Consider a rigid body $B$ undergoing three dimensional motion as shown in the diagram below. $R$ and $S$ represent two reference frames that are rotating relative to each other. The angular velocity of the body $B$ relative to the reference frame $R$ ($^R\omega_B$) may be found by using the summation rule for angular velocities to work through the intermediate reference frame $S$ as follows

\[
^R\omega_B = ^S\omega_B + ^R\omega_S
\]

Here, $^S\omega_B$ represent the angular velocity of $B$ relative to the reference frame $S$, and $^R\omega_S$ represents the angular velocity of frame $S$ relative to $R$.

Consider next the body $B$ in the the diagram below. Here, there are three reference frames, $R$, $S$, and $T$, all rotating relative to each other. In this case, $^R\omega_B$ the angular velocity of $B$ relative to $R$ may be found using the summation rule for angular velocities to work through the intermediate frames $S$ and $T$ as follows

\[
^R\omega_B = ^T\omega_B + ^R\omega_T
= ^T\omega_B + ^S\omega_T + ^R\omega_S
\]

In fact, this rule may be extended to as many frames as necessary.

The summation rule may be used to compute the angular velocity of a body (undergoing three-dimensional motion) by introducing a set of reference frames whose relative angular motions may be described using simple angular velocities. Then, the angular velocity of the body is found by summing the simple angular velocities.

**Note:** There is no corresponding summation rule for angular accelerations. The angular acceleration of a body is found by direct differentiation of the angular velocity vector. That is, $^R\alpha_B = \frac{d}{dt}(^R\omega_B)$. 