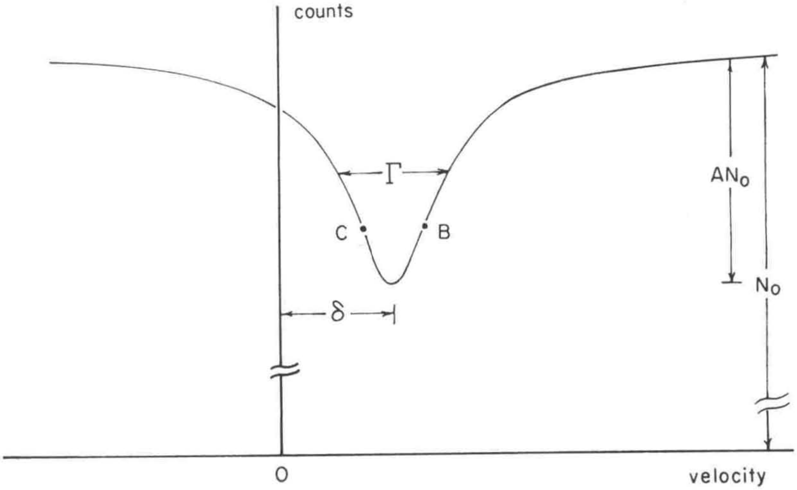

Figure 13. Analytical parameters to be considered.

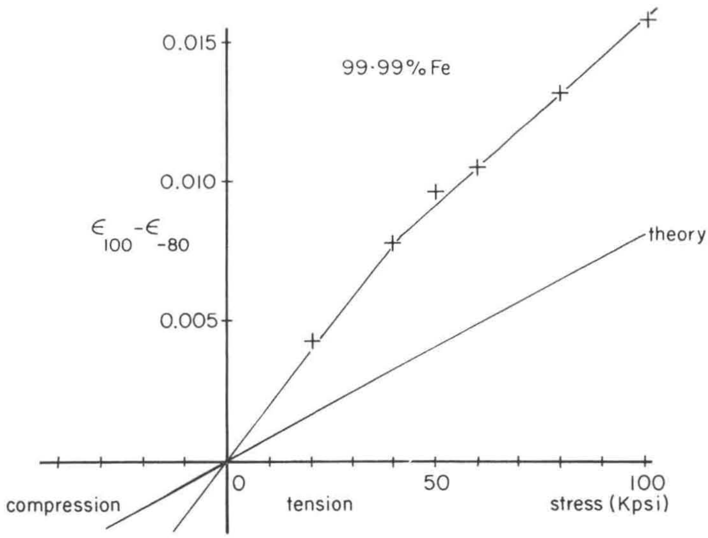

Figure 14. Relative count rates vs stress, ferrite.

Unexpectedly, the plot is not a simple straight line. The theoretical line is also indicated. This theoretical sensitivity requires a knowledge of the parameters A, $\Gamma/2$, and $\mathrm{d}x/\mathrm{d}T$. These were determined for the source and absorber as follows:

Absorber Temperature	Γ, mm/s	dx	A
- 80 C	0.270	+ 0.0528 mm/s	.186
25 C	0.251	0	.185
100 C	0.274	- 0.0400 mm/s	.173

The " theory " line is derived as follows, assuming $\delta = 0$ (source and absorber lattices identical):

$$N(x) = N_0\left(1 - \frac{A}{1+\left(\frac{x-\delta}{\Gamma/2}\right)^2}\right)$$

$$\epsilon_T = \frac{\mathrm{d}N_T}{N_0} = \frac{A\cdot 2\cdot\frac{x_T}{\Gamma/2}\frac{1}{\Gamma/2}\,\mathrm{d}x}{\left[1+\left(\frac{x}{\Gamma/2}\right)^2\right]^2}$$

$$\mathrm{d}x = -0.0000565\ \text{mm/s/K psi}^2$$

$$\epsilon_{100} = \frac{0.173\cdot 2\cdot\frac{0.0400}{0.274/2}\frac{2}{0.274}\cdot\mathrm{d}x}{\left[1+\left(\frac{0.0400}{0.274/2}\right)^2\right]^2}$$

$$= 0.0000350/\text{k psi}$$

$$\epsilon_{-80} = -0.0000461/\text{k psi}$$

Note that $x = x(T)$, but that dx is the response to stress.

The net result of several runs at 100 °C is shown in Fig. 15 and the break seems to always be there. It is always pleasant to find that Mother Nature *can* be generous, with greater sensitivity than expected at the low end of this scale.

A carbon steel foil, 99.9% Fe, 0.001 × 1.00 in. was also examined (i.e., a 1010 steel). The results are quite different, as is shown in Fig. 16. Note, however, that the ϵ_T value at which the foil breaks is nominally the same in both foils. Interesting!