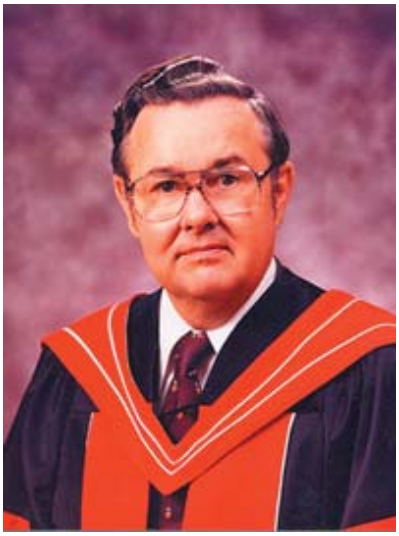

IN MEMORIAM

Roy Clayton Anderson

April 1926 – August 2001

Professor Roy C. Anderson, renowned professor of parasitology at the University of Guelph and world recognized researcher in the field of wildlife disease died August 27, 2001 in Guelph, Ontario. A Memorial Service held in the University of Guelph Arboretum, September 3, was widely attended by close friends, academic colleagues and former graduate students who gathered with Roy's family to celebrate his accomplishments and to relate how his enthusiasm for research and scientific rigor, his love for writing, his joie de vivre and continued friendship affected their lives. Above all, his sense of humour and mastery of story-telling that brought fun and laughter will be sorely missed.

Roy always considered himself to be a member of the North American Moose Group and attended several annual meetings. "Moosers", more than any other scientific group, recognized the importance of one of his biggest discoveries – identifying the cause of the mysterious neurologic disease known for many years simply as "moose sickness". Like many great discoveries, his was part serendipity and part good detective work. While working one summer at the Lake Sasejewun Wildlife Research Station, Algonquin Park, Ontario, a colleague showed Roy a worm he'd found in the cranium of a white-tailed deer killed by a car. This introduction led Professor Anderson to a long and productive series of scientific studies progressively revealing the importance of this parasite, known as the "meningeal worm" or *Parelaphostrongylus tenuis*. First, he showed that *P. tenuis* has to develop in land snails or slugs before the larvae are infective. Deer picked up these land gastropods accidentally while feeding on herbs and grasses close to the ground. The larval worms are released from the tissue of the snail and penetrate the true stomach (abomasum). From there they migrate to the spinal cord and penetrate the nerve tissue where they mature. After about 90 days, they finally emerge from the spinal cord and spend the rest of their lives between the membranes (meninges) covering the brain. In this location they can reach a length of almost 9 cm! Virtually all deer in the east (but not western North America) have this

worm and amazingly, none show any sign of disease. This was all new to science and very exciting, but more importantly, this knowledge led Roy to formulate an even more productive hypothesis.

Interest in moose was growing with the publication of Randolph Peterson's book in 1955 and studies of moose and moose management by Douglas Pimlott at U. of T. and other researchers in eastern Canada. As well, there were renewed questions about an unexplained neurologic disease of moose in the Maritimes and Minnesota and its possible link to moose population declines. Roy knew of other nematodes like *P. tenuis* (in rats of the South Pacific and cattle of China and Korea) that matured in the central nervous system of their "normal host" without causing disease but became pathogenic when transmitted to unfamiliar hosts (like humans and horses). He suspected that *P. tenuis* of white-tails might behave this way if it had the opportunity to infect moose, an abnormal host. Opportunities to do so increased as deer numbers grew in the early 1900s in response to low-snow winters and extensive cutting of mature conifer forests. Increased densities of deer brought with them a parasite with which moose had no prior experience. His suspicions about *P. tenuis* were reinforced when he plotted known cases of moose sickness on a map and discovered that they occurred only where the ranges of moose and deer overlapped. And conversely, cases did not occur, for example, in moose in Newfoundland, on Anticosti Island, or Isle Royale, where deer were absent. His hypothesis was put to the test by experimentally infecting 2 moose calves with larvae of the meningeal worm from deer. Interestingly, these calves were obtained from the Chapleau District of northern Ontario with the assistance of Mr. Vince Crichton Sr., father of the Moose Call Editor. Both calves developed the classical signs of staggers, hind-quarter weakness and paresis typical of moose sickness. These experimental findings were quickly confirmed by Roy and others who found *P. tenuis* in the spinal cords and brains of wild moose showing similar disease signs. Finally, more than 50 years after the first reports of moose sickness, the causative agent had been identified.

It was perhaps fitting that Roy shared his discovery with moose biologists at the North American Moose Conference, convened that year as the 1st International Symposium on Moose Ecology, Quebec City, in 1974. His presentation followed immediately after the keynote address given by Dr. Randolph Peterson. At subsequent annual moose conferences, Roy extended his ideas about the possible role of moose sickness in the decline of moose populations over parts of their range in eastern North America and speculated that *P. tenuis* might similarly limit the present day distribution of caribou and elk which he also demonstrated experimentally to be susceptible to infection. Despite his enthusiasm for these ideas, Roy Anderson was a careful scientist and meticulous writer who spent his career teaching students that even the most imaginative hypothesis, no matter how logical and how well it seemed to explain things, ultimately has to be tested and "proved" by experimentation. Roy was not a field biologist and not really in a position to be able to do this. In fact, he didn't see his first infected sick moose alive in the wild until traveling in northern Minnesota with Bill Peterson and myself in 1995. Although Anderson popularized the idea that *P. tenuis* might have caused historical moose population declines and limited the eastward distribution of other cervids, he continually urged field parasitologists to prove it. This difficult task has been undertaken by a few of us, including several hard working graduate students. We've made progress and now have a much improved understanding of the field biology of the parasite and it's pathogenicity in moose, but a definitive measure of the impact of meningeal worm awaits the use of new tools such as

the newly developed blood test for *P. tenuis* infection in moose.

Although Roy was undoubtedly best known among North American wildlife biologists for discovering the cause of moose sickness, his other research and academic contributions were also remarkable. Beginning with his Ph.D. work in Algonquin Park, Ontario, on *Ornithofilaria fallisensis* of waterfowl, he developed a life-long interest in the spirurid nematodes, particularly the filarioids and the acuarioids. His original contributions to our understanding of the taxonomy, systematics, and transmission of these and related groups earned him an international reputation among nematologists and parasitologists.

Roy was born (April 26, 1926) in Camrose, Alberta, Canada, a small community on the prairies. Here he grew up with an appreciation of the environment and the wildlife that inhabited it. While in high school, Roy became an avid "birder" under the tutelage of Frank L. Farley and learned to recognize birds by sight and by sound. He indulged this hobby throughout his life. On graduating from high school, Roy entered the Navy and served during World War II in communications on a Corvette. After the war, he married Phyllis, had two sons, Douglas and Michel, and enrolled in the Biology program at the University of Alberta. Upon graduation (1950), he went to the University of Toronto as a graduate student studying under Dr. A. Murray Fallis and received his M.Sc. (1952) and the Ph.D. (1956). This was followed by post-doctoral studies with Basil Goodey at the Rothamsted Experimental Station, UK, with J.J.C. Buckley at the London School of Hygiene and Tropical Medicine, and with Professor Alain Chabaud at the College de France, Paris. Roy returned to Canada becoming a member of the staff of the Ontario Research Foundation (1958). In 1965 he was appointed Professor of Invertebrate Zoology at the then fledgling University of Guelph and served as Chair of Zoology (1979-1989) and as Acting Dean of the College of Biological Science (1971 and 1977-78). He remained in the Department until retirement in 1991 and continued as University Professor Emeritus, working daily in the office on books and manuscripts.

Roy's ease with writing, which he tirelessly tried to impart to his students, produced an outstanding legacy of published research. He was the sole or co-author, or main advisor, of 269 peer-reviewed scientific papers. Included in these were descriptions of 81 new species and 8 new genera. The 10 volume C.I.H. keys to the Nematodes (edited with Drs. A. Chabaud and S. Wilmot) set a new standard for nematode classification. He also authored or co-authored 11 chapters in books and 5 books, including his beloved Nematode Parasites of Vertebrates - Their Development and Transmission (CABI Publishing). The 2nd edition of this classic work appeared in spring of 2000 and includes all species of parasitic nematodes of which something is known of their development and transmission (almost 600 spp. and 3,200 references).

Dr. Anderson was a strong supporter of the Canadian Society of Zoologists. He served as its 2nd and 1st Vice-Presidents and President (1975-76). He Chaired the Parasitology Section (1982-83) and Nominating Committee (1978-79), was convener of the annual meeting at the University of Guelph (1975), and on the organizing committee for ICOPA V, Toronto (1982). Roy was the Parasitology Section's Wardle Medalist (1988), received Honourary Membership in the Section (1998), and recently was made an Honourary Member of the Society (2001). Almost as a right of passage for the 14 M.Sc. and 15 Ph.D. students he trained was the expectation that each would become a Society member and present a paper at an annual meeting of the CSZ.

Service to other professional societies included executive positions in the American Society of Parasitologists (Vice-President 1977-78) and the Wildlife Disease Association (President 1981-1983) as well as membership in

numerous committees. He served as Associate Editor, Canadian Journal of Zoology (1968-78); Assistant Editor, Journal of Parasitology (USA) (1968-72); Editor-in Chief for The Classification of the Nematode Parasites of Vertebrates, Commonwealth Agricultural Bureaux (1972-1984); Co-editor, Systematic Parasitology (1978-2001); and on the Editorial Boards of Annales de Parasitologie Humaine et Comparée, Paris (1989-94), Proceedings of the Helminthological Society of Washington (1984-2001), Folia Parasitologia, Prague (1986-96), Helminthological Abstracts, Series A (1988-2001), and CABI Publishing.

Awards for his contributions to parasitology and the training of students included the Henry Baldwin Ward Medal, American Society of Parasitologists (1968); Sigma Xi Award for Excellence in Research, Guelph Chapter (1973); Distinguished Service Award (1978) and Emeritus Member (1993), Wildlife Disease Association; Robert Arnold Wardle Award/Medal, Canadian Society of Zoologists (1988); Mentor Award, American Society of Parasitologists (1997); and Director's Award and Lifetime Member, Friends of Algonquin Park, Ontario (1992). No greater tribute can be bestowed by peers on a parasitologist than to have their name assigned to a valid new species; Dr. Anderson has had a total of 14 species and 2 genera named in his honour.

Regrettably, Roy's untimely death (a young 75) prevented the North American Moose Group from formally recognizing his contributions to our knowledge of moose diseases and for his role in training several generations of Fish and Wildlife students at the University of Guelph. Nonetheless, many will have fond memories of hearing one of Roy's presentations at an annual Moose Conference, enjoying his company on post-conference field trips or simply calling him up on the spur of the moment for an opinion about some peculiar condition seen in a moose. Despite international fame in the academic world, Roy loved most of all to spend time with biologists whose knowledge stemmed from years of working in the field. Moose managers had his genuine respect. Fittingly, Roy's contributions to Canadian science are being commemorated by the the College of Biological Science, University of Guelph in establishing an annual lecture in parasitology named The Roy C. Anderson Memorial Lecture. On behalf of all of its members, the North American Moose Group was one of the first to make a financial contribution to this memorial. The endowed fund still has some growing to do and personal donations (tax-deductible) to The University of Guelph, Guelph, Ontario, Canada N1G 2W1, account # 801801 - "the Roy C. Anderson Memorial Lecture Series" are welcome. Contact pwoo@uoguelph.ca if you need clarification or more information on the lecture series.

Murray W. Lankester