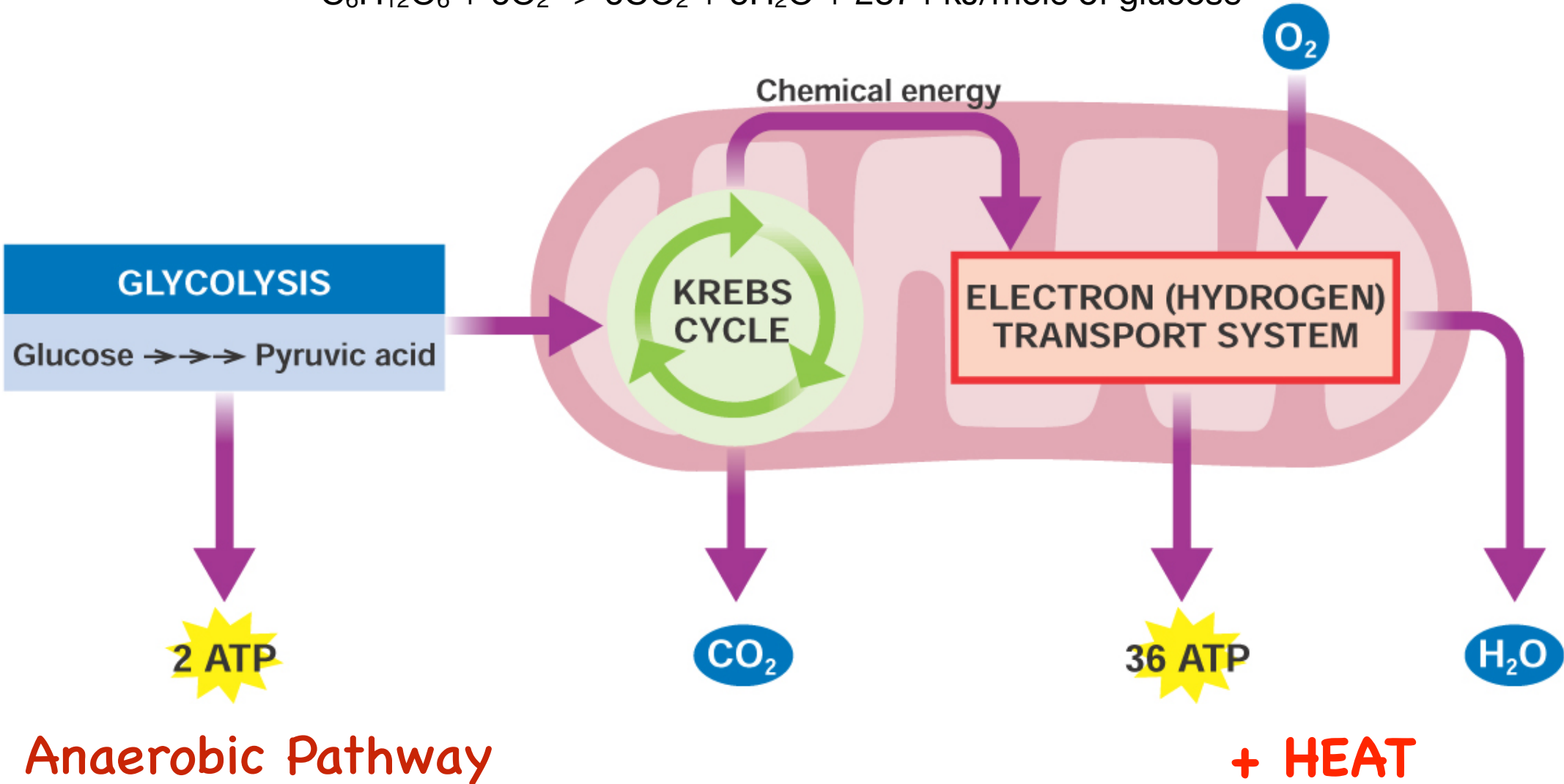
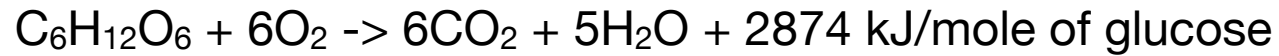


AEROBIC RESPIRATION -- SUMMARY

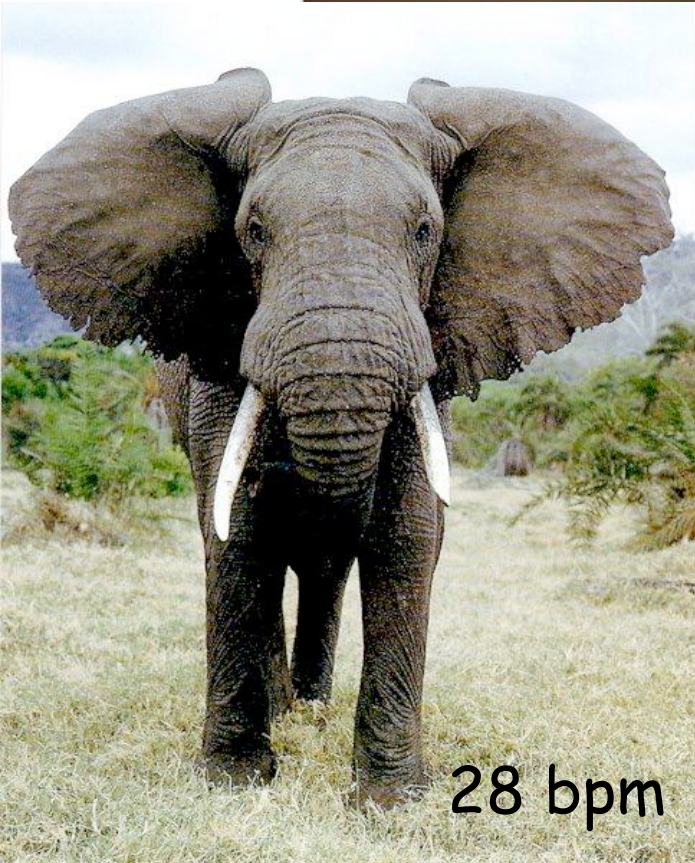




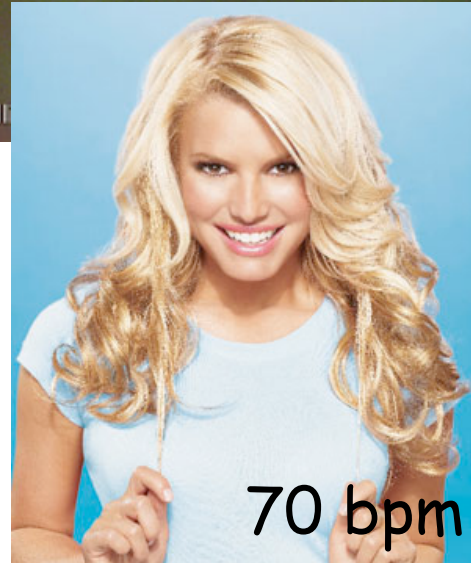
Live Fast Die Young?



1200 bpm



28 bpm



70 bpm



500 bpm

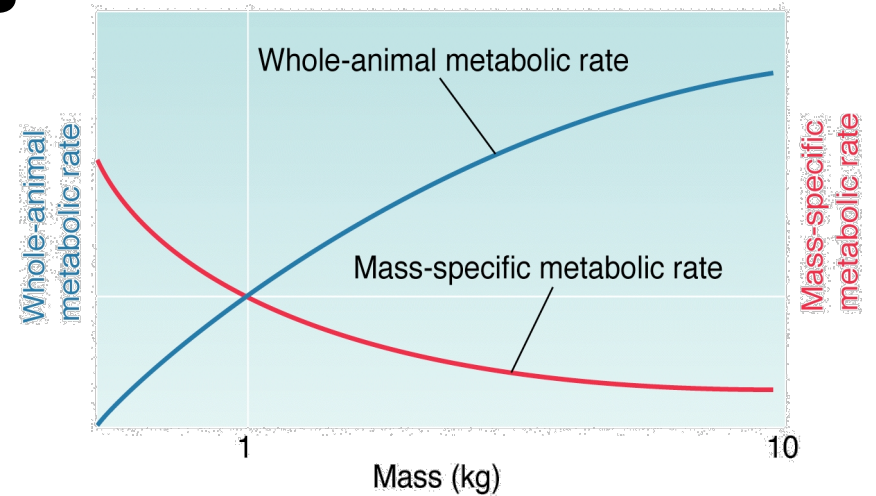
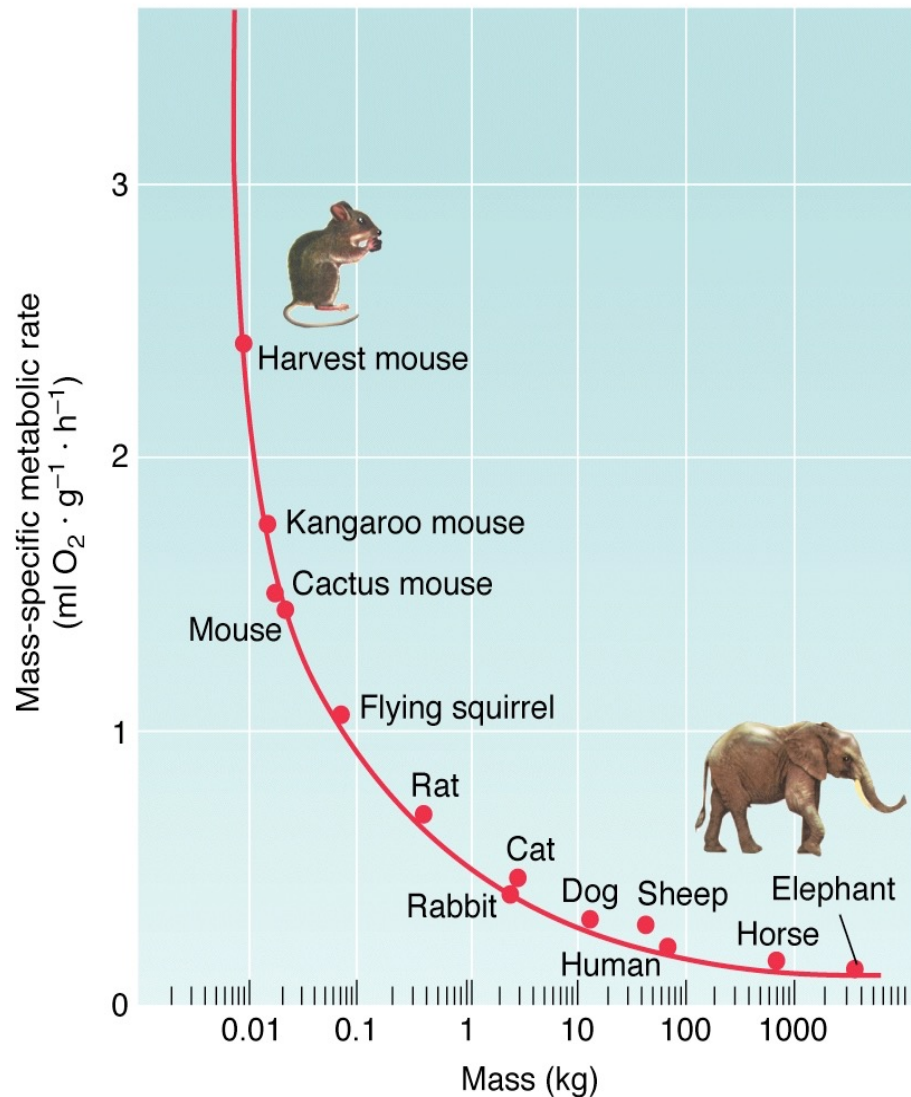
Live Fast Die Old?

Metabolic Rate is a Power Function of Body Mass

“Mouse to Elephant Curve”

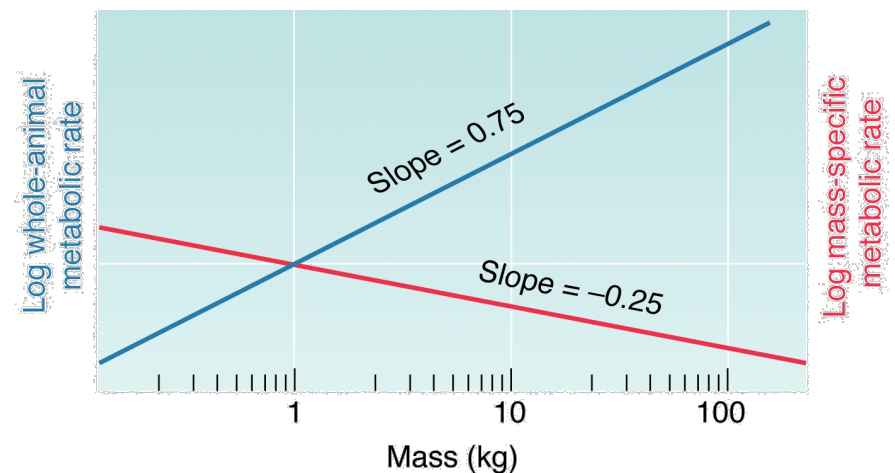
$$\text{Metabolic Rate} = a \cdot \text{Mass}^b$$

(a)



$$\text{MR} = aM^b$$

$$\text{MR}/M = aM^{(b-1)}$$



Why?

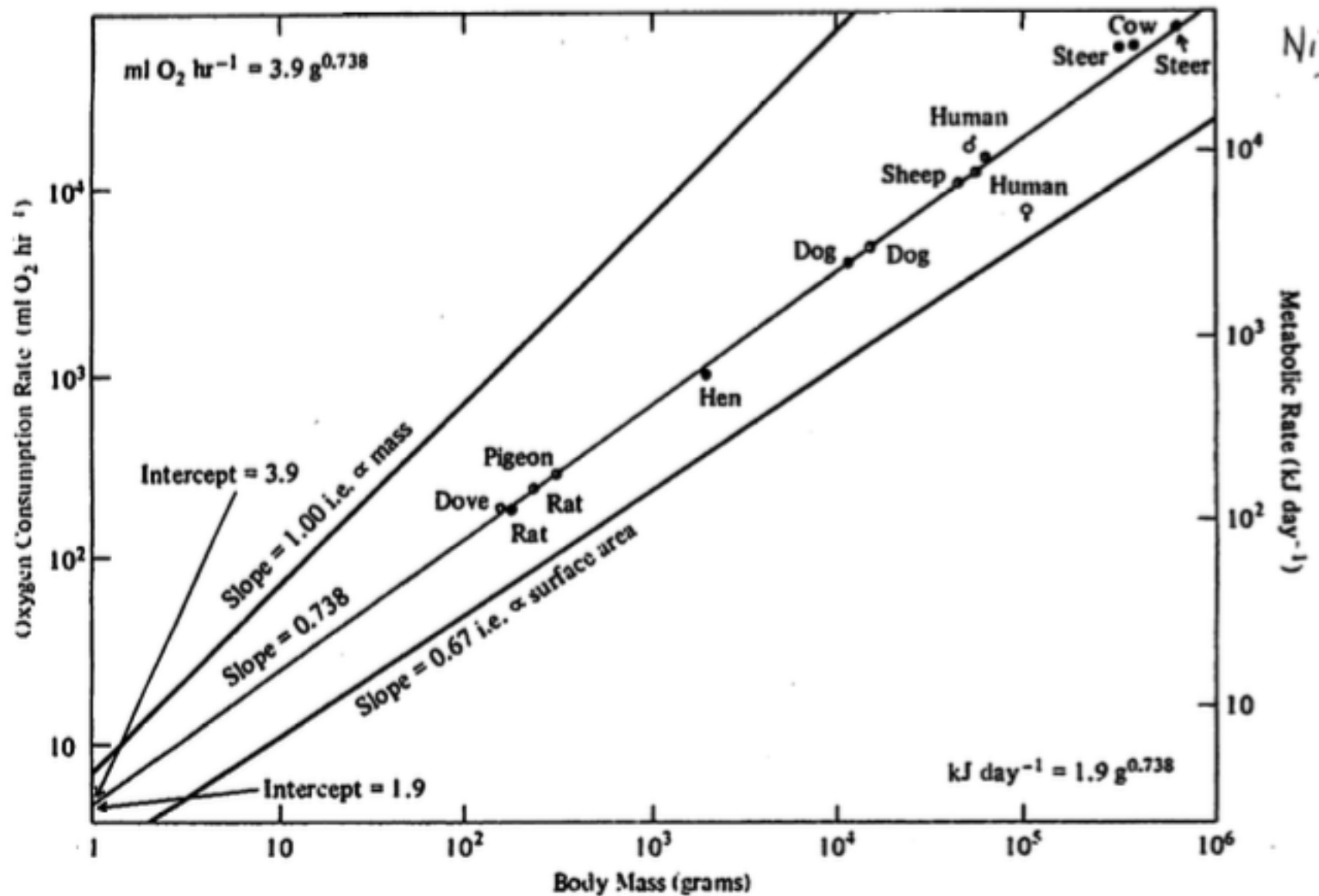
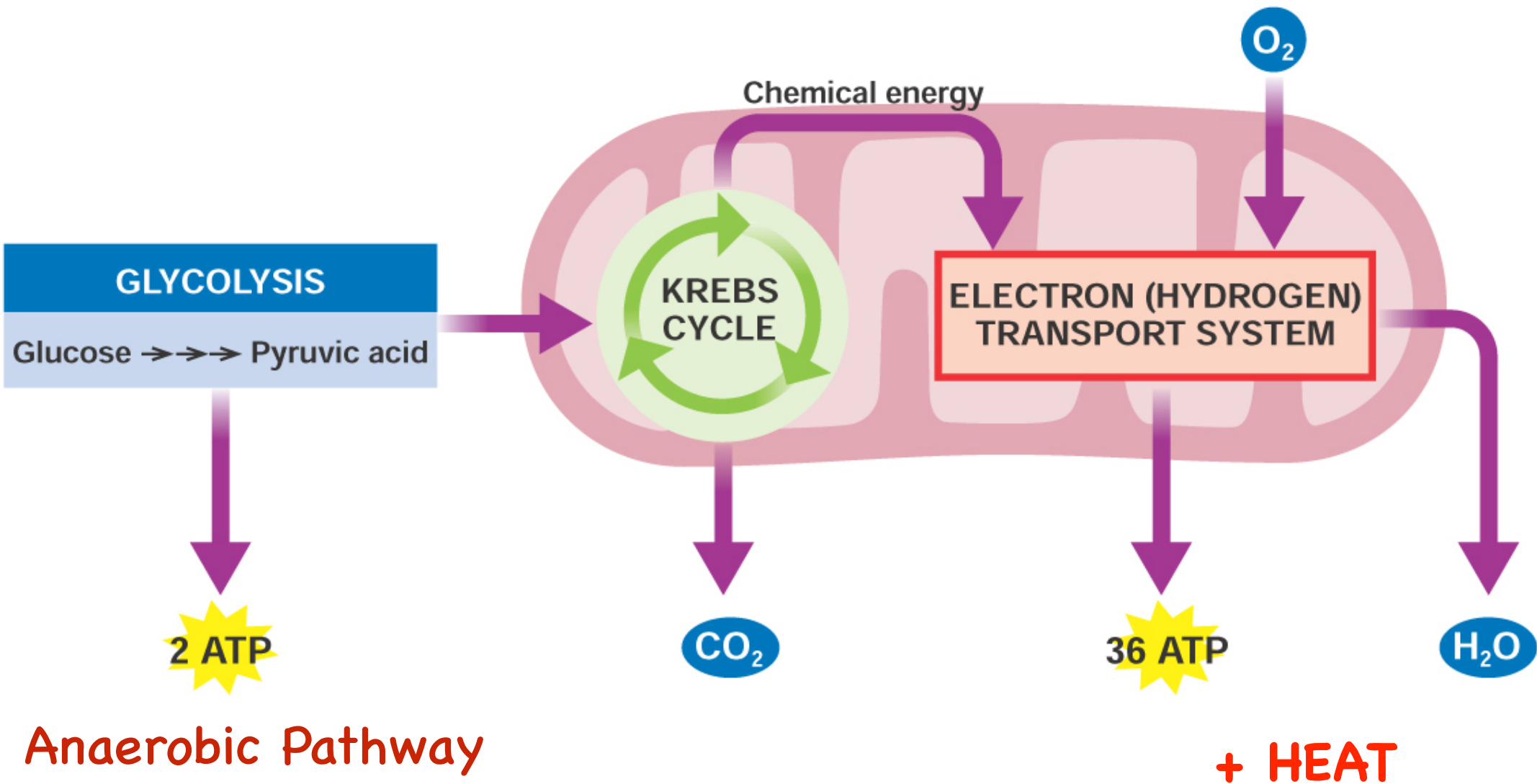


FIGURE 4-6 Relationship between $\log_{10}$ metabolic rate and $\log_{10}$ body mass for mammals and birds. (Modified from Kleiber 1932.)

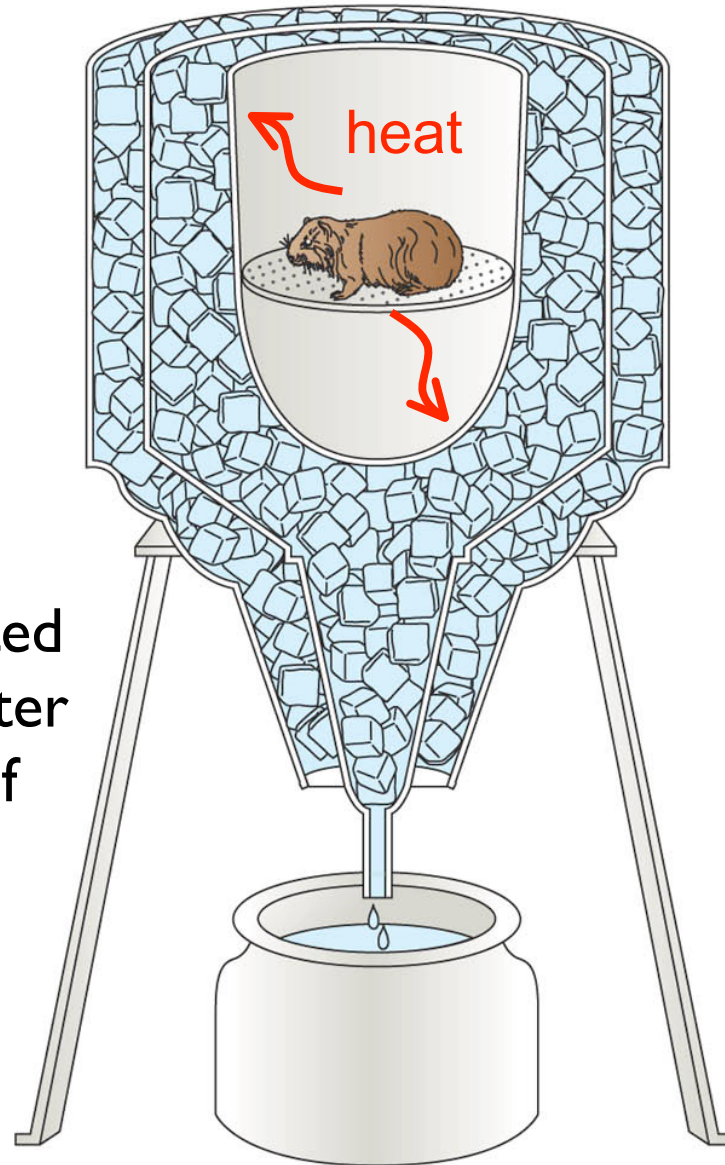
AEROBIC RESPIRATION -- SUMMARY



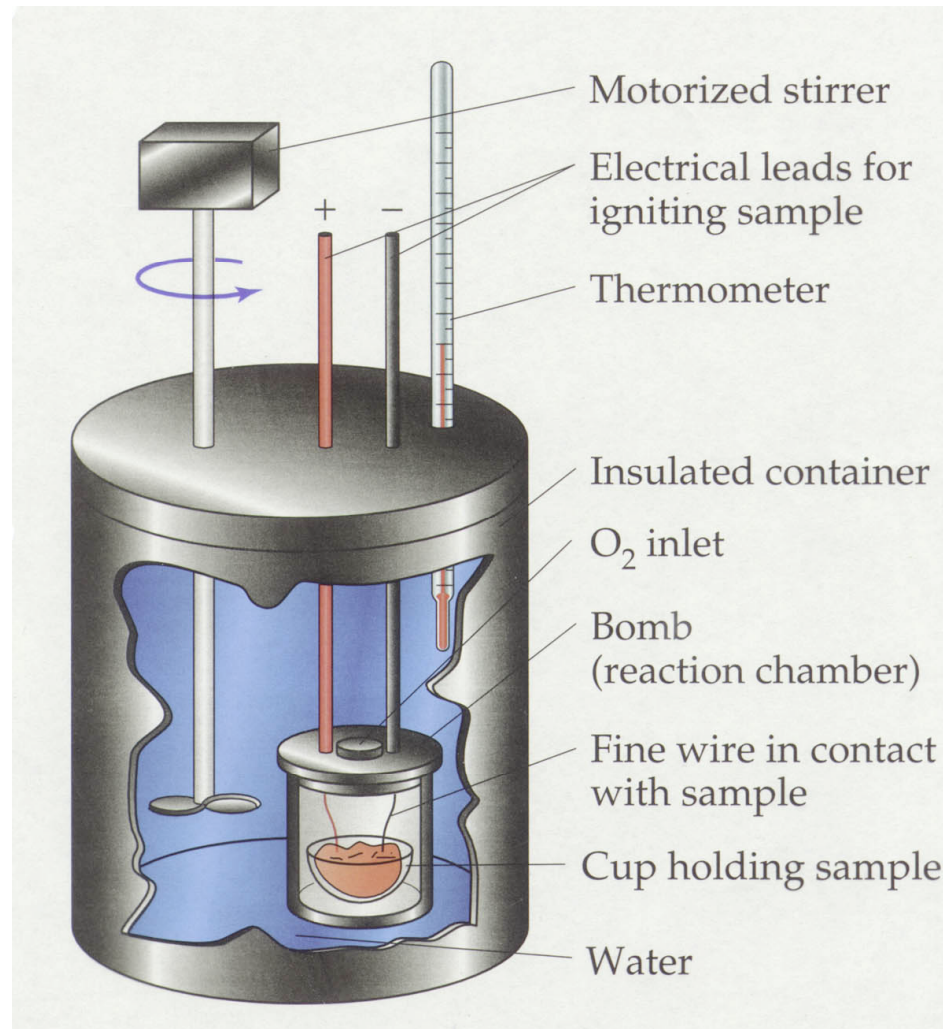
Direct Calorimetry

Lavoisier & Laplace (1780)

heat loss calculated
from mass of water
and latent heat of
melting ice.

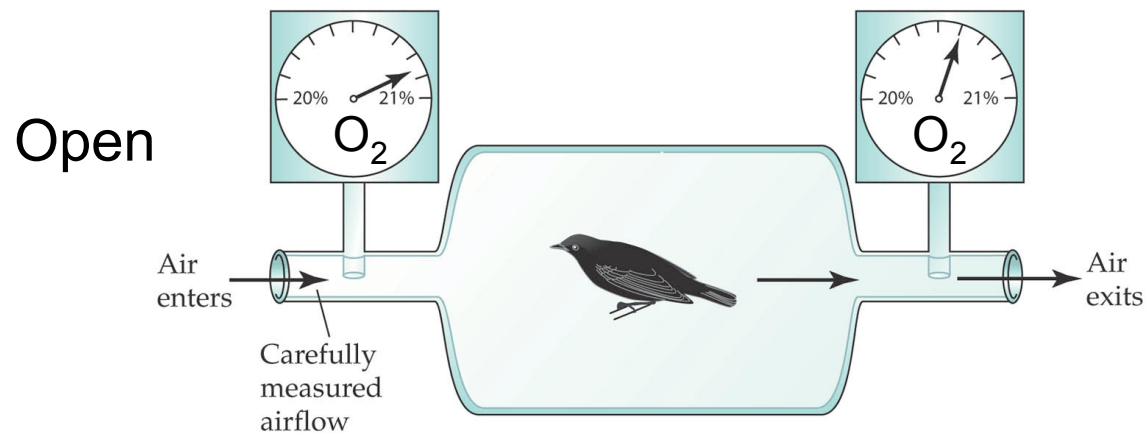
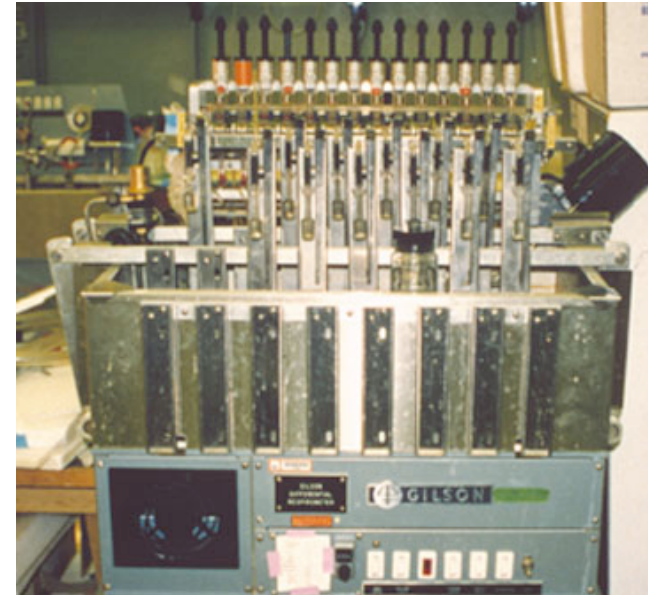
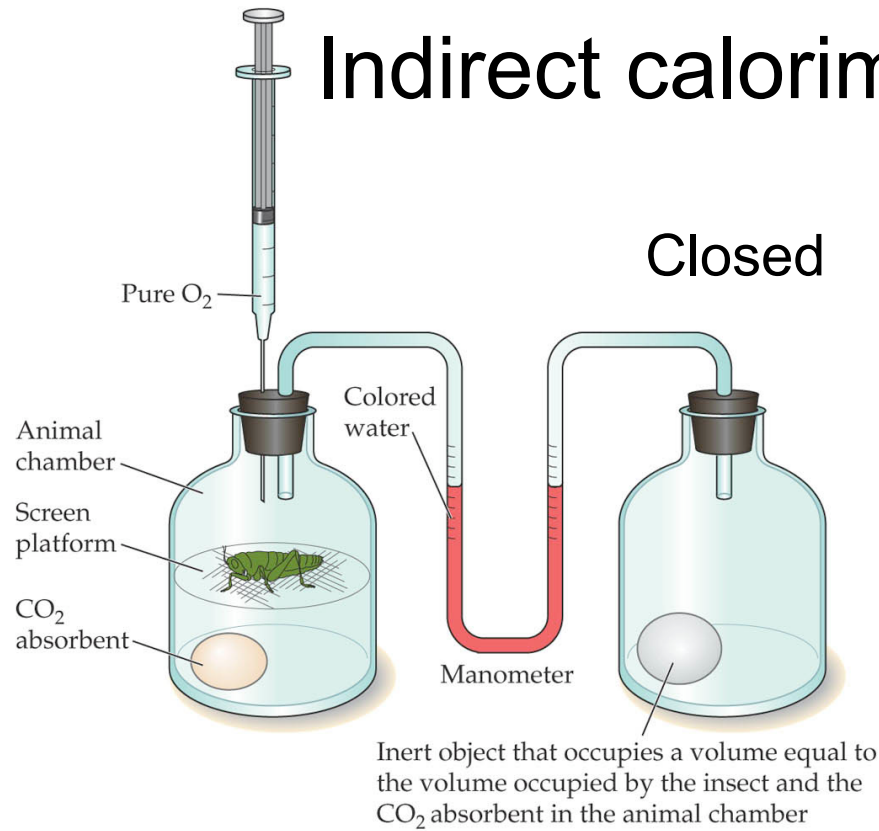


Indirect Calorimetry: Bomb Calorimeter



Energy content of:
food intake - waste excretion = metabolic rate (heat produced)

Indirect calorimetry: Respirometers





Do the Damn Research!
@DamnResearch



41/ This impressive animal is Arsinoitherium. Whilst it may superficially resemble a 2-horned rhino, it's actually an afrothere; making it more closely related to elephants, manatees & armadillos!

Afrothere evolution is fascinating, will have to do an article 1 day! [#FossilFriday](#)



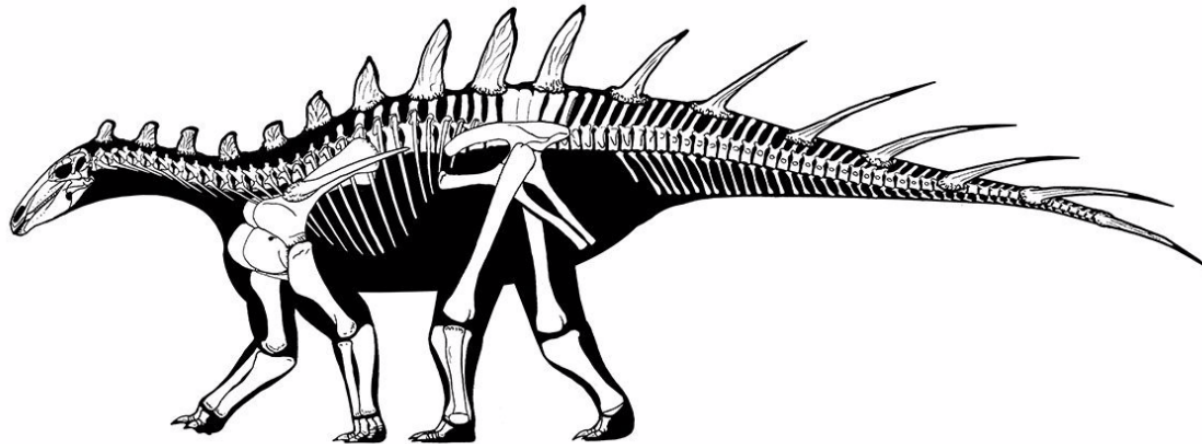
8:29 AM · Aug 30, 2019 · [Twitter Web App](#)

[13 Retweets](#) [17 Likes](#)



#ICYMI Scientists have named the first ever stegosaur from North Africa.

Adratiklit boulahfa is thought to be about 168 million years old, making it the oldest definite stegosaur ever found. #FossilFriday #NHMdino

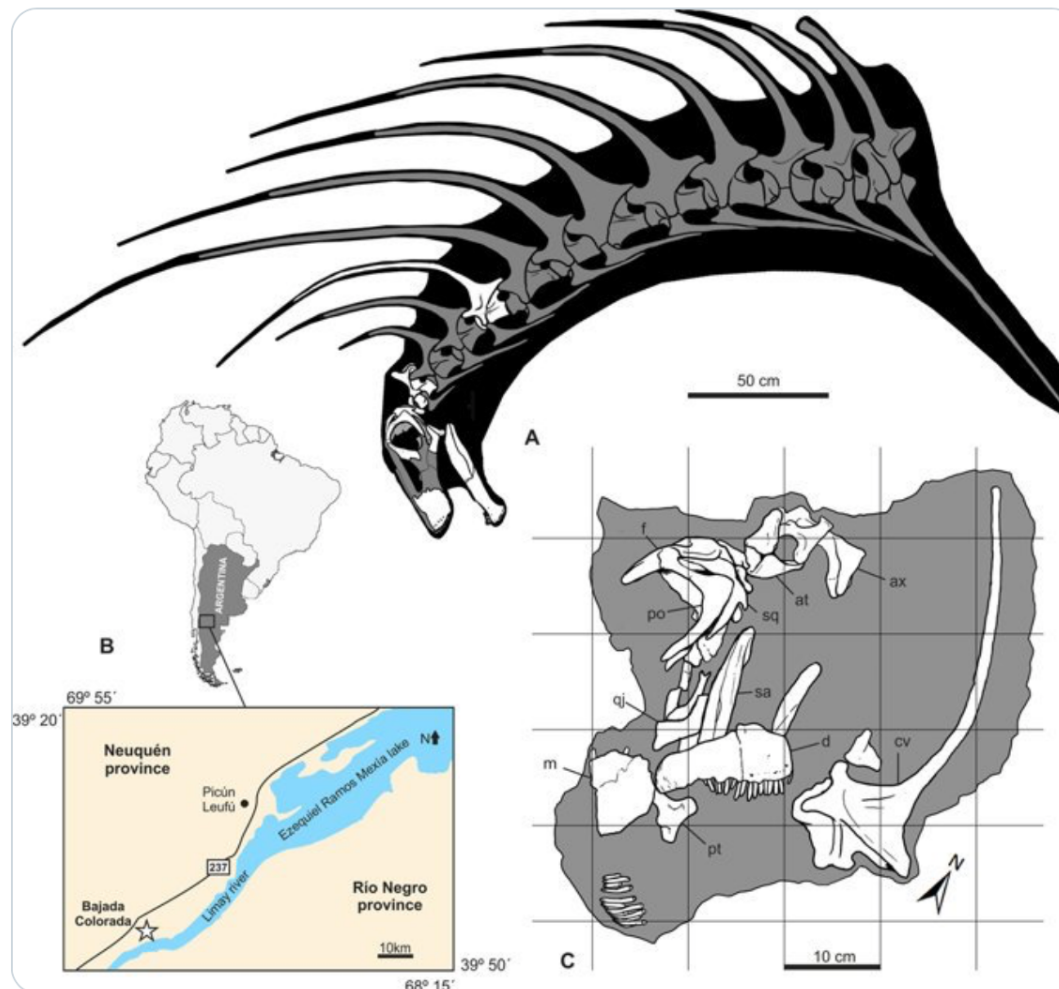


The oldest stegosaur ever has been discovered in Morocco
Its remains were uncovered in the Middle Atlas mountains of Morocco
nhm.ac.uk

1:00 AM · Aug 30, 2019 · [AgoraPulse Manager](#)

44 Retweets 106 Likes

New sauropod dinosaur w/super long cervical neural spines! Very cool, but important to note only one long-spined vertebra is preserved--most of neck reconstruction is hypothetical (although plausible). Great skull w/this fossil, also...lots of useful data!
[nature.com/articles/s4159...](https://www.nature.com/articles/s4159...)



PSA: A new fossil flying squirrel has been found, and this artistic reconstruction is amazing!

elifesciences.org/articles/39270 HT @elife



Gabriel N. U.
@Serpenillus



Morning sketch. A dead, Prognathodon (mosasaur) washes up on the seashore and a group of curious Dromaeosaurus have come to inspect it. Some ichthyornis were already in the scene. I have explored depicting beached marine reptiles many times. [#paleoart](#) [#sciart](#) [#FossilFriday](#)



4:42 AM · Aug 30, 2019 · [Twitter for iPad](#)

190 Retweets 736 Likes



TABLE 4-10

Human basal metabolic rate and metabolic rate with various forms of graded activity. Values are J min^{-1} .
(Data from Passmore and Durnin 1955.)

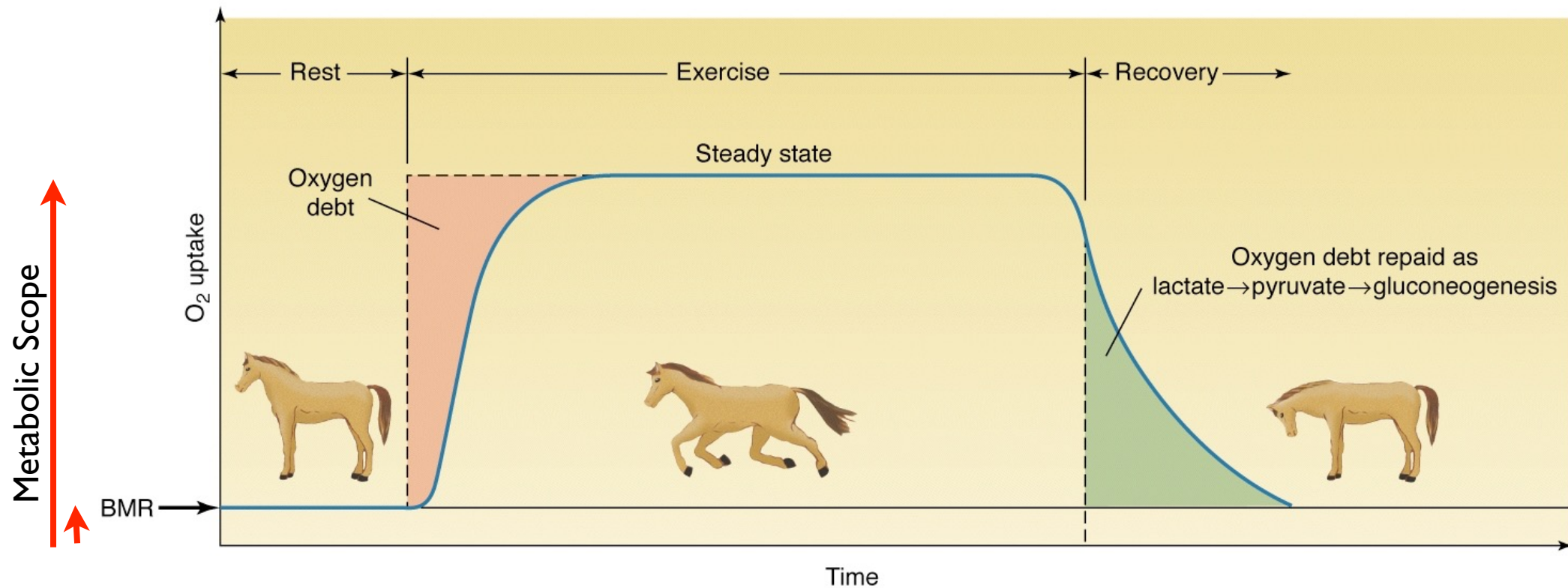
Basal	4.2
Lying at ease	6.3
Sitting at ease	6.7
Standing at ease	7.1
Walking: 1 km hr ⁻¹	8.4
Driving car	11.7
Walking: 4 km hr ⁻¹	14.2
Walking: 6 km hr ⁻¹	20.9
Cricket batting	25.1
Walking: + 15% incline/3 km hr ⁻¹	26.4
Tennis	29.7
Walking: 8 km hr ⁻¹	33.5
Rapid marching	40.6
Squash	42.7
Climbing vertical ladder	48.1
Walking in loose snow: 20 kg load	84.5
Ax work: 51 blows min ⁻¹	100.9
Carrying 60 kg upstairs	128.4

MR's are not directly comparable between individuals (differ in mass, sex, etc.)

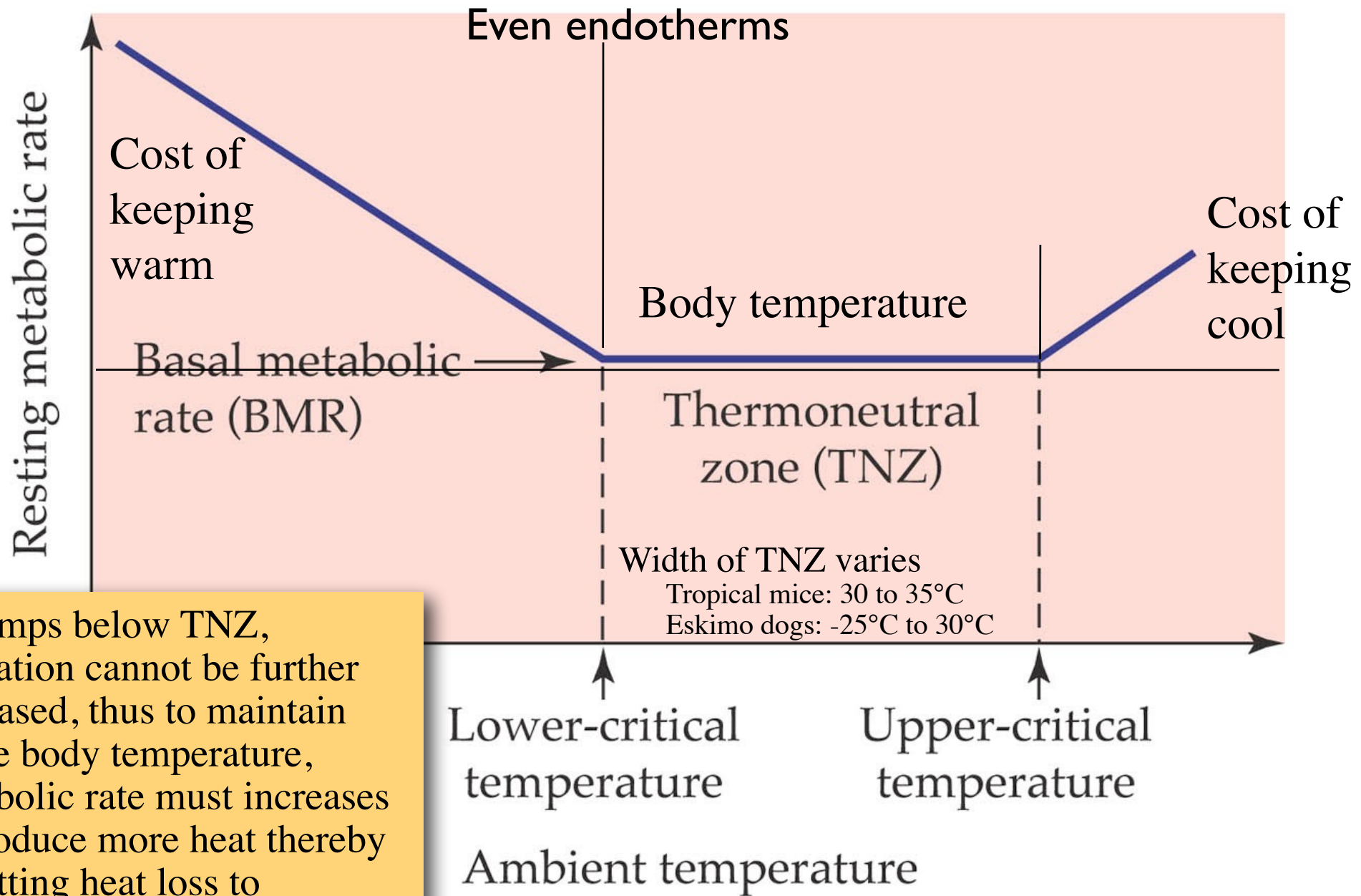
But you can use the scope to calculate how many X some activity elevates BMR.

(Aerobic) Metabolic Scope

describes the # times increase in max MR above BMR

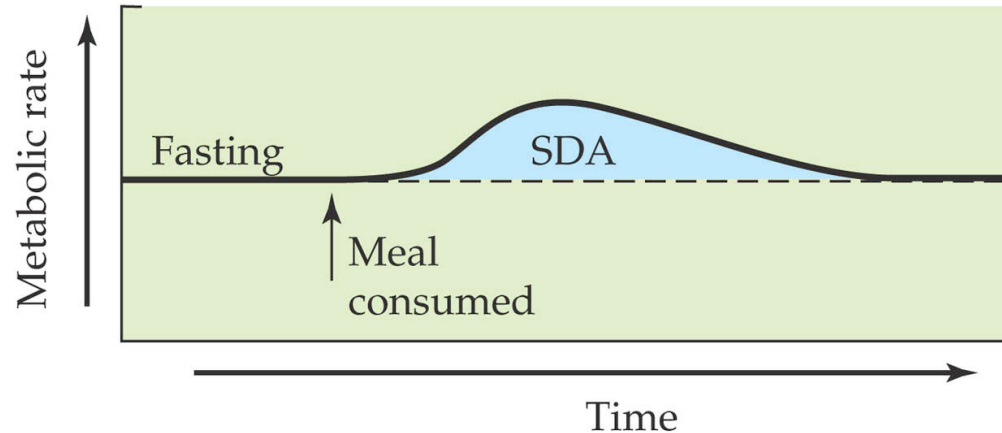


Temperature is important to all animals



At temps below TNZ, insulation cannot be further increased, thus to maintain stable body temperature, metabolic rate must increase to produce more heat thereby offsetting heat loss to environment

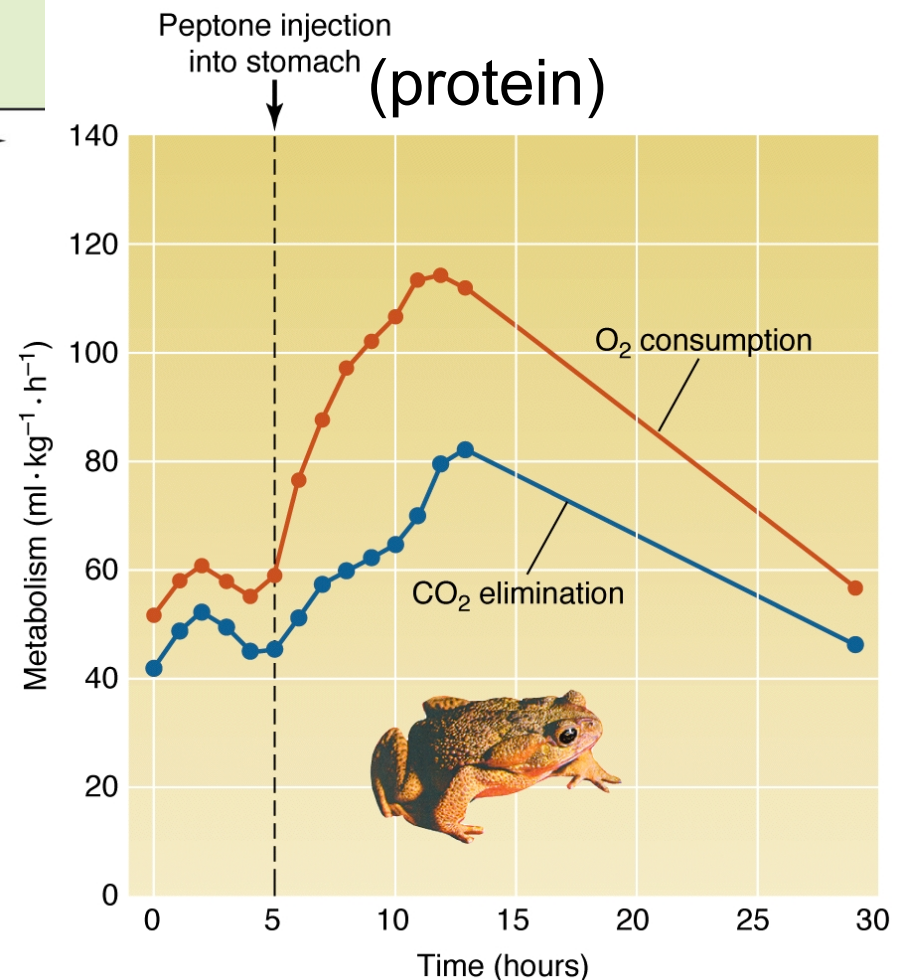
Metabolic Cost of Digestion: Specific Dynamic Action



SDA: increase in metabolic rate following ingestion

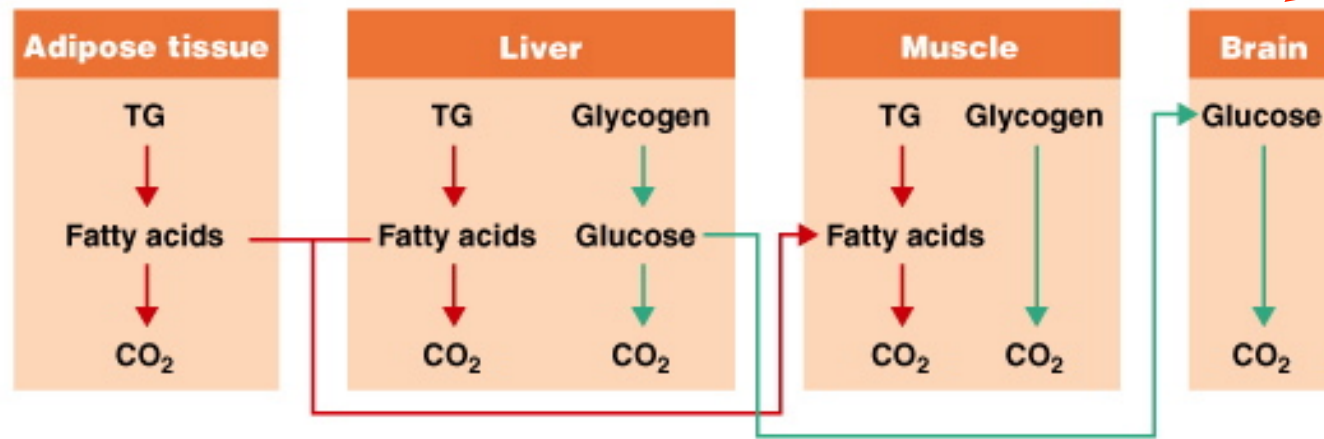
SDA is highest for proteins

CHO, fats: 5-10% of E ingested
Proteins: 25-30% of E ingested

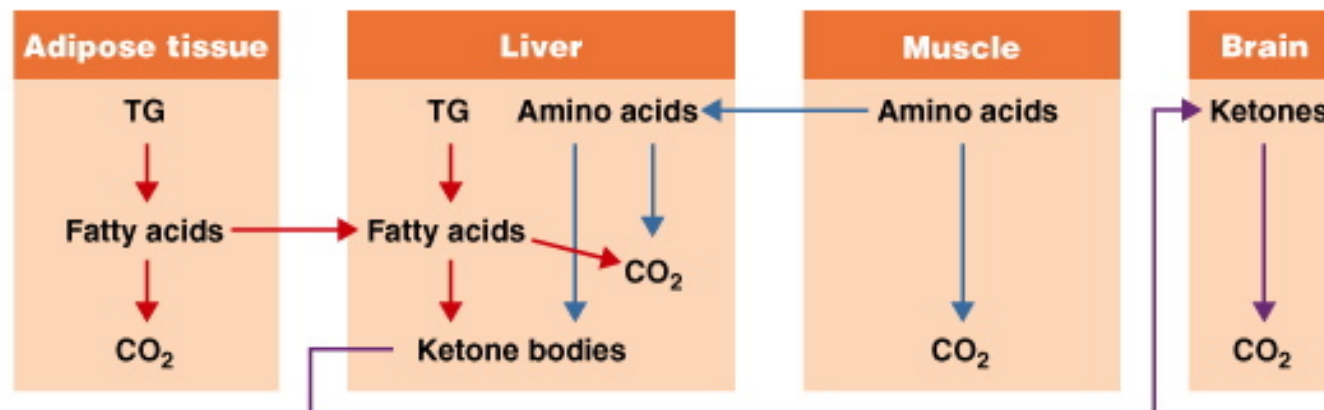


Starvation Response

- Reorganization of metabolism to ensure long-term survival
- Preserve glucose to protect glucose-dependent tissues, e.g., nervous tissue
- Muscles shift to lipid metabolism



(a) Early starvation



(b) Late starvation

- Once lipid and glucose stores are depleted protein breakdown accelerates; amino acids can be converted to fatty acids and carbohydrates
- At this point degradation occurs (muscles, other tissues) because there are no protein stores

Our friend Kimo

After trying unsuccessfully to lose weight on his own, our friend Kimo finally consulted a nutritionist/trainer. Kimo had been skipping breakfast and lunch to lose weight, but ended up eating a large dinner. He had also been doing very little exercise (he thought the dieting strategy would get him off the hook with the exercise). The nutritionist told him to:

- eat 5 small meals a day rather than one large one,
- add more protein to his diet at breakfast, and
- do 30 min. of moderate exercise every day.