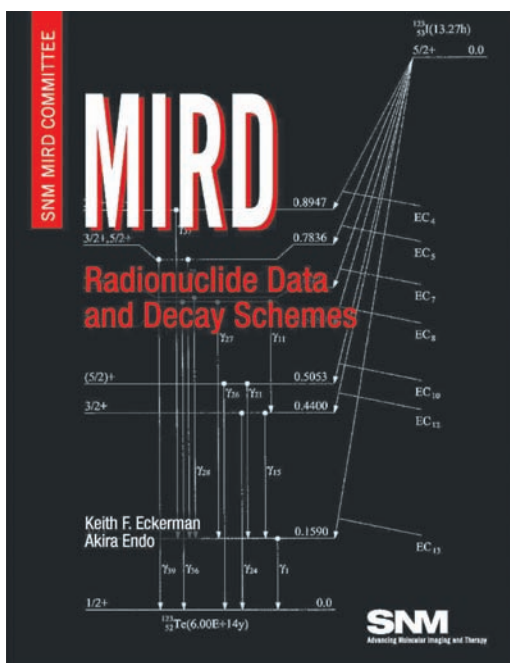


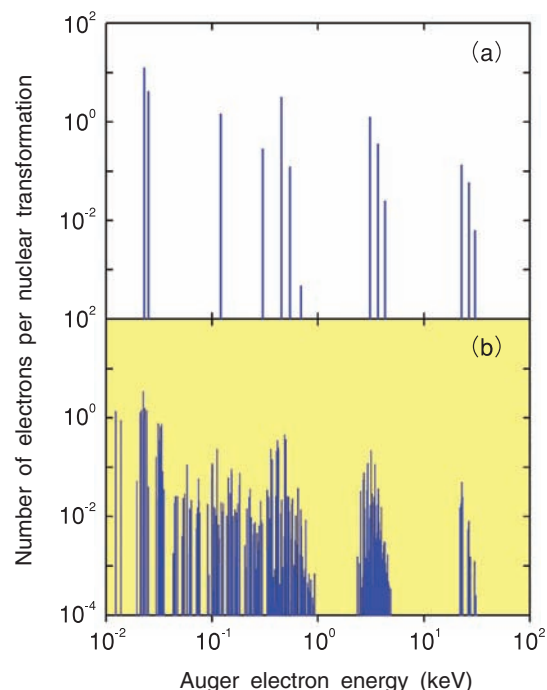
## 7-5 Advancement of Nuclear Medicine Dosimetry –Development of a Radionuclide Database Applicable to Microdosimetry in Subcellular Dimensions–



**Fig.7-10 Radionuclide data book**  
“MIRD: Radionuclide Data and Decay Schemes, 2nd Edition” published by the Society of Nuclear Medicine (Reprinted by permission of the Society of Nuclear Medicine)

Nuclear medicine has been widely used as a safe and painless technique to diagnose and treat disease using small amounts of radiopharmaceuticals labeled with  $^{99m}\text{Tc}$ ,  $^{125}\text{I}$ ,  $^{67}\text{Ga}$ , and so on. In diagnostic and therapeutic nuclear medicine, radiation dose to patients from radiopharmaceuticals is evaluated to perform appropriate examination while avoiding unsafe radiation exposure. We have updated a radionuclide data book entitled “MIRD: Radionuclide Data and Decay Schemes” (published in 1989) used for nuclear medicine dosimetry and have completed its Second Edition (Fig.7-10) with the cooperation of the Medical Internal Radiation Dose (MIRD) Committee of the Society of Nuclear Medicine (SNM), a leading organization in nuclear medicine research.

In the Second Edition, the data of Auger electrons emitted from radiopharmaceuticals have been enhanced so that microdoses can be calculated. Several radionuclides used as radiopharmaceuticals decay by electron capture and/or internal conversion and emit a number of low-energy Auger electrons



**Fig.7-11 Improvement of resolution of Auger electron spectrum of  $^{125}\text{I}$**   
(a) First Edition (b) Second Edition

as a consequence of these decay processes. These low-energy Auger electrons deposit their energy over ranges with subcellular dimensions ( $\text{nm} \sim \mu\text{m}$ ) in the human body and cause severe biological damage by DNA strand break. To evaluate DNA damage, we have developed a computer code EDISTR04 which calculates detailed spectra of Auger electrons emitted from all radiopharmaceuticals by electron capture and internal conversion (Fig.7-11). Using this code, we have developed a database concerning 333 radionuclides for radiation dosimetry calculation. These radionuclides include the 242 nuclides addressed in the First Edition and an additional 91 nuclides for future use in nuclear medicine.

Radiation dosimetry methods and related data developed by SNM comprise the standard methods used in the field of nuclear medicine. This new radionuclide database also will be used for radiation dosimetry to improve and develop diagnostic and therapeutic methods in nuclear medicine.

### Reference

Eckerman, K. F., Endo, A., MIRD: Radionuclide Data and Decay Schemes, 2nd Edition, The Society of Nuclear Medicine, 2008, 671p.