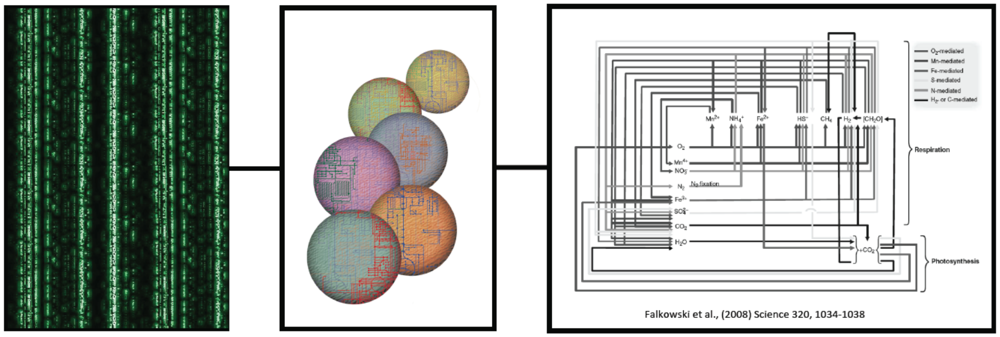


Biological Information | Community Metabolism | Ecosystem Function

- *"The regulation of the pools and fluxes in biogeochemical cycles have their origins in the genetic inventory of individual microbes, and the regulation of these genes within the organism is determined by the environment. As such, one can look at the microbial food web as a collection of genomes whose expression and replication is coordinated through complex feedback loops at the organismal, population, and ecosystem level."* Chisholm

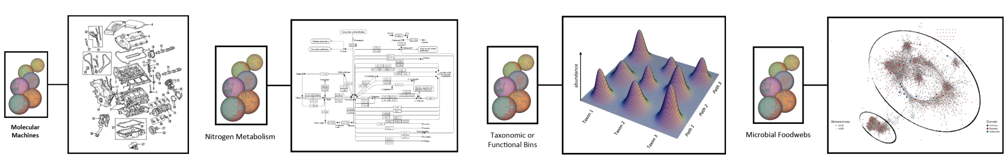
$$G_m = \sum_{i=1}^{l} n_i G_i$$

G_m = metagenome size in bases
l = number of genomes in sample
n_i = number of copies of genome G_i
G_i = size of any given genome in sample of l genomes

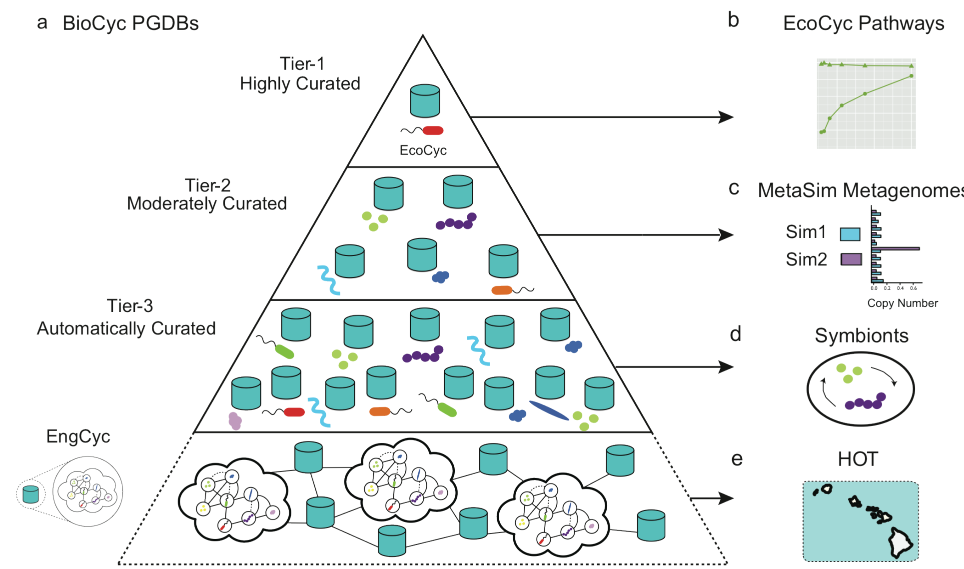
- In any given metagenome sample genotypes appear at different frequencies (evenness). Therefore a metagenome of size G_m composed of genomes of sizes G_i through G_k can be viewed as a sum of fractions where each component genome of size G_i constitutes a fraction of G_m:

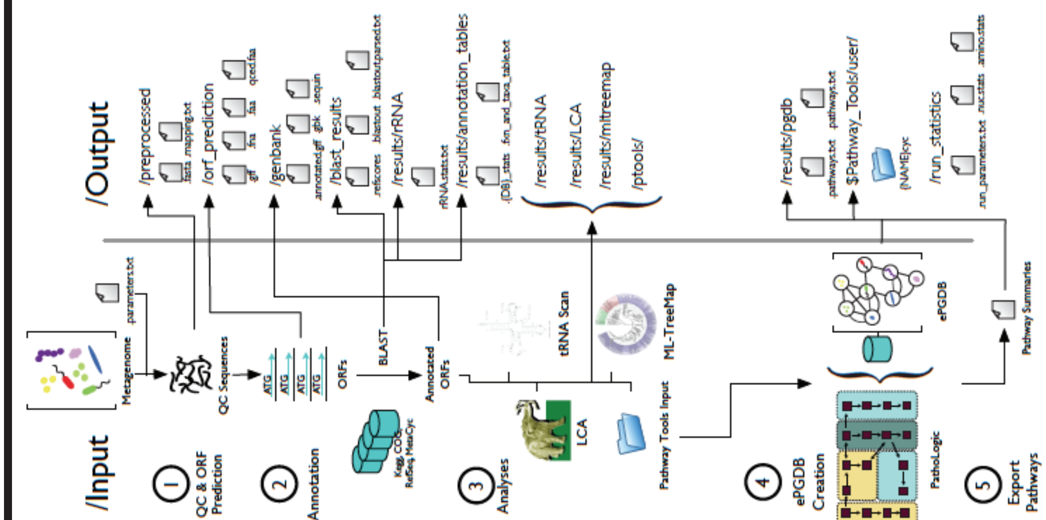
$$\hat{G}_m = p_1 G_m + p_2 G_m + \ldots + p_l G_m$$

Parts | Pathways | Panoramas | Networks



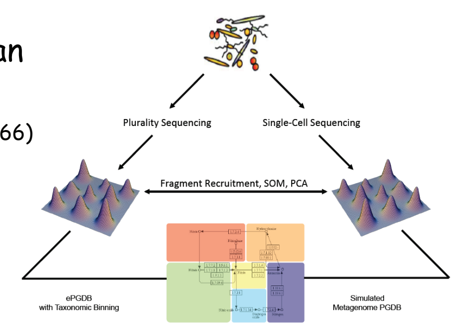
What does a metagenome look like?





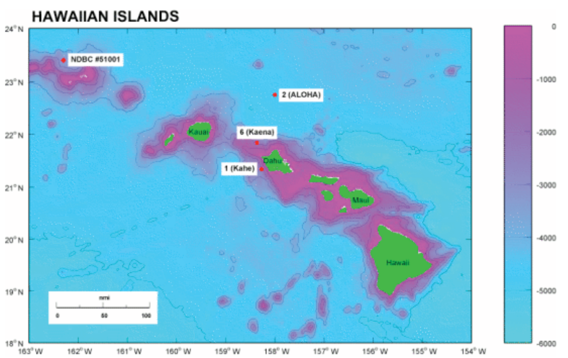
"If your only tool is a hammer than everything looks like a nail"

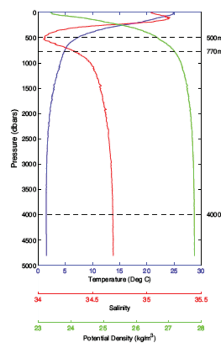
Maslow's Hammer (1966)

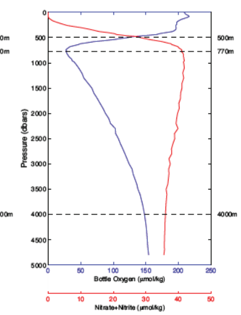


Foundational Questions

- *What is the taxonomic and functional structure of the ecosystem?*
- *How does this structure change in response to environmental perturbation?*
- *What are the ecological consequences of this change?*
- *What are relevant units of selection, conservation or utilization for ecological genomic resources?*







Depth (m)	Temp. (°C)	Salinity	Chl a (µg/kg)	Biomass* (µg/kg)	DOC (µmol/kg)	N + N (nmol/kg)	DIP (nmol/kg)	Oxygen (µmol/kg)	DIC (µmol/kg)
10	26.40 (24.83 ± 1.27) [2,104]	35.08 (35.05 ± 0.21) [1,611]	0.08 (0.08 ± 0.03) [320]	7.21 ± 2.68 [78]	78 (90.6 ± 14.3) [140]	1.0 (2.6 ± 3.7) [126]	41.0 (56.0 ± 33.7) [146]	204.6 (209.3 ± 4.5) [348]	1,967.6 (1,972.1 ± 16.4) [107]
70	24.93 (23.58 ± 1.00) [1,202]	35.21 (35.17 ± 0.16) [1,084]	0.18 (0.15 ± 0.05) [363]	8.51 ± 3.22 [86]	79 (81.4 ± 11.3) [79]	1.3 (14.7 ± 60.3) [78]	16.0 (43.1 ± 25.1) [104]	217.4 (215.8 ± 5.4) [144]	1,981.8 (1,986.9 ± 15.4) [84]
130	22.19 (21.37 ± 0.96) [1,139]	35.31 (35.20 ± 0.10) [980]	0.10 (0.15 ± 0.06) [350]	5.03 ± 2.30 [90]	69 (75.2 ± 9.1) [86]	284.8 (282.9 ± 270.2) [78]	66.2 (106.0 ± 49.7) [68]	204.9 (206.6 ± 6.2) [173]	2,026.5 (2,013.4 ± 13.4) [69]
200	18.53 (18.39 ± 1.29) [662]	35.04 (34.96 ± 0.18) [576]	0.02 (0.02 ± 0.02) [97]	1.66 ± 0.24 [2]	63 (64.0 ± 9.8) [113]	1,161.9 ± 762.5 [7]	274.2 ± 109.1 [84]	198.8 (197.6 ± 7.1) [190]	2,047.7 (2,042.8 ± 10.5) [125]
500	7.25 (7.22 ± 0.44) [1,969]	34.07 (34.06 ± 0.03) [1,769]	ND	0.48 ± 0.23 [107]	47 (47.8 ± 6.3) [112]	28,850 (28,460 ± 2210) [326]	2,153 (2,051 ± 175.7) [322]	118.0 (120.5 ± 18.3) [505]	2197.3 (2,200.2 ± 17.8) [134]
770	4.78 (4.86 ± 0.21) [888]	34.32 (34.32 ± 0.04) [773]	ND	0.29 ± 0.16 [107]	39.9 (41.5 ± 4.4) [34]	41,890 (40,940 ± 500) [137]	3,070 (3,000 ± 47.1) [135]	32.3 (27.9 ± 4.1) [275]	2323.8 (2,324.3 ± 6.1) [34]
4,000	1.46 (1.46 ± 0.01) [262]	34.69 (34.69 ± 0.00) [245]	ND	ND	37.5 (42.3 ± 4.9) [83]	36,560 (35,970 ± 290) [108]	2,558 (2,507 ± 19) [104]	147.8 (147.8 ± 1.3) [210]	2325.5 (2,329.1 ± 4.8) [28]