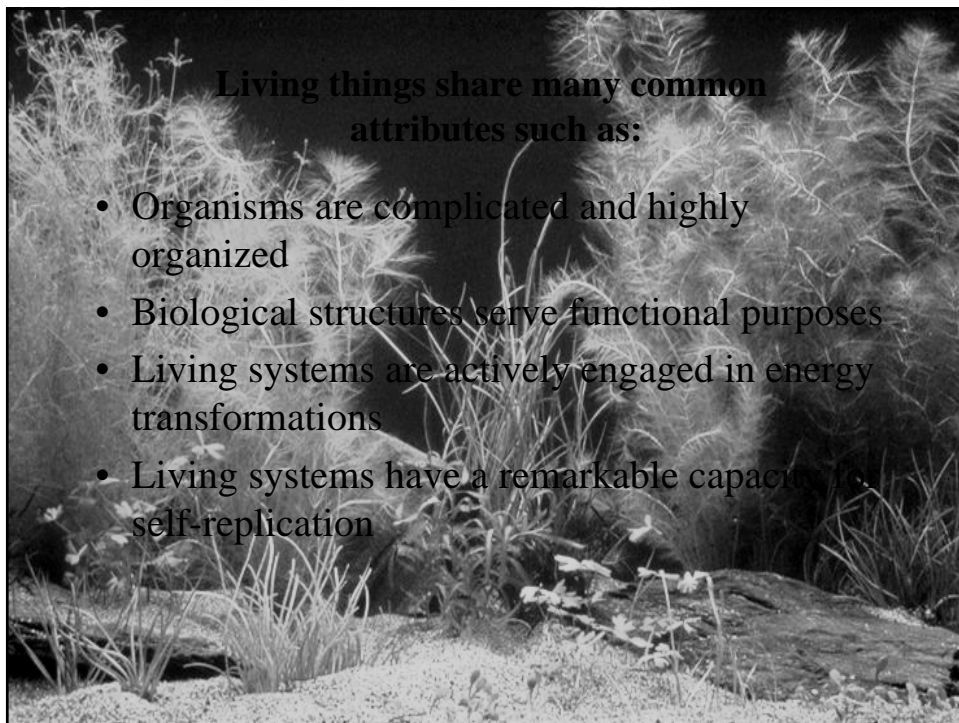
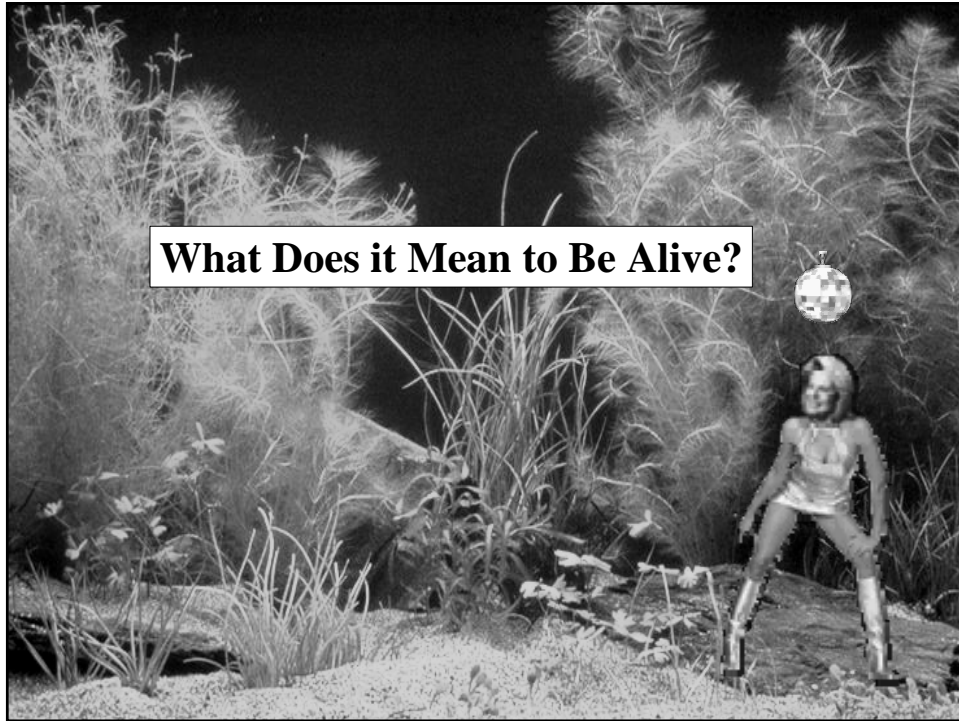


PRINCIPLES OF BIOCHEMISTRY

The Name Game

- 1. What is your name?**
- 2. Where are you from?**
- 3. What is your major?**
- 4. Why are you taking this class?**
- 5. What are your future plans?**
- 6. What is your favorite movie?**
- 7. What is something that most people would not know about you?**



A living organism may not share all of these traits.



A mule is alive, but it cannot reproduce.

**Therefore, it is impossible to define
life in a precise manner.**

What elements are mostly found in living organisms?

IA																	0						
1 H 1.008																	2 He 4.003						
3 Li 6.941	4 Be 9.012															5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18		
11 Na 22.99	12 Mg 24.31	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95																
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80						
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3						
55 Cs 132.9	56 Ba 137.3	57* La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)						
87 Fr (223)	88 Ra (226)	89** Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (264)	108 Hs (265)	109 Mt (268)	110 (269)	111 (272)	112 (277)	113 (285)	114 (289)	115 (289)	116 (293)	117 (293)	118 (293)						
58* Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0										
90** Th 232.0	91 Pa 231	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)										

Biomolecules are the Molecules of Life

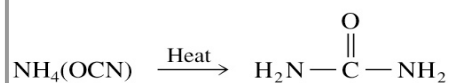
H, O, C and N make up 99+% of atoms in the human body

<u>ELEMENT</u>	<u>PERCENTAGE</u>
Oxygen	63
Hydrogen	25.2
Carbon	9.5
Nitrogen	1.4

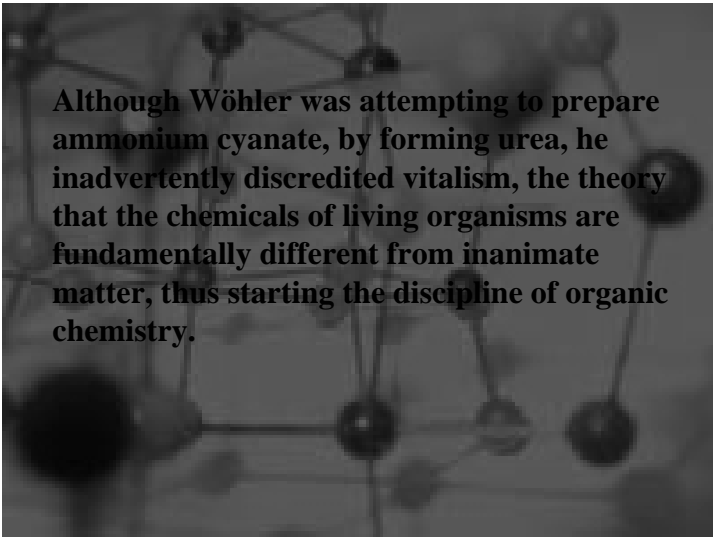
Do all the compounds that make up living organisms come from biological origin (organic compounds) rather than from a mineral origin (inorganic compounds)?



Friedrich Wöhler



- **Urea was synthesized by heating the inorganic compound ammonium cyanate (1828)**
- **This showed that compounds found exclusively in living organisms could be synthesized from common inorganic substances**



Although Wöhler was attempting to prepare ammonium cyanate, by forming urea, he inadvertently discredited vitalism, the theory that the chemicals of living organisms are fundamentally different from inanimate matter, thus starting the discipline of organic chemistry.

Biomolecules: The Molecules of Life

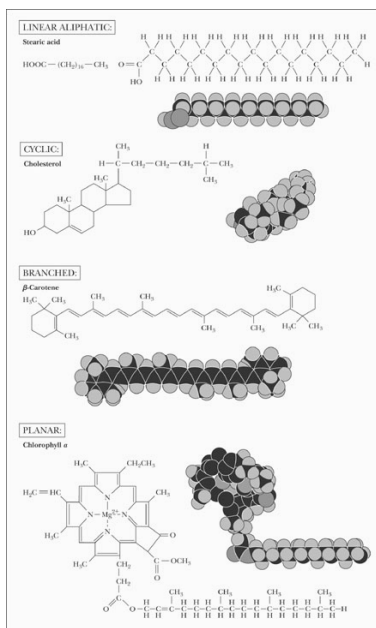
- What property unites H, O, C and N and renders these atoms so appropriate to the chemistry of life?
- Answer: Their ability to form covalent bonds by electron-pair sharing.

Biomolecules: The Molecules of Life

What are the bond energies of covalent bonds?

<u>Bond</u>	<u>Energy kJ/mol</u>
H-H	436
C-H	414
C-C	343
C-O	351

Figure 1.7
Examples of the versatility of C—C bonds in building complex structures: linear aliphatic, cyclic, branched, and planar.



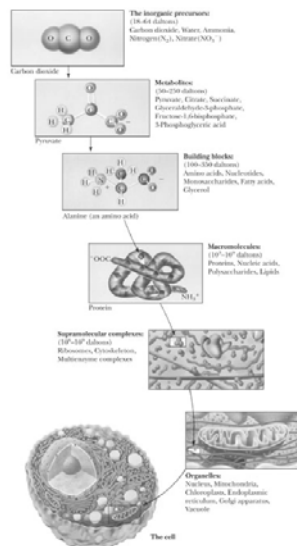
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A Biomolecular Hierarchy

Simple Molecules are the Units for Building Complex Structures

- Metabolites and Macromolecules
- Organelles
- Membranes
- The Unit of Life is the Cell

Figure 1.8
Molecular organization
in the cell is a hierarchy.



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