were themselves in a state of motion. Figure 3 shows DuMond with his apparatus. This instrument, composed of a complex assembly of crystals, recorded data on photographic plates. In turn, the exposure of these plates was measured by a microphotometer; figs. 4 and 5 show samples of the resulting spectra. Classically the experiments of DuMond and collaborators could be interpreted to yield the velocity distribution of the electrons in atoms. Figures 4 and 5 show that the dynamic width of the 'scattered' line increases with scattering angle and incident wavelength, respectively, as can easily be computed from the nature of the process.

DuMond initially analysed his scattering experiments by assuming that the electrons moved in classical Bohr orbits around the nucleus. In that case Compton scattering is simply modified by the Doppler shifts produced by the motion of the struck particle. Quantum mechanically, one must analyse modified Compton scattering by describing the momentum distribution of the extranuclear electrons on a probabilisitic basis, without talking about actual orbits. Both types of analysis give

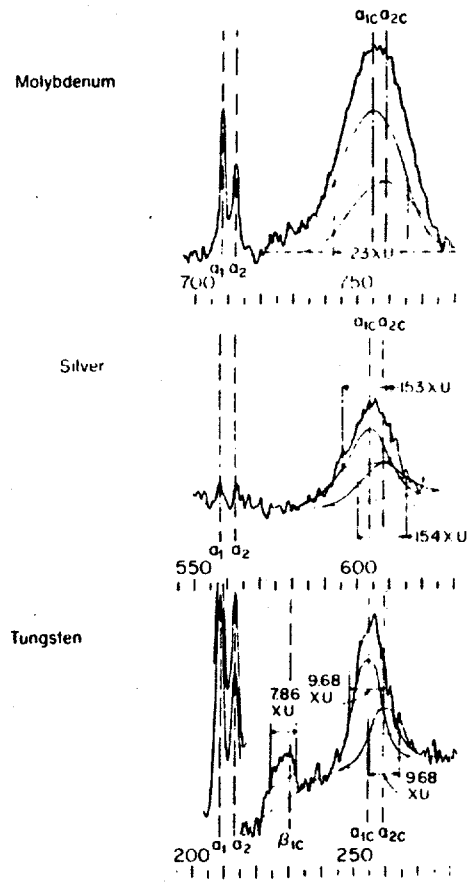


Fig. 5. Microphotometer traces of photographic spectra obtained in the multi-crystal spectrometer of DuMond and Kirkpatrick. The spectra show both the unmodified and Compton-shifted $K_{\alpha_1}$ and $K_{\alpha_2}$ lines of molybdenum, silver and tungsten, respectively, scattered at a fixed angle from graphite. Note that the shorter is the wavelength, the narrower the scattered line. Note also that the central Compton shift at fixed angle is independent of the incident wavelength. (The scales are graduated in ~~eV~~.)

X.U, defined in Fig. 4