The constant k_i will depend on the conditions and may depend on the concentration of a different species of molecules. The fraction of the molecules which will then have been inverted in the time τ is $(1 - e^{-k_i\tau})$. Now, let us choose τ as the mean time that the example can persist without dying, while part but not all of the interacting molecules are inverted. Then, if n molecules must invert for the example to be stabilized in its new form, the chance that this will happen in the time τ is

$$P_i = \prod_{i=1}^{n} (1 - e^{-k_i\tau})$$

If the average time back to the origin of life for this example is t, then this experiment has been performed t/τ times, and the chance that the example has changed to a new optical form is

$$P_i = \frac{t}{\tau}\prod_{i=1}^{n} (1 - e^{-k_i\tau}) \tag{4}$$

When $k_i\tau$ is small compared with 1, we can write

$$\prod_{i=1}^{n} (1 - e^{-k_i\tau}) = \prod_{i=1}^{n} k_i\tau$$

We then have

$$\bar{k}_i\tau = \left(\prod_{i=1}^{n} k_i\tau\right)^{1/n} = \left(P_i\frac{\tau}{t}\right)^{1/n} \quad \text{or} \quad \bar{k}_i = \frac{1}{\tau}\left(P_i\frac{\tau}{t}\right)^{1/n} \tag{5}$$

For illustration we may put the following crude estimate into this formula: If t be estimated at a billion years and τ be taken as 1/10th year, and P_i be set at 10^{-6}, then k_i in reciprocal seconds becomes

$$\bar{k}_i = (3.16 \times 10^{-6})^{-16/n} = 3.2 \times 10^{-(7+(16/n))}$$

Walden inversions with rate constants in the range covered by all possible integral values of n can probably be found. If $k_i\tau$ is not small compared with unity, equation 4 must be used. This treatment shows what the factors are which insure that any life process will continue to maintain the optical isomers with which it began even though individual molecules have a considerable chance of inversion. Thus, this type of stability arises from the fact that life processes involve coöperative interaction between a number of processes, each catalyzed by optically active molecules, and from the fact that a system with part of these molecules inverted has a short life, τ.

However effective the first enzyme molecule was which started a life process, it was eventually destroyed, and the process continued only because this molecule was replaced. Complicated enzyme molecules do not owe either their origin or their perpetuation to thermodynamic stability. Rather they have what we may call kinetic stability. A lake fed and emptied by rivers illustrates kinetic stability, whereas the ocean possesses absolute or thermodynamic stability. A virus or gene or enzyme has the property of giving rise to identically similar