In the respiratory chain, the NADH and FADH2 that was accumulated in the preceding degradative pathways is finally disposed of by reacting it with molecular oxygen. The free energy of this “cold combustion” is used to generate ATP. The amount of ATP generated in the respiratory chain far exceeds the modest quantities produced in the upstream pathways; this is the reason why only aerobic metabolism enables us to sustain physical exertion for extended periods of time.

The workings of the respiratory chain are quite different from all other pathways in human metabolism. Each of those other pathways consists of a succession of discrete enzymatic reactions. Inasmuch as these pathways contribute to the production ATP, the energy is always passed from one energy-rich bond to the next, with a newly created phosphoanhydride bond in ATP as the final recipient. In contrast, the respiratory chain combines chemical reactions with physical forces that are not pinned down to individual molecules, and the energy is stored and converted in novel ways.