Petroleum, coal, and natural gas have accounted for about 80% of the energy production in the United States since their introduction in about 1900. As you learn to name these compounds, you should also remind yourself that there are large societal issues that surround hydrocarbons, in particular. Taking millions of years to produce, the reserves of petroleum are nonrenewable. Our rate of removal of petroleum from the earth, measured in seconds and minutes, far (far, far) exceeds its rate of replacement, measured in eons. And although quadrillions of BTUs of energy per year comes from combustion of these compounds, most of these carbon atoms end up as carbon dioxide, resulting in a change to our global atmosphere that, in turn, affects the global climate.

Thinking about alternatives to using fossil fuels and reducing the amount of carbon dioxide released from human industriousness is an ongoing concern in the 21st century. Solving the "carbon footprint" problem is an active area of research in many fields, and certainly no less so in chemistry, where every academic department includes many faculty members who are working in areas of "energy" and "sustainability."

A2.1 Acyclic Saturated Hydrocarbons

A. Longest Carbon Chain (Root Name)

As explained above, "hydrocarbon" means what the name says: a compound composed of only carbon and hydrogen. "Acyclic" means that there are no rings, and "saturated" means that there are only single bonds. As covered in detail in Chapter 1.4C, acyclic saturated hydrocarbons with uncharged and closed shell atoms all have a C_nH_{2n+2} molecular formula. Organic hydrocarbons with no **rings** or **multiple** bonds are classified as **acyclic** alkanes.

The names of the first four acyclic, straight-chain alkanes are methane (CH_4), ethane (CH_3CH_3), propane ($CH_3CH_2CH_3$), and butane ($CH_3CH_2CH_2CH_3$). These historical names are permitted under IUPAC rules. The systematic nomenclature of the other members of the series is based on a prefix that counts the number of carbon atoms in the chain, followed by the suffix "ane." The prefixes come from Greek or Latin words for the numbers. The names of the first twenty straight-chain alkanes are shown in Figure AP0202. These names are used in naming all other types of organic compounds derived from alkanes, so you should learn them.

Figure AP0202

Straight-chain alkanes (C_1–C_{20}).

CH_4	methane	$CH_3(CH_2)_9CH_3$	undecane
CH_3CH_3	ethane	$CH_3(CH_2)_{10}CH_3$	dodecane
$CH_3CH_2CH_3$	propane	$CH_3(CH_2)_{11}CH_3$	tridecane
$CH_3(CH_2)_2CH_3$	butane	$CH_3(CH_2)_{12}CH_3$	tetradecane
$CH_3(CH_2)_3CH_3$	pentane	$CH_3(CH_2)_{13}CH_3$	pentadecane
$CH_3(CH_2)_4CH_3$	hexane	$CH_3(CH_2)_{14}CH_3$	hexadecane
$CH_3(CH_2)_5CH_3$	heptane	$CH_3(CH_2)_{15}CH_3$	heptadecane
$CH_3(CH_2)_6CH_3$	octane	$CH_3(CH_2)_{16}CH_3$	octadecane
$CH_3(CH_2)_7CH_3$	nonane	$CH_3(CH_2)_{17}CH_3$	nonadecane
$CH_3(CH_2)_8CH_3$	decane	$CH_3(CH_2)_{18}CH_3$	eicosane