the decade of the 1990s.

During the discussions at the 1990 Business Meeting, James Wilson commented that "evolution is better than revolution" when identifying those issues that would garner the most interest. Following the mass creation of specialty groups by the SRA Council in 1990, the process of forming new specialty groups has been one of evolution taking place largely at the grassroots level, usually starting as the idea of one or a few individual members, rather than anything resembling revolution or, even, deliberate effort on the part of the SRA's governing bodies. It was not until 1994 that a Specialty Group Committee was formed to aid those interested in forming specialty groups and to be aware of them and their doings, much as the Chapters and Sections Committee does for chapters and sections. What is known of how the remaining specialty groups were formed follows.

In 1991 Larry Barnthouse, then with ORNL, sought and found some 40 people interested in forming the Ecological Risk Assessment Specialty Group, which was then formed and approved by the SRA Council in that same year. In 1994 Michael Dourson of the U.S. EPA similarly sought those interested in forming a Dose Response Specialty

Group; in that same year the SRA Council approved the formation of that Group. The Risk Science & Law Specialty Group was formed by Wayne Roth-Nelson of Roth-Nelson Risk Science, Layette, Ohio. Paul Deisler remembers Roth-Nelson asking him, during the 1995 Annual Meeting in Hawaii, how to form a specialty group. Deisler responded that Roth-Nelson should get the signatures of as many interested individuals as possible, work with them to prepare a description of the proposed group and its goals, let the Council know of his efforts, and present the material to the SRA Council. The Group received the SRA Council's approval in 1996.

Finally, further illustrating the grassroots method for forming specialty groups, the formation of the Food/Water Safety Risk Specialty Group took several people's ideas to get started. Alwynelle (Nell) Ahl, then of the U.S. Department of Agriculture's (USDA) Office of Risk Assessment and Cost-Benefit Analysis (ORACBA) and now of the College of Veterinary Medicine at Tuskegee University, responded to a request by Deisler to specialty group contacts for information on their groups' histories saying, "I just credit Tanya Roberts [of the USDA, Economic Research Service (ERS)] with the first dream of having a subgroup under SRA. She asked me if SRA would be a good place to get food safety into an international risk analysis organization and, of course, I agreed. With that, my memory is that Jordan Lin, at that time a colleague in ERS, began the process of collecting names of potentially interested folks. In the middle of that Jordan took another position and the opportunity for ORACBA to get involved occurred. Michael McElvaine [with USDA/ORACBA] gladly took over where Jordan left off, got the sign-offs required, and was the first meeting organizer. At that time he was elected President [of the new group] and served, I believe, as President for two years until the organization was up and running." As to the early development of the Food/Water Safety Risk Specialty Group (FWSRSG), Ahl has this to say: "The first thought was that it be a group devoted to food safety only, but there was a considerable interest in water safety within SRA, and of course, in reality food and water safety are closely linked. Thus the mandate of the group properly was broadened. The first Sunday short course organized by the FWSRSG was well received as was the one the following year." Like other specialty groups, the Food/Water Safety Risk Specialty Group plunged immediately into the work of such groups. With regard to the value of SRA from her perspective, Ahl says: "Suffice it to say that the number of SRA members who have had real effect on USDA/food safety risk assessment goes into the high 2 digits at least, perhaps more."

Lest the reader be left with the impression that starting specialty groups is easy and that the SRA Council has merely rubber-stamped the founders' requests for recognition, not all proposed groups have met with the Council's approval. We have seen at the outset that of the originally proposed divisions, three did not become specialty groups: Social Sciences, Policy and Regulatory Analysis, and Health, though aspects of health are represented by two specialty groups, Exposure Assessment and Dose Response. In 1993 a proposal was made to form a Risk Management Specialty Group but the Council did not give its approval on the basis that the idea cut across too many other areas and was not sufficiently focused. In 1998 the possibility that a Risk Education Specialty Group was forming was reported and at the end of 1999 D. Warner North suggested the formation of an Education Specialty Group to the SRA Council. The

function was not clear to the Council so no action was taken and, as of the end of the year 2000, no proposal to form a specialty group in the area of education had resurfaced.

During the 1990 Business Meeting referred to earlier, the question of motivation for forming the then-proposed divisions was raised. One question was whether the formation of divisions was not primarily motivated by the desire to have more engineers join the SRA. Curtis Travis (who assumed the presidency of the SRA at that Business Meeting) responded, explaining that that was not the major motivation although it was an important one. A larger motivation was to place the SRA in a position of leadership on important issues. Certainly, a glance at the list of existing specialty groups shows that important, ongoing issues are at the core of these groups. A warning voiced during the 1990 Business Meeting needs to be kept in mind, however: a division (today, a specialty group) solely focused on an issue should not be allowed to outlive the issue.

Another reason for forming specialty groups was voiced by Elizabeth Anderson (SRA president, 1984-1985) in a personal communication: "Another important part of our history that might be included is the competition that we have started. In the beginning, we were the only society and journal focused on risk analysis. We now have a number of competitors and I think it would be worthwhile including in our history this competition that our Society has inspired. Mostly, I see it as enriching the field."[(66)] The formation of other organizations and the foundation of other journals have been described in Section 4.4. The developing external competition for members and position had, and has to be, a factor in forming specialty groups, though not necessarily a sole factor and not equally for all of them. The formation of specialty groups has also been inspired by the emergence of risk issues and areas as summarized in Section 4. The Engineering Specialty Group is perhaps the best case in point of competition having inspired its foundation: major engineering societies do now publish papers on risk in their fields and the formation of the IAPSAM, encouraged by the SRA, has certainly drawn to itself engineers who, under more favorable circumstances within the SRA, might have been drawn to the SRA. Anderson takes a constructive and broad view of the competition, however, when she says, "Mostly, I see it as enriching the field." This is the view the SRA has mostly taken. Given the existence of an organization that covers, in part, areas of interest to the SRA, the SRA's reaction has usually been to work with those organizations, holding joint workshops, conferences, and annual meetings with them and so further enriching the field.

The formation of specialty groups was a major step forward in the history of the SRA not only organizationally but also in facilitating the accomplishment of the SRA's mission. Surveying the large number of areas and issues the SRA's members deal with it is surprising to these authors that more specialty groups have not formed. The flexible system the SRA has adopted for the formation of such groups is well designed to facilitate the formation of significant specialty groups in the future, to avoid forming those that may not be significant, and to eliminate those that have outlived their usefulness.

6.5. Operations and Governance of the Society

Governance of the Society has been a preoccupation since the days of its formation; the earliest description is contained in the Articles of Incorporation (Section 3.2). Further developments have been both ad hoc, responding to needs as they have arisen, and deliberate: in 1984 a Management and Development Committee, in 1990 a Committee on Governance, in 1992 a Committee on the Future Structuring of the Society, and in 1996 the SRA Structure Committee were created; all of these committees, and their durations, are given in Table VIII. Such records as are available indicate that these committees were not continuations of one committee; rather, they appear to have been separate initiatives designed to study the same overall question, Society governance.

The way in which the Society has governed itself and established its relations with chapters, sections, and specialty groups within the SRA and with other bodies external to the SRA, over time, has been described in part in the sections and subsections preceding this one. The formal way in which the SRA governed its affairs as the year 2000 drew to a close is well described in the Society's Bylaws. A copy of the version of the Bylaws in force at that time is given in Appendix A to this history. The purpose of this section is to provide a summary of the development of the mechanisms of governance of the SRA, including those less-formal ways not contained in the Bylaws.

6.5.1. Development of the Mechanisms of Day-to-Day Governance

Once the start-up periods were over there were still some organizational issues to deal with. When Paul Deisler became president of the SRA (1986-1987) he asked for a copy of the latest version of the Bylaws of the Society. Two copies were produced from the files, differing from each other in various small but clear ways. Neither copy was dated, so in effect the Society did not appear to have an official, membership-approved set of Bylaws at that time, although a Constitutional Review Committee had addressed the problem of governance from 1981 through 1984. Deisler secured the concurrence of the SRA Council to authorize the production of a definitive set of Bylaws for membership approval and Councilor Peter Barton Hutt undertook the task. At the business meeting during the 1987 Annual Meeting, Hutt's new Bylaws were adopted. They became the lineal ancestor of all subsequent sets of Bylaws and one lingering start-up problem was put to rest. Over time, as new needs arose (such as the need to provide for the approval of the formation of specialty groups) or as the SRA's vision of itself matured, further changes were made. The Bylaws in effect in the year 2000 are given in Appendix A. Some other organizational matters dealt with in 1986-1987 were the publication of a Membership Directory, the first in three years, and the writing and adoption of mission descriptions for all committees. The intention in publishing the Membership Directory was for it to be revised and published yearly as is done by many societies. Yearly publication was not finally achieved until 1995.[6] The committee mission statements were prepared not only for clarifying the committees' own understandings of their missions but to be included in a packet of information to be given to all incoming Council members. This latter intention appears to have fallen by the wayside.

In Section 3.2 the basic, earliest system of governance set forth in the Articles of Incorporation has been described: the numbers and titles of officers and their terms and the numbers of councilors and their staggered terms. In Section 5.3.1 the original constitutional (standing) committees and the initial ad hoc committees are named.

6.5.1.1. The SRA Council

Only a few changes have been made since the early days in the Council, either to elaborate upon or to modify the original scheme. One significant, recent modification was the lengthening the total term of service of the treasurer to four years (with only one term allowed to be served): one year as treasurer-elect (a new position), two as treasurer, and one as past treasurer, the individual elected as treasurer thus also serving, at the same time, four years on the SRA Council. The necessary change in the Bylaws was approved in December 2000 by vote of the membership at the recommendation of the SRA Council. This change was made to allow for a learning period, something predecessors had needed to prepare them for the important work they were called upon to do as treasurer. A similar recommendation to lengthen the presidency to two years was made for similar reasons by the Advisory Board in 1996 but that recommendation was not implemented.

Other changes in the Council are in how officers and councilors are chosen. From its earliest days the Nominations Committee (also called, at times, the Nominating Committee) has striven toward "balance." By this was meant balance between the original three, broad classifications of areas of risk analysis (human health, engineering, and societal) and balance among professional connections (academic, governmental, consulting, industrial, and other institutional). Soon, the concepts of balanced representation by gender and of the regular representation of sections came into play. Obviously, with a limited number of members of all types on the SRA Council, exact balance at any one time is not achievable but it can be approached over time. The resolution of the way in which international representation is to be achieved, having gone through various developments within the period covered by this history, is given in the Bylaws, Section 12E (see Appendix A). In brief, where a councilor comes from a particular section, he or she is also, automatically, the representative of the section to the SRA Council and where there is no such councilor, a section may designate a representative. In the latter case, the representative participates in the deliberations of the Council but does not vote. Most recently, at the 1999 Council meetings, the new question of adding ecological risk representation on the Council was raised. As the period covered by this history came to a close, this question had not been resolved. Obviously, as the SRA changes, nationally and worldwide, more questions of representation on or to the SRA Council will arise.

How the SRA Council was constituted is not the only issue addressed with regard to governance by the Council. How it could work more effectively was also addressed. When he was president (1986-1987), Paul Deisler was concerned that the SRA Council, meeting as infrequently as it did, and then for relatively short meetings, needed something to keep individual councilors in touch with events within the SRA between

Council meetings. He therefore instituted, with the SRA Council's concurrence, the practice of naming "contact councilors," each to be a point of contact for designated committees and, in turn, to keep aware of those committees' activities so as to assure that committee work was being advanced, to help when resources or advice were needed, and to report at SRA Council meetings for their contact committees. This mode of acting was not embodied in the Bylaws in preference to leaving it loose and up to individual presidents and councilors as to whether it had ongoing usefulness. The "contact councilor" concept was implemented for about four years after Deisler's term expired; after that, from time to time, a councilor would be named as "liaison" for a particular committee. Yacov Haimes, president in 1997-1998, moved toward a reinstitution of the "contact councilor" concept when he noted that the committees are the "grassroots" of the SRA, that most initiatives should come from them, and that therefore they should be chaired by Council members or, where this is not the case, have a Council liaison.(93)

As a further means of assuring the continuity of important work and the direct contact of the SRA Council with it, certain specified members of the SRA Council chair some of the committees and have done so for many years. In the early years of the Society, the Conferences and Workshops Committee handled the organization of the annual meetings with the assignment of various officers and/or councilors to key roles. During Lester Lave's presidency (1985-1986) the permanent designation of the president-elect as chair of the Annual Meetings Committee took place. In addition, the responsibilities of each past president were established: each would serve for one year, in turn, immediately following their presidencies, as chair of the Publications Committee, of the Nominating Committee, and of the Awards Committee. Election to the office of president was therefore tantamount to committing to a total of five years of service, the first three of which were also served as members of the SRA Council. Presidents-elect also served as chairs of the Annual Meetings Committee. In that latter position, a president-elect served as the general chair of the annual meeting and was charged with setting up the necessary program committees and with maintaining contact with the program committees and assisting them as needed. Presidents-elect were also charged, as chairs of the Annual Meetings Committee, with bringing proposals to the SRA Council on where immediate future meetings might best be held (keeping in mind the SRA Council's decision to hold every third meeting in the Washington, D.C., area). All of this activity could only be carried out effectively with the help of the Secretariat charged, in its turn, with recommending appropriate hotels and with making all financial and logistical arrangements for each meeting. This system has operated well since it was first set up.

6.5.1.2. The Committees

The SRA Council operates both directly and through many other committees and/or task forces. Of the committees, some are defined as Standing Committees and others as Ad Hoc Committees (sometimes named as Task Forces, and there have been subcommittees, too). In 1981 what are now designated as "Standing Committees" were then called "Constitutional Committees." The change in nomenclature came about because of Peter Hutt's observation that there was no need for both a constitution and a

set of bylaws since only one binding document was needed to govern the Society and that the bylaws should logically be that document since they are the more explicit document.

Table VIII, referred to already, shows the committees that have existed from 1981 through 2000, though some ad hoc committees, task forces, or subcommittees (lumped with the ad hoc committees) may have been missed in compiling the table from numerous, sometimes not consistent, sources. In some years the records are not clear (or too many records are missing) so that the existence of a given committee in a particular year is in doubt, as indicated in the Table. With these reservations, the Table nonetheless gives a general, visual picture, over time, of the areas of sufficient importance to the SRA Council to have warranted setting up committees or task forces. In general the titles of the committees describe the objectives of the committees. Comments on the committees will therefore be limited to matters less obvious.

As seen in the first column of the Table, in 1981 five committees were designated as constitutional committees; by 2000, these five plus three additional ones were designated in the Bylaws, Section XIA, as standing committees. In addition, there is the Executive Committee, also designated in the Bylaws.[7] Some committees lasted only about a year, either because their work was completed or because their continuance was deemed no longer necessary to address their issue(s) of interest. Only one committee, the Publicity Committee, has existed throughout the period 1981-2000 without having been designated a standing committee within that period.[8] Some committees existed for a number of years, such as the Liaison Committee (charged with building liaisons between the SRA and other societies), and were then abandoned. This latter committee formed informal liaisons with many other societies—as many as two dozen in a given year—but, in the end, little of lasting significance came of this effort. Interest in liaisons rose again later, as described below.

In 1993-1994, during Robert Tardiff's term as president, a number of committees were discontinued, thus slimming down the total significantly by the time he left office. However, as new needs were recognized, the number of committees began to rise again, reaching 24 by 2000. Among the new committees were the following: Diversity, High Quality Science, International Issues, and the World Congress (earlier established as the SRA 2000 World Symposium and Congresses Committee). As one of his initial acts on assuming the presidency in December 1999 Roger Kasperson, reflecting on the questions of outreach and diversity, of maintaining high scientific quality in the risk assessment process, and of international and global issues, established, with the concurrence of the SRA Council, the first three named committees (note, however, that earlier-established committees also dealt with international matters). The fourth committee was established separately and is discussed in Section 7. The work of the Ad Hoc Committee on Diversity, if successful, might result in giving the SRA and its membership a broader base and scope by engaging groups affected by risk analysis that are not yet represented among the membership of the SRA. In the discussions leading up to the formation of the committee, various minority groups were mentioned, in particular among them, the Native American Tribes.

6.5.1.3. Relating to Other Risk-Related Societies and Organizations

In Section 4.4 the proliferation of societies and organizations related to risk analysis and the spread of interest in risk analysis in several existing societies and organizations has been outlined. This phenomenon provided competition for membership and, to a degree, position to the SRA. In some cases one might surmise that earlier action by the SRA to provide for the interests of those who went on to form alternative societies might have forestalled their efforts and, therefore, the formation of other societies and organizations. However, this surmise may not be entirely true; many if not most such societies and organizations might in all probability have been formed even if the SRA had foreseen that possibility and provided places for the individuals involved within the SRA, such as the timely formation of appropriate specialty groups. In any case, by the end of the year 2000 the Society found itself among a considerable number of other risk-related societies and organizations.

The SRA's response to this apparent competition was a continuation of its early interest in cooperating with other societies and organizations in putting on workshops, conferences, and even annual meetings. Chapters also cooperated with others, as we have seen (Section 6.2.2), in similar endeavors or even in defining themselves. This cooperative effort was seen as a way to make the SRA, its goals, and its benefits better known and, possibly, to attract new members.

The SRA's organized efforts to reach out to other societies and organizations on a formal basis began early, with the establishment of the Liaison Committee in 1984 (possibly in 1983). This ad hoc committee, as noted earlier, was very active, building up long lists of organizations with which liaisons had been formed and designating specific individuals as "contacts." These activities, as pointed out earlier, eventually did not produce many specific benefits to the SRA. However, when she was president of the SRA (1998-1999) Gail Charnley reported to the SRA Council in June of 1999 that she had received many requests from other societies to cooperate with the SRA. She noted that building liaisons with other societies should be an important goal, that it could increase interest, and therefore membership, in the SRA in addition to leading to other possibilities for cooperation such as those discussed earlier. The SRA Council agreed with her assessment and deliberate efforts were launched to establish liaisons. By the end of the year 2000 a significant liaison had been established with the American Association for the Advancement of Science (AAAS), a very large and scientifically eclectic society. The SRA formally set up liaisons with six divisions of the AAAS and Yacov Haimes became the representative of the SRA to the AAAS. In December of 1999 Haimes attended the AAAS meeting as the SRA representative.

Where such liaisons will lead in the future is not known but, as the year 2000 waned, hopes were that the SRA would itself become not only better known but of greater impact and interest as a result of actively maintained liaisons. Maintenance and cultivation of liaisons may well become a part of SRA governance if they yield significant advantages to the Society in the future.

6.5.1.4. Recognition of Individual Accomplishments: Awards and Honors

An important feature of the governance of the SRA is the recognition of those workers in different areas of risk analysis and/or those who have given particularly remarkable service to the Society. This recognition can be of professional benefit to the award recipients, it is certainly satisfying to them to have their work recognized by their colleagues, and it benefits the Society as well, making it known as a Society that recognizes contributions to the field and to itself; it also makes the Society better known.

Table XVII lists the five awards and their recipients during the period covered by this history. The SRA Council approved the establishment of the awards either in the year when they were first granted or, most often, in the preceding year (the year granted is shown in the Table). The following are brief descriptions of the awards (these or equivalent descriptions can be found in several issues of the **RISK** *newsletter* as can the description of the Honor of Fellow, given below the first five award descriptions):

> Distinguished Achievement Award: honors any person, member or nonmember of the SRA, for extraordinary achievement in science or public policy relating to risk analysis.
>
> Outstanding Service Award: honors SRA members for extraordinary service to the Society (when first granted this award was known as the Distinguished Service Award).
>
> Outstanding Risk Practitioner Award: honors individuals who have made substantial contributions to the field of risk analysis through work in the public or private sectors.
>
> Chauncey Starr Award (also called the Young Practitioner Award): honors individuals under the age of 40 who have made exceptional contributions to the field of risk analysis.
>
> Presidential Recognition Award: honors contributions to the Society so exceptional that no other award is an adequate expression of the Society's appreciation.

The Chauncey Starr Award was first proposed by John Graham, who recognized the need to encourage younger risk researchers and practitioners. The Presidential Recognition Award has been granted twice: in 1997 to Steve Brown, president of his own risk consultancy, for his major, personal contributions to setting up the SRA's Web site (see Section 7.5) and in 1998 to Richard and Sue Burk, of Burk and Associates, Inc. (the Secretariat), for their many years of unstinting joint efforts on behalf of the Society.

In 1990 the SRA Council approved a sixth award, the Honor of Fellow. Recipients of this honor form a new level of membership, Fellows. The original requirements for selection for and definition of this honor are as follows[94]:

> Fellows of the Society for Risk Analysis: The Society for Risk Analysis recognizes and honors members whose professional records are marked by significant contributions to one or more of the disciplines served by the Society. Such contributions may be evidenced by (a) recognized, original research or invention, including work in policy areas; (b) technical or scientific leadership in an enterprise of significant scope that involves risk analysis in a substantial way; (c) superior teaching or contributions to improve education and to promote the use of risk analysis that are widely recognized by peers and students. Nominees must have been SRA members for at least five years and must now be members in good standing. Only a restricted number of recognitions will be made in any year.

For someone to be nominated for the honor he or she had to be nominated by three members of the Society, with one nominating member, but no more than one, being from the home institution of the nominee and all nominators having to be widely dispersed geographically.

A later amplification of the definition and requirements added service to the Society as a qualification to be considered and, in 1992, all past presidents were admitted to the Honor of Fellow on the basis of service as president, that service being deemed sufficiently valuable to the Society. The presidents, in their past careers, also often fulfilled one or more of the other requirements to a reasonable degree. Thus the honor was not merely a perquisite of office.

An amplified definition of the class of membership is as follows[95]:

> The membership class of Fellows of the Society for Risk Analysis is established: to recognize and honor members who have compiled a professional record marked by significant contributions to one or more of the disciplines served by the Society. Such contributions may be evidenced by one or a combination of the following: (a) recognized, original research, application or invention; (b) technical, scientific or policy analysis leadership in an enterprise of significant scope that involves risk analysis in a substantial way; (c) superior teaching or contributions to improve education and to promote the use of risk analysis that are widely recognized by peers and students; or (d) service to or constructive activity within the Society of such a quality, nature and/or duration as to be a visible contributor to the advancement of the Society. The Committee will weigh the total contribution of each nominee in these four areas in arriving at its recommendations to the SRA council. Nominees must have been members of the SRA for at least five years and must be members in good standing. Only one percent of the Society members per year may be selected. Each past president will also receive recognition as Fellow of the SRA.

The establishment of each of the five awards went reasonably easily, the justifications for their establishment being quickly evident to most. The establishment of the Honor of Fellow was less simple, taking about a year of argument and discussion. George Apostolakis, who chaired an ad hoc committee aimed at defining the honor, first proposed the establishment of it in 1990. Paul Deisler, a member of the ad hoc committee, was present during the committee's deliberations and remembers some of the arguments that occurred. The committee members were generally in favor of establishing the new honor but the basis for its award and the specific wording were argued extensively. The question of including service to the Society was controversial. As seen above, this requirement was not at first included but added later. Whether the honor was primarily for academic achievement or whether achievement in industry, consulting, government, or other areas might also be recognized was also debated, with the result seen above. Even the word "Fellow" was hotly argued, some committee members arguing that it implied a masculine gender, others arguing it did not necessarily do so, often having a more general application. Other words were sought for feminine honorees without success. It was after a member somewhat facetiously suggested adopting the British term "Dame" for feminine honorees that the argument came to a close with "Fellow" as the final choice, regardless of gender. At times, even committee work has its droll side.

Table XVIII lists all those granted the Honor of Fellow during the period covered by this history. Comparison with Table IV-A and Table IV-B shows that of the 53 individuals designated as Fellows, 19 are past presidents.[9]

Other awards have been made from time to time (not regularly) at annual meetings. Among these irregularly given awards there have been those for the most meritorious paper, for the best poster, and for the student "best paper" (the "best" paper being that given by a student at a particular section of the meeting); thus more than one award could be given. For example, in 1993 two student awards were recorded, each one carrying with it a $500 prize; in 1997 seven awards were given; and in 1998 six were given. As the year 2000 drew to its close, none of these three types of awards had been made permanent features of the annual meetings.

6.5.1.5. Planning for the Improvement and Future of the Society

This subsection will deal with two topics: improving the Society and planning for its future. Before addressing either topic, the development of a vision statement defining the Society's general vision of itself, what it wants to do and to be like, needs to be discussed. Establishing a vision is a first step in determining what needs to be improved to meet the vision and how one might go about it, that is, a strategic plan.

6.5.1.5.1. The Current Vision

From the beginning, every president of the SRA has had a vision of the Society in mind as he or she took office. Some stated specific goals or visions; others' visions became known through their actions in office. Each has pursued those aspects of their

visions that seemed to need attention at the time in addition to pursuing the day-to-day affairs of the Society. Some emphasized expansion, some expansion plus organizational matters, some international links, some policy matters, some the expansion of the scientific and technical scope of the Society, and so forth. Each, in fact, had a good grasp of the overall aims of the Society whose first expression was in the Certificate of Incorporation (Section 3.2). As time passed, however, and as experiences were absorbed, it seemed desirable to develop a formal vision for the Society incorporating not only the early vision but elaborating as needed to accommodate the new. This desire came to fruition at the 1993 Annual Meeting in Savannah, Georgia, when the membership of the SRA unanimously approved this Vision Statement for the Society:

> *The Society for Risk Analysis is a multidisciplinary, interdisciplinary, scholarly, international society that provides an open forum for all those who are interested in risk analysis. Risk analysis is broadly defined to include risk assessment, risk characterization, risk communication, risk management, and policy relating to risk, in the context of risks of concern to individuals, to public and private sector organizations, and to society at a local, regional, national, or global level.*
>
> *The Society for Risk Analysis:*
>
> - *brings together individuals from diverse disciplines and from different countries and provides them opportunities to exchange information, ideas, and methodologies for risk analysis and risk problem-solving;*
> - *fosters understanding and professional collaboration among individuals and organizations for the purpose of contributing to risk analysis and risk problem-solving;*
> - *facilitates the dissemination of knowledge about risk and risk analysis methods and their applications;*
> - *encourages applications of risk analysis methods;*
> - *promotes advancement of the state-of-the-art in research and education on risk analysis;*
> - *and provides services to its members to assist them in developing their careers in risk analysis.*

This brief document was the culmination of nearly three years of work: inputs, thoughts, writing, reviews, more inputs, more writing, and further iterations until a document that satisfied was produced. D. Warner North (president, 1991-1992) who called together a large group of active and past SRA officers and councilors for preliminary input and thinking, launched the effort. Later, North and a few others of the

original group (Paul Deisler, Vlasta Molak, Donald Barnes, and David McCallum) completed the statement using the process already described.

Comparing this document with the purposes stated in the Certificate of Incorporation, it becomes evident that the original founders had a vision not unlike that of 1993. The latter is more complete, including items not in the original certificate, but the early vision and the later one clearly refer to the same SRA. Over the years the Society had stayed on track, learning along the way. While this is certainly reassuring, a primary use of a vision statement is as a starting point for planning how to make the vision a reality where it might not yet be (improvement) and how to aim for a future in keeping with the vision (strategic planning). Two general activities will be described, one for improving the SRA and the other for strategic planning.

6.5.1.5.2. Attempts at Improving the Society

Every president and councilor and many others besides have given strong attention to the question of how to improve the Society, ranging from how to maintain and increase the reputation, scope, and distribution of the Journal to how the Society might attract a larger number of diverse members, how it might best serve them, and how it can best serve the public. Many of these efforts are mentioned in other sections of this history but there is one concerted effort that should be described in some detail if only because of its focused nature and years-long efforts. That effort is that of the Advisory Board.

The Advisory Board, established by the SRA Council in 1994 was, at first, primarily a device for seeking ways to improve the Society in any or all of its aspects. The idea for having such a board originated in the Gifts and Grants Committee as it sought ways to increase funding of the Society. It was originally thought that the board might contain (1) members with experience in different areas of risk analysis, whether members of SRA or not, (2) members of SRA with similar broad-ranging backgrounds in risk analysis and, also, knowledge of the Society, and (3) others from organizations that were particularly strong Sustaining Members.

The Gifts and Grants Committee generated the idea of such a board by analogy to practices in certain university settings. Such a board, while useful in providing advice on any or all aspects of improving the Society from several different standpoints, might also develop stronger links with Sustaining Member organizations through their representatives on the Advisory Board so that, in addition to receiving useful advice, the SRA might benefit from a continuation or, even, an increase in gifts and grants. The proposal contained two important points: Sustaining Member representatives to the board, who would be full board members, would constitute only a minority of the total membership of the board, and the board would have no power to implement its own suggestions. Its relation to the SRA Council would be that the board would propose and the Council would dispose. It was thought that these factors would answer concerns that the board (and thereby the SRA) would somehow become dominated by Sustaining Members' representatives. The board would also be available to the SRA Council to

analyze ideas the Council wanted to have examined. Thus the board would be a two-way tool of the Council, having the time, which the Council did not, to examine issues in depth and make recommendations for disposition by the Council.

The establishment of the new board was at first approved as described. Later, too much concern arose that, despite safeguards, there still would not be adequate protection to the Society against domination by external influences. The idea of inviting particularly supportive Sustaining Members to send representatives to the board was therefore eliminated by the SRA Council in 1995. While the idea that such a board might enhance giving by Sustaining Members was discarded, the rest of the idea remained and proved useful.

Paul Deisler, who had suggested the idea for an Advisory Board while a member of the Gifts and Grants Committee, was asked to be the founding chair of the new Board. He agreed to undertake the job for two years, whereupon he recruited (for appointment by the SRA president) a very small initial membership. Ann Fisher (The Pennsylvania State University), William Farland (U.S. EPA), and B. John Garrick (PLG) were the first members along with Deisler (retired from Shell Oil Company). Among these four people, four sectors and several areas of risk analysis were represented. Later, Lawrence W. Barnthouse (ORNL) and Catherine St. Hilaire (Hershey Foods Corporation) added still more diversity of background to the small group. Altogether, general risk management, health risk assessment, ecological risk assessment, some social aspects of risk (risk communication), and regulatory policy and practice were to be found among this small group of members. Brett Burk of the Secretariat acted as the very capable support staff for the newly formed Board. It was the intention not only for the initial Board but also for future Boards that, in addition to representing a spectrum of disciplines and sectors, the Board should also avail itself of a mixture of experiences: past Council members, past candidates for officer or councilor positions who were not elected, other active members, and outstanding individuals from the broader risk community. The reason for identifying past candidates not elected to office, in particular, was that the talents of these individuals, as carefully selected by the Nominations Committee as were those who were elected, too often later went unused by the Society.

The new Advisory Board developed a very broad mission statement as a first order of business, emphasizing that the function of the Board was advisory only and that, through its advice, it was to act as a stimulus for the thinking of the Council on matters the Board considered important enough to include in its reports. The use of the word "stimulus" in the mission statement of the Advisory Board is deliberate; it was suggested by Garrick and adopted unanimously by Board members. In this statement, the Board opened up every area of the Society to examination, thought, suggestion, and recommendation. All areas covered in the Vision Statement and all areas of governance were thus included.

The Board then turned to the development of recommendations and the discussions supporting them. The first annual report was forwarded to the SRA Council in November 1995 and it stirred much interest. At the 1995 Annual Meeting in Hawaii

John Graham, then president-elect and about to assume the presidency, questioned Deisler, chair of the Advisory Board, in depth on many points in the report. The results of this report and later reports are hard to identify, in retrospect, since similar ideas to those proposed in the series of reports could well come from sources within the Council or elsewhere. However, in succeeding years many of the areas of recommendation in the early reports were taken up by the Council, from whatever actual source, often transmuted by the Council into forms more to their liking. It appears that the role of being a stimulus was fulfilled.

After Deisler and up through the year 2000, Garrick became the Board's chair and, following him, D. Warner North. During the first few years after the formation of the Advisory Board, the minutes of the SRA Council meetings demonstrate an ongoing interest in the reports of the Advisory Board. By the last two years of the period, 1999 and 2000, attention to the Advisory Board's reports, as reflected in the minutes, had slackened. As the year 2000 came to a close, the Advisory Board was under review by the SRA Council which questioned whether the Board was making the best use of the talents within it, whether its mission and task ought not be reevaluated and redefined, or whether it might not, in fact, be abolished.[10]

6.5.1.5.3. Strategic Planning in the SRA

The Advisory Board was not set up as a planning instrument, per se, though such a board can be a useful advisory and analytical adjunct to a planning system. As of the end of the year 2000 no special system had been set up for conducting planning (or strategic planning). However, planning has taken place in less systematic, simpler ways, in one form or another throughout the SRA's existence. The simpler forms of planning, described further on, have met with some success in assisting the SRA to find its heading, but the several initiatives at strategic planning had not coalesced into a tangible, useful system as of the end of the year 2000. Nevertheless, it is worth recording some of the efforts because they raised questions of ongoing importance that need, sometime, to be addressed.

Whenever an SRA president or Council has stated goals or aims, some degree of thought about the future, that is, planning, has taken place. The Certificate of Incorporation is, thus, one of the earliest planning documents since it incorporates a definition of the Society's goals and describes a mechanism for governance, both of which affected the then future of the Society. So is the later-derived Vision Statement. Goals, or desires, for the Society, such as those enunciated by Lester Lave or Roger Kasperson, also constitute a type of planning. Yacov Haimes was doing the same thing when, as the new president of the Society, he stated his four objectives: (1) integration of cultures within SRA, (2) establishment of SRA as a primary society, (3) continued effort to keep the Journal at the heart of the society, and (4) building an appropriate reserve fund to maintain the stability of the Society.(93)

Short-term planning of an intense nature has been practiced, of necessity, within the SRA throughout the period for specific, important projects: annual meetings,

workshops, and the like. Throughout the period covered by this history, planning in the systematic, longer-term, strategic sense was not practiced although, as we have seen, the simple planning result, goal setting, has had real effect. As early as November 1987, however, an explicit use of planning in the longer-term sense and as distinguished from stating thought-out goals or objectives (ordinarily among the results of systematic planning) was mentioned when newly installed President Vincent Covello asked the SRA Council to think about future directions for the Society with the intention of discussing them at the next meeting. There is no record of that particular, second discussion having taken place or of any planning results having been produced but this was the first record of the subject having been broached and Covello's question may have planted a seed. SRA President Richard Schwing (1988-1989), Covello's immediate successor, pressed the question again when he asked: "Where are we going and what are we doing?"—a question that became the subject of discussion during lunch at the March 17, 1989, Council meeting.[96] The resulting discussion of long-range goals brought forth several interesting thoughts. Examples of these thoughts are (1) a cultural revolution concerning risk was underway, then, that offered opportunities for the Society to act as an amplifier to make for cultural change that would create a science of dealing with risk, (2) risk analysis needs to develop into a discipline (and, how can this be done?), (3) risk analysts are professionals since they accumulate judgment in their field over time—the profession needs to be developed in coming decades, (4) risk analysis will survive only if the sciences become more involved—and SRA needs to involve the sciences, (5) risk analysis presentations need to be made at the meetings of other societies, and (6) the Society can play a role in communicating what risk analysis is to the public. This last thought prompted a discussion that led to approval of a motion to hire a graduate student to survey what other societies were doing to produce primers for the public on their fields. Funds were appropriated for this survey, which would be under the direction of Covello and James Wilson. Aside from this one, short-term action, nothing further seems to have developed directly from this meeting. However, several of the points made were to arise again in the future.

In December of 1992 then President James Wilson appointed a Committee on the Future Structuring of the Society, with himself as chair, a committee dedicated to an important aspect of strategic planning given the existence of two strong sections (Europe and Japan) and the possibility of others forming. No report was found of this committee's activities and it seems to have expired by 1994. At around this same time period a retreat was held to focus on long-range planning and the suggestion was made that similar retreats might be held at intervals of, perhaps, two years. No strategic plan emerged from this first effort. Two topics were suggested as of possible interest for a future retreat: the structure of the Society to make it global and the mechanism by which the Society, itself, might publish position papers. This latter policy matter had come up in the past and would do so in the future.

A major effort to get true strategic planning started was made when SRA President Rae Zimmerman caused the May 1, 1997, Council meeting in Alexandria, Virginia, to become a full-day strategic-planning session oriented around the principal recommendations made to the Council by the Advisory Board in its 1996 report. Garrick,

who had just succeeded Deisler as chair of the Advisory Board, was asked to lead the Council in a strategic-planning session.

The Advisory Board's 1996 report contained eight principal recommendations and many smaller ones. The eight major ones provided the framework for the lively, lengthy, and thoughtful discussions of the SRA Council at its Alexandria meeting. These eight recommendations (and the abbreviated statements of the "problems" or questions underlying them) concern the following issues, taken from the minutes of the meeting[97]:

1. Membership: The field is growing much faster than SRA membership is.
2. Public Positions: Strong opinions of SRA leadership have obscured membership preferences on [the SRA] taking public positions.
3. SRA Role in Risk Science Education: Limited knowledge about the risk sciences with the result often being misunderstanding and miscommunication.
4. Student Participation in SRA: How to increase student interest in SRA?
5. Quality of Information Exchange: Some criticisms of the quality of papers and presentations at national meetings and the lack of dissemination of SRA meeting information.
6. Enhance Continuity of SRA Operations: Corporate memory and leadership terms [of office].
7. SRA Chapters and Specialty Groups: Not the membership engines at first envisioned and often divisive.
8. Establishment of Risk Management Specialty Group: [No problem stated in the minutes].

The first seven of these issues deal not only with the problems of the day but also with the future of the SRA. The first and seventh have been addressed earlier in this history. These seven issues do not constitute, necessarily, the starting points for true strategic planning but they are items needing resolution in any strategic-planning effort. The full discussions, as abbreviated, are too lengthy for reproduction here and the interested reader is advised to read the original minutes, available in the history archives of the SRA. However, the vigorous nature of the discussions and the conclusions reached, some on a tentative basis, show that the Advisory Board was indeed living up to its mission of stimulating constructive thinking within the Council at that time. At the meeting of the SRA Council's Executive Committee in September 1997, the need to move more briskly on the Advisory Board's recommendations was stressed, and at the SRA Council meeting in December of the same year, President Zimmerman stated she would like to have a mechanism for taking action on Advisory Board recommendations. Despite its impact in its first few years of its existence the Advisory Board would later be brought up for consideration for possible change or elimination.

The final, major effort at strategic planning made in the period covered by this history was at a meeting of the Executive Committee, May 4-5, 2000, held on Tilghman Island, Maryland. Roger Kasperson, president of the SRA at the time, organized this meeting to be, primarily, a meeting whose goal was to start a process of strategic planning that the SRA Council and then SRA President-elect John Ahearne would move

along (only a small part of the meeting would be devoted to normal business). Thus the major objective of getting started on strategic planning within the SRA was the same as that of the earlier meeting under the leadership of Zimmerman, just described. However, its specific focus differed: the Tilghman Island meeting's focus was getting a process started, whereas the Alexandria meeting's focus was doing strategic planning using recommendations of the Advisory Board as starting points. Moreover, the earlier meeting had used the Advisory Board's then current chair, Garrick, to lead the discussions, thus including representation of the Board directly at the meeting. The later meeting on Tilghman Island used only inputs of the Executive Committee members present (Gail Charnley, Dale Hattis, Roger Kasperson, Timothy McDaniels, John Ahearne, and Richard Belzer) and made no apparent use of the Advisory Board or any recommendations it might have had. Considering that the Board was under review, as described earlier, this is not surprising. Also, those present at the meeting were all, individually, very experienced in risk analysis and in the Society, very qualified to conduct the effort before them, and from a great variety of backgrounds.

The results of this meeting were, principally, a fairly large list of important matters, some very detailed and some of major scale, to be further considered—a rich trove from which to continue a strategic-planning effort. Whether this material was the beginning of a systematic and useful process of strategic planning within the SRA is something the authors must leave for future historians to report.

As the year 2000 drew to a close, the SRA had developed no systematic way to conduct strategic planning. Such an ongoing effort would be subject to one of the main difficulties facing a relatively small, fast-changing organization of volunteers such as the SRA: maintaining continuity of effort over time. It is also a resource-intensive effort if conducted well, another potential problem for the SRA, and if not conducted well it is of questionable value. Strategic planning is difficult to conduct by committees of volunteers whose members can only devote limited time to the effort. There is some question whether full strategic planning or something simpler (such as goal setting by inspired leadership or the results of occasional, intensive, professionally led retreats) might be a better fit for the SRA. There is no question but that finding the right directions for the SRA has continued to be of major interest down through the years. Only the future, as it unfolds, can tell us what the final outcome, if there is one, will be for strategic planning in and for the SRA.

6.6. Some Further Ongoing Issues

Many of the issues already discussed are ongoing and will exist long after these historians are gone (we take the optimistic view that the Society will also then still exist). Here we discuss the histories of two additional issues not yet covered that have been and continue to be raised within the SRA: whether there is a central discipline or profession that can be called risk analysis (if so it should be possible to define it) and what the role of the SRA vis-à-vis government is or should be, if there is one.

6.6.1. Risk Analysis: Is There a Central Discipline and/or Profession of Risk Analysis?

The term "risk analysis" has come to be understood as a name encompassing a highly varied collection of fields of analysis of many different types of risks. Any one analysis can involve a variety of sciences (of any kind) and technologies. The main things that provide any unity at all to these often highly different and disparate areas is the concept known as risk and the practical need to be aware of, to understand, to assess, to characterize, and even to manage risks. The concept of risk, itself, is hard to define once and for all for everybody (unlike, say, chemistry or psychology) because it is a human concept whose subject is not found in nature (as are substances or human beings); it is therefore mutable over time and subject to different understandings in different cultures. It is not surprising that it is hard to define in a general sense. Nevertheless, there are many people who are practicing risk analysts, defining themselves as such because of their expertise in one or a few specific areas of risk analysis. These practitioners usually have university degrees, often advanced degrees, in one of the scientific or technological fields but not in "risk analysis" per se. In this section we shall examine, briefly, the efforts of the Society for Risk Analysis to bring some sort of definition and unity to the overall field and, perhaps, to turn risk analysis into a recognizable profession with clear academic roots.

6.6.1.1. Defining Terms

One thing that a unified discipline has and relies on is well-defined, universally understood terms. The question of settling on definitions in risk analysis was examined briefly very early in the Society's history. In that first look at the question, no consensus was achieved and the effort was soon abandoned. The question continued to be of interest and so it was that in 1985 an ad hoc Definitions Committee was commissioned to take up the task of determining common definitions of terms used in risk analysis.[11] The Committee's original charge was "to prepare a consensus set of definitions for the Society."[(98)] The Committee did not limit its efforts to any one kind of risk (for example, cancer risk) but covered many other kinds of risks (though ecological risks may not have been kept explicitly in mind). Lawrence Gratt, a highly expert risk analysis consultant, chaired the Definitions Committee throughout its life. Including Gratt, the Committee started out with a membership of eight well-known risk experts. In time it grew to a membership of 14 and attracted a list of 18 SRA members interested in the Committee's project (the list was in addition to Definitions Committee members). The project was a popular one and Gratt and his Committee pursued it intensively considering, for example, as many as 13 possible definitions for "risk" at one point and holding special sessions on the subject of their search during at least two annual meetings. By mid-1986 the Committee decided that "risk analysis" itself could not be defined in a way agreeable to all participants. By March 1987 the Committee had found it impossible to reach consensus on such additional terms as hazard, risk, risk assessment, and risk characterization (this despite—or perhaps encouraged by—the publication a few years earlier of *Risk Assessment in the Federal Government: Managing the Process* by the NAS/NRC[(29)]) and they believed that no consensus would be forthcoming; the Committee opined that it was back to where it had started.[(98)] At that same time the Committee modified its original charge to the following: "to produce communications that will

produce a broader understanding and appreciation of the differences in the way risk terminology is used and encourage broader-based discussions among risk professionals. The longer range goal is to provide a means for uniform usage of key terminology and/or a forum for use of different terminology in different disciplines."

Despite the initial discouragement and armed with its revised charge, the Definitions Committee continued its efforts. Gratt prepared a draft report to his committee members in mid-1987 giving an excellent, detailed account of the Committee's work and thoughts up to that time.[99] It is too bad that, because of its length, this very interesting report cannot be reproduced here. The interested reader will find the memo and its attached report in the SRA's history archives. By the end of 1987 Gratt was attempting to find out what the Committee thought should be done with its work, which, despite the fact that the Committee had not accomplished its charge, did contain many useful insights. Options stated by Gratt included publication in *Risk Analysis: An International Journal*, preparation of a report to be sent to the Secretariat where it would be available on request, continuing to keep the issues current and having another meeting during the 1988 Annual Meeting, or stopping without making any further effort. The third option was selected and a meeting of the Committee was held at the 1988 Annual Meeting, the results of which have not been found. Although records indicate that the Definitions Committee continued in being through 1990, no indication has been found of further activity beyond the 1988 meeting. In spite of the interest the topic inspired and the participation of talented, expert people, the effort, in the end, arrived at the same conclusion as the earlier, brief effort: no consensus was reached sufficient to respond to the charge, original or modified. The subject may not be dead, however, because in the meantime the many activities discussed in Section 4 resulted in the de facto adoption of a number of common definitions, some of which transcended the boundaries of specific types of risk analysis. Risk analysis, itself, has been officially defined by the Society in its current Vision Statement (Section 6.5.1.5.1).

6.6.1.2. Efforts to Define Risk Analysis as an Academically Distinct Field

In 1985 Michael Gough of the now-defunct Office of Technology Assessment of the U.S. Congress, then the incoming SRA treasurer, commented[100]:

> "When asked what they do, only a few, if any, SRA members would respond, 'I'm a risk assessor (or analyst).' There are a lot of reasons for that. The Society is united far more by a general approach and interest than by the use of particular methods, and we tend to describe ourselves by reference to specific training and tasks. For instance, most members were educated in a well-characterized discipline and have jobs that engage their skills as biologists, engineers, lawyers, mathematicians, physicists, or politicians. In fact, it is difficult to imagine this group of people as members of any other single organization."

Despite this early diversity, much of which continues today (although there may be many, now, who would characterize themselves as risk analysts of one kind or another), there was an early interest in the Society in education—not only in the

education of the public about risk but in the academic education of students. Later there would come discussions and actions to establish risk analysis programs at the graduate or even the undergraduate levels, perhaps leading to degrees in risk analysis or, even, to certification as risk assessors.

To pursue the question of academic education, an Education and Training Committee was established in 1981. The Committee's activities included what kinds of courses might be suitable, what curricula might look like, what courses were already being taught at universities in departments or centers, making other contacts with universities, and so on. This first Education and Training Committee lasted through 1984. Later, in 1999, an Education Committee would be established, as discussed further on. In the meantime, the Conferences and Workshops Committee began organizing and holding risk assessment short courses in the springtime in Washington, D.C. These courses continued for many years, starting with cancer risk assessment but, later, branching out into other kinds of risk assessment. Thus the Society worked to promote knowledge of risk assessment (and risk analysis) to the interested public as well as to university students. Over the years (see Section 4.4) many centers dealing with risk analysis of one kind or another were established both within and outside of universities. Many were established by SRA members and/or had SRA members on their staffs. Some of those established at universities offered graduate research programs within which students could do risk analysis work germane to their principal fields as partial fulfillment of the requirements for advanced degrees in those fields. Private companies became interested in risk analysis during the 1980s, developing and applying their own, internal methods as well as adopting the methods then developing within federal agencies such as the U.S. EPA. In 1989 one company, Chevron, offered a risk analysis post-doctoral fellowship which began in 1990. This fellowship was offered to individuals having doctorates in science, mathematics, or engineering (it did not cover all areas of risk analysis) for two years of study and research with the payment of a handsome stipend, benefits, and expenses.[101] While the SRA's own activities no doubt were influential in stimulating the interest just cited, the external realities of the time (Section 4) also stimulated interest in risk analysis from the theoretical to the applied sides.

The SRA continued to exhibit its own strong interest in defining risk analysis as a field and in risk analysis education. Articles in the **RISK** *newsletter* throughout the 1980s and 1990s reported special symposia and discussions on these subjects at SRA annual meetings, including discussions on the pros and cons of doctoral programs in risk analysis, whether risk analysis is or is not really a science, and continuing reports and discussions on programs at various universities. In 1992 a major article in the **RISK** *newsletter*—"Should there be an academic program offering a Ph.D. in risk analysis?"—reported the results of a panel discussion at the 1991 SRA Annual Meeting chaired by John Graham, founder of the Harvard Center for Risk Analysis and a member of the SRA Council.[102] There were those in the affirmative, those in the negative, and others with diverse opinions at the session. Tony Cox of Cox Associates in Denver, Colorado, in the affirmative, stated that "there is a field of risk analysis" which has developed largely outside of academia. Others, including Lester Lave of Carnegie-Mellon University, disagreed, offering the view that the main reason for offering PhDs is to fill academic

positions in the basic sciences. Other academic participants expressed the view that risk analysts should have solid backgrounds in already-recognized disciplines but thought that such individuals should be able to obtain PhDs in risk analysis. Others debated whether establishing separate university departments of risk analysis was a good idea or not, or even a feasible one. Chairman John Graham offered the view that universities are not organized to promote the type of interaction required for departments of risk analysis. An unidentified member of the audience summarized his understanding of the situation as follows: "Twenty years ago people used to have the same arguments about systems engineering. Now it is accepted. When you look at risk analysis, first of all, it is a philosophy. You might argue that you cannot restrict expertise to those who know the methodologies, but in 10 or 20 years this dialog will stop being dichotomous. We will have people doing their job in the field." We give this much space to this discussion not because it settled the matter at hand but because it brought forth the clear views of people who, without doubt, are expert risk analysts and it made the possibilities and difficulties plain. The status of debate on the topic at the time is well clarified by this article. It is also clear that, at that time, genuine interest in the topic was alive and well.

Discussions of the related topics, the field of risk analysis and education in the field, did not come to an end after the panel discussion just described. In 1996 the Advisory Board's report addressed the question of the SRA's role in risk science education (Section 6.5.1.5.3). During the Board's discussions, while developing its report, the possibility of developing curricula—establishing risk analysis as a field of graduate or post graduate study within universities—and the SRA's possible role was discussed at some length.(103) Opinions were mixed but the pros somewhat outweighed the cons. Advantages were seen not only to the field but also to the SRA (for example, student memberships in student chapters leading to full memberships). The idea of establishing university-level training was raised by others from time to time as well, and in 1997 a new Education Committee, chaired by SRA Secretary Timothy L. McDaniels, was established to pursue the matter. This Committee received a major task when in 1998[12] the SRA Council, then chaired by SRA President Yacov Haimes, commissioned the Education Committee to follow up on an initiative made by John Graham (president, 1995-1996) that the SRA should promote the establishment of risk educational and research centers.(104) The Committee was charged with preparing a report detailing the need for having such centers and their benefits. The proposal, itself, contains a discussion of benefits to be expected from establishing additional centers within universities. In the same article, a proposal by B. John Garrick to develop technical standards for risk analysis is outlined, such standards to be applied to selected industries. Here we have another proposal to improve and better define at least some aspects of the overall field.

The Education Committee went into action promptly in 1998, completing its initial charge by the end of May. President Yacov Haimes summarized the main points of the Education Committee's report in a letter published in the **RISK** *newsletter*.(105) Summarizing even more briefly, the growing national need for more well-educated and trained risk analysts was cited as the main reason for pursuing more university-level education in the field at four levels: (1) undergraduate students (access to high quality, multidisciplinary, educational resources), (2) graduate students in diverse fields

(particularly medicine, public health, statistics, law, environmental studies, toxicology, pharmacology, ecology, engineering, and economics and the other social sciences, integrating risk analysis into their required curricula), (3) midcareer professionals in the public and private sectors (providing intensive, short educational opportunities to improve their understanding), and (4) doctoral-level training for the smaller number of people in each facet of risk analysis (to provide future theory, applications, and curricula). University-based centers for risk analysis should be funded through a competitive, peer-reviewed process such as is used by the National Science Foundation (NSF) or like that used to review proposals by the recent, joint actions of the NSF and U.S. EPA. Haimes further expanded on his thinking about risk and risk analysis education in an article in the next issue of the RISK *newsletter*.[106]

President Haimes sent letters and the proposal to many governmental agencies: the White House, all Cabinet members and their deputies, the leadership of the House of both parties, House and Senate committee chairs and subcommittee chairs, major agencies involved in risk analysis such as U.S. EPA and FEMA (Federal Emergency Management Agency), the director of NSF, and the Office of Science and Technology Policy. By the third quarter of 1998 over 200 letters had been sent out and about two-dozen responses had been received. The responses were favorable but no commitments were forthcoming. While this was considered a good start at the time, it soon became evident that actual, committed support would be unlikely to emerge. The Education Committee then turned its attention to starting a column in the RISK *newsletter* that would provide a clearinghouse for students and others on the availability of educational programs in risk analysis. This type of information is, in general, hard to find and the column was envisioned as a real service to the searcher for resources in the field. This column, titled "Risk Education Resources," continued to be published at least through the end of the period covered by this history.

The outcomes of their efforts to define risk analysis as a coherent field and a clear discipline, and to promote education in it, must surely have been frustrating to those hard workers who had tried their best over the years. One of those workers was Gail Charnley (SRA president 1998-1999). In her past president's message, Charnley called risk analysis a discipline, but expressed the concern that risk analysis, far from being an established, well-accepted discipline was, in fact, under fire at that time.[107] She saw a growing anti-risk analysis sentiment with risk analysis on its way out, in the eyes of critics, as a way to conduct rational, governmental decision-making, a part of the problem and not a part of the solution. She was concerned that those seeking easy solutions and preferring ideology, with its simplistic solutions, to science, with its seeking after the true and best solutions, would choose the paradigm, misusing the Precautionary Principle and neglecting risk analysis. If the Precautionary Principle were to be adopted as a new paradigm it would eliminate a major portion of risk analysis, namely risk assessment and characterization, and thus greatly reduce true risk analysis. The enormous value that scientific risk characterization has in arriving at meaningful and equitable risk management would be lost. Charnley's basic message then was this: those who understand how and why risk analysis is a useful and efficient tool for decision-making need to continue the fight for its long-term acceptance.

On page one of the same issue of RISK *newsletter*, one of John Ahearne's stated goals as he took up the office of SRA president for 2000-2001 was to change the outside perception of the field which he said was not well recognized as a discipline, thus expressing his determination to continue the efforts of past decades that Charnley called for. An example of what might become a model for the future university-level organization for education in risk analysis is given on page 17 of the same issue of the *newsletter*: a description of the Harvard Center for Risk Analysis, its nature, its core courses (applicable to all forms of risk analysis), and its overall program at several academic levels. With more hard work this model might become one of those that emerges to define the field, promote understanding of its inherent necessity and usefulness, give it a firm position in academia, and provide knowledgeable and effective future practitioners and researchers.

6.6.2. The SRA's Interactions with Government

Risk, understanding it quantitatively (mathematically) and qualitatively, and such aspects of it as an individual's or a society's reactions to it are established fields of study in and of themselves. Risk analysis is ultimately an applied field aimed at finding ways to give protection against the adverse consequences of risks. It is defined in the current SRA Vision Statement (Section 6.5.1.5.1) as follows: *Risk analysis is broadly defined to include risk assessment, risk characterization, risk communication, risk management, and policy relating to risk, in the context of risks of concern to individuals, to public and private sector organizations, and to society at a local, regional, national, or global level*. The maturing of the concept of risk analysis within the SRA is indicated by the fact that the term "policy" was not included, even inferentially, when the original vision of the Society for Risk Analysis was written into the Articles of Incorporation (Section 3.2). There are thus not only scientific and technological aspects of risk analysis but also policy aspects. Moreover, all the activities given in the current Vision Statement must have policy decisions incorporated in them even if only because of gaps or uncertainties in the underlying sciences. The term "default assumption" has become common in certain types of risk assessments, a term which is short for "policy decisions made to facilitate completing a quantitative risk assessment in the face of gaps or large uncertainties in scientific knowledge." Much larger policy decisions have also been made, for example, to use specification-based rather than risk-based regulation in a given law or regulation. If the Precautionary Principle were to be adopted as a new risk management paradigm as opposed to current, risk-based paradigms as Gail Charnley has discussed (Section 6.6.1.2), a major policy decision would have been made (not without protest, however!). In what follows, two possible areas of interaction of the SRA with government are discussed: policy and scientific/technological.

6.6.2.1. The SRA and Risk Policy

Policy is a necessary adjunct to government and while no policy can declare a known law of mathematics or nature invalid (it has been tried), there is plenty of room for policy in risk analysis as just discussed. Policy is by nature controversial. Debate, often

heated, is almost a necessity for the development of policy which, in practice, proves sound. In the earliest days of the SRA the Society feared embroilment in controversial issues and its first stance on such matters was expressed as follows (Section 5.3.8): "The Society is religiously [that is, *scrupulously*] neutral on controversial issues—it is impartial and multi-faceted, dedicated to scientific excellence dealing with risks." This does not say that individual members, many of whom are engaged in areas of risk analysis where policy is a natural feature of their work, should somehow eschew policy. Indeed, the statement is aimed at the Society as a whole, warning against the taking or expressing of positions on policy by the Society itself.

The statement has been challenged and revisited over time. The fact that the Society was incorporated as a 501(c)(6) not-for-profit organization, the same tax status as business and industrial trade associations who can lobby for their preferred policy positions, made it possible to think that the Society could, indeed, take policy positions without affecting its tax status. Indeed, the SRA has members who have expressed interest in the Society taking stands on risk policy matters on behalf of the whole membership, citing advantages to the Society such as achieving renown and stature and, thereby, attracting new members. Opponents of the idea have stated that taking a position for the Society was impossible since the membership and support of the Society is so diverse that such an action might be divisive, even destructive. Paul Deisler recalls that during his presidency (1986-1987) the question was raised as to whether the Society could send a representative to testify on its behalf, *as to the science only*, in a then-current litigation. While this did not require the Society to take a policy position it could have immersed the Society in controversy. The SRA Council of that time rejected the idea on the basis that even though testifying on the science, alone, the Society would be seen to be taking a stand for or against one or more litigants, a kind of indirect and even inadvertent "policy" statement, and it could become another potentially dangerous and possibly destructive act. The Council thus decided that the Society should stick to its intent to avoid controversy and to its objectives to be a place for those interested in risk science to exchange ideas, learn from each other, promote risk science, and help educate others by various means. At the time it was pointed out that while the Society might not inject itself, on its own behalf or by invitation, into controversial, policy-related areas, individual members were obviously free to take part in any risk-related activities they desired on their own behalf or on behalf of organizations they represented so long as they spoke from their own expertise and did not give the impression they were speaking (or writing) as from or for the SRA. Examples of issues on which the Society was asked to comment publicly are a Risk Communication Bill and the Delaney Clause of the Food, Drug and Cosmetic Act. The only policy position the Society could and would take at the time was that of promoting scientifically sound risk analysis.

This cautious stance was several times brought into question in subsequent years, fully recognizing the dangers of "going public" but seeking ways of doing so that would minimize the risks to the Society. The January 1992 **RISK** *newsletter* (pages 10 and 11) published Curtis Travis' statement as outgoing president and D. Warner North's statement as he took up the presidency. An area of public interaction suggested by Travis was research on risk analysis, which he found to be underfunded. He expressed the hope

that the Society could gain enough influence to alter that fact. North, in his article, called the Society "an activist organization," hoping that, collectively, members could "contribute enormously toward a better understanding of risk and decision-making on risk-related issues." Neither writer embraced the taking of public positions as such by the Society but they showed a keen sense of the importance of the Society's possible role in influencing governmental policy in areas related to risk research or to the correct understanding and use of risk analysis.

In 1992 an ad hoc Committee on Public Issues (first called the ad hoc Committee on Improving Inputs to Governmental Units, chaired by Ann Fisher) was established to study, in depth, the issue of public policy statements by the Society. In the Fourth Quarter 1993 RISK *newsletter*, Fisher, of The Pennsylvania State University, published a report for the Committee. The intention of the report was to expose all sides of the question addressed by the Committee—"should the SRA make policy statements"—for review and comment by the membership. Further discussion of the report and responses to it was scheduled for the 1993 Annual Meeting in Savannah.

The subtitle of Fisher's report is "The Decision is in the Hands of the Membership." The two main questions addressed in the report are "(1) whether the SRA should develop policy issue statements and (2) what should be the nature of the process used to obtain membership input [*assuming the answer to (1) is affirmative*]." Speaking to the second question, Fisher lists important characteristics of an appropriate process to be addressed: "which issues to address; how a position is to be drafted; what should be the composition of the committee that drafts the position statement; how SRA members give input on the issue; how the position is to be made final; and, how it is to be disseminated." The report is a very thorough, well-thought-through airing of the issues at stake and possible responses to questions. Some of the questions asked and discussed are what might the benefits and risks be for the Society and why should the Society make statements in the first place; can the objective be accomplished by holding sessions at the annual meetings on selected risk issues and then publishing the results in *Risk Analysis: An International Journal*; should the Society respond quickly to issues of the day or take its time—after all, it is not a lobbying organization; and what might the SRA sections think of the idea and what inputs might they make. The session on taking a stand on issues took place at the 1993 Annual Meeting as planned and afterwards Fisher again asked the members to read the article just summarized and to offer their views. The intention was then that the membership would vote on the issue of taking positions at the 1994 Annual Meeting.

So far as we have been able to determine, the hoped-for vote did not occur during the 1994 Annual Meeting. The issue did not die. It was a matter for discussion at the December 2, 1995, planning meetings where the options offered by the Advisory Board were discussed among other inputs and the ad hoc Committee on Public Policy continued its work. The report by the Committee, just discussed, had an effect on the general thinking within the Society on what things might be done. Thus it was that in 1995 the Society began to sponsor a series of briefings for Congressional staff on risk analysis and its nature. These briefings, while sponsored by the Society, did not state any position by

the Society. Rather, the briefings were given by expert SRA members who spoke from their own knowledge and expertise. Here, indeed, was a way for the SRA to provide useful information to government and to become known as a source of expertise while not entering into possibly controversial issues on its own account. These briefings apparently were appreciated and continued, in one form or another, on throughout the rest of the period covered by this history.

In 1997 Gail Charnley succeeded Fisher as chair of the ad hoc Committee on Public Policy and a report by Charnley on the activities of the Committee that appeared in the RISK *newsletter* detailed the many activities of the Committee.[108] Two of these were (1) the sponsorship of a luncheon discussion at the National Press Club on many aspects of risk analysis and its applications and (2) the sponsorship of a symposium jointly sponsored by SRA and the American Chemical Society's Risk Education Project. On the first page of the same issue of the RISK *newsletter*, a speech by Paul Portney, president of Resources for the Future and an economist well versed in risk analysis, offered many challenges that the SRA can help to resolve. In the same year the SRA began to sponsor forums on various risk policies. In 1998, with Jack Fowle of the U.S. EPA now chair of the Committee (Gail Charnley having become SRA president), a luncheon meeting was cosponsored, again with the American Chemical Society's Risk Education Project, at the Rayburn House Office building on the subject "Regulation and Science: Challenges and Opportunities for Congress"; about 110 attended.

SRA's efforts to impact and inform the understanding of risk analysis by groups within government were being pursued vigorously, as the examples mentioned (not a full list) show. Still, the question of whether the SRA should actually take stands on risk-related policy issues remained unresolved. As he became SRA president-elect in 2000, John Ahearne, director of the Sigma Xi Center and a policy expert, said that his main goal would be to "develop a greater interaction with and recognition by Congress and federal agencies of the role SRA can play in enhancing understanding and application of risk analysis."[109] He went on to say that "the SRA should develop a process by which Society positions can be taken when issues directly involving risk analysis are being discussed in the media." He noted that other societies, while not finding this an easy task, have succeeded in establishing and using such processes. He noted that it is one that needs to be carried out with care.

In the same issue of the RISK *newsletter* (pages 8 and 9) Charnley, by then past president, asked in a different way the question Ann Fisher asked in 1997: "Should the SRA take positions on public policy issues?" There was no answer to the question in her article because this was a report of a round table discussion that took place at the 1999 Annual Meeting. The discussion shed further, important light on the question and asked, once again, for opinions from the membership. At the request of Paul Deisler, Charnley wrote her input to this history in an essay.[110] It is an excellent statement of where this very important issue stood in the Society as the year 2000, the last year covered by this history, came to an end. In her essay she reviewed points already made for consideration and discussion, brought forth the experience of other societies with publicly taken positions, and summarized the points for and against taking positions. We cannot

summarize her main points better than to quote at length from portions of her essay. To begin with, Charnley wrote:

> "There have been a number of occasions when SRA has been appealed to by legislative staff members, regulators, scientists, and others to express an opinion on a piece of legislation or a regulatory decision, or to provide guidance on particular science policy issues of concern. SRA leadership has always declined to do so, believing that it would be impossible—and unfair—to try to represent the diversity of opinions within our membership in such situations. Opinions expressed by other professional societies have provoked divisiveness, disruption, and discontent among their memberships, bearing out the wisdom of refraining from taking official positions on issues."

By no means did this last statement put an end to the discussion, different as it was from that of John Ahearne mentioned earlier. Recalling other significant statements from the 1999 round table discussion, Charnley further wrote:

> "Sheldon Krimsky, a keynote speaker, stated that when issues of interest to SRA begin to be 'worked outside established institutions, science and scientists begin to lose their relevance.' SRA's 1999 distinguished achievement awardee, Bernie Goldstein, described one of the impediments to SRA growth and development as ourselves, and the danger of 'failing to make ourselves relevant.' Goldstein pointed out that if we are unwilling to speak for the role of science and risk analysis, then there are a number of change agents who will and we probably will not like what they have to say.
>
> "On the other hand, SRA member Paul Slovic's research on risk attitudes and perceptions has led him to conclude that although danger is real, risk is a construct of the human mind. Scientists differ greatly in their views about what risk is and about how to measure it. Definitions of risk and methods of risk assessment are inevitably subjective and value laden. As a result, scientists' views on risk often depend strongly on whether they are men or women, whether they work in industry or in academia, or whether they prefer an egalitarian society to a hierarchical society. He believes that those differences underlie much of the fighting that takes place in society when it deals with risk controversy, and will inevitably surface and lead to bitter conflict within SRA as well if we were to take stands on risk policy issues"

One interesting suggestion arose from the discussions, no doubt at least partly impelled by Slovic's comments. Charnley reports it thus:

> "A suggestion was made that, at a minimum, SRA members ought to be able to agree upon a set of risk assessment principles that could be used to advocate on behalf of the discipline and its use in societal decision-making."

This suggestion became a conclusion of the 1999 round table discussions and was recorded as follows by Charnley:

> "A shared set of SRA principles would facilitate any discussion of what our membership is or is not likely to support. If the SRA membership agreed to shared principles or ideals, they could be used to guide any future statements that the Society might choose to make."

In the spring of 2000, at the request of President Roger Kasperson, Dale Hattis undertook the drafting of such a set of principles. The draft was discussed and accepted by the SRA Council at its June 2000 meeting. It was published in the Third Quarter 2000 RISK *newsletter* on page 4.

The basic question of taking or not taking SRA policy positions was still to be resolved by following a process of receiving further input from members and subsequent discussion as outlined in Charnley's essay. The intent was to do two things at the spring 2001 SRA Council meeting: (1) discuss the results of the 1999 round table discussion, including member input, and (2) vote on the principles drafted by Dale Hattis and his collaborators.

As the year 2000 came to an end, the decision on whether the SRA should take policy positions or not was still pending. What decision to take, considering the probable consequences, good and bad, is itself an exercise in risk analysis and decision theory. At this point the Historians must leave the matter in the hands of the Society for Risk Analysis and its leadership.

In the meantime, the ad hoc Committee on Public Policy has continued to hold conferences and meetings. No matter what the fate of the question Charnley has posed may be, useful contacts with government are taking place on the subject of risk science and risk analysis.

6.6.2.2. Scientific and Technical Interactions with Government

With the discussions on the history of thinking about taking policy positions behind us, how contacts with government on scientific and technological issues might take place is clear enough. Although without question risk science affects and must affect risk policy, one can discuss and explain the scientific principles and needs in an appropriate environment and under appropriate auspices even when policy and science are very intertwined. For any discussions on risk science and risk analysis, the SRA can serve the useful purpose of acting as host, organizer, or sponsor for panels, workshops, or whatever vehicle seems appropriate, wherein the advice or principles are offered by experts as experts and not as messengers for SRA-approved positions or opinions. The results of such events can then be published in *Risk Analysis: An International Journal* (where workshop reports are often published) without any position taking on the part of the SRA. On reflection, the same can be said for dealing with policy matters, but at least at the beginning, scientific or technical matters seemed easier to deal with.

As we have seen in the last subsection, in the later years of the historical period under discussion the ad hoc Committee on Public Policy organized, for the SRA or the SRA jointly with others as sponsors, meetings of various types to discuss risk science and risk analysis. The one area not yet touched on is that of scientific endeavors executed by the SRA under terms of grants or other financial arrangements from particular agencies.

The first such event took place on the Saturday immediately before the start of the 1992 Annual Meeting in San Diego. The topic of the event, a day-long workshop, was a combination of (1) reviewing and critiquing the U.S. EPA's proposed revised guidelines for carcinogen risk assessment and (2) identifying key issues. The results of the workshop were published in *Risk Analysis: An International Journal*.[111] There were eight authors listed in alphabetical order, but James Wilson, who was a principal organizer of the workshop, did the writing assisted by commentary from the others. The workshop was a considerable success, bringing experts from many sectors and areas of risk analysis together to examine the subject matter in depth. It was held under a cooperative agreement between the U.S. EPA and the SRA, although there was some concern that the SRA might be seen to be giving advice on an area of science fraught with policy considerations, an impression not belied by the title of the article. The contents of the published article soon made it clear that those communicating were the participants in the workshop and not the SRA. Concerns were allayed: there was no complaint about the workshop.

Encouraged by this turn of events, the SRA pursued other financially supported endeavors of various types in the areas of risk science and risk analysis with a number of agencies. This is not always easy since agencies' budgets can suddenly be changed or cut, leaving negotiating parties high and dry. In 1995 it was reported, "The Society has acquired several grants and we are negotiating for others. One grant is for a residential exposure assessment and another is for developing distributions for exposure analyses."[112] The former project was completed but the latter project may have later fallen through, at least for the time being. In 1998, however, a panel chaired by Elizabeth Anderson began the review of the two previous years' technical programs and activities of the Office of Risk and Cost Benefit Analysis of the U.S. Department of Agriculture under a contract with that office, signed by its director and approved by the SRA Council.[113] These are but a few examples of how widely the SRA was willing to cast its net in the search for projects that it could staff from its membership and that, in the long run, would stand as examples of SRA's own willingness and ability to perform useful, scientific public service.

The activity in this area grew sufficiently large as to require the establishment of a Grants Management Committee. The Committee was established and began its work in 1996 under guidelines also established that year by the SRA Council. Clearly, although the SRA had not yet resolved the question of whether or not it could or would take positions on policy issues on behalf of the whole Society, by the end of the year 2000 the Society's activities aimed at (1) informing government about risk analysis and (2)

doing service work helpful to government in that same area were proceeding well and the SRA had mechanisms in place to facilitate continuation of these kinds of efforts.

7. THE SOCIETY COMMUNICATES

As indicated in Section 3.2, the driving force that led Robert Cumming and Lars Ehrenberg to contact their peers was the dream of a new journal. With the focus of the organizing committee shifting from a journal to the organization of a society that would provide appropriate ownership for the journal as well as (and very importantly as it turned out) a multidimensional forum for the exchange of ideas, several mechanisms for information exchange soon became important instruments to promote the aims of the Society for Risk Analysis.

To paraphrase the SRA Bylaws (Appendix A), the major aims of the Society are to promote:

- knowledge and understanding of risk analysis techniques and their applications;
- communication and interaction among those engaged in risk analysis; and,
- dissemination of risk analysis information and concepts and the advancement of the state-of-the-art in all aspects of risk analysis.

This section will cover the official publications and official means of communication as parts of the SRA which include the journal, *Risk Analysis: An International Journal,* the **RISK** *newsletter*, annual meetings, and volumes of proceedings covering technical papers given at the first nine annual meetings (with some additional, invited papers). The Society emerged and developed simultaneously with the World Wide Web but the Society's use of this flexible and rapid means of communication is recent. It is therefore fitting that this section conclude by describing the Society's adoption and use of the Web.

As described in Sections 3.2 and 5.3, by March 1981 there were approximately 300 charter members, a four-page newsletter had been mailed, six articles had been collected and edited for the first issue of the Journal, and the first annual meeting and workshop was organized for June 1-3, 1981, at the National Academy of Sciences in Washington, D.C. The conversations between Cumming and Ehrenberg in February 1979 had born the first fruit. Generous kudos are due to Cumming for his service in having called together the Steering Group and for serving as the first editor-in-chief of both the Journal and the **RISK** *newsletter* in these early days, in addition to his service as SRA president.

The early histories of both the Journal and the *newsletter* were so intertwined that the history of the Society could not be told without reference to these two publications. Sections 7.1 and 7.2 repeat some of this earlier material for the reader's convenience but go far beyond it in telling the histories of these two important publications.

7.1. *Risk Analysis: An International Journal*

What can happen? What is the probability? What are the consequences? This triplet, the essence of risk analysis, was the topic of Stan Kaplan and John Garrick's paper in 1981, "On the Quantitative Definition of Risk"[114] (see Table XIX). This first issue of the Journal was published in March 1981. It soon became a respected technical journal as well as the flagship of the SRA.

Cumming had found several publishers who were excited over the prospect of breaking new ground with the publication of a well-reasoned interdisciplinary journal. An agreement was signed in 1981 with Plenum Publishing Corporation of New York and London. This flexible agreement was favorable to the Society in that the editorial structure and policy was established as solely the prerogative of the Society. Copyrights to material published in the Journal and the Journal name were assigned to the Society. By the time the agreement was reached with Plenum, Cumming had enough fully "peer reviewed" papers to publish the first two issues.

Initially, the Journal was issued quarterly and a subscription to it was included in the membership dues for the Society. While the Society recruited charter members in late 1980 and early 1981, the editorial policies for the Journal were still evolving. However, the following documents were distributed: (1) a preliminary "Instructions for Contributors" sheet; (2) an information sheet of "Peer Reviews, Comments and Responses"; (3) a preliminary "Contents" of Volume 1 Number 1; and (4) a list of those involved in the editorial structure of *Risk Analysis*.[115]

The Editorial Board of the Journal, led by Cumming as editor-in-chief with Joseph Rodricks of Clement Associates and Timothy O'Riordan, a professor at the University of East Anglia, as associate editors, contained a total of 54 members who had already distinguished themselves in the emerging risk field. The composition of this group was made up of 24 persons affiliated with government agencies or government laboratories, 29 affiliated with academic institutions or research institutes, and one from the private sector.

By March of 1983, Plenum had begun the payment of royalties for institutional subscriptions to *Risk Analysis* as the SRA contract with Plenum specified that 10% of gross receipts beyond the first 300 subscriptions would be paid to the Society. With this unexpected growth in subscriptions, Cumming proposed that the Society explore the prospects of renegotiating the established page limit upwards and consider the use of royalties to expand publication activities.

SRA President Chris Whipple subsequently proposed that the SRA designate someone to review the financial relationship with Plenum and serve jointly on the Publications Committee and on the Finance Committee. Later in 1983, Whipple charged Publications Committee Chairman Vincent Covello to begin a process to develop formal procedures for the Society to oversee publications of the Journal, addressing such matters as the *Risk Analysis* management structure along with policies regarding the terms of, and a selection process for, editors. It was considered imperative that the Society

delineate authority and responsibility between the Council, officers, Publications Committee, and editors.

Following completion of Volume 3 of *Risk Analysis* in 1983, Dr. Curtis Travis of Oak Ridge National Laboratories was appointed editor-in-chief of the Society's Journal. Cumming, having served as the first editor-in-chief of the Journal from its founding in 1981 until 1983, then served as senior editor. Travis led the Journal through a continuous series of expansions. In the summer of 1997, the Publications Committee under the leadership of Elisabeth Paté-Cornell (recognizing the prodigious load on Travis for so long as a strictly "part time" activity) proposed that there be an editor-in-chief under whom there would be three area editors, one for Health and Environmental, one for Engineering, and one for Social Sciences. With this arrangement, the area editors would supposedly have the time to try to attract authors to write in these areas and, particularly in Engineering, to bring new authors into the fold (numbers of papers in this field were low). The new system would also provide for an orderly transition over time as editors moved on. Travis agreed to stay on for adequate time to ease the transition; Vicki Bier, of the University of Wisconsin, agreed to focus on Engineering; Paul Deisler, a retired vice president for Health, Safety and the Environment for Shell Oil Company, agreed to take Health and Environmental; and Detlof von Winterfeldt, of the University of Southern California, agreed to take Social Sciences.

As Deisler recalls, when Paté-Cornell called him to ask if he would take on the task of an area editor she explained that the intention was for each area editor to serve for three years and it was hoped one of the three would agree to become the editor-in-chief. Deisler agreed to take on the duties but only on condition that he would be considered an interim incumbent, serving for no more than two years and being replaced before then if a candidate could be found. He also stated that he would not be a candidate for editor-in-chief. With the advance of years Deisler did not want to take on commitments he was not sure he would be able to fulfill. Paté-Cornell agreed to the conditions and Deisler began his service, reminding successive Publications Committee chairs, as they took office (John Graham and Rae Zimmerman), that they should be looking for his successor. In fact, he suggested to Zimmerman that he have two successors: one for human health risks and one for ecological risks. He had found that promised invited papers by ecorisk experts did not materialize, probably because the Journal was not in their main discipline but possibly because he, himself, while familiar with the general processes of ecological risk assessment, was not at all in their field. A year and eight months into Deisler's term, Zimmerman found John Evans of the Harvard School of Public Health's Center for Risk Analysis to take the human health area and ecologist Bill van der Schalie of the U.S. Environmental Protection Agency (U.S. EPA) to take the ecology area. Deisler continued for the best part of a further year to handle all manuscripts whose editorial processing had begun under him.

Deisler also recalls that his own transition into the post of area editor went very smoothly because of the extremely conscientious efforts of Travis to supply him with all the tools and advice needed to do the job. Before he left the post of area editor, Deisler wrote an extensive account of what was involved in doing the work of an area editor for

his successors and for Zimmerman, then chairing the Publications Committee. In his short term Deisler had had an intensive education in what it took to do the work since he was a one-man operation: mail boy, file clerk, secretary, and area editor, all in one.

By 1999 the transition was complete and Travis turned the Journal over to Elizabeth Anderson and was honored with the title Editor Emeritus. Both Cumming and Travis have served as editor emeriti since 1999.

Extensive knowledge of the SRA and its membership had prepared Editor-in-Chief Anderson for her appointment. In addition to being a past president of the Society and a founding member, Anderson had participated in and, often, chaired many committees; and she knew a great deal about the scientific and intellectual content of much of the work of her colleagues.

Under the editorship of Anderson, the four area editors' areas were renamed as follows: *Environment/Health, Environment/Ecological, Engineering,* and *Social & Decision Sciences*. The four area editors then were John Evans for *Environment/Health*, Bill van der Schalie for *Environment/Ecological*, Vicki Bier for *Engineering,* and Detlof von Winterfeldt for *Social & Decision Sciences.*

In the Second Quarter 1999 RISK *newsletter*, Anderson, as *Risk Analysis* editor-in-chief, began the series "Journal Notes" to share news and solicit input for the Journal. In this issue, she noted that the acceptance rate of the Journal was approximately 40% in response to questions from the membership. In addition, Anderson announced the appointment of Ann Walker, whose duties would be to log in each submitted paper, assign it to an area editor, and track its progress. This was a great help in reducing the non-editorial work of the area editors that Deisler had experienced and in maintaining timing.

It was also announced that the Journal's publisher, Plenum, had been acquired by a new parent company, Kluwer, of the Netherlands. With regard to content, it was announced that a special collection of "Nugget Papers" would appear in the August 1999 issue. These papers, written by prominent members of the Society, were presented at the 1997 Annual Meeting by invitation. Also a single issue of the Journal published as Volume 19, Number 5 was totally devoted to a Special Collection: Performance Assessment for Radioactive Waste Disposal.

Figure 1 shows the distribution in Journal issues covering the years 1981-2000 of the categories *life sciences, physical sciences,* and *social sciences,* adopted from an analysis in Chapter 2 of Krimsky and Golding's book *Social Theories of Risk*.[12]

While the *physical science* papers held a majority in the first few years, a balance of disciplines was soon achieved. Then in 1992 there was a clear decrease in the number of *physical science* articles that persisted for four years. One interpretation of this decrease was that engineers and the physical scientists in the Society were more focused on the technologies and less interested in the interdisciplinary characteristics of the

Society. A surge in the number of *life science papers* occurred in 1994 but a more typical pattern continued through 2000.

If one disaggregates the article count using the categories *estimation, evaluation,* and *management*, it is clear in Figure 2 that articles in the risk estimation category dominate each of the other categories in almost every year until 1995 when a more even distribution takes hold. The changes in Figures 1 and 2 reflect the nature of change in the field of risk analysis that have had especially large impacts on the development of the Society as well as some significant developments external to the Society. Discovery of the reasons for these trends would be of great interest but it is well beyond the authors' scopes and the scope of this history and must be left to others.

In 1999 the Editorial Board staff (editor-in-chief and the area editors) worked closely with the Publications Committee, chaired by Yacov Haimes, to further refresh and restructure the Editorial Board. A modest expansion of the Board was begun in part to accommodate the need for additional expertise in response to specific trends in the nature of risk analysis. Candidates were sought in the following disciplines: (1) statistical and uncertainty analysis, (2) regulatory and legal applications of risk assessment, (3) environmental and ecological risk assessment, (4) biotechnology and risks associated with genetically altered organisms, (5) risk assessment and economic analysis involving food products in international trade, (6) basic biology and regulatory toxicology (experimental practice and its use in the regulatory context, mechanistic biology, modeling orientation), (7) epidemiology, (8) exposure measurement and modeling, (9) Bayesian statistics, and (10) risk communication.

Another manifestation of these changes is reflected by the fact that, over its history, the composition of the Editorial Board was expanded and shifted to include private-sector members. By December 2000, the composition of this 84-person group was made up of 15 persons affiliated with government agencies or government laboratories, 44 affiliated with academic institutions or research institutes, and 25 from the private sector.

With the emergence of Web-based publishing, efforts in 2000 were started to make it possible for authors to submit their manuscripts electronically on the World Wide Web. *Risk Analysis*; its then-new publisher, Blackwell Publishing; and ScholarOne, a computer firm hired by Blackwell, began to design an interface where all facets of the submission, review, and acceptance and rejection processes could become streamlined.

By February of 2001, *Risk Analysis: An International Journal* had gone digital. The manuscript submission and review process for the Journal was moved to a Web-based system called Manuscript Central. The system allows authors to submit their papers to the Web site, instead of mailing a hard copy to the editorial office. The editor-in-chief assigns each paper to an area editor, and the area editors send the paper out to reviewers, as before, except that all correspondence is by e-mail. The system saves a significant amount of time for the area editors, and saves significant postage as well. One considerable advantage is that the users can access the system from any location

connected to the Internet. Richard Reiss, the managing editor since December 2000, continues to administer the system.

For the record, the first paper submitted to the electronic system was "The Risk of Groundling Fatalities from Airplanes," by Kimberly Thompson at Harvard. The paper was later accepted and eventually appeared in the December 2001 issue. The transition was not without some bumps, but after about a year most of the kinks were worked out.

By 1985 *Risk Analysis* was distributing 1,000 copies to members and 500 to libraries, placing the SRA in a favorable negotiating position to alter its agreement with Plenum. In 1989 member subscriptions reached 1,400 and library subscriptions had gone to 733. In addition, the number of pages in each issue went above 600 and publication frequency increased from a quarterly to as many as six issues per year, again placing the SRA in a strong position as it prepared to renew its publishing agreement in 1991. The new agreement with Plenum provided the provision that starting in 1993 the publisher pay the Society $50,000, which represented combined royalties, editorial office expense monies, and newsletter subsidy. Starting in 1999, as told in Section 6.1.2.4, the Society changed publishers from Plenum Press (which had become Kluwer Academic/Plenum Publishers) to Blackwell Publishing. In addition to greater operating advantages, Blackwell's profit-sharing arrangement was far better, economically, for the Society and the Journal became a much greater contributor to the financial stability of the Society.

The Society is especially proud of having gained prestige in short order. In the category Social Science, Mathematical Methods Journals, *Risk Analysis: An International Journal* ranked second in three of the five years from 1996 to 2000 as determined by the Social Science Citation Index. In the year 2000, the number-one-ranking journal was *Econometrica* with an impact factor of 1.874 and the third-ranking journal was the *Journal of the Royal Statistical Society Series A* with an impact factor of 1.279. These journals were first published in 1933 and 1837, respectively.[116] The recent rankings of *Risk Analysis* are:

Year	Impact factor	Rank
1996	2.087	2 of 16
1997	1.271	4 of 25
1998	1.066	9 of 25
1999	1.366	2 of 26
2000	1.389	2 of 29

It is worth restating here that *Risk Analysis: An International Journal* is the flagship publication of the Society for Risk Analysis!

7.1.1. Other Journals

With the burgeoning interest in risk, the SRA journal now has overlap with several other risk-oriented journals. Besides *Risk Analysis: An International Journal*, the

field includes *Health and Safety Science Abstracts; Human and Ecological Risk Assessment Journal; Japanese Journal of Risk Analysis* (Official Journal of SRA-Japan); *Journal of Risk Research* (Official Journal of SRA-Europe in cooperation with SRA-Japan); *Risk Abstracts; Risk and Uncertainty; Risk Decision and Policy;* and *Risk: Health, Safety & Environment,* as well as many other journals concerned with risk but which may or may not have "risk" as part of their title (see Section 4.4).

The reaction to these journals by the SRA was a parallel to its reaction to the existence and increase in numbers of other risk or risk-related societies: accommodation and rapprochement. John Graham, as president-elect and later during his presidency (1995-1996) and beyond, pressed for the development of links with other journals related to risk. His approach was to establish discount opportunities for SRA members to subscribe to multiple journals and so to be able to follow even more activity in risk research and practice than reading *Risk Analysis* alone could possibly offer, however high its quality. By the third quarter of 1994, it was announced in the **RISK** *newsletter* that membership application/renewal forms would offer options to subscribe to the quarterly *Risk: Health, Safety & Environment*. At the same time, the Society's own journal, *Risk Analysis: An International Journal*, would be offered to members of the American Society of Mechanical Engineers. In 1996 the SRA Council decided not to offer *Risk Analysis* to other societies but sought to expand the number of others' journals available at a discount to SRA members. An accounting was requested of the Publications Committee of how well received this initiative might be by potential subscribers. Graham led the negotiations and in 1997 the number of journals so offered rose to four, with others reported as possible. We have seen no report on the reception of the opportunity to subscribe but, in subsequent years, this activity seems to have declined and by the end of 2000 there is no record of its having continued.

Although this initiative may not have survived, we record it because the idea it embodied is in keeping with SRA's mission to "spread the word" about risk and for possible future reference. With the ongoing developments in the Internet and the Society's involvement in it (see Section 7.5) the possibility of implementing Graham's idea while spreading the information even more widely and at lower cost to possible users exists.

7.2. RISK *newsletter*

While the establishment of *Risk Analysis: An International Journal* was Robert Cumming's original and main objective, he also recognized, as mentioned earlier, the need for a newsletter. A journal informs members of a society of developments in their scholarly fields and unites them as members of a field of study. A newsletter provides much other information of interest, providing still other links to the society, to other members, and to events in the field not covered by a scholarly journal.

7.2.1. Early Days

To promote awareness, the very first issue of the *newsletter* was widely distributed beyond the charter membership. The lead paragraph in this first issue of the SRA RISK *newsletter,* dated March 1, 1981, reads:

> *SRA: Off and Running*
>
> The Society for Risk Analysis (SRA) is off to a good start and is already involved in numerous activities. Its first major goal is to attract enough members so that it can function as a strong and independent, international and interdisciplinary, professional organization. A good start has been made. At present, there are approximately 300 members, and the Society is growing rapidly. The first issue of the Society's Journal, RISK ANALYSIS, will be out soon, and all indications are that it will be successful. SRA was incorporated in the District of Columbia (USA) late last year as a nonprofit organization. Several of its activities are described elsewhere in this newsletter.

This issue contained an announcement of the first annual meeting of the Society and the workshop scheduled in Washington, D.C., on June 1-3, 1981; an announcement that Plenum would be the official publisher for the SRA; and some news briefs on risk-related matters.

The fourth and final page included an invitation to potential members from the interim Society officers, President Robert B. Cummings, Vice President Joseph Rodricks, Secretary Robert G. Tardiff, and Treasurer Gordon W. Newell. These four pages were published with adequate time and content for all persons receiving it to decide whether or not to participate in the emerging world of risk analysis.

This newsletter, written by Cummings—the SRA's principal founder, Journal editor, and RISK *newsletter* editor—became the primary written mode to communicate with the total membership on Society activities for the next 20 years. The masthead of the first issue indicated that this publication would be published quarterly by the Society but that goal was not reached until later.

The first page of the second *newsletter,* published in December of 1981, announced plans for the next annual meeting of the Society on June 17-18, 1982, preceded by a three-day workshop starting on June 15.

A letter to the membership from Vincent T. Covello, chairman of the newly formed SRA Publications Committee, was also on the front page of the second issue. The letter addressed some of the start-up problems with the Journal.

7.2.2. Newsletter Editors

Covello also announced in his letter that the Publications Committee had appointed George F. Flanagan and Lorraine S. Abbott as editor and associate editor, respectively, of the **RISK** *newsletter*. Flanagan and Abbott were located in the Engineering Physics Division of Oak Ridge National Laboratory, where many of the early seeds in the field of risk analysis were first planted.

By September 1982, Katie Lawhorn joined the **RISK** *newsletter* staff as production assistant. By December 1985, Abbott, having become thoroughly a part of the Society start-up, familiar with its goals and leadership as well as its day-to-day operation, was ready to take over the job as editor. Flanagan remained in a technical advisory role to Abbott. This team wrote, published, and distributed the *newsletter* out of Abbott's offices in Knoxville, Tennessee.

Abbott, having retired from her full-time position at Oak Ridge National Laboratory, took on several tasks in promoting the Society, actively soliciting news stories, attending annual meetings, promoting membership, and answering questions for both the curious and active.

The number of issues jumped to four per year in 1986, settling back to three per year from 1987 until the quarterly rate was resumed in 1992. With the growth of the Society and Abbott's commitment to the *newsletter,* one can observe in Table XX the abrupt increase in the availability and density of the many Society activities covered.

With the First Quarter 1997 **RISK** *newsletter,* a new *newsletter* staff was introduced consisting of Editor Genevieve S. Roessler, Managing Editor Mary A. Walchuk, and Office Manager Sharon R. Hebl. Roessler brought a depth of experience to the job, having been past president of the Health Physics Society (HPS), a former editor of *Health Physics,* and editor of the *HPS Newsletter*. Mary Walchuk came to the **RISK** *newsletter* with a BA in mass communications and a wide variety of newsletter-editing roles. These highly trained and experienced members of the *newsletter* staff continued the efforts of the previous team in a smooth transition, working from their offices in Elysian and Mankato, Minnesota.

7.2.3. Newsletter Patterns of Growth

Inspection of Table XX indicates that **RISK** *newsletter* publication and size was quite erratic during the first five years. (Note that though the *newsletter* was planned to be a quarterly, in the row showing the number of pages in issue there is frequently a zero, indicating that no issue was published.) In the interval 1981 through 1985, the numbers of issues per year were 2, 3, 2, 1, and 2, respectively. Between 1986 and 2000, the issue count was much more steady, either three or four per year, with total page counts per year ranging between 40 and 72. The change from the originally intended quarterly publication to trimestral publication and back again has been discussed in Section 5.3.6.

7.2.4. General Newsletter Content

The second issue of the **RISK** *newsletter* included news of other risk activities, committee activities, election results, Journal contents, and a calendar of events. By June 1986 this pattern of content serving the rhythm and the routine matters in the SRA reached the point that an index describing the routine content was placed on the front page of most issues.

In various sections of this history, there are discussions of the key activities and functions of the Society. These topics were routinely covered by the *newsletter* on a periodic basis dependent upon the timing of events or the rhythm of the Society. From the very beginning, items in the following five categories appeared in all 20 volumes of the **RISK** n*ewsletter* during the Society's 20-year history: Annual Meeting; Journal; Elections; Committees; and Calendar, Announcements, and Happenings. Soon after the Society's start-up, additional categories appeared in the *newsletter*. Articles about Risk, both pertaining to the SRA interests and risk articles concerning the Government or the Media, were routinely published. Chapters and Member Recognition articles began to appear. And finally, in 1985 and 1989, routine coverage of International matters and Specialty Groups, respectively, began.

The frequency and intensity of coverage of the five main categories plus additional ones (for a total of 10 categories) is apparent in Table XX. The 10 categories are Annual Meetings, Journal, Risk Topics, Elections, Committees, Chapters, Member Recognition, Specialty Groups, International Focus, and a composite of Calendars, Announcements, and Happenings. The note at the bottom of the table describes the significances of the different types of entries.

Each of the 10 categories is discussed briefly here.

7.2.4.1. Annual Meetings

Pre-annual meeting announcements in the *newsletter* were consistently timed to give the SRA membership adequate notice of when, where, and the subject matter for every annual meeting and were provided in a timely manner. However, systematic coverage of annual meetings (that is, post-annual meeting reporting) did not appear in the *newsletter* until adequate space was available. Such reporting was not consistent until the mid-1980s when page counts were increased to an adequate number.

Though some consider the annual meeting publicity among the most important categories covered, budget and deadline constraints have led to a somewhat irregular pattern of space devoted to both pre- and post-meeting publicity. In the Third Quarter 1999 issue of **RISK** *newsletter*, a more rigorous set of deadlines and mailing dates was established, thereby allowing more systematic coverage of annual meetings.

7.2.4.2. Journal

Coverage of *Risk Analysis: An International Journal* began in the second *newsletter* in 1981 with a page describing the status and the content pages of issues 2, 3, and 4 of Volume 1 of the Journal. The pattern of publishing the content pages from the Journal continued through 1990 but did not continue after that time. As editorial demands of the Journal increased and several staff changes were made, more space was devoted to keeping the membership informed. In issue 3 of 1996, new area editors of the Journal were announced on page 1. In 1998 a steady series of columns written by Editor-in-Chief Elizabeth L. Anderson, titled "Journal Notes," appeared.

7.2.4.3. Risk Topics

When especially interesting stories came up about the subject matter of "risk"—either involving the Society specifically or outside the Society in government or the media—the editors frequently took space in the *newsletter* to inform the membership. As indicated by the number of bold symbols on these lines in Table XX, the membership was kept well informed of such matters. Typically, the subject matter of these items varied widely. However, no column covering risk topics appeared on a regular basis in the *newsletter* until the second quarter of 1998 when David Clarke accepted the responsibility to write a quarterly article on regulatory/risk issues titled "Regulatory Risk Review."

7.2.4.4. Elections

The elections of officers were consistently carried out using mailed ballots along with candidates' biographies. In the early years of the Society the *newsletter* merely reported the results of these elections. By 1990, however, additional space was utilized to announce the candidates standing for the upcoming election with brief biographies.

7.2.4.5. Committees

Meager space was utilized to announce and describe committee activities until 1997 when two or three pages were used to publish committee announcements, reports, or activities each ranging from a few lines to a full page.

7.2.4.6. Chapters

The formation of the first local chapter in the Society was announced in the first issue of the 1982 *newsletter*. An ad hoc committee appointed by Society President Cumming met on March 24 to name a provisional set of officers and announced the first meeting of the Washington, D.C., chapter on June 18, 1982. In the third and last issue of the 1983 *newsletter*, published in December 1982, official status of the second chapter, the Eastern Tennessee Chapter, was announced in the front-page story. Space for chapter activities steadily increased as the number of chapters increased.

7.2.4.7. Member Recognition

As membership increased and the number of awards recognizing achievements increased, so did the space allocated to such events increase substantially with time. However, some fall-off in space appears in 1999 and 2000 as the award ceremonies became a part of the space allocated to the post-annual meeting space allocation.

7.2.4.8. International Focus

Reports on international activities increased steadily between 1985 and 1994 as the European and Japan sections experienced significant growth. In subsequent years, international activities and exchanges continued to take place, however, the *newsletter* received fewer reports.

7.2.4.9. Calendar, Announcements, and Happenings

Space for routine calendar announcements increased steadily through 1993, however, perhaps due to the emergence of the Internet communications, including the World Wide Web, there was less space devoted to such matters in subsequent issues of the *newsletter*.

7.2.4.10. Specialty Groups

In the May issue of the 1989 *newsletter*, a story describing the SRA Council's allowing for the formation of a "topical" section on global risk analysis appeared. Subsequently, in 1991, the need for additional groups occurred and the term "Specialty Groups" appeared. Space devoted to the activities of specialty groups has increased in every subsequent issue.

*7.2.5. Some Items of Particular Historical Interest Published in the **RISK** newsletter*

The pages of the **RISK** *newsletter* are filled with items of historical interest. In Appendix B we summarize some items that caught our particular attention. While many of these items have been touched upon elsewhere in earlier parts of this history, we believe that they are of such interest that they are worth including; often, they add depth to discussions found elsewhere in the text.

7.3. SRA Annual Meetings

As mentioned in Section 3.1 of this history, the Technology Assessment and Risk Analysis (TARA) Program of the National Science Foundation (NSF) sponsored a significant arena of risk research. As identified in *Social Theories of Risk*, "the TARA triumvirate, (Vincent) Covello, (Joshua) Menkes, and (Jeryl) Mumpower" provided a list of 10 generic questions as the organizing framework for the NSF program direction.[12] This is reproduced in Table XXI. As Krimsky and Golding note, the questions have

dominated the field of risk at various times and continue to dominate with two notable exceptions— *risk communication* and the *social and cultural context of risk.*

It was also observed that "the TARA Program was instrumental in drawing the distinction between 'technical' risk assessment and risk evaluation and management." It is safe to say that the annual meetings of the Society, with varying degrees of emphasis. have addressed these questions throughout its history. Specifically, the very first meeting of the Society addressed the sixth question in Table XXI and was based on findings from the psychometric research already being undertaken by the social science community.

7.3.1. First Annual Meeting

It was fitting that the first annual meeting take place where the steering committee held its early meetings. The National Academy of Sciences building, adjacent to the Mall on Constitution Avenue in Washington, D.C., provided an excellent environment. The meeting was held in conjunction with the workshop "The Analysis of Actual vs. Perceived Risks" which was jointly sponsored by the Society for Risk Analysis, the World Health Organization, and the U.S. National Academy of Sciences (the Board on Toxicology and Environmental Health Hazards and the Assembly of Behavioral and Social Sciences). Twenty-two research papers and two summary presentations were given in the workshop.

As stated in the preface of the proceedings to this meeting, Publications Committee Chairman Vincent T. Covello wrote:

> "The decision to hold a workshop on this theme was stimulated by the provocative research finding that technical experts and non-experts differ substantially in their risk estimates. Risk estimates by technical experts tend to be closely correlated with annual fatality rates, whereas the risk estimates by non-experts are only moderately-to-poorly correlated with annual fatality rates. In the hope of clarifying this issue, the workshop organizers selected cases that represent some of the most important aspects and dimensions of risk: voluntary vs. involuntary; low vs. high probability of occurrence, exposure, and effects; and high vs. low health, safety, or environmental consequences."

With this statement Covello aligned the workshop directly with Question # 6 in Table XXI.

The workshop was supported with funds from the Alfred P. Sloan Foundation, the Environmental Protection Agency, and the Nuclear Regulatory Commission.

The first set of elected officers and councilors was installed at this meeting, having been elected by mail ballot a month previous to the meeting.

7.3.2. Subsequent Meetings

The second meeting of the Society was held June 15-18, 1982, near Washington, D.C., at the Hyatt Regency Crystal City in Arlington, Virginia. However, recognizing that Society activities had a significant influence on regulations and decision-making in the federal government, a sequence was established at that time to hold annual meetings in various regions of the country with every third meeting to be held in the vicinity of Washington, D.C.

There were eight technical sessions containing a total of 41 papers in the three-day workshop covering the theme *Low-Probability/High-Consequence Risk Analysis*. In addition, 19 poster presentations were given. Table XXII tracks the number of plenary and technical sessions along with the number of presentations in each of the first 20 meetings. Editors of the proceedings from this meeting, Ray Waller and Vincent T. Covello, noted that at least 8 of the 10 generic questions in Table XXI were addressed in the analyses of low probability/high consequence risks.

On Thursday afternoon, after the third day of the workshop, a business meeting and a mixer followed the last session of technical papers. Then on the fourth day of the meeting, the panel discussion "Risk Analysis: Everybody's Talking About It, But Is Anybody Using It?" was held to provide insight into directions for development of risk assessment to more positively influence national decision-making.

As is apparent in Table XXII, there was a monotonic increase in the number of presentations in the first decade of Society meetings. Modest fluctuations occurred in the second decade, varying with the attraction of the host city and the strength of the economy. In 1996 a maximum number of papers were presented as the Society held a joint meeting with the International Society of Exposure Analysis in New Orleans.

By the third annual meeting, in 1983, plenary sessions were introduced, luncheon speakers provided stimulating perspectives, and concurrent sessions were held to accommodate an increasing number of presentations.

Subsequent meetings, throughout the interval 1983 through 1987, followed a 3½-day rather than the previous 4-day format used in 1982. Except for registration hours, these meetings began with a plenary or technical session on Mondays and were followed by a business meeting and a reception scheduled later in the first day. By 1987, a welcoming reception was added to the traditional registration times on Sunday and various special sessions were fitted into the previously more casual Sunday schedule.

By 1991 a number of full-day workshops were offered to the membership on Sundays preceding the evening receptions. Though there was a desire by some to extend the technical sessions through Thursdays, this occurred only in 1996 when the International Society of Exposure Analysis jointly sponsored the meeting. The total number of presentations was also the highest in this year with 537 presentations.

By the fourth meeting, as indicated in Table XXIII, the general chairperson's role in the annual meeting was assigned to the president-elect. Therefore, Elizabeth Anderson,

elected in 1983 and installed at the 1983 Annual Meeting as president-elect, became the general chair of the 1984 Annual Meeting. Subsequently, the president-elect held all annual meeting general chair positions.

Assignments for the general program chair and technical program chair were not achieved in a consistent manner; however, the immediate past president was consistently assigned the publications chair when Lester Lave finished his term as president.

7.3.3. Program Content of the Annual Meetings

Research in risk analysis is performed because individual researchers select research topics they deem important. At least to some degree the selection of research topics by researchers will be influenced or even inspired by current work and current overall trends in research (see Section 4), but only to some degree. Research interests vary and may be related to very specific, important topics of interest to researchers, topics that are part of or are relatively unaffected either by overall trends or by which areas might be popular within a given time period. Thus, the contents of the Society's two main means for facilitating the broadcasting and interchange of risk information and research, the Journal and the annual meetings, will tend to reflect a wide range of interests in addition to reflecting any overall trends such as were described in Section 4.

Organizers of annual meetings have usually chosen themes for their meetings, shown in Table XII. For all but two meetings, themes were selected and approved by the SRA Council (in 1992 and 1993 no themes were chosen). The idea of the theme is to reflect some then-current major idea or trend and to have this reflect, in turn, to a significant degree the content of the annual meetings; this was accomplished in the first three annual meetings to a high degree (see Section 7.4). In general, since the themes are chosen well in advance of any call for papers, there is the possibility that some papers or even some sessions or symposia will reflect the theme. The bulk of the papers will not necessarily reflect the theme but will be concerned with other important topics, many of which were included in Section 4.

As examples of how themes relate to meeting programs, we have examined the meeting program contents of the 1987 and 1991 Annual Meetings whose themes were, respectively, "Risk Assessment in Setting National Priorities" and "Risk Analysis in Support of Public and Private Sector Decision-Making." These two themes reflect interest in priority setting and decision-making and, possibly, interest then current in comparative risk assessment of the type popularized by the U.S. EPA's report *Unfinished Business* (1987)[40] and the Agency's Science Advisory Board's report *Reducing Risk* (1990).[42] These two reports provide tools for priority setting and decision-making. Interest in this type of comparative risk assessment ran high in that time period and for a few years afterward.

Examining the two actual programs shows that in 1987 only one session, on the afternoon of the third and last day of the meeting, had anything to do with the theme—the discussion session (no presented papers) "Discussion: What Are Our National Priorities?"

Aside from that session, other sessions dealt with many specific, interesting topics. In 1991 there was a "super session" titled "Comparative Risks and Setting Environmental Priorities" as well as sessions on global warming and policy and other risk-policy decision-making sessions. The bulk of the sessions covered a wide gamut of risk analysis topics, as is always the case, but some sessions did reflect the theme.

There is little question, however, that whether there is any reflection of the themes in the programs of annual meetings, the overall subject matter represents a major exchange of the best of risk research at the times of the meetings and is reflective of the many interests, long- and short-term research, as well as "hot topics" then current.

7.3.4. Workshops Connected with Annual Meetings

The Conferences and Workshops Committee has lent yeoman service to the Society throughout its existence in organizing workshops and conferences at various times of each year on many risk analysis subjects. These have been another very effective means of spreading risk knowledge and understanding and they have received high and well-deserved acclaim. Here, we intend to discuss briefly the workshops specifically organized around annual meetings. Earlier the fact that the first annual meeting of the Society, in 1981, took place within a workshop has been mentioned. Later, annual meetings took place as the principal offering and still later (1991) workshops were added to take place in conjunction with annual meetings. Typically, these workshops would be scheduled for the Saturday before the Sunday on which registration for an annual meeting would first take place and/or on that same Sunday. Table XXII shows the workshops that took place in conjunction with annual meetings, starting in 1991. In all but one year (1997, when no workshops were scheduled) no fewer than four workshops were scheduled and the maximum number was eight (in 2000).

The subject matter of the workshops was extremely varied. Table XXIV shows the workshops scheduled for four of the years in the 1991-2000 period. A quick reading of the table provides a sense of the width of the range and diversity of subjects covered. Expert practitioners of each of the areas of risk analysis led all of these workshops so that participants in the workshops were exposed to the latest and best knowledge in each area.

7.3.5. International Meetings

The 1995 Annual Meeting in Hawaii was the first major meeting of the SRA held jointly with one of its sections, SRA-Japan. As discussed earlier, this meeting was not a financial success but in all other respects it was a great success: program, location, and especially the gathering of participants from the United States and Japan at one meeting. The successes of this meeting led to thinking about possibilities for having a joint meeting with SRA-Europe in Europe.

Anticipating the end of the second millennium, the SRA Council began considering having a First World Conference on Risk Analysis to take place in 2000, the last year of the millennium. Reflecting the SRA Council's desire to emphasize the

international nature of the SRA, the conference was originally planned to take place in either London or Brussels. Planning for the conference began in 1996, and in 1997 a committee established by the SRA Council began the planning and organizational effort looking toward holding the conference in London in June of 2000. It was not conceived of as an annual meeting as was the Hawaii meeting.

As the tentative date for the conference drew closer it became evident that the original desires would have to be modified significantly. The organization of the event proved to be more complicated and to require more time than anticipated. Ultimately, the original conference was transformed into a symposium with the thought that holding this meeting would be a good preliminary to developing and holding the originally desired conference. This thought materialized into a Year 2000 World Symposium on Risk, which was held successfully in Warrenton, Virginia, in June 2000. Support for the Symposium was received from the National Science Foundation.

With this experience behind them, members of the SRA Council continued working toward the original intent of holding a World Congress on Risk, now proposed for June 2003 with the hope that this would be the first of a series of such congresses. The Committee, under the chairmanship of John Graham, proceeded with plans for such a conference with the theme "Risk and Governance" and including SRA, SRA-Europe, SRA-Japan, and other risk-related societies among its cosponsors. As of this writing, the World Congress on Risk has just taken place in Brussels, Belgium, on 22-25 June 2003.

7.4. Proceedings of Annual Meetings

The original publication agreement with Plenum Press provided for the publication of a proceedings volume covering the technical content of each annual meeting and that the Society have editorial control and ownership. For each annual meeting, the responsibility of providing edited copy to the publisher fell to teams designated by the Society.

As indicated in Table V, proceedings were published for the first nine annual meetings. The content and number of papers reflected the respective annual meetings. Though the titles of the first three volumes reflected the content and emphasis of the first three annual meetings, respectively, titles for the subsequent meetings became quite general and it is safe to assume that the content of both the annual meeting and the subsequent proceedings title covered manifold areas not captured by a "label" chosen by the organizers (see Section 7.3.3).

The acceptance of papers at annual meetings was determined by the judgment of the Publications Committee based on a title and abstract and possibly the reputation of the authors. However, there was no information available to judge the edited quality of the final paper until after final copy was submitted.

This led to a lengthy sequence of editorial scrutiny followed by author revisions. Furthermore, the figures, illustrations, and tables were not always of camera-ready

quality, thereby adding to the costs associated with publication. The combined factors of time delays and added cost, plus the fact that authors had a preference to publishing peer-reviewed papers in the prestigious *Risk Analysis: An International Journal,* led to a Council decision to terminate the series at nine volumes in 1990.

Nonetheless, the proceeding series represents a high-quality documentation containing Technical Programs organized for the annual meetings of the Society as well as material to document the evolution of the field of risk assessment and risk management. They also contained a few specially invited papers.

7.5. Web Site

As mentioned in Section 3.1 of this history, the kernels of risk analysis were written in the 1960s. Rachel Carson's *Silent Spring*, Garratt Hardin's *Tragedy of the Commons*, and Chauncey Starr's *Social Benefit versus Technological Risk* coincided with the Department of Defense work in the 1960s by Vincent Cerf and Bob Kahn to protect computer networks in the event of wars, which led to the Internet.(117)

The simultaneous appearance of these rapidly evolving technologies cannot be ignored when considering the important means of communication in the SRA. Communications in the SRA at the end of the millennium are difficult to imagine without the Internet, the World Wide Web, and the pervasive use of personal computers.

Within the Society, the Ohio Chapter, led by P. J. (Bert) Hakkinen, Steve Lutkenhoff, and Ron Marnicio, provided a leadership role by hosting a one-day conference and exhibition—"Riskware '90"—on December 7, 1990, to bring together developers and users of computer-based risk analysis tools for a mutual educational exchange. Approximately 120 were in attendance representing federal and state agencies, industry, consulting firms, and academia. Individuals from 10 states were present.(118)

Subsequently, a Riskware Exhibition was provided in Baltimore in 1991, in San Diego in 1992, and Savannah in 1993, in conjunction with the Society annual meetings, thereby furthering the networking of members and the range of interests in software and databases.

While the network of those interested in computer-based risk analysis tools grew, several new computer technologies emerged to facilitate communication for all members of the risk analysis community. In addition to new computer power and software, CD-ROMS; global electronic communication networks, including the Internet and its World Wide Web; "personal assistants"; electronic books; "information appliances" and "intelligent assistant" devices; and "intelligent agent" software were adopted by many in the Society.

It was observed in the First Quarter 1993 **RISK** *newsletter* that SRA members find the new information technologies, specifically e-mail, a boon to communicating with

other SRA members, especially those overseas. The new SRA Membership Directory began to include e-mail addresses.

At the 1994 SRA Annual Meeting, Jim Dukelow introduced the possibility of a Web discussion group at the business meeting. His ideas were instrumental in starting up *RiskAnal*, a discussion group on risk matters operated by the SRA Columbia-Cascades Chapter and the Pacific Northwest Laboratory. About the same time, Lorraine Abbott of Tec-Com was introduced to the World Wide Web and developed a site that included both SRA-approved material and non-SRA materials. The Web site *RiskWatch* was launched in the fall of 1995, however, the term RiskWatch had been used by another company for a software product. Subsequently, at the 1995 Annual Meeting of the Society in Hawaii, Abbott and her Tec-Com Inc. staff introduced the Society to *RiskWorld*, an international World Wide Web publication to provide news and information on the identification, critical analysis, and management of risks to the natural environment, human health, and economic, social, and political structures. *RiskWorld* remains an independent Web site and continues to publish the abstracts of SRA's annual meetings, some abstracts for SRA-Europe, and miscellaneous materials provided by SRA members. It also offers links to other risk-related organizations along with other risk-related materials.

In 1996 the SRA allocated $3,000 to begin its in-house Web site with Steve Brown as the Webmaster. Led by Brown, the Electronic Media Committee (Jim Butler, Allison Cullen, Jim Englehardt, Chris Frey, Steve Maher, and Paul Price) successfully began the design effort with Brett Burk of the Secretariat as liaison. Following a great deal of tedious and careful work, as attested to by a copious flow of e-mails detailing triumphs and sorrows, Alpha and Beta testing were completed for a new SRA Web site in February 1997. This Society Web site was announced to the membership in the First Quarter 1997 **RISK** *newsletter*. At that time, the Web site (www.sra.org) was ready to accept abstracts for the 1997 Annual Meeting.

By the third year of operation, 72% of the annual meeting abstracts were submitted through the site, credit card transactions were feasible, and a steady stream of improvements were completed, making the Web site one of the most useful communication tools available to the Society members. In addition, the site contained all the "boiler-plate" information possibly desired by a prospective member or anyone curious about the Society.

By the year 2000, when Jim Butler took over the Webmaster position, the site received 162,000 visits per year with the most frequently visited pages being the Journal, Opportunities, Risk-Related Sites, Risk Science, and Events.

The Society has continued to take advantage of new ways to communicate and it is expected that future developments will be as novel and at least as useful as past ones have been.

8. FINAL REFLECTIONS

There is much more the authors could have included in this history. Each topic addressed has much more behind it not recorded here. To write such a more ample history would lengthen the text unmercifully so we, the authors, hope that what we have included at least will give readers a reasonable impression of the story of the Society for Risk Analysis from its conception through the end of the second millennium. We have mentioned many people throughout this history and can only hope we have done justice to their contributions. No doubt other contributions might have been noted and others' names mentioned. If we have left out any important name or contribution we can only say we regret having done so and hope future historians will do better. We have found that our doctorates in chemical engineering were of no great help as we attempted the task of historians. We have no doubt that real historians would have done a much better job.

On reviewing the history of the Society for Risk Analysis as presented here and bearing in mind the many documents we have reviewed before writing it, the overall impression the authors have is of a live and vibrant Society, true to its vision, sure of its role, moving forward and expanding to bear its message about risk analysis to all who might listen.[13] Initiatives have not always been successful, but the effort to make them has often brought understanding and so paved the way for better solutions to the issues addressed. Many issues have not reached conclusive solutions and remain to be addressed anew. However, because of the energy, ingenuity, creativity, foresight, and sheer persistence of successive presidents, councilors, and members of many different committees, great progress has been achieved in going from a dream to today's active reality. Despite the continuing problems noted in the history as the period came to an end, there is every reason to expect continued progress and increased recognition for the Society for Risk Analysis and its journal as time goes by.

Starting as a simple, scientific society into whose membership all interested in risk analysis were invited to join, the Society has made great strides in making itself national and international in scope, in contributing to the scientific education of many, in broadening the understandings of its members and others as to the value of integration across different fields of risk analysis, in encouraging researchers and students, and in offering understanding to governmental bodies and to those within them. Many members of the Society, including those mentioned in this history and others not mentioned, have contributed personally to the use of risk analysis in making sound decisions at many levels and in many sectors of society through their daily work. Throughout, the Society has remained flexible in its approach, especially as regards its relations with SRA members everywhere and sections outside North America. Flexibility and the ability to accommodate intelligently to a changing external reality is one of the Society's strengths. There have been changes in governance and policy in response to change and there will be more such changes.

The authors hope readers of this history will come to understand the Society better and to appreciate its social and scientific significance and usefulness. As for ourselves, the authors, we feel honored to have had the opportunity to prepare this history, we are glad to have completed it but, if asked, we are not up to writing a further history. Selah!

REFERENCES

(1) Cited References

1. Golding, D. (1992). Chapter 2: A social and programmatic history of risk research. In S. Krimsky & D. Golding (Eds.), *Social theories of risk*. Westport, CT: Praeger.

2. Kasperson, J.X. & Kates, R.W. (1983). Comparative risk analysis of technological hazards: A review II: A look at the book-length literature. *Proceedings of the National Academy of Sciences*, U.S.A. 80. Washington, D.C.

3. Carson, R. (1962). *Silent spring*. Houghton Mifflin.

4. Hardin, G. (1968). The tragedy of the commons. *Science, 162*, 1243-1248.

5. Starr, C. (1969). Social benefit versus technological risk. *Science, 165,* 1232-1238.

6. Starr, C. & Whipple, C. (1980). Risks of risk decisions. *Science, 208,* 1114-1119.

7. U.S. Environmental Protection Agency. (1976). Interim procedures and guidelines for health risk and economic assessments of suspected carcinogens. *Federal Register 45*: 79318-39379.

see also: Albert, R., Train, R., & Anderson, E. (1977). Rationale developed by the Environmental Protection Agency for the assessment of carcinogenic risks. *Journal of the National Cancer Institute, 58*, 1537-1541.

8. Congress of the United States, Office of Technology Assessment. (1981). *Assessment of technologies for determining cancer risks from the environment*. Washington, D.C.: U.S. Government Printing Office.

9. Doll, R. & Peto, R. (1981). *The causes of cancer: Quantitative estimates of avoidable risks of cancer in the United States today*. Oxford, UK: Oxford University Press.

10. Occupational Safety and Health Administration. (1977). Identification, classification and regulation of toxic substances posing a potential occupational carcinogenic risk. *Federal Register 42*: 54148-54247.

11. Lawless, E.W. (1977). *Technology and social shock*. New Brunswick, NJ: Rutgers University Press.

12. Krimsky, S. & Golding, D. (Eds.). (1992). *Social theories of risk*. Westport, CT: Praeger.

13. Lowrance, W.W. (1976). *Of acceptable risk–Science and the determination of safety*. Los Altos, CA: William Kaufmann, Inc.

14. Rowe, W.D. (1977). *An anatomy of risk*. New York: John Wiley and Sons.

15. Schwing, R.C. & Albers, W.A., Jr. (1980). *Societal risk assessment: How safe is safe enough?* New York: Plenum Press.

16. Hohenemser, C. & Kasperson, J.X. (Eds.). (1982). Risk in a technological society. *AAAS Selected Symposium 65*. Boulder, CO: Westview Press, Inc.

17. Correspondence, Lars Ehrenberg/Robert Cumming, April 17, 1979.

18. Correspondence, Robert Cumming/Lars Ehrenberg, August 13, 1979.

19. Correspondence, Robert Tardiff/Robert Cumming, May 29, 1979.

20. Personal Communication, Joseph Rodricks/Paul Deisler, June 2002.

21. Letter, Robert Tardiff to Alexander Hollaender, Lars Ehernburg, Fred de Serres, Gary Flamm, Joseph Rodricks, Richard Hill, Chester R. Richmond, Roy Albert, Professor Sugimura, Marvin Schneiderman, and Charles Brown, September 10, 1979.

22. Letter and attachment, Cumming to colleagues, October 1980.

23. Marked-up copy of the Constitution and Bylaws of the Society of Toxicology, copy dated by hand, December 17, 1979.

24. Personal Communication, Rodricks to Deisler, 2001.

25. Minutes of Meetings: First Annual Meeting of the Society for Risk Analysis, June 2, 1981.

26. Renn, O. (1998). Three decades of risk research: Accomplishment and new challenges. *Journal of Risk Research, 1*(1).

27. U.S. Nuclear Regulatory Commission. (1974). *Reactor safety study*. Document No. WASH-1400. Washington, D.C.: U.S. Nuclear Regulatory Commission.

28. Office of Science and Technology Policy, Congress of the United States. (1981). *Assessment of technologies for determining cancer risks from the environment*. Washington, D.C.: U.S. Government Printing Office.

29. National Academy of Sciences. (1983). *Risk assessment in the federal government: Managing the process*. Washington, D.C.: National Academies Press.

30. National Academy of Sciences. (1989). *Improving risk communication*. Washington, D.C.: National Academies Press.

31. National Academy of Sciences. (1993). *Issues in risk assessment*. Washington, D.C.: National Academies Press.

32. National Academy of Sciences. (1994). *Science and judgment in risk assessment*. Washington, D.C.: National Academies Press.

33. National Academy of Sciences. (1996). *Understanding risk, informing decisions in a democratic society*. Washington, D.C.: National Academies Press.

34. Douglas, M. & Wildawsky, A. (1982). *Risk and culture: An essay on the selection of technical and environmental dangers*. Berkeley, CA: University of California Press.

35. U.S. Environmental Protection Agency. (1986). Guidelines for estimating exposures. *Federal Register 51*: 34042-34054.

36. U.S. Environmental Protection Agency. (1992). *Framework for ecological risk assessment*. EPA/630/R-92/001.

37. National Environmental Policy Act of 1969.

38. Suter, G. (1993). *Ecological risk assessment*. Chelsea, MI: Lewis Publishers.

39. U.S. Environmental Protection Agency. (1998). Hazardous Waste Identification Rule. 63 FR 65874.

40. U.S. Environmental Protection Agency, Office of Policy, Planning and Evaluation. (1987). *Unfinished business: A comparative assessment of environmental problems* (Overview and four appendices).

41. Personal Communication, Paul Deisler (who was present as a member of the SAB's EC), August 2002.

42. U.S. Environmental Protection Agency. (1997). *Reducing risk: Setting priorities and strategies for environmental protection*. SAB-EC-90-021.

43. Deisler, P. (1997). A score comparison method as an aid to integrating separate comparative risk rankings into a single comparative risk ranking. *Risk Analysis: An International Journal, 17*(6).

44. U.S. Environmental Protection Agency, Office of Policy, Planning and Evaluation. (1993). *A guidebook to comparing risks and setting priorities.* EPA 230-B-93-003.

45. U.S. Environmental Protection Agency. (1981). Policy on public participation. *Federal Register 46*, No. 112.

46. U.S. Environmental Protection Agency. (2000). *Draft public involvement policy*. 65FR(250): 82335.

47. U.S. Environmental Protection Agency. (2000). *Toward integrated environmental decision-making*. EPA-SAB-EC-00-011.

48. Wilson, R. (1979). Analyzing the daily risks of life. *Technology Review*, p. 31.

49. Zeckhauser, R. & Shepard, D. (1976).Where now for saving lives? *Law and Contemporary Problems*, *40,* 5-45.

50. Schwing, R.C. (1979). Longevity benefits and costs of reducing various risks. *Technology Forecasting and Social Change, 13*, 1-23.

51. Bailey, M.J. (1980). *Reducing risks to life: Measurement of the benefits*. Washington, DC: American Enterprise Institute.

52. Graham, J.D. & Vaupel, J. (1981). Value of life: What difference does it make? *Risk Analysis: An International Journal, 1*, 692-704.

53. Morrall, J. (1986). A review of the record. *Regulation,* 25-34.

54. Tengs, T.O., Adams, M.E., Pliskin, J.S., Safran, D.G., Siegel, J.E., Weinstein, M.C., & Graham, J.D. (1995). Five-hundred life-saving interventions and their cost effectiveness. *Risk Analysis: An International Journal, 15*(3), 369-390.

55. Industrial Union Department, AFL-CIO v. American Petroleum Institute, et al. No. 78-911, decided July 2, 1980.

56. Cameron, J. & O'Riordan, Tim (Eds.). (1994). *Interpreting the precautionary principle*. Holmes Beach, FL: Gaunt Inc.

57. The Clean Air Act Amendments of 1990, Title III.

58. Brundtland, G. (Ed.). (1987). *Our common future: The world commission on environment and development*. Oxford, UK: Oxford University Press.

59. U.S. President's Council on Sustainable Development. (1996).

60. Elkington, J. (1998). *Cannibals with forks: The triple bottom line of 21st century commerce*. Chestnut Hill, MA: Conscientious Commerce Press.

61. Weinberg, A. (1985). Science and its limits: The regulator's dilemma. *Issues in Science and Technology*, pp. 59-72.

62. Calabrese, E., Baldwin, L., & Holland, C. (1999). Hormesis: A highly generalizable and reproducible phenomenon with important implications for risk assessment. *Risk Analysis: An International Journal, 19*(2), 261-282.

63. Deisler, P. (2000). A personal perspective on hormesis. *Human and Ecological Risk Assessment*, 6(2), 245-246.

64. Cothern, R. (Ed.). (1992). *Comparative Environmental Risk Assessment*. Boca Raton, FL: Lewis Publishers.

65. Personal Note, Chris Whipple to Paul Deisler, 2000.

66. Personal Communication, Elizabeth Anderson to Paul Deisler, 2002.

67. Personal Communication, Jim Wilson to Paul Deisler, 2000.

68. Personal Communication, John Mikus to Paul Deisler, 2003.

69. Personal Communication, Harlee Strauss to Paul Deisler, 2001.

70. Personal Communication, Margaret McDonell to Paul Deisler, 2000.

71. Personal Communication, Doug Kononen and Mike Kamrin to Richard Schwing, 2003.

72. Personal Communication, John Nelson to Paul Deisler, 2000.

73. Personal Communication, Elaine Faustman to Paul Deisler, 2000.

74. RISK *newsletter*, March 1987, p. 4.

75. Poumadère, M. (1998). From risk analysis in Europe to European risk analysis: The first ten years of SRA-E (1987-1997). *Journal of Risk Research*, *1*(1), 77-96.

76. Personal Communication, Ortwin Renn to Richard Schwing, 2000.

77. RISK *newsletter*, 1st Quarter, 2000, p. 16.

78. Personal Communication by phone, Elizabeth Anderson/Paul Deisler, 2002.

79. RISK *newsletter*, January 1990, p. 13; RISK *newsletter*, January 1991, p. 15.

80. Personal Communication, D. Warner North to Paul Deisler, 2000.

81. RISK *newsletter*, 2nd Quarter, 1995, p. 9.

82. Personal Communication, Vitaly Eremenko to Paul Deisler, 2003.

83. RISK *newsletter*, 2nd Quarter, 1993, p. 4.

84. RISK *newsletter*, 4th Quarter, 1993, p. 13.

85. RISK *newsletter*, 2nd Quarter, 1995, p. 13.

86. RISK *newsletter*, January 1991, p. 15.

87. RISK *newsletter*, 1st Quarter, 1994, p. 17.

88. RISK *newsletter*, 1st Quarter, 2000, p. 2.

89. RISK *newsletter*, May 1989, p. 1.

90. Personal Communication, Elisabeth Paté-Cornell to Paul Deisler, 2000.

91. RISK *newsletter* , September 1990, p. 3.

92. RISK newsletter, January 1991, p. 1.

93. Council Minutes, December 7, 1997, p. 1.

94. RISK *newsletter*, May 1990, p. 1.

95. RISK *newsletter*, 1st Quarter, 1995, p. 6.

96. Council Minutes, March 17, 1989, pp. 6-7.

97. Council Minutes, May 1, 1997, pp. 1-9.

98. Memo, Lawrence B. Gratt to Michael Gough, SRA Secretary, Paul Deisler, SRA President, and Sam Morris, SRA Contact Councilor, Subject: Definitions Committee charge. March 16, 1987.

99. Attachment to a Memo of Transmittal from Lawrence Gratt to Committee Members, dated July 31, 1987.

100. RISK *newsletter*, December 1985, p. 3.

101. RISK *newsletter*, September 1989, p. 5.

102. RISK *newsletter*, 2nd Quarter, 1992, p. 1.

103. Draft Interim Report of the SRA Advisory Board to President John Graham and the Council, July 24, 1996.

104. RISK *newsletter*, 1st Quarter, 1998, p. 2.

105. RISK *newsletter*, 2nd Quarter, 1998, p. 2.

106. RISK *newsletter*, 3rd Quarter, 1998, p. 2.

107. RISK *newsletter*, 1st Quarter, 2000, p. 3.

108. RISK *newsletter*, 2nd Quarter, 1997, p. 5.

109. RISK *newsletter*, 1st Quarter, 2000, p. 1.

110. Personal Communication, Gail Charnley to Paul Deisler, *The evolving controversy about the SRA's taking of positions on public policy issues*, September 6, 2000.

111. Anderson, E., et al. (1993). Key issues in carcinogen risk assessment guidelines. *Risk Analysis: An International Journal*, *13*(4), 379-382.

112. RISK *newsletter*, 1st Quarter, 1995, p. 5.

113. RISK *newsletter*, 4th Quarter, 1998, p. 3.

114. Kaplan, S. & Garrick, B. (1981). On the quantitative definition of risk. *Risk Analysis: An International Journal, 1*(1), 11-27.

115. Letter on Oak Ridge National Laboratory Stationery addressed to Dear Colleague and Signed by Robert B. Cumming, President of SRA, October 1980.

116. RISK *newsletter*, 1st Quarter, 2002, p. 18.

117. Wexler, P., Hakkinen, P.J., & Stoss, F. (2000). Internet and other digital resources. *Information Resources in Toxicology*, *Third Edition*. Academic Press.

118. Marnicio, R., Hakkinen, P.J., Lutkenhoff, S., Hertzberg, R., & Moskowitz, P. (1991). Risk analysis software and databases: Review of Riskware '90 Conference and Exhibition. *Risk Analysis*: *An International Journal, 11*(3), 545-560.

(2) General Sources

These materials are filed in the History Archive of the SRA. They include some items that have been cited, above, as well as others not specifically cited but which have contributed to the substance of the History.

- File Containing SRA's Certificate of Incorporation, August 28, 1980.

- Society for Risk Analysis, Membership Directories for the years 1984, 1987, 1990, 1992, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002 (Note: these are the only years in which Directories were published; none are missing).

- **RISK** *newsletters* by years and issues (issues identified by month or quarter [Q] as appropriate): **1981**, March, December; **1982**, April, September, December; **1983**, May, December; **1984**, August; **1985**, August, December; **1986**, March, June, September, December; **1987**, March, June, September; **1988**, January, May, September; **1989**, January, May, September; **1990**, January, May, September; **1991**, January, May, September; **1992**, 1st Q, 2nd Q, 3rd Q, 4th Q; **1993**, 1st Q, 2nd Q, 3rd Q, 4th Q; **1994**, 1st Q, 2nd Q, 3rd Q, 4th Q; **1995**, 1st Q, 2nd Q, 3rd Q, 4th Q; **1996**, 1st Q, 2nd Q, 3rd Q, 4th Q; **1997**, 1st Q, 2nd Q, 3rd Q, 4th Q; **1998**, 1st Q, 2nd Q, 3rd Q, 4th Q; **1999**, 1st Q, 2nd Q, 3rd Q; **2000**, 1st Q, 2nd Q, 3rd Q, 4th Q; **2001**, 1st Q, 2nd Q, 3rd Q, 4th Q; **2002,** 1st Q, 2nd Q, 3rd Q, 4th Q. (Note: issues missing were never published).

- Files of Miscellaneous Documents Pertaining to:
  - Proceedings
  - Journal
  - Newsletter

- Annual Meetings, Final Programs, Preliminary Programs, and Related Materials, 1982-2001.

- Minutes of Steering Group and SRA Council Meetings: (1) Minutes of the Steering Group (October 1979-June 1981); (2) Minutes, Notes, on SRA Council Meetings, 1981-1986; (3) Minutes of Council and Executive Committee, 1986-2000.

- File: Personal Communications, 2000-2003.

- File: Miscellaneous SRA Committee Documents.

- File: Miscellaneous SRA Financial, Membership, Policy, and Administrative Documents.

- File: Miscellaneous SRA Chapters, Sections, and Specialty Groups Documents.

- Ring Binders Received from Yacov Haimes[*]:
  - SRA President-elect
  - SRA President-elect and President
  - SRA President
  - SRA Council Meeting, December 5, 1999, Atlanta, Georgia

- File Folders Received from Yacov Haimes* Covering Miscellaneous Topics from His Presidency and Some Years Before and Afterwards.

- Files: Miscellaneous Documents (Correspondence, Memos, etc.), Filed by Years: 1979-1999 (Incl.).

- Files of Published Material, Files I, II, III, and IV.

- Files of Material Obtained from the Internet, Files I, II, and III.

- SRA Advisory Board File.

- File: SRA Vision Statement.

- File of Miscellaneous, Unrelated Information and Documents.

[*] Contributions of bulk files by the authors and Robert Tardiff appear distributed among other files as do other materials from Yacov Haimes not included here.

APPENDIX A: BYLAWS OF THE SOCIETY FOR RISK ANALYSIS

SECTION I
Name

The name of the corporation shall be the Society for Risk Analysis (the "Society").

SECTION II
Office

The principal office of the Society shall be located at Suite 402, 1313 Dolley Madison Blvd, McLean, Virginia 22101, or such other place as the Council may designate from time to time.

SECTION III
Purpose And Powers

A. Purpose. The purpose of the Society is to foster and promote:

1. Knowledge and understanding of risk analysis techniques and their applications.
2. Communication and interaction among individuals engaged in risk analysis.
3. Application of risk analysis and risk management techniques to the hazards and risks to which individuals and populations are exposed.
4. Dissemination of risk analysis information and concepts to all interested individuals.
5. Advancement of the state-of-the-art in all aspects of risk analysis.
6. Integration and interaction of the various disciplines involved in risk analysis.

B. Powers. The Society shall have all such powers as are provided by law, its Articles of Incorporation, and these Bylaws, including without limitation the power to hire and discharge employees and consultants, to acquire, own, and dispose of property, including contributions made to it, and the power to do any and all lawful acts necessary or desirable for carrying out the Society's purposes. The Society is not organized for profit and no part of its assets or income shall inure to the benefit of any private individual, partnership, or corporation. The Society shall not engage in any activities that are inconsistent with its qualification as a tax exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1954, as amended (or the corresponding provision of any future United States Internal Revenue law).

SECTION IV
Membership

A. Classes of Membership. There shall be four classes of membership:

1. Active: persons who are engaged in some phase of development or application of risk analysis or have a continuing interest in risk analysis.
2. Student: students engaged in a degree program, whose studies relate to risk analysis.
3. Retired: interested persons who would otherwise be active members but who have retired from an active career and who apply in this category.
4. Sustaining: organizations interested in risk analysis.

B. Eligibility. Any interested person shall be eligible for membership in one of the four classes of membership.

C. Application. Application for membership shall be made in writing to the Society and shall be acted upon in accordance with procedures established by the Council.

D. Rights and Privileges. Active members shall be eligible to vote on any matter subject to a vote of the membership under these Bylaws and shall be eligible to hold office. Other members shall not be entitled to vote or to hold office but shall be eligible to attend all meetings, receive all information, and otherwise to participate in the affairs of the Society. All members shall receive the journal of the Society.

E. Dues. The dues for each category of membership shall be established by the Council once each year, for the following calendar year.

F. Resignation. Resignation from membership shall be made in writing to the Society. Resignation shall not relieve any member from liability for any dues accrued and unpaid at the time when such resignation is submitted.

G. Delinquency. Any member whose dues remain unpaid within the time specified by the Council shall automatically be dropped from membership in the Society but shall be reinstated whenever the member discharges all past indebtedness to the Society.

SECTION V
Meetings of Members

A. Annual Meeting. The Society shall have an annual business meeting of the members at such time and place as shall be determined by the Council. Members of the Society shall be notified of the time and place of the meeting at least four weeks in advance.

B. Additional Meetings. Additional meetings of the members of the Society may be called by the Council at any time. Members of the Society shall be notified of any such additional meeting at least four weeks in advance.

C. Voting. At any meeting of the membership of the Society, each active member shall be entitled to one vote on any matter requiring a vote of the members.

D. Quorum. At any meeting of the members of the Society, 20 percent of those active members present at the Annual Meeting (including those present by proxy) shall constitute a quorum. Unless required by District of Columbia law, the Articles of Incorporation, or these Bylaws, the affirmative vote of a majority of the active members voting at a meeting shall be necessary for the adoption of any matter.

E. Matters Determined by Mail Ballot. In lieu of holding a meeting of the members, the Council may submit any matter to the members for determination by a mail ballot. Notice of the matter to be voted upon shall be mailed to every active member of the Society, and active members shall be provided at least 30 days to return their votes on the matter to the Society. Unless required by District of Columbia law, the Articles of Incorporation, or these Bylaws, the affirmative vote of all of the active members voting on any matter by mail ballot shall be necessary for the adoption of any matter.

SECTION VI
Council of the Society

A. Composition of Council. The affairs of the Society shall be managed by a board of directors, which shall be called the Council, composed of:

1. The President of the Society.
2. The Immediate Past President of the Society.
3. The President Elect of the Society.
4. The Secretary of the Society.
5. The Treasurer of the Society.
6. Nine Councilors, three of whom shall be elected by the members of the Society each year, each for a three-year term, as provided in Section VI(C) of these Bylaws.

B. Powers of the Council. The Council shall have the power of management and supervision of the property and affairs of the Society, including appropriation of funds, appointment of the editor and editorial board of the journal of the Society, establishing the dues, establishing sections, chapters, and specialty groups, selecting individuals for Society awards, calling the membership meetings, and all other authority relating to the management of the Society that customarily resides in a corporation's board of directors.

C. Eligibility. To be eligible for election as a Councilor, an individual shall be an active member and shall not be an officer of the Society. Upon election as an officer, an individual who is a Councilor shall cease to be a Councilor.

D. Nomination of Councilors. Each year, in sufficient time prior to the annual meeting, the Nominating Committee established under Section XI(A)(1) of these Bylaws shall nominate at least two individuals to be placed on the ballot for each Councilor to be

elected. The active members shall be given an opportunity to submit in writing to the Secretary of the Society the name, proposed office, and written consent to serve, of any additional qualified nominees. Such nominations from the membership shall be sent by an active member, with the signature of at least 25 additional active members, to the Secretary of the Society and shall be listed on the ballot. The ballot shall be mailed to all active members, who shall have at least 30 days to return their ballots to the Society. Each active member shall have up to three votes for Councilors, but such votes shall be for different individuals and shall not be cumulative. The three individuals who receive the largest number of votes shall be elected as Councilors of the Society, each for a term of three years beginning at the end of the annual business meeting that follows the election and continuing through the third annual business meeting that follows taking office.

E. Chairperson. The President of the Society shall serve as the Chairperson of the Council.

F. Removal. Any Councilor may be removed, with or without cause, by a two-thirds vote of the members of the Council or of the active members of the Society.

G. Resignation. Any Councilor may resign from the Council by notifying the Secretary in writing.

H. Vacancies. Any vacancy occurring in the Council may be filled by a majority vote of the Councilors then in office, for the remainder of the unexpired term of the vacancy.

I. Compensation. Councilors shall receive no compensation for their services as Councilors but may be reimbursed for their expenses incurred in carrying out their duties if approved by the Council and if such reimbursement does not affect the qualification of the Society under Section 501(c)(3) of the Internal Revenue Code of 1954 (or the corresponding provision of any future United States Internal Revenue law).

J. Succession. A Councilor shall not be eligible for reelection to the Council until one year after serving a full term of membership on the Council has expired.

SECTION VII

Meetings of the Council

A. Notice. Regular or special meetings of the Council may be held, within or without the District of Columbia, upon notice to each Councilor of not less than seven days, either personally or by mail, telephone, or telegram, subject to waiver of notice as provided in District of Columbia law. Unless otherwise specified in these Bylaws, neither the business to be transacted at, nor the purpose of, any regular or special meeting of the

Council need be specified in the notice or waiver of notice of such meeting. The time and place of the meeting shall be specified in the notice of the meeting.

B. Meetings. The Council shall hold at least two meetings each year, one at the time of the annual meeting of members of the Society.

C. Quorum. At any meeting of the Council, either regular or special, a majority of the Councilors shall constitute a quorum. Unless otherwise required by District of Columbia law, the Articles of Incorporation, or these Bylaws, the vote of a majority of the Councilors present and voting at a meeting at which a quorum is present shall be necessary for the adoption of any matter. The members of the Council shall act only as a Council and the individual Councilors shall have no powers as such.

D. Action by Mail Ballot. Any action required or permitted to be taken at a meeting of the Council may be taken by mail ballot. The affirmative vote of all members of the Council shall be necessary for the adoption of any matter voted upon by mail ballot by the Council, except that the affirmative vote of the majority of all members of the Council shall be necessary for any election voted upon by mail ballot by the Council.

E. Telephone Meetings. Unless otherwise provided in these Bylaws, the Council may meet by conference telephone or any other means of communication by which all persons participating in the meeting are able to hear and speak to each other. Notice of any such telephone meeting shall be given to all members of the Council in the way specified in Section VII(A) of these Bylaws, and the provisions governing a quorum and voting established in Section VII(C) shall also apply to telephone meetings.

F. Executive Committee. The Council shall establish an Executive Committee, which shall exercise the authority of the Council and the management of the Society between meetings of the Council. The Executive Committee shall consist of the President, the President Elect, the Secretary, and the Treasurer of the Society, the Immediate Past President, and any other member of the Council appointed by the President or by a majority of the entire Council. Notice of Executive Committee meetings shall at the same time be provided to all members of the Council, at least seven days prior to the meeting, and any member of the Council who wishes to attend any meeting of the Executive Committee shall be entitled to do so.

G. Section Representation. Every section shall have the right to be represented at Council meetings in accordance with Section XII(E).

SECTION VIII
Officers

A. Officers of the Society. The officers of the Society shall consist of a President, a President Elect, a Secretary, and a Treasurer.

B. Eligibility. To be eligible for election as an officer, an individual shall be an active member of the Society. A Councilor is eligible for election as an officer but, upon such election, shall cease to be a Councilor.

C. Nomination and Election. The Nominating Committee established under Section XI(A)(1) of these Bylaws shall submit in writing to the Secretary of the Society at least two nominations for each open officer position to be filled. The procedure for nominations by the membership and for voting for officer positions shall be the same as the procedure specified in Section VI(C) for Councilors. The individual who has been nominated for an officer position and who has received the largest number of votes for that position shall be elected.

D. Term of Office. The term of office for each officer of the Society shall commence at the end of the annual business meeting of the Society and shall last for the following periods of time:

1. The President shall serve for a term of one year, beginning at the end of the annual business meeting after service as President Elect for one year and continuing through the annual business meeting of the Society that follows taking office.
2. The President Elect shall serve for a term of one year, beginning at the end of the annual business meeting that follows the election as President Elect and continuing through the annual meeting that follows taking office as President Elect, and shall thereafter automatically become the President of the Society.
3. The Secretary shall serve for a term of two years, beginning at the end of the annual business meeting that follows the election and continuing through the second annual business meeting that follows taking office, and shall be eligible for one reelection for a second term of two years.
4. The Treasurer shall serve a term of two years, beginning at the end of the annual business meeting that follows the election and continuing through the second annual business meeting that follows taking office, and shall be eligible for one reelection for a second term of two years.

SECTION IX
Duties of Officers

A. Duties of Officers. The officers of the Society shall have the following duties:

1. The President shall act as the chief executive officer and chief operating officer of the Society and shall preside at all meetings of the Society.
2. The President Elect shall serve in the absence or inability of the President to act.
3. The Secretary shall have custody of the records of the Society, keep the minutes of the meetings of the Society and of the Council, and send notification of all meetings of the Society and of the Council.

4. The Treasurer shall keep the Society accounts, prepare annual budgets and fiscal reports, control all funds, and perform all other duties customarily undertaken by the Treasurer of a corporation.
5. The officers of the Society may delegate appropriate responsibilities to the Executive Secretary appointed under Section X(A).

B. Removal of Officers. Any officer may be removed, with or without cause, at any time by a vote of two-thirds of the Councilors then in office or two-thirds of the active members of the Society, whenever in their judgment the best interests of the Society will be served thereby.

C. Resignation. Any officer of the Society may resign by notifying the Secretary in writing.

D. Vacancies. Any vacancy occurring in an office of the Society may be filled by a vote of the majority of the Councilors then in office. Any officer so elected to fill a vacancy shall be elected for the remainder of the term of the office vacated.

E. Bonding. The Council may, by resolution, require any officer, employee, or agent of the Society to give bond to the Society, with sufficient sureties, conditioned on the faithful performance of the duties of the respective office or position, and to comply with such other conditions as may be required from time to time by the Council. The premiums for all such bonds shall be paid by the Society.

SECTION X
Executive Secretary

A. Appointment. The Council may appoint an Executive Secretary to assist in the administration of the affairs of the Society.

B. Duties of the Executive Secretary. The Executive Secretary shall have the duties and authority that are specified by the Council. The officers and Council may delegate to the Executive Secretary the responsibility for any action for which an officer or the Council has authority unless such authority is nondelegable under these Bylaws.

SECTION XI
Committees

A. Standing Committees. The Society shall have the following standing committees:

1. The Nominating Committee. The Nominating Committee shall consist of five active members of the Society, of whom no more than two may be current members of the Council. The Nominating Committee shall submit in writing to the Secretary no fewer than two nominations for each elective office of the Society to be filled in any annual election.
2. The Finance Committee. The Finance Committee shall review the financial status of the Society, develop a budget, make any recommendations to the Council

relating to finances, and shall submit an annual financial report to the membership at the annual meeting.

3. The Publications Committee. The Publications Committee shall determine the editorial policy for all publications of the Society and shall recommend to the Council individuals to serve as the Editor and on the Editorial Board of any publications of the Society.
4. The Meetings Committee. The Meetings Committee shall be responsible for the overall organization and planning for future annual meetings. The President Elect of the Society shall serve as Chairperson of the Meetings Committee.
5. The Annual Meeting Committee. The Annual Meeting Committee shall be responsible for the program and all other aspects of the annual meeting. The President Elect shall appoint the Chairperson and, in consultation with the Chairperson, the members of the Annual Meeting Committee.
6. The Conferences and Workshops Committee. The Conferences and Workshops Committee shall make plans and recommendations to the Council for sponsorship for participation in conferences and workshops other than the annual meeting.
7. The Sections and Chapters Committee. The Sections and Chapters Committee shall encourage the establishment of sections and chapters of the Society and shall review and recommend to the Council appropriate action on any application for a section or chapter.
8. The Awards Committee. The Awards Committee, which shall be selected from among former Presidents of the Society, shall recommend all awards to the Council.

B. Other Committees. The President or the Council may establish such other committees as may be deemed appropriate for the objectives of the Society. All committees shall report on their activities to the Council. The Council may disband any committee other than a standing committee, and the President may disband any committee established by the President.

C. Appointment of Committee Members. The President of the Society shall appoint all members, and the chairpersons, of standing and other committees of the Society, except that the President Elect shall serve as Chairperson of the Meetings Committee and shall appoint the Chairperson and members of the annual Meeting Committee. Any member of the Society, in any of the categories of membership, shall be eligible to serve on any committee of the Society.

SECTION XII
Regional Sections and Chapters

A. Establishment. The Council may establish criteria, requirements, and procedures for the formation, operation, and termination of regional sections and chapters of the Society. A section shall include one or more countries and a chapter shall include one or more areas within a country.

B. Applications. Any individual or group may submit an application to the Council for approval for the establishment of a regional section or chapter.

C. Council Approval. A regional section or chapter shall be established upon the approval of an application by the Council. Such regional section or chapter shall continue in existence until the section or chapter dissolves itself or until the Council takes action to withdraw its approval of the section or chapter.

D. Purposes and Procedures of Regional Sections and Chapters. The purposes and procedures of a regional section or chapter shall be consistent with the principles established in these Bylaws.

E. Representation of Sections. Every section shall have the right to be represented at Council meetings by a section member.

1. Where a section member is also a member of the Council, that person shall represent the section at Council meetings.
2. Where no section member is a member of the Council, the section may designate a person to attend Council meetings to represent the section. Such person may participate in Council deliberations but shall not have a vote.

SECTION XIII
Specialty Groups

A. Establishment. The Council may establish criteria, requirements, and procedures for the formation, operation, and termination of specialty groups of the Society. A specialty group shall represent a substantive or disciplinary area of interest relating to risk analysis.

B. Applications. Any individual or group may submit an application to the Council for approval for the establishment of a specialty group.

C. Council Approval. A specialty group shall be established upon the approval of an application by the Council. Such specialty group shall continue in existence until the specialty group dissolves itself or until the Council takes action to withdraw its approval of the specialty group.

D. Purposes of Specialty Groups. The purposes and procedures of a specialty group shall be consistent with the principles established in these Bylaws.

SECTION XIV
Contracts, Loans, Checks, and Deposits

A. Contracts. The Council may authorize any officer, employee, or agent to enter into any contract or execute and deliver any instrument in the name of and on behalf of the Society. Such authority may be general or confined to specific instances. Any contract shall be executed by the President.

B. Loans. No loans shall be contracted on behalf of the Society and no evidence of indebtedness shall be issued in its name unless authorized by the Council. Such authority may be general or confined to specific instances. Any loan shall be executed by the President.

C. Checks and Drafts. All checks, drafts or other orders for the payment of money, issued in the name of the Society, shall be signed by such officer, employee, or agent of the Society and in such manner as shall be determined from time to time by the Council.

D. Deposits. All funds of the Society not otherwise employed shall be deposited from time to time to the credit of the Society in such depositories as the Council may select.

SECTION XV
General Provisions

A. Waiver of Notice. Whenever any notice is required to be given to any Councilor or other person under the provisions of District of Columbia law, the Articles of Incorporation, or these Bylaws, a waiver thereof in writing signed by the person entitled to such notice, whether or before or after the time stated therein, shall be equivalent to the giving of such notice.

B. Auditors. A certified public accountant may be employed by the Council to audit the books of the Society for each fiscal year and at such other time or times and for such other periods as the Council may deem advisable, and to furnish reports on such audits and make available an annual report of audits completed.

C. Prohibition Against Sharing in Society Earnings. No Councilor, officer, employee, or agent of, or person connected with, the Society or any other private individual shall receive at any time any of net earnings or pecuniary profits from the operations of the Society, except that the Council may employ and pay any person reasonable compensation for services rendered to or for the Society in effecting any of its purposes.

D. Exempt Activities. Notwithstanding any other provision of these Bylaws, no Councilor, officer, employee, agent, or other representative of the Society shall take any action or carry on any activity by or on behalf of the Society not consistent with the exempt status of organizations described in Section 501(c)(3) of the Internal Revenue Code of 1954, as amended (or the corresponding provision of any future United States Internal Revenue law).

E. Fiscal Year. The fiscal year of the Society shall begin on the first day of January and end on the last day of December in each year.

F. Indemnification. The Society shall indemnify, to the full extent permitted by the laws of the District of Columbia, any Councilor, officer, employee, or agent of the Society against expenses actually and necessarily incurred in connection with the defense of any action, suit or proceeding in which such individual is made a party by reason of being or

having been such Councilor, officer, employee, or agent, except that the Society shall not indemnify such individuals for willful misconduct. Such indemnification shall not be deemed exclusive of any other rights to which such Councilor, officer, employee, or agent may be entitled under any agreement, vote of the Council, or otherwise.

G. Insurance. The Society may purchase such directors and officers liability insurance as the Council may from time to time deem advisable.

H. Awards. After considering the recommendations of the Awards Committee, the Council may select individuals for the following Society awards.

1. Fellows, who shall include all former Presidents of the Society, and up to one percent of the Society members per year who are selected based upon substantial achievement in science or public policy relating to risk analysis and substantial service to the Society.
2. The Outstanding Service Award, which shall be awarded to members of the Society for extraordinary service to the Society that deserves special recognition.
3. The Distinguished Achievement Award, which shall be awarded to any person for extraordinary achievement in science or public policy relating to risk analysis.
4. Such other awards as the Council may establish.

SECTION XVI
Amendments

A. Bylaws. These Bylaws may be amended at any annual or special meeting of members upon a majority vote of those active members voting, except that no such action shall be taken that would adversely affect the qualification of the Society under Section 501(c)(3) of the Internal Revenue Code of 1954, as amended (or the corresponding provision of any future United States Internal Revenue law).

B. Articles of Incorporation. The Articles of Incorporation may be amended at any annual or special meeting of members upon a two-thirds vote of those active members present and entitled to vote at a meeting of the members, except that no such action shall be taken that would adversely affect the qualification of the Society under Section 501(c)(3) of the Internal Revenue Code of 1954, as amended (or the corresponding provision of any future United States Internal Revenue law).

C. Proposals. Proposed amendments to the Bylaws or the Articles of Incorporation may be sent in writing to the Council at any time by any active member. Any amendment endorsed in writing by 50 active members shall be submitted for a vote of the entire active membership at the next meeting of the members.

SECTION XVII
Duration and Dissolution

A. Duration. The Society shall continue as a corporation until a proposal for dissolution shall be passed by the Council and the members of the Society. For purposes of notice and voting requirements, any such proposal shall be treated as an amendment to the Articles of Incorporation and shall comply with the provisions of Section XVI(B) of these Bylaws.

B. Dissolution. Upon the dissolution of the corporation, the Council shall, after paying or making provision for the payment of all of the liabilities of the corporation, dispose of all of the assets of the corporation exclusively for purposes related to the purposes in Section III(B) of these Bylaws to such organization or organizations organized and operated exclusively for educational or scientific purposes as shall at the time qualify as an exempt organization or organizations under Section 501(c)(3) of the Internal Revenue Code of 1954 (or the corresponding provision of any future United States Internal Revenue law), as the Council shall determine.

APPENDIX B: ITEMS FROM THE RISK *NEWSLETTER* OF HISTORICAL INTEREST

The following **RISK** *newsletter* stories or reports struck the authors as being of special and/or more novel interest. This somewhat arbitrary selection provides the context in which each event touched the life of the Society for Risk Analysis (SRA).

September 1982

The first photo was used when the *newsletter* announced the SRA's election of our second president, Chris Whipple.

December 1982

The results of a design contest for the SRA logo was announced. John Holbrook, an illustrator at Oak Ridge National Laboratory, designed the official logo, which continues to serve the SRA. Not many logos trace a logical path but Holbrook's design quite appropriately features a fulcrum and balance supported by the "R" in SRA.

The first "Letter to the Editor" appeared. Roch Parayre, on behalf of "non-nuclear" people attending the Low Probability/High Consequence Workshop in Arlington, expressed concern for the "scanty" attention to transportation risks.

December 1985

This issue included a notice that Marina von Neumann Whitman's address to the 1985 Annual Meeting of the SRA, "Black Hats, Economists, and Societal Risk Assessment," was reprinted in its entirety in *Vital Speeches of the Day,* Vol. 62, No. 4, 115-118, Dec. 1, 1985.

September 1987

The Committee on Definitions reported that Committee members had been considering 13 definitions of "risk" and that a session at the 1987 Annual Meeting would strive to obtain a consensus from the membership on a definition or definitions.

June 1987

It was announced that William D. Ruckelshaus would chair an advisory council for the formation of the Center for Risk Management at Resources for the Future (RFF) in Washington, D.C. This new center, funded by the U.S. Environmental Protection Agency (U.S. EPA), signaled the fact that "risk centers" were increasingly gaining acceptance and funding from the government and corporate communities. The RFF Center would join other fairly geographically dispersed centers—the CENTED Hazard Assessment Group at Clark University; the Institute for Risk Research at the University

of Waterloo, Canada; the Environment and Policy Institute at the East-West Center in Hawaii; and the Risk and Decision Center at the University of Pennsylvania.

Liaison Committee Chairman James D. Wilson reported that the SRA had liaison with 15 Societies.

January 1988

Lester Lave, chairman of the Publications Committee, reported to the 1987 annual business meeting that the Journal *Risk Analysis* was subscribed to by approximately 1,000 institutions, and SRA Secretary Francis M. Lynn reported that the total number of members in good standing was 1,304.

January 1989

Clark University graduate student Srinivas Emani provided a newcomer's perspective of 1988 Annual Meeting.

The **RISK** *newsletter* editor noted that SRA was scheduling its annual meeting at Halloween time. This practice was beginning to be opposed by members with small children, as Halloween is generally understood to be second only to Christmas for shared parent-children festivities.

January 1990

A column noted that William D. Ruckelshaus, first administrator of the EPA from 1970 to 1973 and confirmed by a vote of 97-0 to return and become the EPA's fifth administrator, presented a seven-item "wish list" to the society upon his receiving SRA's 1989 Distinguished Service Award.

May 1991

A long list of generous and positive responses to the **RISK** *newsletter* editor's request for readership likes and dislikes was provided.

First Quarter 1992

With this issue, the **RISK** *newsletter* began printing on white enamel recycled paper and utilized two ink colors, the first steps in a gradual upgrade in appearance approved by the SRA Council.

Second Quarter 1992

A story was printed about a panel chaired by John Graham, which debated the question "Should there be an academic program offering a PhD in risk analysis?" There

was no consensus in the debate but at the time of the debate, there was one person, L. A. (Tony) Cox, Jr., present with a PhD in risk analysis. Tony is perhaps the only person who has a PhD in risk analysis.

Third Quarter 1992

It was announced that two SRA members were appointed to the National Risk Assessment and Management Commission. This commission, which was created by the 1990 amendments to the Clean Air Act, raised the credibility of the field of risk analysis in setting national standards and priorities.

Fourth Quarter 1992

It was noted that Senator Patrick Moynihan sponsored a bill, the Environmental Risk Reduction Act (2132), to preserve the integrity of the risk assessment process, which came under considerable fire in recent years. SRA member John Bailar of McGill University in Montreal said, "Some of this criticism was justified; some was motivated by inappropriate considerations such as politics, personal profit, or conversely an uncritical worshiping of the environment." While the bill stemmed in large part from the report *Reducing Risks and Setting Priorities and Strategies for Environmental Protection* from the EPA's Science Advisory Board, it was another indication of the importance of risk analysis and the SRA at the highest levels.

First Quarter 1993

This issue included a note that three alternative paradigms for setting environmental priorities were compared with the risk-based approach favored by the U.S. Environmental Protection Agency at a national conference held November 16-17 in Annapolis, Maryland. The Center for Risk Management (CRM) at Resources for the Future in Washington, D.C., organized the conference, which was attended by approximately 100 invitees from various interested groups. According to Adam Finkel of CRM, the conference accomplished its goal of providing a forum of various risk-reduction methods and allowing controversial questions to be posed about each. A summary of Finkel's report on the conference was also published in this **RISK** *newsletter*.

Third Quarter 1993

A Carnegie report that urged reform in risk regulation after three years of deliberation by a task force was noted. The report, *Risk and the Environment: Improving Regulatory Decision-Making*, presented a comprehensive vision of a more effective and efficient regulatory system that would improve decision-making within the current regime of environmental and risk-related laws. The significance of the report justified three full pages in the **RISK** *newsletter*.

Fourth Quarter 1993

An announcement appeared that two reports on pesticides had been published on the heels of a National Research Council report calling for improvements in the evaluation and regulation of pesticides in children's diets. The first report was titled *Pesticides in the Diets of Infants and Children: Scientists' Review* and the second report was titled *Pesticides: A Comparative Study of Industrialized Nations' Regulatory Systems.*

In a separate story it was mentioned that an amendment proposed by U.S. Senator J. Bennett Johnston to the EPA Cabinet-elevation bill passed by a 95-3 vote. While the Senate amendment was strongly opposed by members of the House of Representatives, many risk professionals supported the amendment for its focus on science-based decision-making at the EPA.

The *newsletter* noted in this issue that members of the Ad Hoc Committee on Policy Issues had explored possible mechanisms that the SRA could use to make public statements on risk analysis matters. Since SRA members are likely to have a variety of opinions on salient risk issues, it was important to set up a process for deciding the following:

- which issues to address,
- how a position is to be drafted,
- what should be the composition of the committee that drafts the position statement,
- how SRA members give input on the issue,
- how the position is to made final, and
- how it is to be disseminated.

Could this be done in a way that preserves the interaction among various disciplines and among those from different types of organizations? Could it be done in a way that accounts for the differences in needs and interests in risk policy issues across different countries or regions?

First Quarter 1994

A story appeared that a Congressionally mandated report involving several members of the SRA was expected to impact the risk analysis methods that the U.S. EPA used to assess the health risks of air pollution. Released in January, the review titled "Science and Judgment in Risk Assessment" was the culmination of 27 months of work by the National Research Council's 25-member Committee on Risk Assessment of Hazardous Air Pollutants. In the 1990 Clean Air Act Amendments, Congress mandated the report's publication and directed the EPA to consider the report in revising its risk assessment guidelines. "This report will play a significant role in reorienting and making more effective risk assessment as it is used at EPA," said D. Warner North, who was part of a small group that presented the report's findings to senior-level staff at the White House, the U.S. Office of Management and Budget, and the EPA, as well as to Congressional staff.

As not all SRA members are scientists, it is of historical interest to report a discussion that was presented in this 1994 issue. SRA members Michael Gough and Jim Wilson debated the question "If Risk Assessment Ain't a Science, What Is It?" They suggested that risk analysis is not a science. It is a professional activity built on a strong scientific base with roots in the professions of public health, medicine, and engineering. Risk analysis is sometimes performed to form policy decisions but always done in support of some decision. Gough and Wilson defined science by three characteristics: its deliberations are public, its conclusions are inferential and testable, and tests of its inferential hypothesis lead to a rapid identification of those ideas that agree to a test of reality. While Gough and Wilson argued that risk analysis is not a science, they emphasized that it is strongly based on scientific disciplines, especially those that provide the foundations for professions such as public health, medicine, law, architecture, and engineering.

Second Quarter 1994

This *newsletter* reported that risk analysis had become a high priority both on Capitol Hill and in the White House as the government pursued both environmental protection and economic growth. According to Mark Schaefer in an interview, the point person for risk assessment issues in the Clinton administration, "We are in a time of constrained budgets, and people are asking themselves if we're getting the most from our money for environmental issues." Schaefer continued in the interview, "Risk analysis is a logical mechanism to order scientific information and make it useful in the public policy-making process."

Third Quarter 1994

The lead story noted that one of the hottest buzz-words on Capitol Hill those days—"risk"—was rarely mentioned three years previously. Interest among members of Congress began snowballing in 1993. "Last year was the big bang," said SRA member March Sadowitz, who was a research specialist for legislative affairs with the Harvard Center for Risk Analysis in Boston, Massachusetts. Several forces had propelled risk analysis to the legislative forefront. "The nation has realized how difficult it is to prioritize risks in the face of limited resources," Sadowitz said. "Lawmakers are taking an interest in risk as a way to help decide what we should spend the money on."

A boxed list, taking the better half of the front page, described five major bills under consideration in the U.S. Congress.

On another matter, outside the content of Society matters, the *newsletter* editor noted the second article in a series on graduate-level courses at universities on risk.

Fourth Quarter 1994

The Executive Committee submitted a report on the Society's financial status. This was the first double-page, centerfold report in the *newsletter,* with excellent graphics to illustrate the financial condition of the SRA.

First Quarter 1995

Approximately 30 Congressional staff members attended the first two of a series of breakfast briefings on risk assessment that the Society for Risk Analysis sponsored. Proposed at the December SRA Council meeting in Baltimore and initiated on January 27, the briefings coincided with the introduction of several risk-related bills in the 104th Congress. SRA's hosts for the briefings were Representatives Dick Zimmer (R-NJ) and George Brown (D-CA).

Second Quarter 1995

Lynn R. Goldman, MD, Assistant Administrator for the Office of Prevention, Pesticides and Toxic Substances at the U.S. Environmental Protection Agency, was the speaker at the plenary session of the Society for Risk Analysis 1994 Annual Meeting in Baltimore, Maryland. Dr. Goldman admonished, "Let us work together to create the best assessment tools we can. The challenges that face us today demand no less of us than making government work for the people of this country, and that entails using the best science."

Second Quarter 1996

The SRA Advisory Board identified several areas it believed required aggressive focused, long-term attention by the leadership and members:

1. Competition from other long-established technical and scientific societies, now offering significant programs providing competition to SRA.
2. Important areas of risk analysis are not adequately covered by SRA.
3. Overall SRA membership, worldwide, has remained stagnant despite growth in interest and practice in the last few years.
4. Significant private sector interest in risk analysis is under-represented within the SRA membership.

Third and Fourth Quarters 1996

In these issues, Granger Morgan generally graded the risk community's best practice from *fair* to *good,* but said typical practice had serious problems with quality. Having assigned generally *poor* grades to the way things typically got done by federal risk management agencies and their contractors in the various area of risk analysis, Granger provided ideas for improvement as the SRA launched into a general discussion on quality issues. Among the strategies proposed for increased quality, Morgan listed:

1. Be better at learning from experience and figure out how to design institutions that make learning part of the process.
2. Make financial and other incentive structures faced by society congruent with the risks imposed.
3. Work on producing and disseminating better information.
4. Build on and use the rather substantial social science knowledge.
5. Encourage cooperative problem solving.
6. Make systematic risk comparisons.
7. Be flexible.
8. After learning new things, be adaptive.
9. Separate learning from establishing blame.
10. Run experiments in risk management.

"We have 50 states in the US and hundreds of countries in the world. We need to run far more experiments than we have in the past, draw lessons from them and then adapt," Morgan said.

Third Quarter 1997

Extensive use of photographs marked the coverage of SRA-Europe's Tenth Anniversary Meeting in Stockholm.

First Quarter 2000

The second page of this *newsletter* contained a description of the SRA followed by a disclaimer pointing out that statements and opinions are strictly those of the author(s) and not necessarily the official position of the SRA. As the gavel was passed between SRA's presidents, Past President Gail Charnley chose the topic "Risk Analysis Under Fire" for her message to those gathered for the 1999 Annual Meeting. Roger Kasperson's "President's Message" to the membership focused on the possibilities as the SRA celebrated its twentieth birthday. Each leader provided an articulate message for the SRA membership as the third millennium began. It is fitting that these messages be reproduced as they appeared in the RISK *newsletter.*

Here, first, is Gail Charnley's "Past President's Message" from the First Quarter 2000 RISK *newsletter,* page 3:

> ***Risk Analysis Under Fire***
>
> One of the things I've tried to focus on this year is continuing to enhance the visibility and profile of the Society for Risk Analysis (SRA). I've done that by having SRA jointly sponsor a number of important meetings with other societies, government agencies, and other organizations; by continuing to sponsor Congressional briefings on risk on Capitol Hill; by talking about the Society and our activities in different forums around the world; and by trying to engage in productive discussions those who are currently not enamored with risk analysis as a discipline. And I've been focusing on this partly because I'm scared.

Risk analysis is a discipline under fire. There is a serious, growing, antirisk-analysis sentiment that is challenging the legitimacy of science in general and risk analysis in particular. Risk assessment is being described as a "bogus discipline" that is "on its way out" as a way to "rationalize government decision-making." Risk assessment is supposedly a key part of "the problem" and not a part of the solution. And what is it being replaced with? The so-called precautionary principle, or the "better-safe-than-sorry" approach. The precautionary principle is being described as a "new paradigm" that is "taking the place" of risk assessment.

I think most people in this room would agree that better safe than sorry is just common sense, but I don't think anybody would agree that risk analysis and precaution are interchangeable. When used judiciously and constructively, the precautionary approach can be a useful component of decision-making and priority setting and, in fact, is often used that way. But when it's used in the absence of considerations of risk, it promotes fear and politicizes science. After all, risk is just part of the information that is used to protect public health and the environment. Public values, politics, feasibility, economics, and the law also play important roles.

The fact is, we are only human and cannot really predict the future or anticipate all possible outcomes of a decision. Human decisions inevitably have unforeseen consequences, reflecting the basic underlying reality of what Herbert Simon called "bounded rationality," or the idea that our individual human brains are much less complex than the external reality they are attempting to model. Our plenary speakers this morning provided some very educated guesses about what we need to worry about and what we can look forward to in the next century. But even they readily acknowledged that we can't foresee it all.

I think, really, that the risk-versus-precaution debate is really just the newest skirmish in the age-old battle between science and ideology, between evolution and creationism. It's about religion. In one corner, we have risk analysis—the practice of using science to draw conclusions about the likelihood that something bad will happen—and in the other corner, we have the belief that instead of science, the precautionary principle will somehow solve all our problems.

But this is a false opposition because precaution and risk analysis can and do work together, as the work of many people in this room will attest. The precautionary principle recognizes the fundamental role of uncertainty in policy making and attempts to shift the burden of ignorance towards precaution rather than inaction. Unfortunately, those who misuse it also challenge the role of science as the preeminent basis of decision-making while offering no alternative source of authorizing knowledge.

We need to work hard to defend our discipline and to engage those who oppose it. We need to do our best to show that risk analysis is not a threat; it's a useful tool. Risk analysis doesn't tell us what is safe; people make those decisions. We can never prove absolutely that something bad might not happen, but if we ignore what science helps us infer, emotional and financial resources are diverted towards worrying about every potential risk and real health and environmental problems stay under funded, overlooked, or on the back burner. Enough pontificating. All in all, it's been a delight and an honor to be SRA president this year and to be part of the Society's evolution into the next century. But it will also be a delight to pass on the presidential authority to Roger Kasperson, who will now take over as the new SRA president. I know he will be a capable leader and I wish him all the best as he shepherds us forward. Thank you, Roger and thanks to you all for your support this year.

Second, here is Roger Kasperson's "President's Message" from the First Quarter 2000 RISK *newsletter,* page 2:

President's Message

With the Society for Risk Analysis about to celebrate its twentieth birthday and as the 21st century takes hold, the time is ripe for taking stock of the risk field. There is much to celebrate concerning the past 20 years—a 2,200+ membership spanning scholars and practitioners ranging over diverse disciplines; a successful set of journals in *Risk Analysis*, the *Japanese Journal of Risk Analysis*, and the fledging *Journal of Risk Research*; annual meetings occurring regularly in three continents; and the emergence of the Society as the recognized source of risk expertise and authority. Where do we go from here?

The possibilities are many, of course, but the Society needs to focus its energies to register progress. Accordingly, I see my presidency as an opportunity to initiate a process of strategic thinking and planning, to extend the Society's gains to new areas of public policy and to new quarters of the world where risk approaches now only flicker on the horizon. Accordingly, we will enlist the Society's governance process to assess the major challenges that merit our attention. We will use modern technology to accomplish much of the Society's routine business via the Internet and teleconferencing. Executive committee and council meetings this year will center upon thinking through strategic initiatives that can be brought to the membership for decision and action. This will not be in the form of a strategic or master plan for the Society, but rather a set of concrete initiatives designed to capitalize on the Society's leadership position in risk matters.

The first step is to assess challenges, strategy, and initiatives. To begin the process, my opening address at the Atlanta meeting identified three candidate pathways for consideration. The first recognizes the globalization of risk associated with expanding economic, life-style, and communication systems, a

threatened planetary environment, and international transfers ranging from technology to terrorism. Risk analyses need to address these changes. We also need to become more international in our research. Currently, we have sections in Europe and Japan, and active discussions are now underway to explore possible new sections in Australia, New Zealand, India, China, and Russia. We need to cast an even broader net to engage the developing world where most future vulnerability and risk will be concentrated.

Second, and concurrent with the growth of risk analysis, is the emergence of a worldwide civil society and democratic movement. The nation-state system is in metamorphosis, with nongovernmental organizations and citizen activists playing expanding roles in risk assessment and management. A marked absence of productive dialogue continues to divide risk experts and these groups, many of which exhibit a marked hostility to risk thinking. We need a strategy of engagement to initiate dialogues in a variety of new arenas. And we also should consider the composition of our own Society membership.

Third, the Society must also be aggressive in its responsibility for ensuring high-quality science (including the social sciences) in the conduct of risk assessment and management. The national movement to more participatory and collaborative decision processes, laudatory in most respects, raises fundamental questions as to how to conduct good science and still accommodate social values—in short, how to operationalize the analytic-deliberative process espoused in the U.S. National Research Council's "Understanding Risk" and how to integrate risk and precautionary principles. The Society needs to be in the forefront of these efforts and not fighting back fires.

As we initiate strategic thinking on these issues, we seek your counsel, wisdom, and advice. We need to hear from you. Please weigh in with me (rkasperson@clarku.edu) or your Council members.

Second Quarter 2000

Two full pages of this *newsletter* were devoted to a process to help resolve the debate since 1993 and revived at the 1999 Annual Meeting around whether or not the Society should make public statements. (See also reference above to the **RISK** *newsletter*, Fourth Quarter 1993. Also see Section 6.6.2.1.)

Third Quarter 2000

The issue of SRA taking positions evolved into the issuance of a draft for "SRA Principles for Risk Analysis."

Fourth Quarter 2000

SRA President Roger E. Kasperson alerted membership to the pitfalls in interpreting public participation experiments with regard to risky decisions. Left for the third decade of the SRA was the approval of a set of "SRA Principles for Risk Analysis."

APPENDIX C: ACRONYMS FOUND IN THE TEXT

AAAS	American Association for the Advancement of Science
AG	Advisory Group
AIHC	American Industrial Health Council
BAI	Burk and Associates, Inc.
BRAG	Boston Risk Assessment Group
CENTED	Center for Technology, Environment, and Development
CEPN	Centre d'étude sur l'évaluation de la protection dans le domain nucléaire
CIIT	Chemical Industry Institute of Toxicology
CIS	Commonwealth of Independent States
CPSC	Consumer Product Safety Commission
CRM	Center for Risk Management
EC	Executive Committee
EDF	Environmental Defense Fund
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
ERAAG	Ecological Risk Assessment Advisory Group
ERS	Economic Research Service
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FSQS	Food Safety and Quality Service
FWSRSG	Food/Water Safety Risk Specialty Group
HPS	Health Physics Society
HWIR	Hazardous Waste Identification Rule
IAPSAM	International Association for Probabilistic Safety Assessment and Management
IARC	International Agency for Research on Cancer
ILO	International Labour Organization
ILSI	International Life Sciences Institute
IRLG	Interagency Regulatory Liaison Group
IRP	Integrated Risk Project
IRS	Internal Revenue Service
ISEA	International Society of Exposure Analysis
ISRTP	International Society of Regulatory Toxicology and Pharmacology
LASL	Los Alamos Scientific Laboratory
MACT	Maximum Achievable Control Technology
NAS	National Academy of Sciences
NCEA	National Center for Environmental Assessment
NCI	National Cancer Institute
NEPA	National Environmental Policy Act
NGO	Nongovernmental organization
NIOSH	National Institute for Occupational Safety and Health
NRC	Nuclear Regulatory Commission
NRDC	Natural Resources Defense Council
NSF	National Science Foundation

NTSB	National Transportation Safety Board
OECD	Organisation for Economic Co-Operation and Development
ORACBA	Office of Risk Assessment and Cost-Benefit Analysis
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
OSTP	Office of Science and Technology Policy
OTA	Office of Technology Assessment
PRA	Probabilistic Risk Analysis
PSAM	Probabilistic Safety Assessment and Management
RAPA	Risk Assessment & Policy Association
RCRA	Resource Conservation and Recovery Act
RFF	Resources for the Future
SAB	Science Advisory Board
SASC	Society and Association Services Corporation
SETAC	Society of Environmental Toxicology and Chemistry
SG	Steering Group
SRA	Society for Risk Analysis
TARA	Technology Assessment and Risk Analysis
TRG	The Risk Group
UCLA	University of California, Los Angeles
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
USDA	U.S. Department of Agriculture
U.S. EPA	U.S. Department of Energy
VNISI	Institute of Systems Sciences (Russia)
WHO	World Health Organization

FIGURES

TABLES

FOOTNOTES

1. Terms as defined in the NAS/NRC, 1983, four-stage paradigm described in Section 4.2.1.

2. The Precautionary Principle is a major example of hazard assessment-driven risk management as opposed to risk assessment-driven risk management. The terms hazard assessment-driven and risk assessment-driven are defined in the NAS/NRC, 1983, four-stage paradigm described in Section 4.2.1.

3. In December 2001 the SRA Council approved the formation of the Economics and Benefits Analysis Specialty Group.

4. Not to be confused with the term "section" when used to define the country or region of more than one country covered by an SRA Section, such as SRA-Europe or SRA-Japan.

5. In some reports this Group has been called the Engineering and Applications Specialty Group though the shorter name has won out in the end.

6. The Membership Directory is now (2003) online at www.sra.org but it is accessible only to members.

7. The Executive Committee is not a "standing" committee. It is defined in the Bylaws, Section VIIF. It is marked as if it were a standing committee in the Table only to indicate that it is named in the Bylaws and it persists from one Council to another.

8. According to the SRA's Web site, www.sra.org (in 2003), it and several other committees have been designated as standing committees since the end of the year 2000.

9. The 20th president, John Ahearne (2000-2001), became a Fellow in 2001, at the end of his term.

10. The Advisory Board was apparently continued after the year 2000, being shown as a standing committee on the SRA Web site, www.sra.org.

11. The date of establishment of the committee is not known; it could have been sometime in 1984.

12. Or in late 1997.

13. For the views of the two presidents of the SRA to serve their full terms before the end of the year 2000 on the status and prospects of the Society at that time, see Appendix B under the heading **First Quarter 2000**.

ACKNOWLEDGEMENTS

The authors would like to acknowledge and thank the many members of the Society for Risk Analysis who responded to our requests for help in writing this history with their personal communications, telephone interviews, and contributions of materials from their files. We also acknowledge the help of the staff of the Secretariat (Burk and Associates, Inc.) for their answers to questions and their successful searches for documentation. The personal communications, the transcripts of interviews, and the other documents and materials are to be found in the History Archive of the Society for Risk Analysis. Finally, the authors also wish to acknowledge the professional editorial work of Mary Walchuk, Managing Editor of the RISK *newsletter*, which has made this History far more readable, and to thank the SRA Council for its funding of her work.

Figure 1. Articles in *Risk Analysis* by Discipline, 1981-2000

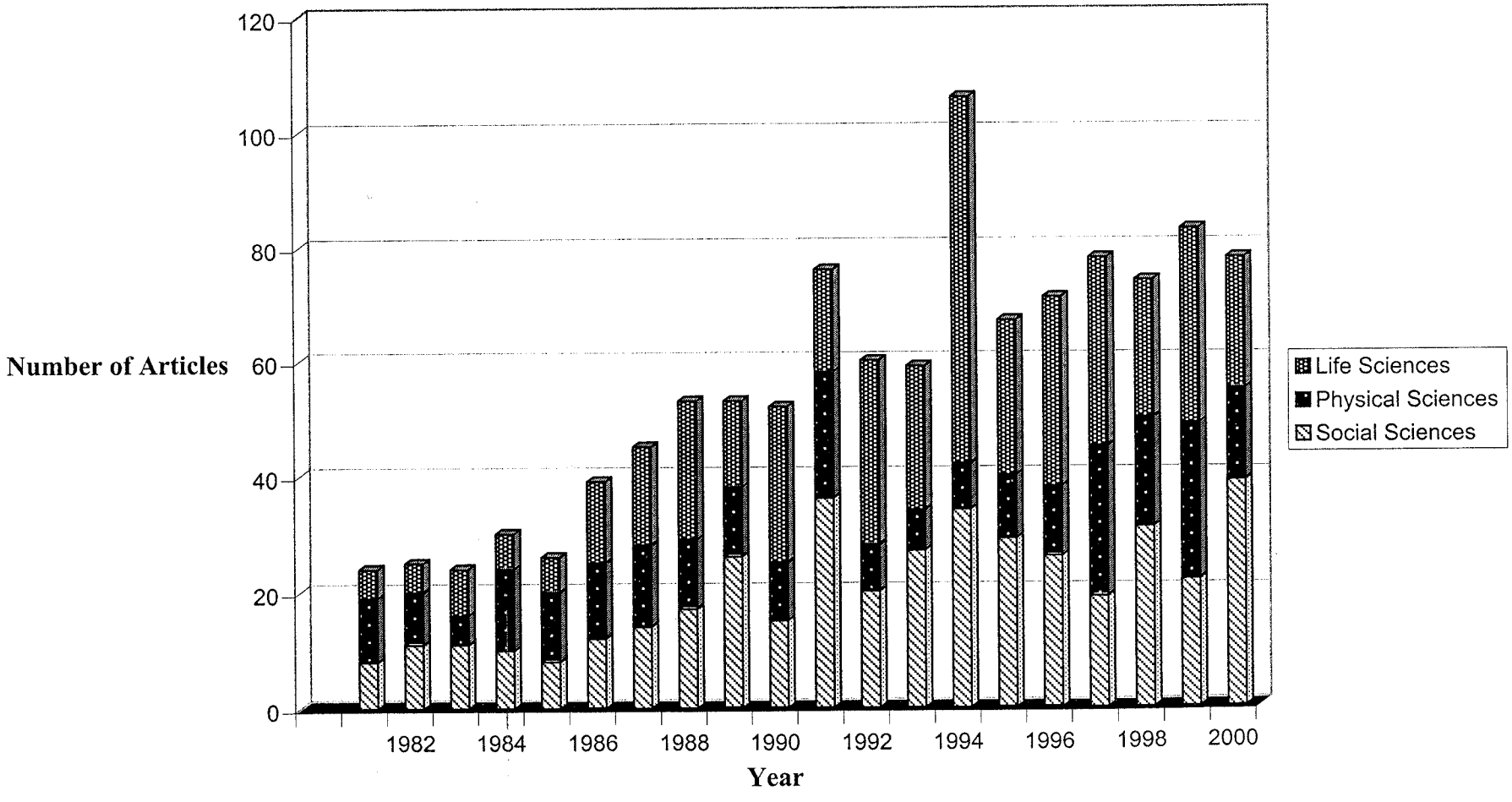


Figure 2. Articles in *Risk Analysis* by Risk Assessment Categories, 1981-2000

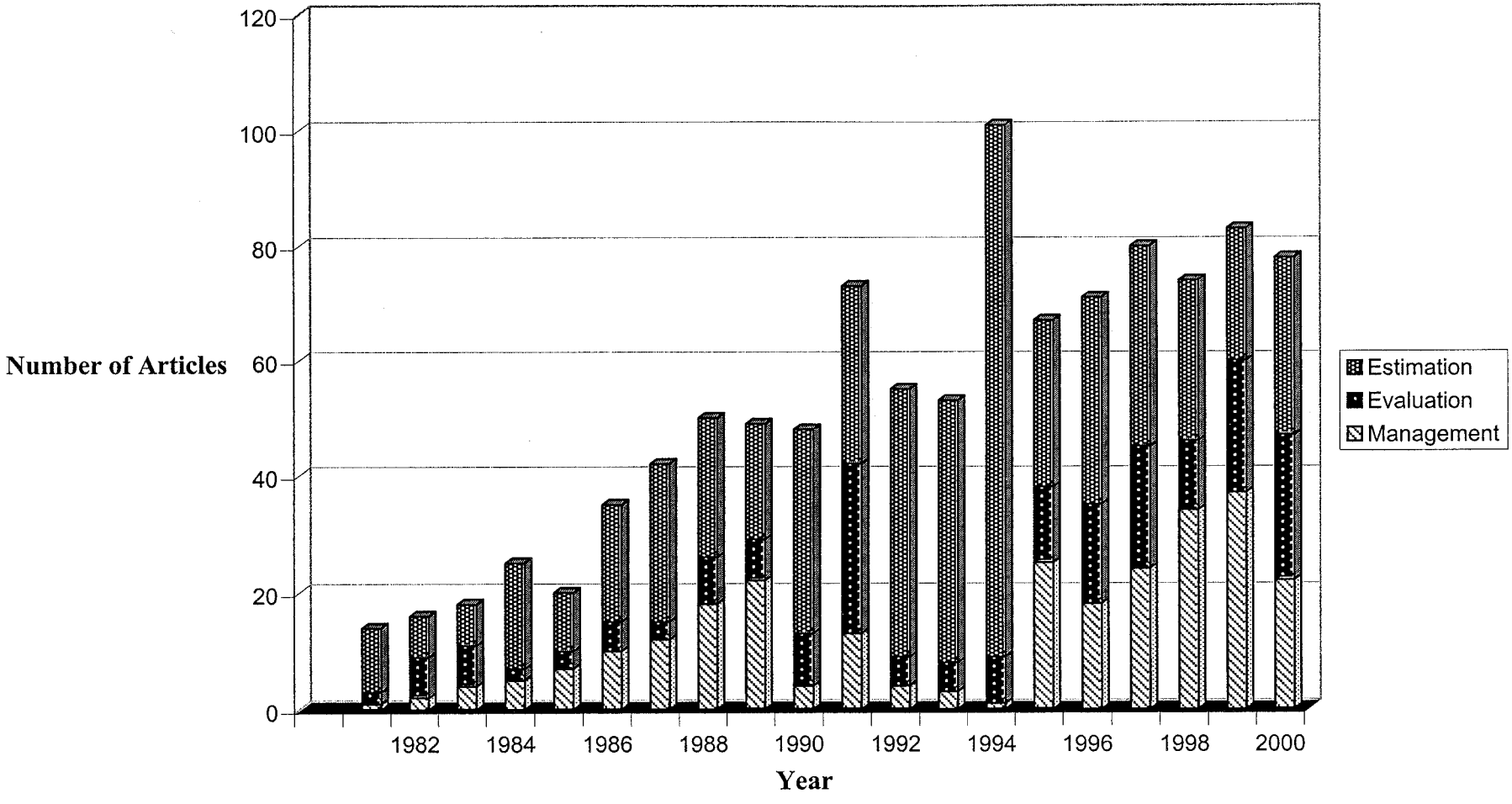


Table I. Steering Group: Members, Attendees, and Others Associated[a]

Name	Major Affiliation	Attendance at Meeting No.
Robert B. Cumming, Chair*	Oak Ridge National Laboratory, Oak Ridge, TN	1 2 3 4 5
Robert G. Tardiff, Secretary*	National Academy of Sciences, Washington, D.C.	1 2 3 4 5
C.S. Aaron*	U.S. Environmental Protection Agency, Washington, D.C.	2 3 4
Roy Albert*	New York University Medical Center, New York, NY	
Elizabeth L. Anderson*	U.S. Environmental Protection Agency, Washington, D.C.	2 3 5
Donald G. Barnes*	U.S. Environmental Protection Agency, Washington, D.C.	1 3
Charles Brown*	National Cancer Institute, Bethesda, MD	1
Kenneth Cantor*	National Cancer Institute, Bethesda, MD	2 3
Joseph Coleman*	Department of Energy, Washington, D.C.	3
Vincent T. Covello*	National Science Foundation, Washington, D.C.	4 5
Lars Ehrenberg*	University of Stockholm	
W. Gary Flamm*	U.S. Food and Drug Administration, Washington, D.C.	1 2 3
George F. Flanagan*	Oak Ridge National Laboratory, Oak Ridge, TN	3 4
Gio B. Gori*	Franklin Institute, Silver Springs, MD	4
Peter G. Groer*	Oak Ridge Associated Universities, Oak Ridge, TN	
Richard Hill*	U.S. Environmental Protection Agency, Washington, D.C	2 3
David Hoel**	National Institute of Environmental Health Sciences, Research Triangle Park, NC	
Alexander Hollaender*	Associated Universities, Washington, D.C.	1 2 4
Peter Barton Hutt	Covington and Burling, Attorneys, Washington, D.C.	
James W. Johnson	Nuclear Regulatory Commission, Washington, D.C.	4
Raphael Kasper	National Academy of Sciences, Washington, D.C.	3
Howard C. Kunreuther	University of Pennsylvania, Philadelphia, PA	
Lester B. Lave	Carnegie Mellon University, Pittsburgh, PA	
M. Granger Morgan	Carnegie Mellon University, Pittsburgh, PA	
Gordon W. Newell*	National Academy of Sciences, Washington, D.C.	1 2 3 4 5
Timothy O'Riordan*	University of East Anglia, Norwich, UK	5
Peter Piver	Oak Ridge National Laboratory, Oak Ridge, TN	4
Chester R. Richmond*	Oak Ridge National Laboratory, Oak Ridge, TN	2 3
Joseph V. Rodricks*	Food and Drug Administration, and, later, with Clements Associates, Washington, D.C.	1 2 4 5
Marvin A. Schneiderman*	National Cancer Institute, Bethesda, MD	
Frederick de Serres*	National Institute of Environmental Health Sciences, Research Triangle Park, NC	1
Paul Slovic	Decision Research, Eugene, OR	5
Chauncey Starr	Electric Power Research Institute, Palo Alto, CA	
Takahashi Sugimura*	National Cancer Center Research Institute, Tokyo, Japan	
V.R.R. Uppuluri	Union Carbide Nuclear Division, Oak Ridge, TN (Later, ORNL)	3 4
William Vesely*	Nuclear Regulatory Commission, Washington, D.C.	1
John S. Wassom	Oak Ridge National Laboratory, Oak Ridge, TN	4
Chris Whipple	Electric Power Research Institute, Palo Alto, CA	3

a The professional associations shown are those believed to have existed during the time of the Steering Group.
* Names asterisked appeared on various SG membership lists. Others who attended may have been members or visitors; others listed who did not attend were reportedly associated with the work of the SG one way or another. All listed are reported to have made significant contributions to the work of the SG.
** With NIEHS but spent one year (1980) at the Radiation Effects Research Foundation, Hiroshima, Japan.

Table II. Meetings of the Steering Group

Meeting*	Dates of the Meetings	Name of the Group at Each Meeting, as Given in the Minutes
First	October 1, 1979	Ad Hoc Committee on the Formation of a New Journal in the Area of Risk Analysis
Second	December 4, 1979	Steering Group for the Formation of a Risk Assessment Journal
Third	February 11, 1980	Steering Group for the Formation of a Journal for Risk Analysis
Fourth	May 12, 1980	Steering Group for the Formation of a Journal for Risk Analysis
Fifth	June 3, 1980	Ad Hoc Steering Group
* All meetings took place at the National Academy of Sciences, Washington, D.C.		

Table III. Incorporators and Interim Officers of the SRA, August 11, 1980

Incorporators

W. Gary Flamm, U.S. Food and Drug Administration, Washington, D.C.

Alexander Hollaender, Associated Universities, Washington, D.C.

Gordon W. Newell, Oak Ridge National Laboratory, Oak Ridge, TN

Robert G. Tardiff, National Academy of Sciences, Washington, D.C.

Interim officers

President, Robert B. Cumming, Biology Division, Oak Ridge National Laboratory, Oak Ridge, TN

Vice President, Joseph V. Rodricks, Clements Associates, Washington, D.C.

Secretary, Robert G. Tardiff, National Academy of Sciences, Washington, D.C.

Treasurer, Gordon W. Newell, Oak Ridge National Laboratory, Oak Ridge, TN

Table IV-A. Elected Officers and Councilors of the SRA, 1981-1991

Office ⇓ / Years ⇒	1981-1982	1982-1983	1983-1984	1984-1985	1985-1986
President	R.B. Cumming	C.G. Whipple	P. Slovic	E.L. Anderson	L.B. Lave
President-elect	C.G. Whipple	P. Slovic	E.L. Anderson	L.B. Lave	P.F. Deisler, Jr.
Secretary	K.A. Solomon	K.A. Solomon	M.S. Baram	M.S. Baram	M. Gough
Treasurer	V.R. Uppuluri	V.R. Uppuluri	H. Kunreuther	H. Kunreuther	S.M. Swanson
Past President	----------	R.B. Cumming	C.G. Whipple	P. Slovic	E.L. Anderson
Councilors	E.L. Anderson V.T. Covello M.C. Cullingford R.W. Hockenbury N. Nelson T. O'Riordan J.V. Rodricks A. Sivak P. Slovic	V.T. Covello M.C. Cullingford D.G. Hoel R.W. Hockenbury L.B. Lave J.C. McCann N. Nelson T. O'Riordan A. Sivak	V.T. Covello M.C. Cullingford F. Fagnani D.G. Hoel L.B. Lave J.C. McCann M.G. Morgan A. Sivak A.C. Upton	A.R. Buhl V.T. Covello F. Fagnani J.C. McCann M.G. Morgan C.S. Morris M.E. Paté-Cornell S.M. Swanson A.C. Upton	V.T. Covello B.J. Garrick P.B. Hutt M.G. Morgan C.S. Morris T. Page M.E. Paté-Cornell P-J. Stallen A.C. Upton

Office ⇓ / Years ⇒	1986-1987	1987-1988	1988-1989	1989-1990	1990-1991
President	P.F. Deisler, Jr.	V.T. Covello	R.C. Schwing	B.J. Garrick	C.C. Travis
President-elect	V.T. Covello	R.C. Schwing	B.J. Garrick	C.C. Travis	D.W. North
Secretary	M. Gough	F.M. Lynn	F.M. Lynn	V. Molak	V. Molak
Treasurer	S.M. Swanson	J. Fiksel	J. Fiksel	R. Boykin	R. Boykin
Past President	L.B. Lave	P.F. Deisler, Jr.	V.T. Covello	R.C. Schwing	B J. Garrick
Councilors	B.J. Garrick P.B. Hutt C.S. Morris D.W. North T. Page M.E. Paté-Cornell P-J. Stallen O. Svenson R.G. Tardiff	G. Apostolakis W.G. Flamm B.J. Garrick P.B. Hutt D.W. North T. Page O. Svenson R.G. Tardiff R. Wilson	G. Apostolakis W.G. Flamm J. Lewtas D.W. North C. St. Hilaire O. Svenson R.G. Tardiff J.D. Wilson R. Wilson	G. Apostolakis R.A. Cox W.G. Flamm P.B. Hutt R.E. Kasperson J. Lewtas C. St. Hilaire J.D. Wilson R. Wilson	R.A. Cox A. Fisher P.B. Hutt S. Ikeda R.E. Kasperson J. Lewtas D.B. McCallum C. St. Hilaire J.D. Wilson

Table IV-B. Elected Officers and Councilors of the SRA, 1991-2000

Office ⇓ / Years ⇒	1991-1992	1992-1993	1993-1994	1994-1995	1995-1996
President	D.W. North	J.D. Wilson	R.G. Tardiff	M.E. Paté-Cornell	J.D. Graham
President-elect	J.D. Wilson	R.G. Tardiff	M.E. Paté-Cornell	J.D. Graham	R. Zimmerman
Secretary	V. Molak	V. Molak	W.G. Flamm	W.G. Flamm	W.G. Flamm
Treasurer	R. Boykin	R. Boykin	R. Boykin	R. Boykin	R. Boykin
Past President	C.C. Travis	D.W. North	J.D. Wilson	R.G. Tardiff	M.E. Paté-Cornell
Councilors	D.G. Barnes R.A. Cox A. Fisher J.D. Graham P.B. Hutt S. Ikeda R.E. Kasperson D.B. McCallum R. Zimmerman	D.G. Barnes V.M. Bier T.A. Burke A. Fisher J.D. Graham S. Ikeda R. Kemp D.B. McCallum R. Zimmerman	D.G. Barnes V.M. Bier T.A. Burke C. Chess J.D. Graham Y.Y. Haimes R. Kemp T. Morioka R. Zimmerman	V.M. Bier T.A. Burke D.E. Burmaster G. Charnley C. Chess Y.Y. Haimes R. Kemp T. McKone T. Morioka	D.E. Burmaster G. Charnley C. Chess Y.Y. Haimes A.M. Jarabek T. McKone C. A. Menzie T. Morioka R. J. Mulvihill

Office ⇓ / Years ⇒	1996-1997	1997-1998	1998-1999	1999-2000
President	R. Zimmerman	Y.Y. Haimes	G. Charnley	R.E. Kasperson
President-elect	Y.Y. Haimes	G. Charnley	R.E. Kasperson	J. Ahearne
Secretary	W.G. Flamm	T.L. McDaniels	T.L. McDaniels	T.L. McDaniels
Treasurer	P.S. Price	P.S. Price	R.B. Belzer	R.B. Belzer
Past President	J.D. Graham	R. Zimmerman	Y.Y. Haimes	G. Charnley
Councilors	D.E. Burmaster R. Cantor G. Charnley W. Farland H.C. Frey A.M. Jarabek T. Mckone C.A. Menzie T. Morioka R.J. Mulvihill	R. Cantor A.C. Cullen W. Farland H.C. Frey D.B. Hattis A.M. Jarabek C.A. Menzie R.J. Mulvihill D.J. Paustenbach	R. Cantor A.C. Cullen W. Farland D.B. Hattis F.O. Hoffman P. Locke D.J. Paustenbach L. Zeise	A.C. Cullen M.R. Greenberg D.B. Hattis F.O. Hoffman P. Locke D.J. Paustenbach M. Small J. Vandenberg L. Zeise

Table V. ADVANCES IN RISK ANALYSIS
Volumes of Proceedings of Annual Meetings
Edited by the Society for Risk Analysis
Published by Plenum Press • New York and London

Volume 1	THE ANALYSIS OF ACTUAL VERSUS PERCEIVED RISKS (Annual Meeting year: 1981; year of publication: 1983). Edited by: Vincent T. Covello, W. Gary Flamm, Joseph V. Rodricks and Robert G. Tardiff
Volume 2	LOW PROBABILITY/HIGH CONSEQUENCE RISK ANALYSIS (Annual Meeting year: 1982; year of publication: 1984). Edited by: Ray A. Waller and Vincent T. Covello
Volume 3	RISK ANALYSIS IN THE PRIVATE SECTOR (Annual Meeting year: 1983; year of publication: 1985). Edited by: Chris Whipple and Vincent T. Covello
Volume 4	UNCERTAINTY IN RISK ASSESSMENT, RISK MANAGEMENT AND DECISION-MAKING (Annual Meeting year: 1984; year of publication: 1987). Edited by: Vincent T. Covello, Lester B. Lave, Alan Moghissi, and V.R.R. Uppuluri
Volume 5	RISK ASSESSMENT AND MANAGEMENT (Annual Meeting year: 1985; year of publication: 1987). Edited by: Lester B. Lave
Volume 6	NEW RISKS, ISSUES AND MANAGEMENT (Annual Meeting year: 1986; year of publication: 1990). Edited by: Louis A. Cox, Jr., and Paolo F. Ricci
Volume 7	RISK ASSESSMENT IN SETTING NATIONAL PRIORITIES (Annual Meeting year: 1987; year of publication: 1989). Edited by: James J. Bonin and Donald E. Stevenson
Volume 8	RISK ANALYSIS, PROSPECTS AND OPPORTUNITIES (Annual Meeting year: 1988; year of publication: 1991). Edited by: Constantine Zervos
Volume 9	THE ANALYSIS, COMMUNICATION AND PERCEPTION OF RISK (Annual Meeting year: 1989; year of publication: 1991). Edited by: B. John Garrick and Willard C. Gackler; Contributing Editors: Caron Chess, Roger Kasperson, and Curtis C. Travis

Table VI. A Selection of U.S. EPA Risk Guidelines

Guideline	Year Issued	Federal Register Reference
Guidelines for Carcinogen Risk Assessment	1986	51(185):33992-34003
Guidelines for Mutagenicity Risk Assessment	1986	51(185):34006-34012
Guidelines for the Health Risk Assessment of Chemical Mixtures	1986	51(185):34014-34025
Guidelines for Developmental Toxicity Risk Assessment	1991	56(234):63798-63826
Guidelines for Exposure Assessment	1992	57(104):22888-22938
Guidelines for Reproductive Toxicity Risk Assessment	1996	61(212):56274-56322
Guidelines for Ecological Risk Assessment	1998	63(93):26846-26924
Guidelines for Neurotoxicity Risk Assessment	1998	63(93):26926-26954

Table VII. Presidents' Highest Academic Degrees and Their Professional Affiliations When Elected

Robert B. Cumming, PhD, University of Texas, Genetics/Cytogenetics; Genetic Toxicologist and research staff member, Oak Ridge National Laboratory, Oak Ridge, TN

Chris G. Whipple, PhD, California Institute of Technology, Engineering Science; Technical Manager, Energy Study Center, Electric Power Research Institute, Palo Alto, CA

Paul Slovic, PhD, University of Michigan, Psychology; President, Decision Research, Eugene, OR

Elizabeth L. Anderson, PhD, American University, Organic Chemistry; Director, Cancer Assessment Group, U.S. EPA, Washington, D.C.

Lester B. Lave, PhD, Harvard University, Economics; James H. Higgins Professor of Economics, Graduate School of Industrial Administration, Carnegie Mellon University, Pittsburgh, PA

Paul F. Deisler, Jr., PhD, Princeton University, Chemical Engineering; Vice President, Health, Safety and Environment, Shell Oil Company, Houston, TX

Vincent T. Covello, PhD, Columbia University, Quantitative Sociology and Social Psychology; Director, Risk Assessment Program, National Science Foundation, Washington, D.C.

Richard C. Schwing, PhD, University of Michigan, Chemical Engineering; Principal Research Engineer, Operating Sciences Department, General Motors Laboratories, Warren, MI

B. John Garrick, PhD, University of California, Los Angeles, Engineering and Applied Science; President, PLG, Inc., Los Angeles, CA

Curtis C. Travis, PhD, University of California at Davis, Applied Mathematics; Director, Office of Risk Analysis, Oak Ridge National Laboratory, Oak Ridge, TN

D. Warner North, PhD, Stanford University, Operations Research; Consultant, Decision Focus, Inc., Los Altos, CA, and Consulting Professor, Stanford University

James D. Wilson, PhD, University of Washington, Chemistry; Regulatory Management Director, Risk Assessment, Corporate Environmental, Safety and Health Staff, Monsanto Company, St. Louis, MO

Robert G. Tardiff, PhD, University of Chicago, Pharmacology and Toxicology; Vice President, Health Sciences, EA Engineering, Science and Technology, Inc., Silver Spring, MD

Marie-Elisabeth Paté-Cornell, PhD, Stanford University, Engineering-Economic Systems; Professor, Industrial Engineering, Stanford University, Stanford, CA

John D. Graham, PhD, Carnegie Mellon University, Public Policy; Professor of Policy and Decision Sciences, Founder and Director, Harvard Center for Risk Analysis, Harvard School of Public Health, Boston, MA

Rae Zimmermann, PhD, Columbia University, Planning; Professor of Planning and Public Administration, Wagner School of Public Service, New York University, New York, NY

Yacov Y. Haimes, PhD, University of California, Large Scale Systems Engineering; Lawrence R. Quarles Professor of Engineering and Applied Science, Systems Engineering Department, and Founding Director, Center for Risk Management of Engineering Systems, University of Virginia, Charlottesville, VA

Gail Charnley, PhD, Massachusetts Institute of Technology, Toxicology; Practice Director for Risk Management, U.S., Worldwide Environmental, Health, and Safety Group, The Weinberg Group, Inc., Washington, D.C.

Roger E. Kasperson, PhD, University of Chicago, Geography; Professor and Director, George Perkins Marsh Institute, Clark University, Worcester, MA

John F. Ahearne, PhD, Princeton University, Physics; Director, Ethics and Research Program, Sigma Xi Center, Research Triangle Park, NC

Table VIII. Committees, Years in Existence

Committee ⇓ / Year ⇒	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00
Advisory Committee	■	?	?	?	?															
Advisory Board															■	■	■	■	■	■
Annual Meetings -- **b**					?	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Awards -- **b**							■	■	■	■	■	■	■	■	■	■	■	■	■	■
Conferences and Workshops -- **a** -- **b**	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Constitutional Review	■	■	■	■																
Curricula																■				
Definitions				?	■	■	■	■	■	■										
Diversity																			■	■
Education & Training **	■	■	■	■													■	■	■	■
Electronic Media (first called Internet)																■	■	■	■	■
Executive -- **b**	?	?	?	?	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Finance -- **a** -- **b**	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Future Structuring of the Society												■	■							
SRA Structure															■	■				
Gifts and Grants					?	?	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Global Risk Analysis										■										
Governance □ □										?	■	■								
Government Relations													■	■	■	?				
Grants Management																■	■	■	■	■
High Quality Science																				■
Historian												■	■	■	■	■	■	■	■	■
Improve Risk Analysis Practice *****																	■	■		
Interim Web Editor																				■
International Affiliations (Subcommittee)								?	?	■	?									
International Issues																			■	■
Liaison		?	■	■	■	■	■	■	■	■										
Management & Development*				?	■	■	■													
Meetings -- **b**					?	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Membership -- **a**	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Nominations -- **a** -- **b**	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Peer Review; later, Special Projects***	■	■	■	■	■	■	■													
Proceedings Criteria (Subcommittee)									?	■	?									
Professional Development										■										
Publications -- **a** -- **b**	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Publicity	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Public Policy Issues													?	■	■	■	■	■	■	■
Research and Fellowship Programs									?	■	?									
Research Support							■													
Sections and Chapters **** -- **b**							■	■	■	■	■	■	■	■	v	■	■	■	■	■
Specialty Groups														■	■	■	■	■	■	■
SRA Structure																■				
SRA 2000 World Symp. and Cong. □																		?	■	■

LEGEND: (1) ■ Committee in existence this year. (2) **?** Committee may have existed or been started or been ended in this year. (3) Empty cell: committee not known to have existed in this year. (4) -- **a** Standing (Constitutional) Committees, 1981. (5) -- **b** Standing Committees, 2000. (6) * Also called the Management Committee. (6) ** Later reincarnation called Education Committee. (7) *** Named Special Projects by 1984; it handled anything outside the purview of other committees. (8) **** Called Chapters Committee at first. (9) ***** Also called Improving Risk Assessment Practice. (10) □ From 2000 on, called World Congress. (11) □ □ Asked to consider, specifically, how SRA structure might include international sections.

Table IX. SRA Membership, 1981-2000

Year	Individual Members	Individual Student Members	Individual Members, Total		USA, Individual Members	Canada, Individual Members	Elsewhere, Individual Members	Individual Members, Total		Sustaining Members, Total
1981	ca. 300	?	300		?	?	?	300		---
1982	ca. 500	?	500		?	?	?	500		---
1983	ca. 700	?	700		?	?	?	700		---
1984	855	32	887		810	23	54	887		---
1985	881	35	916		?	?	?	916		9
1986	1,060	48	1,108		?	?	?	1,108		17
1987	1,229	49	1,278		1,146	39	93	1,278		11
1988	1,439	43	1,482		?	?	?	1,398		22
1989	1,476	42	1,518		?	?	?	1,518		20
1990	1,665	65	1,730		1,452	39	239	1,730		12
1991	1,786	72	1,858		?	?	?	1,858		3
1992	1,718	77	1,795		1,567	46	182	1,795		9
1993	1,850	89	1,939		?	?	?	1,939		12
1994	1,856	103	1,959		1,717	65	177	1,959		16
1995	1,936	105	2,041		1,773	79	189	2,041		7
1996	2,252	123	2,375		1,964	96	315	2,375		17
1997	2,290	122	2,412		1,885	96	431	2,412		9
1998	2,371	146	2,517		1,966	110	441	2,517		4
1999	2,288	168	2,456		1,873	104	479	2,456		9
2000	2,347	178	2,525		1,792	112	621	2,525		5

Table X. North American Chapters**

Chapter Name	When Approved		Chapter Name	When Approved
Châpitre St. Laurent* (St. Lawrence Chapter)	May 1997		New England	February 1986
Chicago Regional	March 1995		Northern California	July 1986
Columbia Cascades (Eastern WA)	November 1988		Ohio (Southwest and Southern OH, Northern KY)	March 1989
East Tennessee	Fall 1982		Philadelphia	February 1988
Greater Pittsburgh (Western PA)	November 1989		Prairie Land	June 1998
Lone Star (TX)	July 1986		Puget Sound (Western WA)	December 1997
Metropolitan (NY, NJ)	July 1987		Rocky Mountain	October 1990
Michigan	December 1991		Research Triangle Park	July 1987
National Capital Area (DC, MA, VA)	Fall 1982		Southern California	July 1987

* In Canada; all others listed for North America are in the United States

** Outside of North America, the SRA Council in 1992 approved the Kiev, Ukraine Chapter. The total number of approved chapters directly affiliated with the SRA is therefore 19.

Table XI. Cumulative Chapter Formation, 1981-2000

Year	Names of Chapters Formed	Cumulative Totals
1981		0
1982	East Tennessee, National Capital Area	2
1983		2
1984		2
1985		2
1986	New England, Northern California, Lone Star	5
1987	Metropolitan, Research Triangle Park, Southern California	8
1988	Columbia Cascades, Philadelphia	10
1989	Greater Pittsburgh, Ohio	12
1990	Rocky Mountain	13
1991	Michigan	14
1992		
1993		
1994		
1995	Chicago Regional	15
1996		
1997	Puget Sound, St. Laurent	17
1998	Prairie Land	18
1999		
2000		

Table XII. Annual Meetings and Their Themes

Meeting Dates	Meeting Theme	Meeting Location
June 1, 1981 (during a workshop on the meeting theme, June 1-3, 1981)	The Analysis of Actual vs. Perceived Risks (this was the organizational meeting)	National Academy of Sciences, Washington, D.C.
June 17-18, 1982	Low Probability/High Consequence Risk Analysis	Hyatt Regency Hotel, Arlington, VA
July 31-August 3, 1983	Risk Analysis in the Private Sector	Grand Hyatt Hotel, New York, NY
October 1-3, 1984	Uncertainty in Risk Assessment, Risk Management and Decision-Making	Hyatt Regency Hotel, Knoxville, TN
October 7-9, 1985	Risk Assessment and Management	Radisson Mark Plaza, Alexandria, VA
November 9-12, 1986	New Risks, Issues and Management	Boston Park Plaza Hotel, Boston, MA
November 1-4, 1987	Risk Assessment in Setting National Priorities	The Wyndham Hotel - Greenpoint, Houston, TX
October 30-November 2, 1988	Risk Analysis: Prospects and Opportunities	Mayflower Hotel, Washington, D.C.
October 29-November 1, 1989	The Analysis, Communication and Perception of Risk	Hotel Nikko, San Francisco, CA
October 7-10, 1990	Promise of Risk Analysis in the '90s	Hotel Intercontinental, New Orleans, LA
December 8-11, 1991	Risk Analysis in Support of Public and Private Sector Decision Making	Hyatt Regency Hotel, Baltimore, MA
December 6-9, 1992	Society for Risk Analysis 1992 Annual Meeting	Hotel del Coronado, San Diego, CA
December 5-8, 1993	Society for Risk Analysis 1993 Annual Meeting	Hyatt Regency Hotel, Savannah, GA
December 4-7, 1994	Learning Across Fields of Application	Hyatt Regency Hotel, Baltimore, MA
December 3-6, 1995	Learning from Cross-Cultural Comparison	Sheraton Waikiki Hotel, Honolulu, HA
December 8-11, 1996	Risk Assessment and Risk Management: Partnerships Through Interdisciplinary Initiatives	Fairmont Hotel, New Orleans, LA
December 7-10, 1997	Improving Public Policy Through Risk Assessment and Risk Management	Capitol Hilton, Washington, D.C.
December 6-9, 1998	Assessing and Managing Risks in a Democratic Society	Hilton South Mountain Hotel, Phoenix, AZ
December 5-8, 1999	The Future of Risk in the 21st Century	Marriott Marquis Hotel, Atlanta, GA
December 3-6, 2000	Applications of Risk Analysis in Industry and Government	Crystal Gateway Marriott Hotel, Arlington, VA

Table XIII. Countries Having at Least One SRA Member

Argentina	France	Portugal
Australia	Germany	Russia
Austria	Greece	Saudi Arabia
Belarus	Hungary	Senegal
Belgium	India	South Africa
Brazil	Ireland	South Korea
Canada	Israel	Spain
Chile	Italy	Sweden
China (Hong Kong)	Japan	Switzerland
Colombia	Malaysia	Taiwan
Croatia	Mexico	Ukraine
Czech Republic	Netherlands	United Kingdom
Denmark	New Zealand	United States
El Salvador	Norway	
Finland	Philippines	

Table XIV. List of Sustaining Members Through 2000

American Cyanamid Company	E.I. Dupont de Nemours & Company
American General Corporation	Electric Power Research Institute
American Industrial Health Council	Environ Corporation
American Petroleum Institute**	Environmental Protection Agency**
Amoco Corporation	Exxon Biomedical Sciences, Inc.
Arthur D. Little, Inc.	Exxon Corporation**
Atlantic Richfield Company (later, ARCO Corporation)	Ford Motor Company
	General Motors Corporation
BP Chemical, Inc.	General Motors Research Laboratories
BP Oil Company	Hercules, Inc.
Burroughs Wellcome	Hershey Foods Corporation
Canadian Aviation Safety Board	Hoffman-La Roche Company
Chemical Industry Institute of Toxicology	Mobil Oil Company
	Monsanto Company
Chemical Manufacturers Association*	National Center for Toxicological Research
Chevron Corporation	
Chevron Environmental Health Center	Nuclear Regulatory Commission
Chevron Research & Technology Company	PLG, Inc.
	Resources for the Future, Center for Risk Management
Clairol, Inc.	
Cleary, Gottlieb, Steen and Hamilton, Attorneys	Riskfocus
	R.J. Reynolds Tobacco Company-RND
Clement Associates, Inc.	Rohm and Haas Company
Coca-Cola Company	Science Applications International Corporation
Concurrent Technologies Corporation	
Corning Hazelton, Inc.	Sciences International, Inc.
Covington & Burling, Attorneys	Shell Oil Company**
Decision Focus Inc.	Stauffer Chemical Company
Department of Energy*	The Gillette Company
Dow Chemical Company, U.S.A.	The Procter & Gamble Company
Dupont Haskell Laboratory	The Sapphire Group
EA Engineering, Science and Technology Company	Union Carbide Corporation*
	Union Oil Company of California
E.G.& G. Idaho	Versar, Inc.

* Early contributor, then denominated "co-sponsor".
** Early contributor, then denominated "co-sponsor"; later contributed as a "sustaining member"

Table XV. Chapters' Mission Statement

The mission of a chapter is to*:

1. provide a public forum for the discussion of risk analysis and risk management issues at local and regional as well as national levels;
2. foster the advancement and understanding of new methodologies and technology in the practice of risk analysis;
3. serve as a resource for the local scientific, regulatory, and industrial/municipal community;
4. represent the interests and goals of SRA in a regional setting;
5. enhance communication between the national organization and its membership;
6. develop membership within the SRA at a local or regional level.

The following activities are encouraged:

1. The chapter should schedule, manage, and publicize periodic meetings. The frequency of meetings should be dependent upon the level of local interest. At least two meetings a year (and preferably more) in addition to the annual meeting is considered a minimum in order to foster a continuing spirit of exchange. Consideration should be given to the location(s) of meetings so that the membership within the Chapter has an opportunity to attend. This might involve rotating the meeting locations.
2. The chapter should develop communication tools (mailing, newsletters, e-mail) for announcing events and local news.
3. The chapter should maintain a mailing list with notation of dues paying members.
4. The chapter should encourage all its members to become members of the national organization and to receive the newsletter, meeting announcements, and journal.
5. The chapter should regularly advise the national office of its activities. This includes the preparation of periodic news pieces for the Risk Newsletter.
6. The chapter president, or a designated representative, should make an effort to attend the annual national meeting. Chapters should discuss possible travel support to the national meeting for a chapter representative.
7. The chapters should contact the SRA Chapter Liaison or the Secretariat as needed for assistance on: a) monetary issues, b) ideas on setting up workshops or poster presentations, c) obtaining speakers from the national organization, and d) publicizing events or activities.

The chapters should look for opportunities to cooperate with other scientific organizations and professional societies in activities pertaining to risk analysis.

* From the SRA Web site, www.sra.org.

Table XVI. SRA Specialty Groups[a]

Group Title	Year Founded	Initial Leadership
Global Risk Analysis	1989	Rob Coppock
Exposure Assessment	1990	Paul Price
Risk Communication	1990	Ann Fisher
Engineering	1990	Bill Gekler
Space	1990	Hatice Cullingford
Ecological Risk Assessment	1991	Larry Barnthouse
Dose-Response	1994	Michael Dourson
Food/Water Safety Risk	1996	Michael D. McElvaine
Risk, Science and Law	1996	Wayne Roth-Nelson

a Initially named "Interest Groups" in 1990, renamed "Specialty Groups" by the SRA Council in 1991.
b Called, variously, President, Chair, or Spokesperson.
c No longer in existence
d Founded as a "Topical Section" in 1989.

Table XVII. Awards and Their Recipients as of the End of the Year 2000

Year	Distinguished Achievement	Outstanding Service	Outstanding Practitioner	Chauncey Starr*	Presidential Recognition
1984	Roy E. Albert Howard Raiffa Chauncey Starr	Curtis C. Travis			
1985	Alexander Hollaender	Vincent T. Covello			
1986	Sir Reginald Farmer	Steven Swanson			
1987	Gilbert F. White	Anthony R. Buhl			
1988	---	Fred D. Hoerger			
1989	William D. Ruckelshaus	---			
1990	Norman C. Rasmussen	Howard G. Kunreuther, Pieter-Jan Stallen, Chris G. Whipple			
1991	Baruch Fischhoff, Paul Slovic	George Apostolakis, Ann N. Fisher			
1992	Sheila Jasanoff	Robert B. Cumming			
1993	Richard Wilson	Peter B. Hutt			
1994	B. John Garrick	Lorraine Abbott, Raymond F. Boykin			
1995	M. Granger Morgan	Saburo Ikeda			
1996	Stanley Kaplan	Larry R. Froebe, P.J. “Bert” Hakkinen, Harlee S. Strauss	Penelope Fenner-Crisp	Hank C. Jenkins-Smith	
1997	Arthur C. Upton	Elizabeth Anderson	Dennis Paustenbach	Ann Bostrom	Stephen L. Brown
1998	Lester B. Lave	Paul F. Deisler, Jr.	Peter Preuss	Adam Finkel	Richard and Sue Burk
1999	Bernard D. Goldstein	Robin Cantor	D. Warner North	H. Christopher Frey	
2000	Yacov Y. Haimes	Vicki Bier, Detlof von Winterfeldt	Christopher J. Portier	Ragnar Löfstedt	

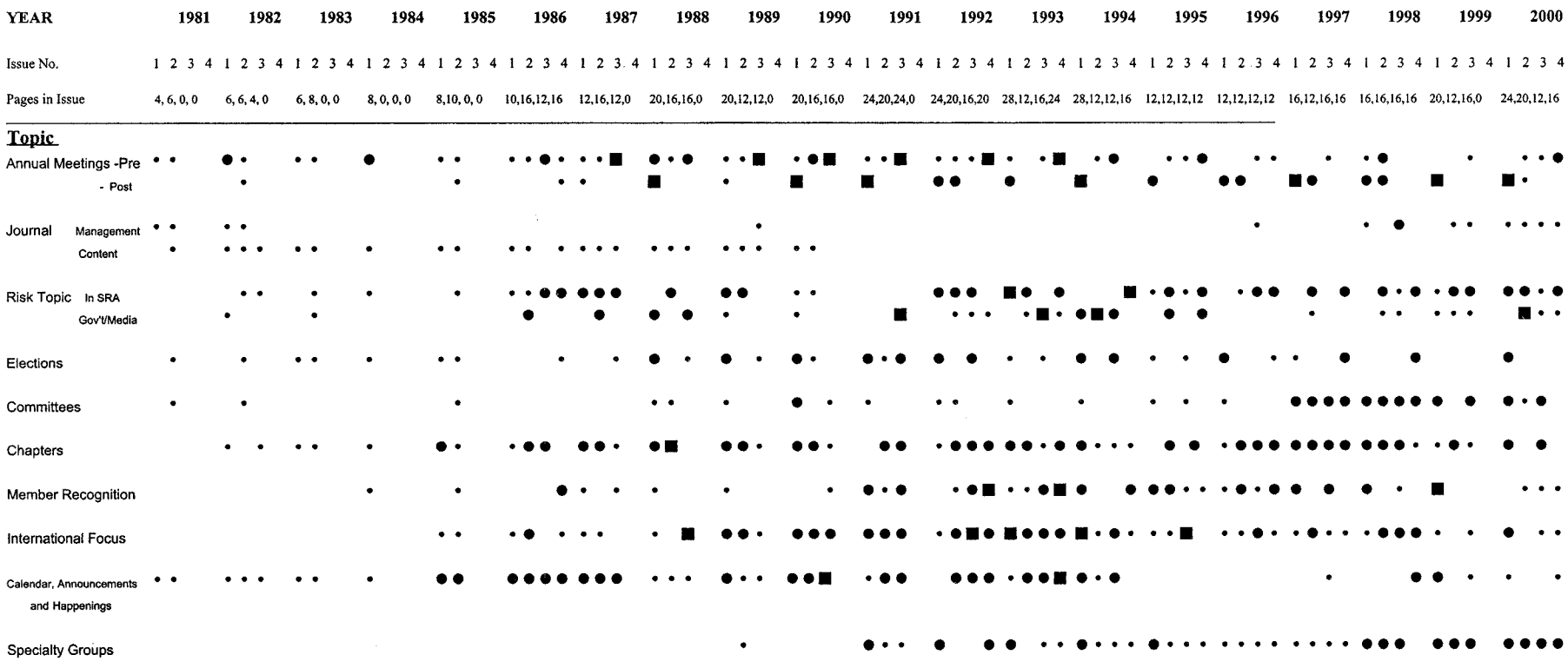
* Also known as the Young Practitioner Award

Table XVIII. Fellows of the Society for Risk Analysis, as of the End of the Year 2000

Elizabeth L. Anderson	Ralph L. Keeney
George Apostolakis	Daniel R. Krewski
Donald G. Barnes	Howard C. Kunreuther
Vicki M. Bier	Lester B. Lave
Halina Brown	Roger McClellan
Robert J. Budnitz	M. Granger Morgan
Gail Charnley	Ali Mosleh
Vincent T. Covello	Jeryl L. Mumpower
Louis A. Cox, Jr.	D. Warner North
Kenny S. Crump	David Okrent
Robert B. Cumming	M. Elisabeth Paté-Cornell
Paul F. Deisler, Jr.	Ortwin Renn
John S. Evans	Milton Russell
Baruch Fischhoff	Richard C. Schwing
Ann N. Fisher	Lennart Sjoberg
B. John Garrick	Paul Slovic
David W. Gaylor	Catherine L. St. Hilaire
Michael Gough	Ola Svenson
John D. Graham	Robert G. Tardiff
Yacov Y. Haimes	Curtis C. Travis
Dale Hattis	Detlof Von Winterfeldt
Fred D. Hoerger	Chris G. Whipple
Christoph Hohenemser	James D. Wilson
Peter B. Hutt	Richard Wilson
Saburo Ikeda	Lauren Zeise
Stanley Kaplan	Rae Zimmerman
Roger E. Kasperson	

Table XIX. Contents of *Risk Analysis: An International Journal*, Vol. 1, No. 1, March 1981

Table XX. History of Newsletter Content



KEY TO SYMBOLS

Symbol	Pages Devoted to Topic
none	>0 to 1/2
•	>1/2 to <1-1/2
●	1-1/2 to < 4
■	> 4

Table XXI. Ten Generic Questions for Risk Analysts*

1. How do we determine "how safe is safe enough?"
2. How good are the knowledge base and methods for estimating the risks associated with different technologies?
3. How are estimates of risk incorporated into decision-making?
4. How do decision-makers treat uncertainties associated with different risks and hazards?
5. How do features of the context affect decision-making bodies concerned with risk and uncertainty?
6. What factors influence individual perceptions of risk and benefit?
7. How are perceptions of risk and benefit incorporated into public policies?
8. How does society cope with risks unacceptable to some segments of the population?
9. How are normative considerations such as equity and social justice balanced in decision-making about risk?
10. What are the criteria for comparing and evaluating different management policies?

* Title modified from that of the original author.

Table XXII. Annual Meeting Data, 1981-2000

Year	Sessions		Presentations				Workshops Held With Annual Meetings
	Plenary*	Technical	Technical Papers (A)	Posters (B)	Poster Platforms (C)	Total of (A), (B), and (C)	
1981	0	8	24	0	0	24	0
1982	0	8	41	19	0	60	0
1983	2	13	63	0	0	63	0
1984	2	35	116	0	0	116	0
1985	1	36	146	0	0	146	0
1986	1	30	190	0	0	190	0
1987	1	40	159	10	0	169	0
1988	1	48	169	11	0	180	0
1989	1	70	274	0	0	274	0
1990	1	77	285	0	0	285	0
1991	1	92	371	0	0	371	4
1992	2	65	246	105	0	351	5
1993	2	67	261	46	0	307	6
1994	2	60	237	91	0	328	6
1995	2	94	336	46	0	382	5
1996	2	105	445	76	16	537	7
1997	2	97	327	57	48	432	0
1998	2	87	323	74	25	422	6
1999	1	79	270	55	46	371	5
2000	2	90	358	69	16	443	8

* Speeches given in Plenary Sessions, though sometimes of a technical nature, were not counted in the Technical Presentation Totals. Also, while there were various other sessions such as luncheon sessions with speakers or speeches by awardees, only sessions labeled “Plenary” are included here.

Table XXIII. Annual Meeting Organizers

Meeting Dates	General Meeting Chair	General Program Chair	Technical Program Chair	Publicity Chair
June 1, 1981	Robert Tardiff		Norton Nelson	Vincent T. Covello
June 17-18, 1982	Gio Gori, Joe Penland		Vincent T. Covello Ron Waller	Vincent T. Covello
July 31-August 3, 1983	Chris Whipple		Vincent T. Covello, Richard C. Schwing, Robert G. Tardiff, Chris Whipple	Vincent T. Covello
October 1-3, 1984	Elizabeth Anderson	Ray Boykin	Ram Uppuluri	Vincent T. Covello
October 7-9, 1985	Lester Lave	Alan Moghissi	Janice Longstreth	Vincent T. Covello
November 9-12, 1986	Paul F. Deisler, Jr.	Roger Kasperson	Paulo Ricci	Michael Gough
November 1-4, 1987	Vincent T. Covello	Donald E. Stevenson	James J. Bonin	Lester B. Lave
October 30-November 2, 1988	Richard C. Schwing	Constantine Zervos		Paul F. Deisler, Jr.
October 29-November 1, 1989	B. John Garrick	Ray Boykin Chris Whipple	Willard C. Geckler	Vincent T. Covello
October 7-10, 1990	Curtis C. Travis	Ann Fisher Howard Kunreuther	Sheri Tickle Hester	Richard C. Schwing
December 8-11, 1991	D. Warner North			B. John Garrick
December 6-9, 1992	James D. Wilson	Douglas Orvis	6 committees	Curtis C. Travis
December 5-8, 1993	Robert G. Tardiff		Bob Hetes, Deborah Amoral, Annie Jarabek	D. Warner North
December 4-7, 1994	M. Elisabeth Paté-Cornell		14-member committee	James D. Wilson
December 3-6, 1995*	John D. Graham	Eiji Yokoyama from SRA-Japan	16-member U.S. committee plus Hirotada Hirose, Saburo Ikeda, Tohru Morioka, Taketoshi Taniguchi, Iwao Uchiyama from SRA-Japan	Robert G. Tardiff
December 8-11, 1996**	Rae Zimmerman	Barbara Petersen Tom McKone	16-member committee	M. Elisabeth Paté-Cornell
December 7-10, 1997	Yacov Y. Haimes		19-member committee	John D. Graham
December 6-9, 1998	Gail Charnley		13-member committee	Rae Zimmerman
December 5-8, 1999	Roger E. Kasperson		16-member committee	Yacov Y. Haimes
December 3-6, 2000	John F. Ahearne		19- member committee	Gail Charnley

* Joint SRA, SRA-Japan meeting; ** Joint SRA, ISEA (International Society of Exposure Analysis) meeting.

Table XXIV. A Sampling of Workshops Held in Conjunction with Annual Meetings

Year Held	Summary of Subject Matter of Workshops Held in Conjunction with Annual Meetings
1991	• Risk communication, introduction to principals • Dietary exposure assessment, training using selected software • Fundamentals of risk analysis • Molecular biology for risk assessors
1992	• Understanding and performing desktop risk assessments • California's Proposition 65: Risk assessment and dietary exposure assessment methodologies • Residential exposure • Fundamentals of risk analysis • Process safety management and risk management plans • Key issues in carcinogen risk assessment guidelines*
1996	• Risk assessment and risk management • Quantitative techniques for analysis of variability and uncertainty in exposure and risk assessment • Risk communication: making risk management more effective • Developments in public policy affecting the practice of risk assessment • Risk of extreme and rare events • Beyond point estimates: risk assessment using interval analysis and fuzzy arithmetic • Integrated multimedia exposure modeling with sensitivity and uncertainty analysis
2000	• Introduction to ecological risk management • Risk of extreme and rare events • U.S. EPA's guidelines for health risk assessment of chemical mixtures • Engaging the community in decision-making • Multimedia modeling workshop on human and ecological risk assessment • Beyond point estimates: risk assessment using interval analysis and fuzzy arithmetic • Performing an ecological risk assessment
* Carried out under a cooperative grant with the U.S. EPA (see Section 6.6.2.2).	