A few examples of theories (according to Matt Ayres)
Notice that all have the general structure of having a modest number of postulates (often about 5), which, if true, permit some statements about nature that are more general than any of the postulates by themselves ("Therefore, ..."). Theories do not have to be true, just logical.

1. **PHENOLOGICAL RACE HYPOTHESIS** (Ayres 1993)

   **Postulates**
   - $P_1$: Mature leaves are of lower nutritional quality for insect herbivores than immature leaves.
   - $P_2$: Insects have lower survival and fecundity when they eat leaves of lower nutritional quality.
   - $P_3$: Insect development rate is temperature-dependent.
   - $P_4$: Leaf maturation rate is temperature-dependent.
   - $P_5$: Insect development and leaf maturation have different temperature responses.

   **Therefore**, insect herbivores that feed in the spring are engaged in a developmental race with their host plants. Depending on the temperatures, the insects or the leaves might complete development first. Insect abundance tends to increase when they win the developmental race.

2. **LIEBIG’S LAW OF THE MINIMUM**

   **Postulates**
   - $P_1$: Plant growth requires many different resources (e.g., H2O, sunlight, N, P, K, CO2)
   - $P_2$: The relative availability of different essential resources may vary dramatically from site to site and year to year
   - $P_3$: Each resource fills unique physiological needs of the plant
   - $P_4$: One resource cannot be substituted for another.

   **Therefore**, plant growth is limited by the one resource that is least available relative to physiological needs of the plant. However, the limiting resource can vary depending upon the environment.


   **Postulates**
   - $P_1$: Plants will allocate resources towards growth until water, nutrients, or carbohydrates limit further growth
   - $P_2$: Tissue growth is negatively associated with tissue differentiation because:
     1. They compete for the same pool of carbohydrates
     2. Differentiation processes require mature intracellular architecture
   - $P_3$: Sink-limited plants tend to be differentiation-dominated; source-limited plants tend to be growth-dominated
   - $P_4$: Differentiation dominated plants have relatively high allocation to secondary metabolism

   **Therefore**, plant growth tends to be inversely related to defense. Water or nutrient limitations tend to increase plant defenses, even as they constrain plant growth.
4. A THEORY OF ANTHROPOGENIC CLIMATE CHANGE

Postulates
P1: Atmospheric concentrations of CO2 are increasing.
P2: Anthropogenic combustion of fossil fuels account for the increases in CO2.
P3: CO2 is permeable to shortwave radiation (e.g., incoming sunlight) but tends to reflect longwave radiation (e.g., radiant heat from the surface of the earth). That is, CO2 is a greenhouse gas.
P4: Realistic simulations of atmospheric dynamics, ocean current systems, and global energy flux indicate that the increases in CO2 will lead to meaningful climate warming and significant alterations of precipitation patterns.
P5: The attributes of individuals, populations, communities, and ecosystems will change as a result of projected alterations in temperature, precipitation, CO2, and cloud cover.

Therefore, human combustion of fossil fuels is altering the planetary ecosystem, and a continuation of current patterns in human energy use will have global impacts (probably some of them deleterious) on biodiversity, agriculture, forestry, recreation, water supplies, ocean levels, disease, economics, urban geography, and other aspects of human society.

5. THEORY OF EVOLUTION BY NATURAL SELECTION (DARWIN 1859)

Postulates
P1: All populations have potential for exponential growth
P2: Resources are limited therefore not all individuals survive and reproduce
P3: Individuals within a population vary
P4: Some variable traits have a heritable basis
P5: Some heritable traits are linked to fitness

Therefore natural selection occurs and the fit of organisms to their environment tends to improve.

6. FICK’S LAW OF DIFFUSION

\[ R = D \cdot A \cdot \frac{\Delta p}{d} \]

Where:
\( R = \) Rate of diffusion (moles / sec)
\( D = \) Diffusion constant; value depends upon material through which diffusion is occuring (cm² / sec)
\( A = \) Area across which diffusion is occuring (cm²)
\( \Delta p = \) Difference in partial pressures or concentration across diffusion surface (mm Hg or moles / cm³)
\( d = \) Distance a molecule must travel to reach the area of lower concentration; e.g., membrane thickness (μm)

Therefore, the effect of \( D, A, \Delta p, \) and \( d \) on diffusion of \( O_2 \) is as described by the equation, which permits understanding of the adaptations of organisms for oxygen acquisition.