

1. PROFILE of

Dr Bobby Scott

Bobby Scott, Ph.D. is a senior scientist in the Aerosol and Respiratory Dosimetry Program at Lovelace Respiratory Research Institute (LRRRI), Albuquerque, NM, USA. Dr. Scott was born in Minden, Louisiana, USA in December 1944 just 4 days before Christmas. He took interest in reading at a very young age and could always be found during the summer reading books in the shade of a giant pecan



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A Photo appeared in article by Megan Fleming in Fall 2010 issue of Breathe:

http://www.lrrri.org/downloads/Breathe_Magazine_Fall_10.pdf.

Permission granted by LRRRI for reprinting the photo

tree in the front yard of the family home, where he, his sister (Renetta), and mom (Ethel) lived. Passers-by often raised the question "why waste your time reading rather than engaging in manual [hard] work." Unfortunately work opportunities in the very small town were very limited during that period of time, pointing out the need for a good education.

While attending Webster High School in Minden he became quite interested in science, mathematics, music (school band), and art (oil painting and sketching) due in part to having excellent teachers. During his senior year, he was **winner of first prize** in a regional science fair for his rather complicated project that focused on *beta-radiation-induced mutations (abnormal phenotypes) in the progeny of fruit flies*. Science fair judges were quite surprised that during that early time (sixties) a high school student could carry out such a project. He was quite proud to have represented his graduating class as its valedictorian.

After starting colleague at Southern University, Baton Rouge, LA, USA, he became even more interested in mathematics and science (especially the physical sciences) and may have taken all of the advanced-level mathematics and physics courses available. While at Southern University he also took interest in Jazz Piano (self taught, starting in high school). He spent much of his spare time in one of the freely-available piano rooms in the Music Department building playing jazz (discouraged during that time but now highly encouraged by the University).

After graduating from Southern University with a B.S. Degree in physics in 1966, he entered graduate studies at the University of Illinois (Urbana Campus), initially in the Nuclear Engineering Program; he later switched to their physics program and received his M.S. Degree in physics in 1969. His Ph.D. thesis work was also conducted at the University of Illinois in the biophysics program under thesis advisor Professor Howard Ducoff. Professor Ducoff was one of the first investigators of radiation hormesis (insect studies) and is still actively following the developments in the field. The term, **radiation hormesis**, refers to the *beneficial effects of low-dose radiation (e.g., suppression of cancer)*. His thesis work initially presented some challenges in that it was theoretical, and it was carried out under an advisor

who was an experimentalist. However, this limitation was compensated for by having support from theoreticians then at the university (Eric Jakobsson and Heinz Von Foerster) and at Argonne National Laboratory (George Sacher and Sylvanus Tyler). The Ph.D. thesis was titled "*A Mechanistic State Vector Model for the Interaction of Ionizing Radiation with Cells*" and was typed by hand on a personal mechanical typewriter. Because the thesis involved many equations that employed Greek symbols, each symbol had to be hand-loaded when used and then replaced by hand with the next symbol used. Further, at that time, there were no personal computers and computations were achieved via first punching computer cards (boxed of cards with punched holes [code instructions]) that had to be delivered to a computing center on campus and read by a special device (card reader) in order to carry out the complex mathematical computations.

He performed his postdoctoral work at Argonne National Laboratory in a group (Janus Group) headed by Dr. E. John Ainsworth. "**JANUS**" [after a Roman mythology god] was the name of the reactor used to expose cells and animals to mixed neutron and gamma-ray fields. Many animal studies were being carried out at Argonne and one of Dr. Scott's first challenges was to predict the future work loads (monthly) for the pathology staff that was responsible for necropsy in the numerous studies involving whole-body irradiation of animals. Using data exploratory analysis methods and empirical functions, prediction of future work loads (based on the expected mortality rate) were made and by the end of the 2-year postdoctoral stay at Argonne, the numbers of animals that came to necropsy monthly were scattered along the curve predicted by Dr. Scott. The success of his prediction gave him confidence in being able to model radiobiological response data and make predictions of potential future occurrences (e.g., for the consequences of a nuclear accident).

Dr. Scott's first challenge after being hired at Lovelace Respiratory Research Institute (then the Inhalation Toxicology Research Institute (ITRI)) in 1977 was to develop models that predicted the casualties (lethality and morbidity) in the event of a nuclear power plant accident such as occurred at Chernobyl. Fortunately, there were abundant data (published and unpublished, animal and human) on lethality and morbidity effects of ionizing radiation. Also, there were abundant in-house data at ITRI on the biological effects of radionuclides on different mammalian species. These data were used along with exploratory analysis methods to develop risk models for lethality and morbidity from complex exposures from radionuclides as a result of a nuclear accident. The complex exposures could involve external beta and gamma radiation as well as internal (inhalation, ingestion, wound entry) exposure to alpha, beta, and gamma radiations. An especially challenging task was to be able to address the influence of the combined exposure to alpha, beta, and gamma rays and also the complex dose rate patterns (increasing over time, decreasing over time, or both). The challenge was met and led to numerous publications and to the development by others of computer codes to implement Dr. Scott's models. The codes are used internationally for assessing the health consequences of radiological incidents. His risk model for deterministic radiation effects played a key role in assessing the intake of Polonium-210 by Mr. Alexander Litvinenko during the poisoning incident in London in November 2006.

Dr. Scott along with scientists at the Southern Urals Biophysics Institute in Ozyorsk, Russia also conducted research on stochastic and deterministic radiation effects among Mayak Facility workers chronically exposed to gamma and alpha (from Plutonium-239) radiation.

More recently his research has focused on the beneficial effects (radiation adaptive response/hormesis) of low radiation doses. A 5-year research project supported by the U.S. Department of Energy Office of Science (BER) was recently initiated with the aim of

elucidating the biological basis for radiation adaptive responses (hormesis) in the lung. The new project is discussed in an article by Megan Fleming titled "Researching the Highs and Lows of Radiation" that appears in the Fall 2010 Issue of *Breathe*. A video of his presentation titled "**Radiation Hormesis and Life—Mild Radiation Stress Makes You Stronger**" is available at the following link:

<http://dspace.lrrri.org:8080/xmlui/handle/123456789/891>

Other presentations given by Dr. Scott over the years are also available at the following link: <http://www.radiation-scott.org>.

For his major contributions to the area of dose-response research, Dr. Scott received the **International Dose-Response Society 2008 award** for *Outstanding Leadership in the Field of Dose-Response*. A podcast of his expert commentary presented at the society's 2010 meeting is available at the following link (click on Bobby Scott):

<http://www.dose-response.org/conference/2010/videos.htm>

Dr. Scott is especially proud of his two daughters (Robin and Renee) who are both involved in the medical field and of his granddaughter (Kaylah). He attributes his success to the strong support of the LRRRI directorate, scientific and other staff, colleagues around the world, and family.



Bobby Scott (*left*) receiving the 2008 **International Dose-Response Society (IDRS) Award** for *Outstanding Leadership in the Field of Dose-Response* from **Edward (Ed) Calabrese**, Director of the IDRS (*right*):
<http://www.dose-response.org/conference/2008/awards.htm>