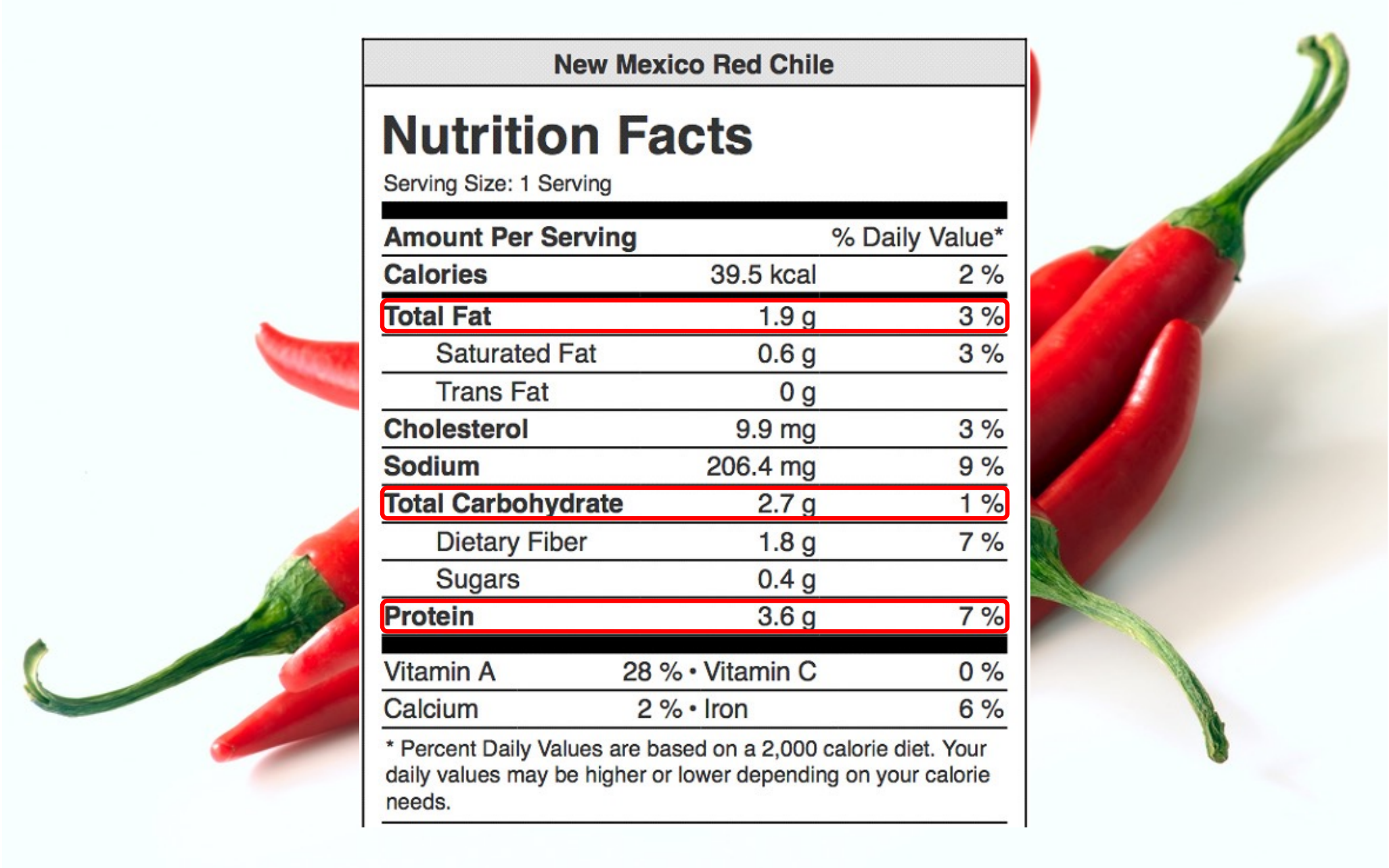
Nutrition



New Mexico Red Chile

Nutrition Facts

Serving Size: 1 Serving

Amount Per Serving		% Daily Value*
Calories	39.5 kcal	2 %
Total Fat	1.9 g	3 %
Saturated Fat	0.6 g	3 %
Trans Fat	0 g	
Cholesterol	9.9 mg	3 %
Sodium	206.4 mg	9 %
Total Carbohydrate	2.7 g	1 %
Dietary Fiber	1.8 g	7 %
Sugars	0.4 g	
Protein	3.6 g	7 %

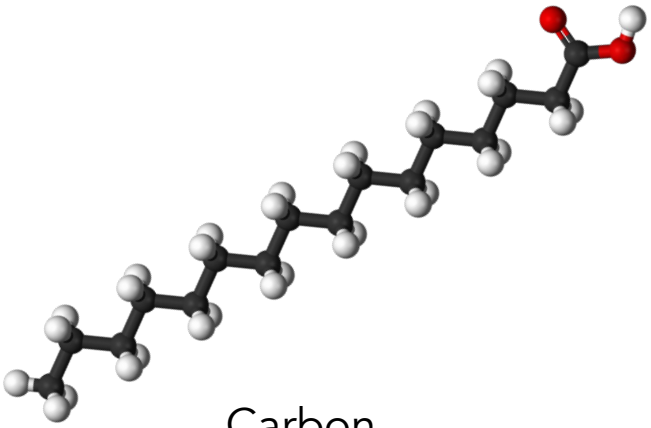
Vitamin A	28 % • Vitamin C	0 %
Calcium	2 % • Iron	6 %

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Macromolecules

Fats
Fatty Acids
Cholesterol

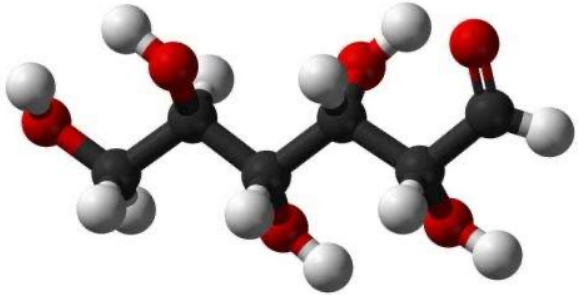
Ex: Palmitic Acid



Carbon
Oxygen
Hydrogen

Carbohydrates
Sugars
Starches
Cellulose

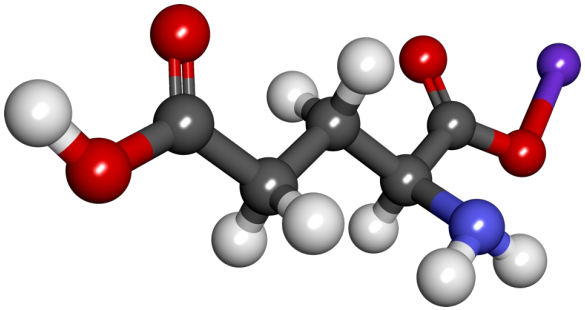
Ex: Glucose



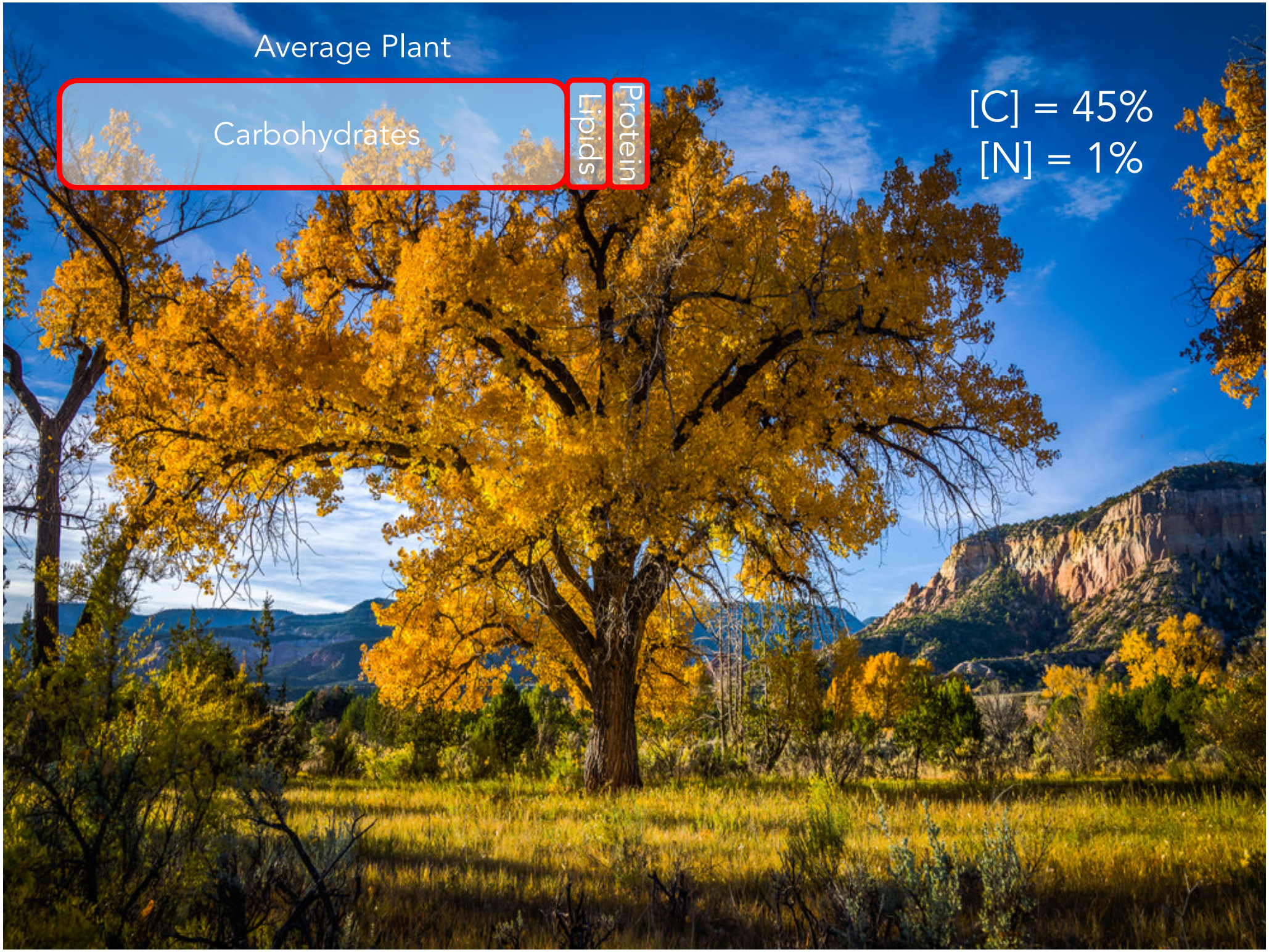
Carbon
Oxygen
Hydrogen

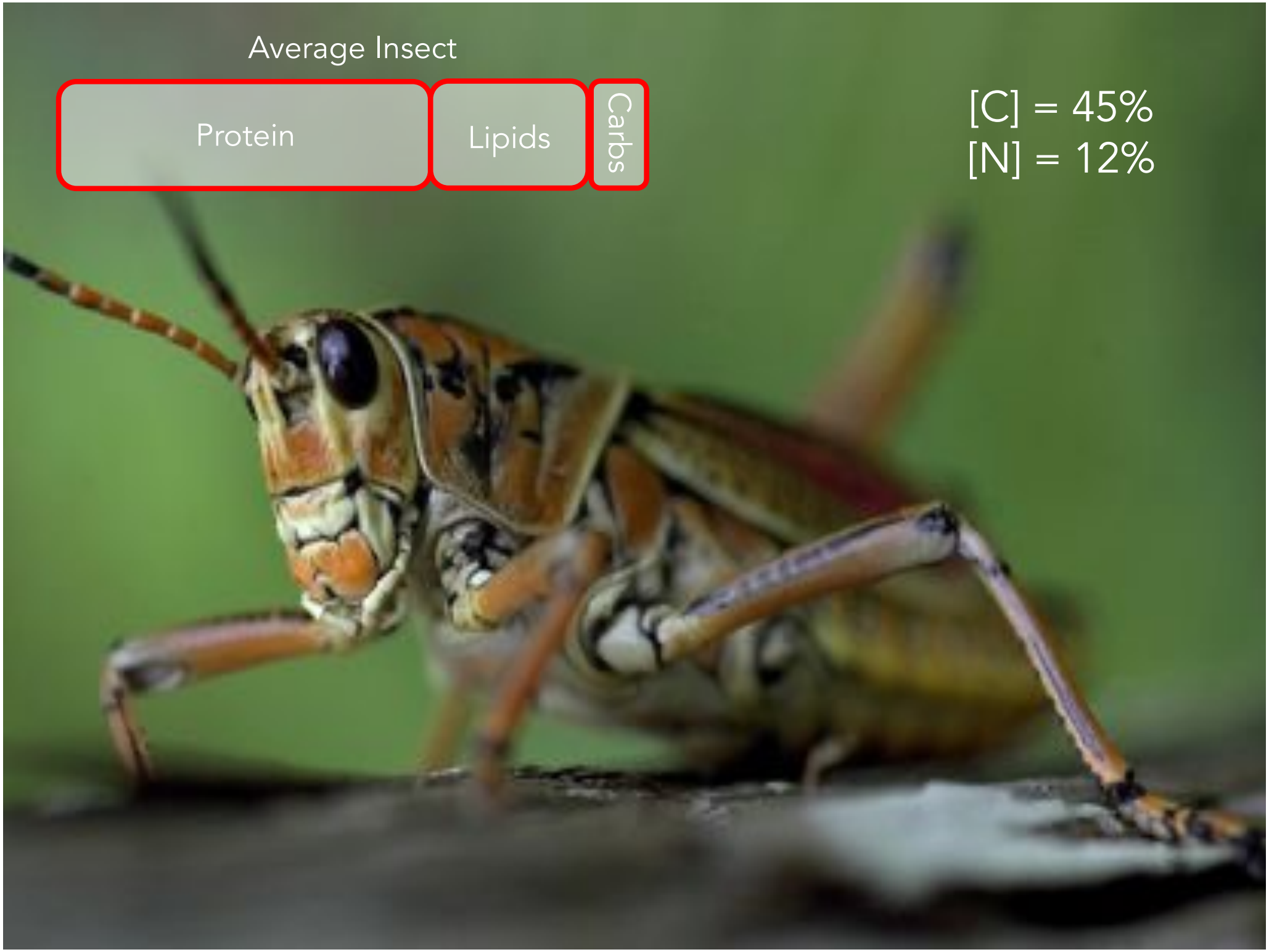
Proteins
Amino Acids

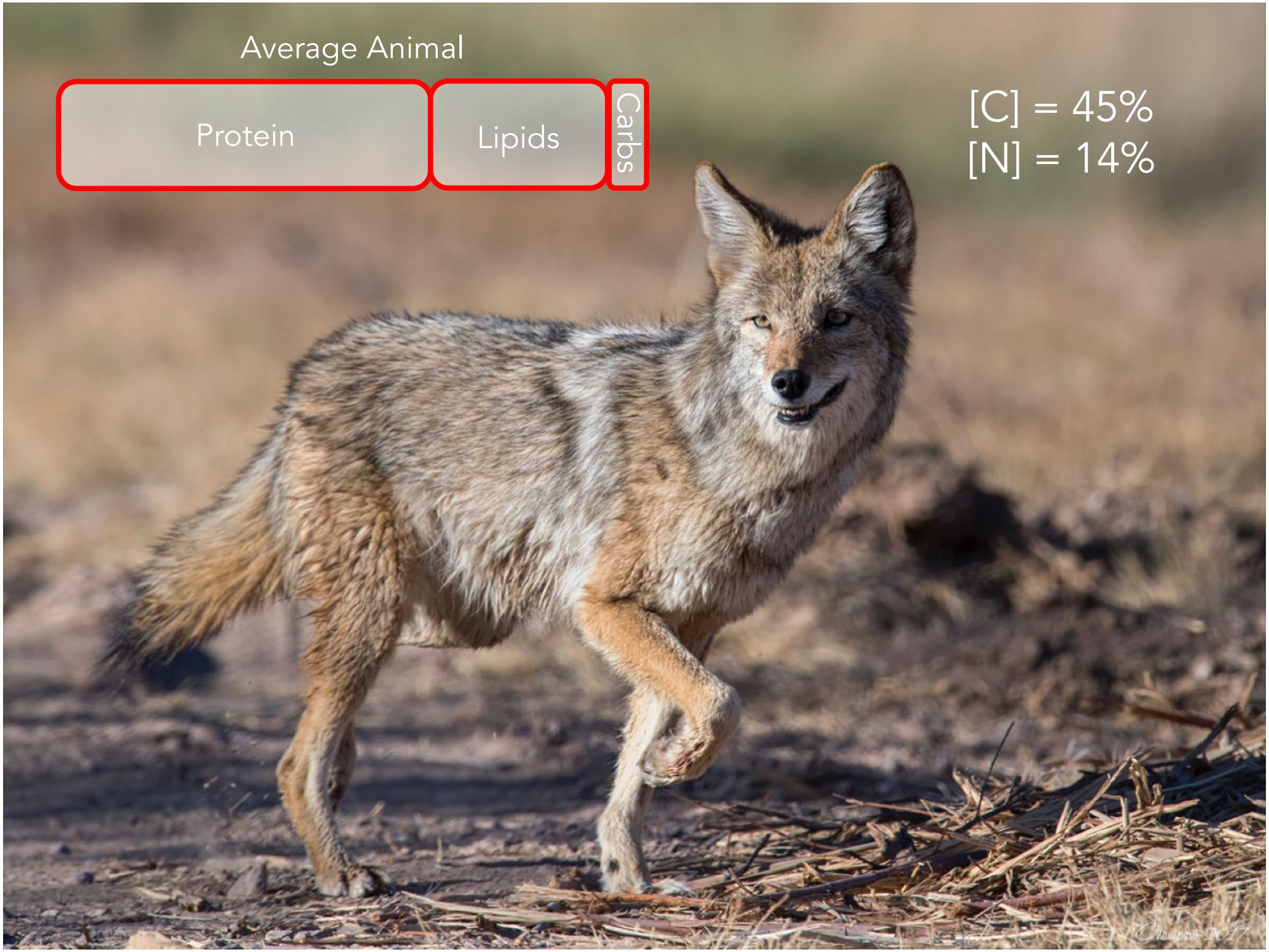
Ex: Glutamate

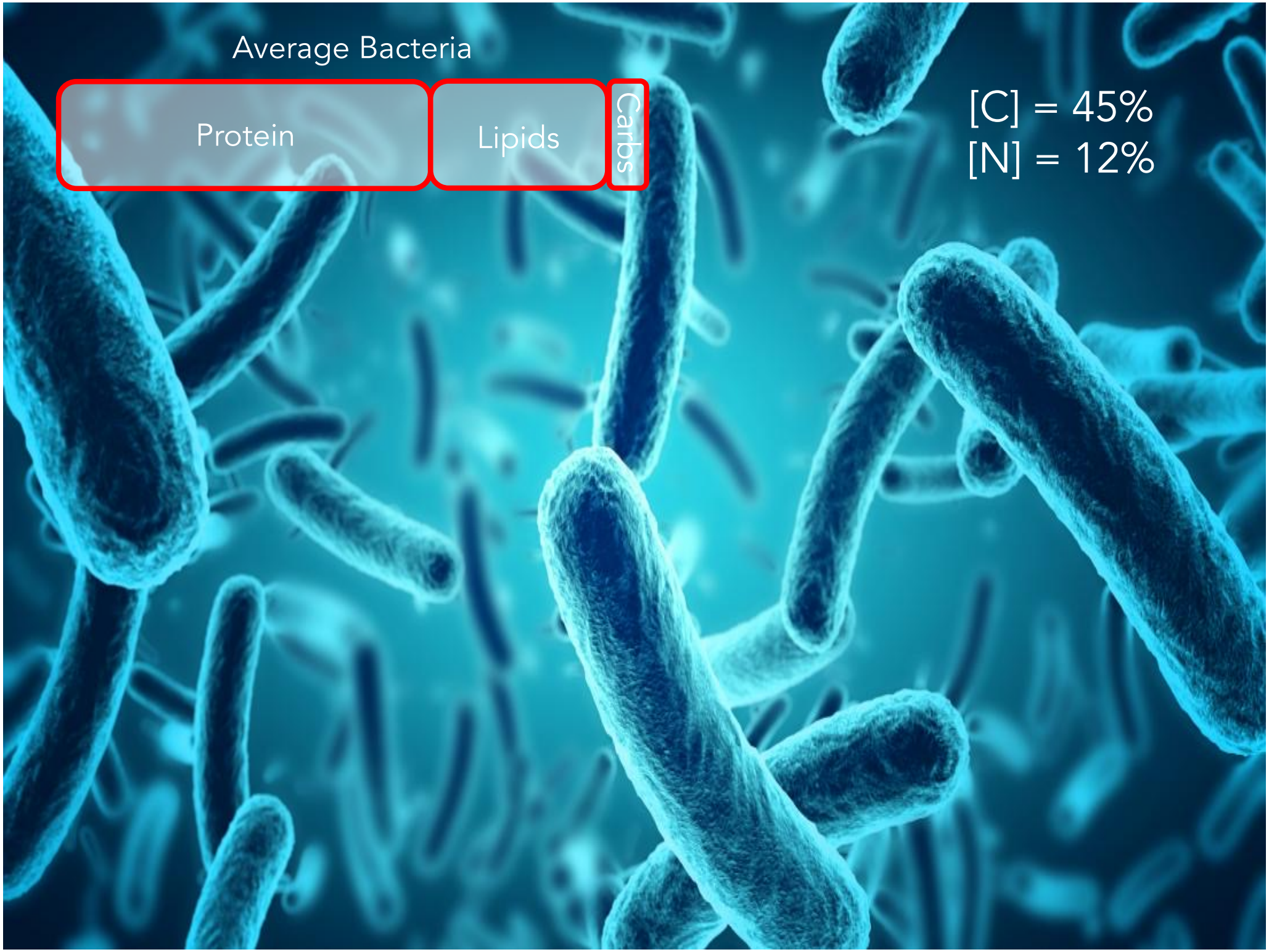


Carbon
Oxygen
Hydrogen
Nitrogen


Average Plant
Carbohydrates
Lipids
Protein
[C] = 45%
[N] = 1%


Average Insect
Protein
Lipids
Carbs
[C] = 45%
[N] = 12%


Average Animal
Protein
Lipids
Carbs
[C] = 45%
[N] = 14%


Average Bacteria
Protein
Lipids
Carbs
[C] = 45%
[N] = 12%

Periodic Table of the Elements

Main groups												Main groups					
1 1A	2 2A											13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1 H 1.00794																	2 He 4.00260
3 Li 6.941	4 Be 9.01218											5 B 10.81	6 C 12.011	7 N 14.0067	8 O 15.9994	9 F 18.998403	10 Ne 20.1797
11 Na 22.98977	12 Mg 24.305	3 3B	4 4B	5 5B	6 6B	7 7B	8	9 8B	10	11 1B	12 2B	13 Al 26.98154	14 Si 28.0855	15 P 30.97376	16 S 32.066	17 Cl 35.453	18 Ar 39.948
19 K 39.0983	20 Ca 40.078	21 Sc 44.9559	22 Ti 47.88	23 V 50.9415	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.69	29 Cu 63.546	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.4678	38 Sr 87.62	39 Y 88.9059	40 Zr 91.224	41 Nb 92.9064	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.9055	46 Pd 106.42	47 Ag 107.8682	48 Cd 112.41	49 In 114.82	50 Sn 118.710	51 Sb 121.757	52 Te 127.60	53 I 126.9045	54 Xe 131.29
55 Cs 132.9054	56 Ba 137.33	57 *La 138.9055	72 Hf 178.49	73 Ta 180.9479	74 W 183.85	75 Re 186.207	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.9665	80 Hg 200.59	81 Tl 204.383	82 Pb 207.2	83 Bi 208.9804	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.0254	89 †Ac 227.0278	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (264)	108 Hs (269)	109 Mt (268)	110 (271)	111 (272)	112 (277)		114 (289)		116 (289)		118 (293)

Transition metals

*Lanthanide series	58 Ce 140.12	59 Pr 140.9077	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.9254	66 Dy 162.50	67 Ho 164.9304	68 Er 167.26	69 Tm 168.9342	70 Yb 173.04	71 Lu 174.967
†Actinide series	90 Th 232.0381	91 Pa 231.0359	92 U 238.0289	93 Np 237.048	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)

Stable Isotopes of H, C, N, O

Measuring Isotopes: Little (δ) Notation

Means of expressing the *relative* abundance of the heavier stable isotope in a mixture of atoms.

R = molar ratio of heavy-to-light isotopes of an element

R for carbon isotopes = $^{13}C/^{12}C$

$$\delta = \left(\frac{R_{sample}}{R_{standard}} - 1 \right) \times 1000$$

$$\delta^{13}C = \left(\frac{[^{13}C/^{12}C]_{sample}}{[^{13}C/^{12}C]_{standard}} - 1 \right) \times 1000$$

Units of δ are "‰" or "per mil"

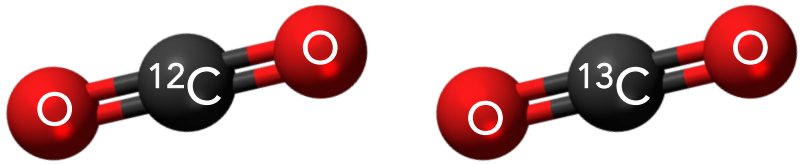
International Reference Standards

Acronym	Standard Name	Isotopes	$R_{heavy/Light}$
V-SMOW	Vienna Standard Mean Ocean Water	$^{2}H/^{1}H$	0.00015576
V-SMOW	Vienna Standard Mean Ocean Water	$^{18}O/^{16}O$	0.00200520
V-PDB	Vienna Pee Dee Belemnite	$^{13}C/^{12}C$	0.0112372
Air	Atmospheric Air	$^{15}N/^{14}N$	0.0036765

International reference standards (by definition) have a value of 0‰ on the δ-scale of interest.

Isotopic Fractionation: Some Basics

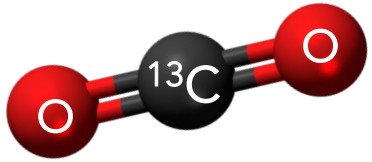
Isotopes of the same element undergo the same chemical reactions
(because isotopes have same number of protons and electrons)



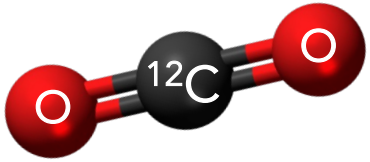
But isotopes have **different thermodynamic properties**
because they have different masses.
(melting point, vapor pressure, diffusion coefficient, reaction rate constants)

Thus, different isotopes react at different **rates** in chemical reactions

(Wait Up!)



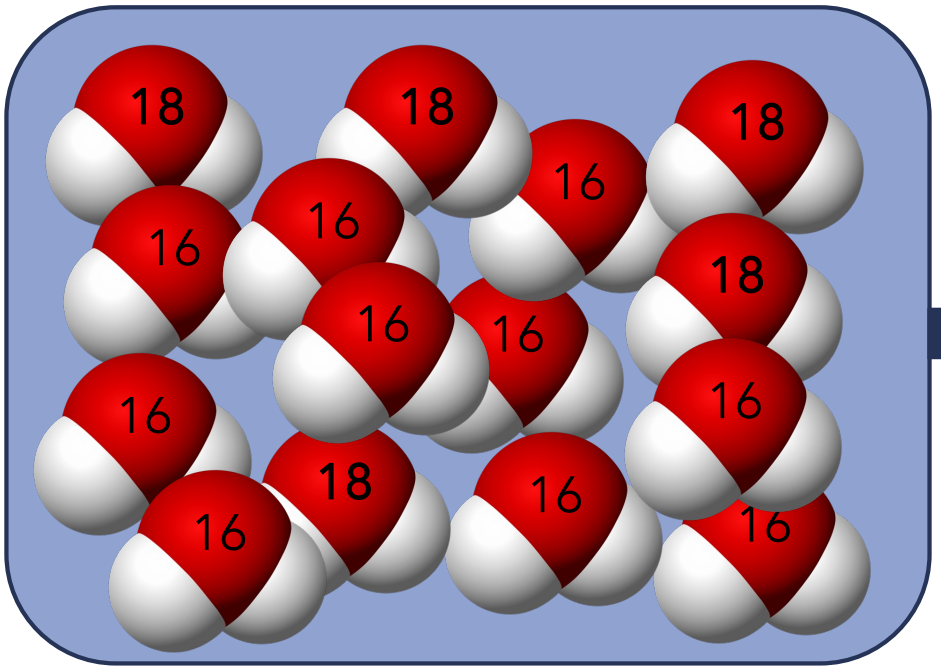
(Follow Me!)



This leads to isotopic sorting (**fractionation**).

Isotopic Fractionation: Lighter Goes Faster

Reactant (A)



Product (B)

$\frac{^{18}O}{^{16}O} = \frac{5}{10}$

5/15 = 33%

$\frac{^{18}O}{^{16}O} = \frac{4}{6}$

4/10 = 40%

$\frac{^{18}O}{^{16}O} = \frac{1}{4}$

1/5 = 20%

Process that occurs during chemical reactions resulting in abundance of heavy isotopes in the **reactant (A)** being different from the abundances of the heavy isotopes in the **product (B)**