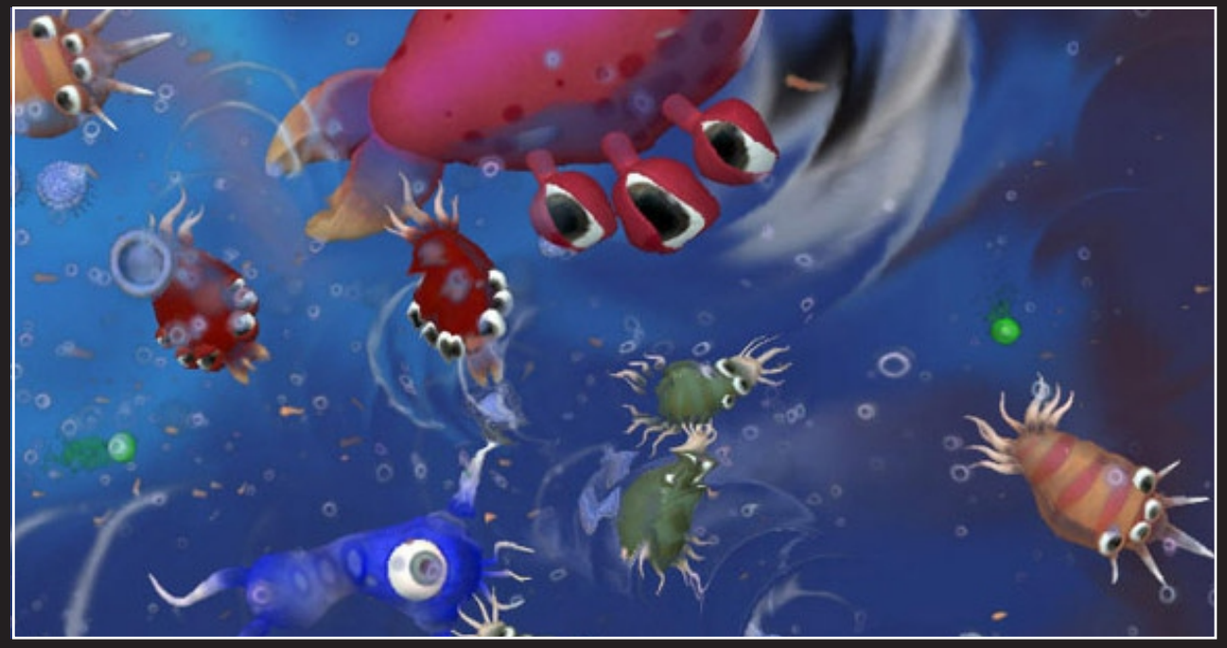
ERC 'PALEOGENiE' workshop:

European Research Council
Established by the European Commission

University of BRISTOL

GLOBAL CO-EVOLUTION OF THE OCEAN ENVIRONMENT AND ITS ECOLOGY

University of Bristol, Bristol, Europe[+]

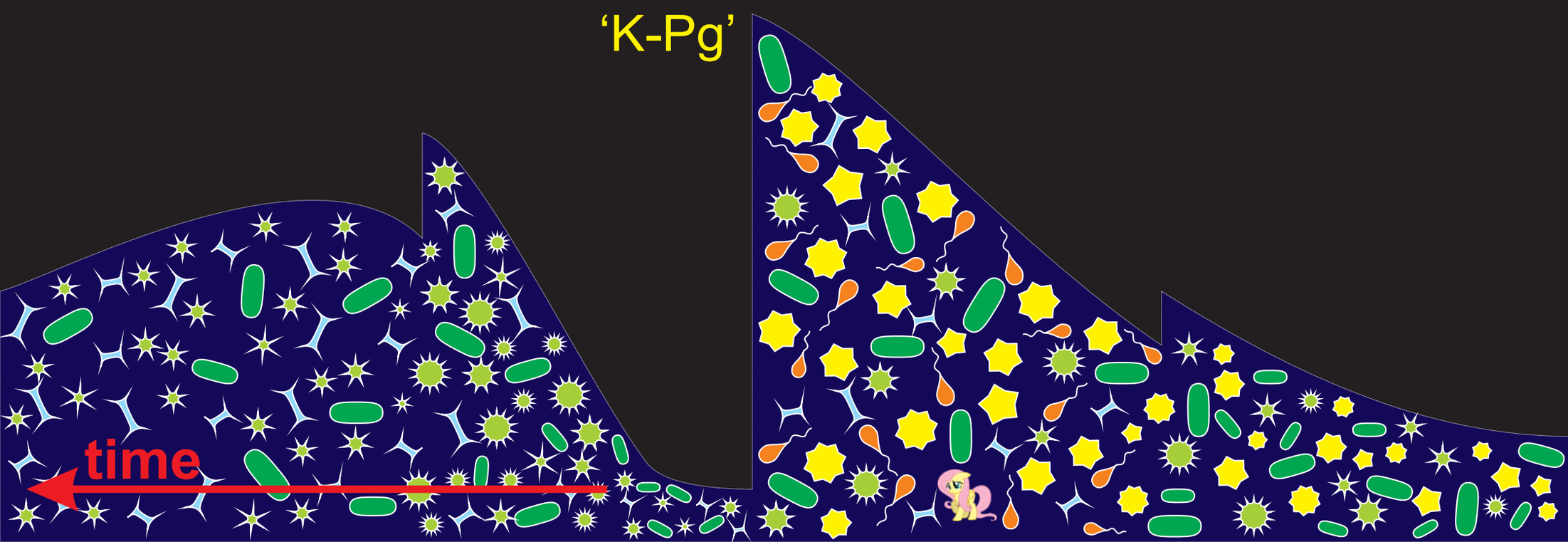


[+] as of 07/10/2016

Why am I here? Why did I get out of bed this morning?

Changes in physical (e.g. temperature, circulation) and biogeochemial (e.g. nutrient, acidification) environment will affect ecosystem composition and drive selection.

'K-Pg'



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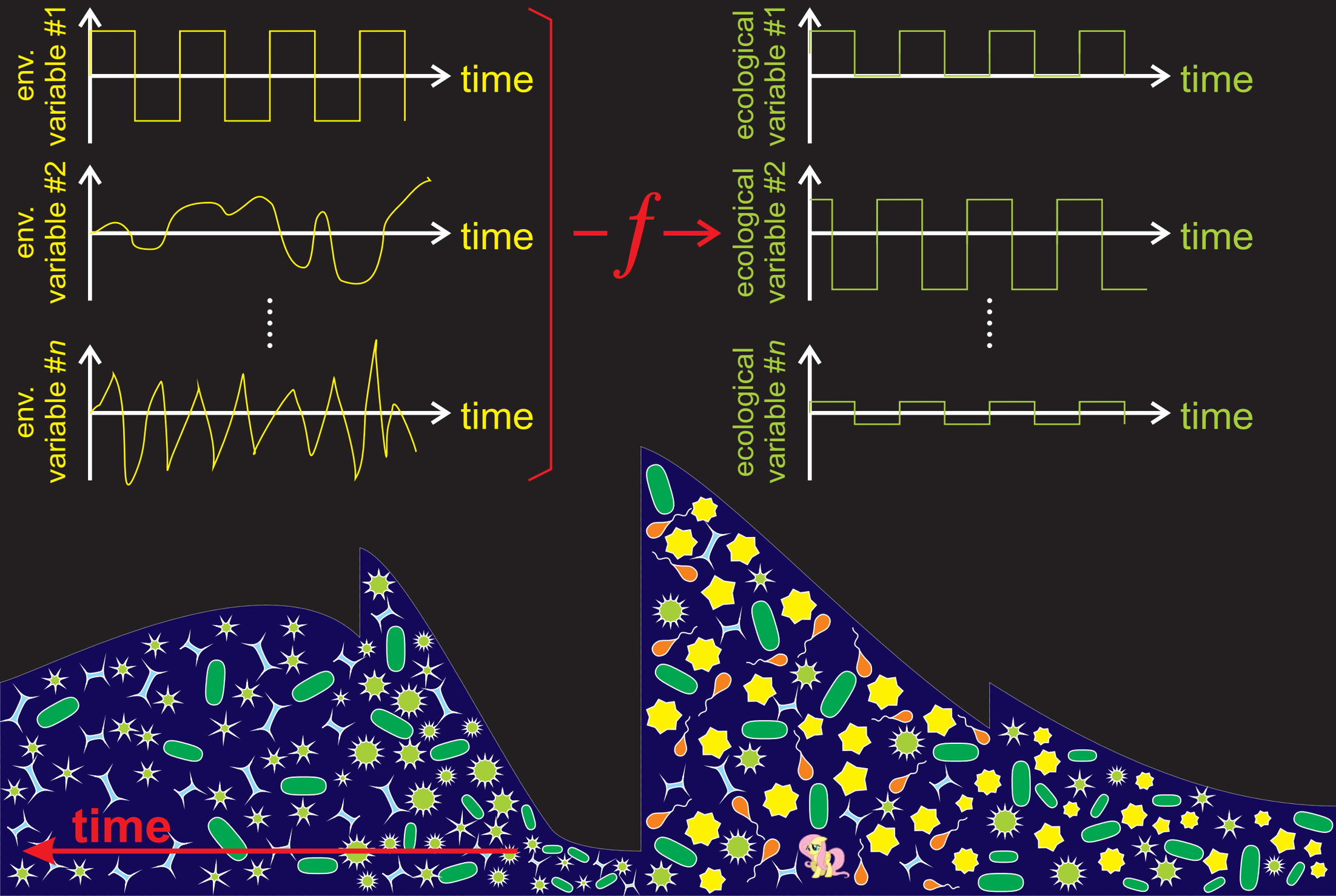

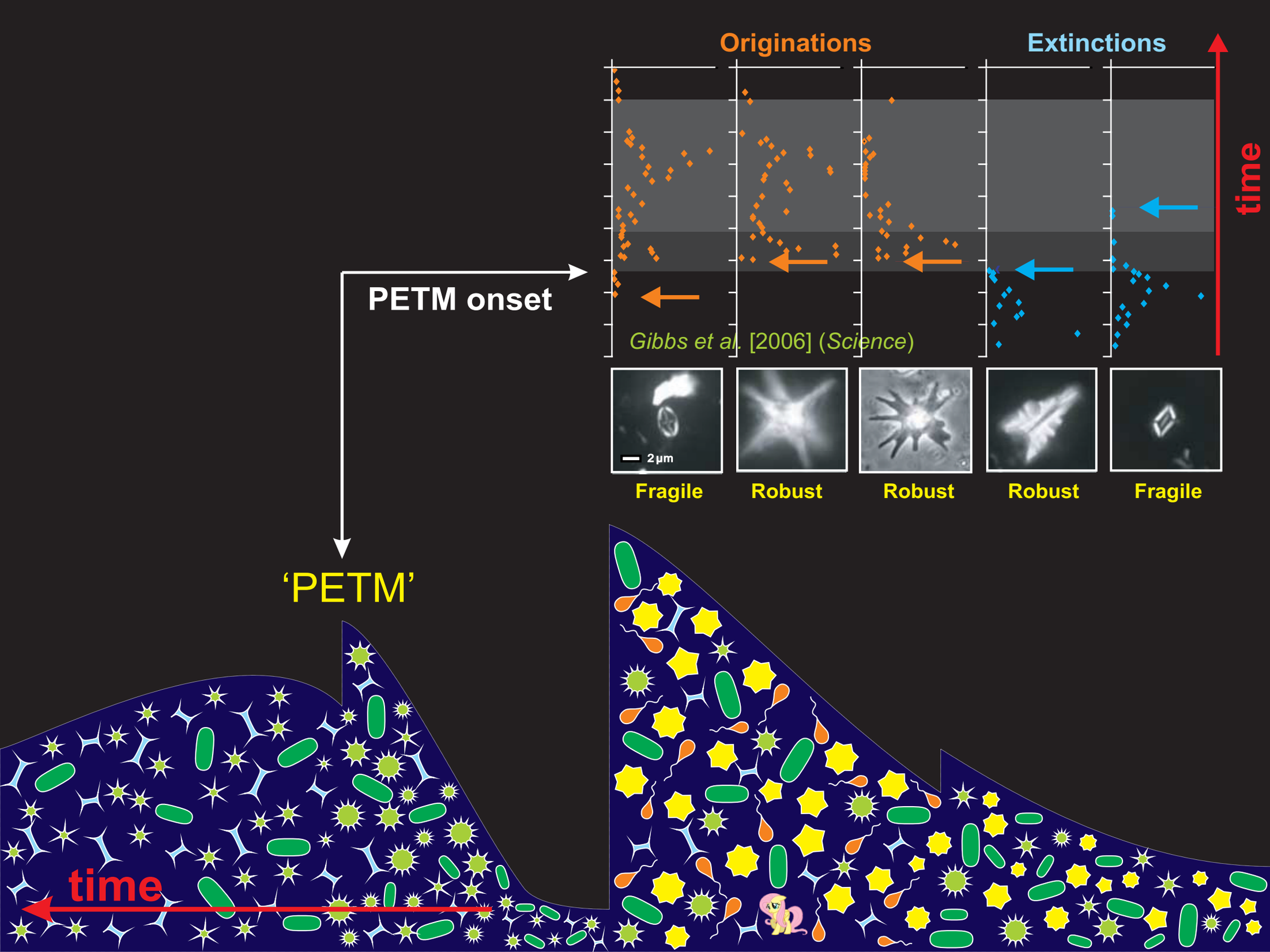
Originations
Extinctions
time
PETM onset
Gibbs et al. [2006] (Science)
2 µm
Fragile
Robust
Robust
Robust
Fragile
'PETM'
time

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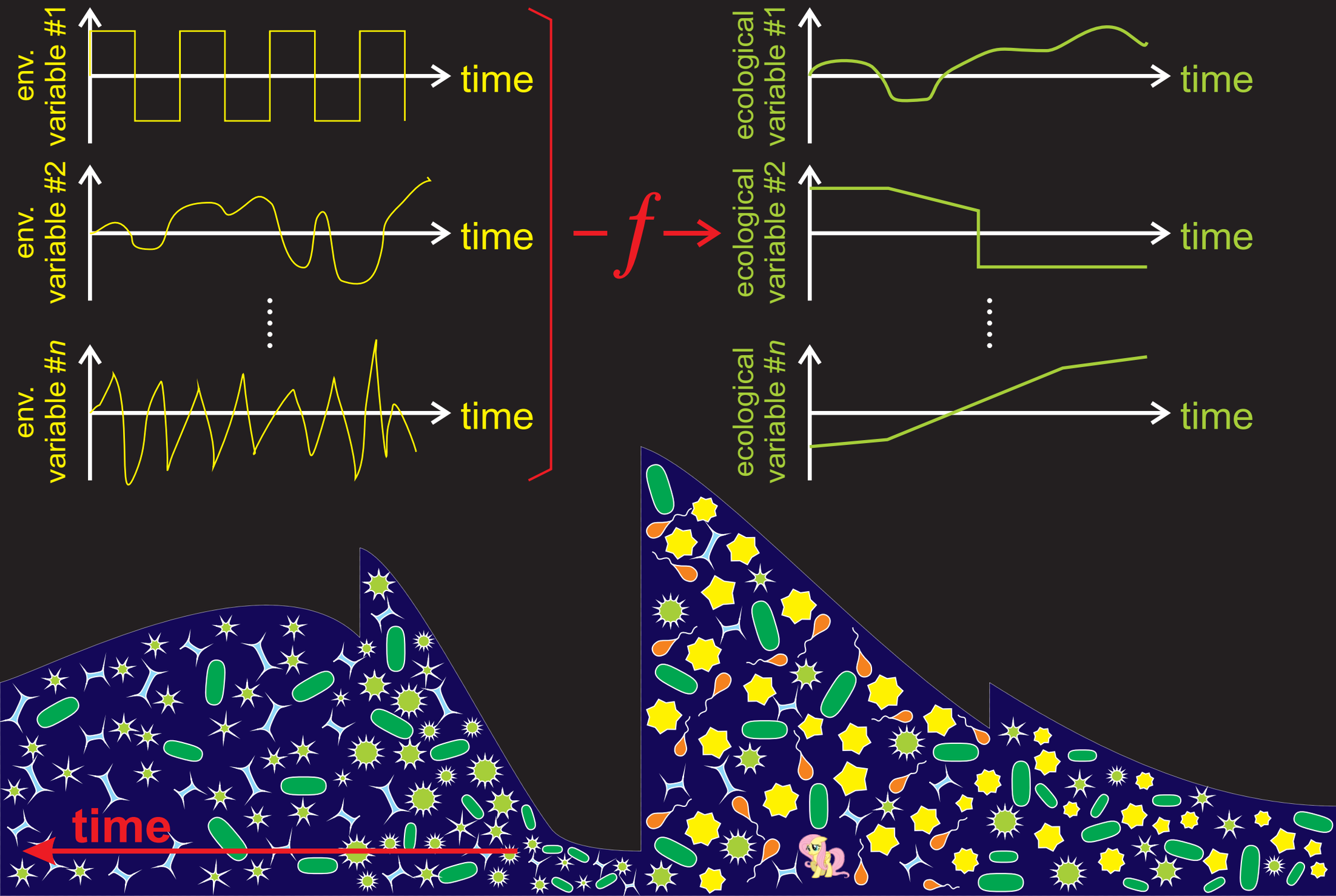

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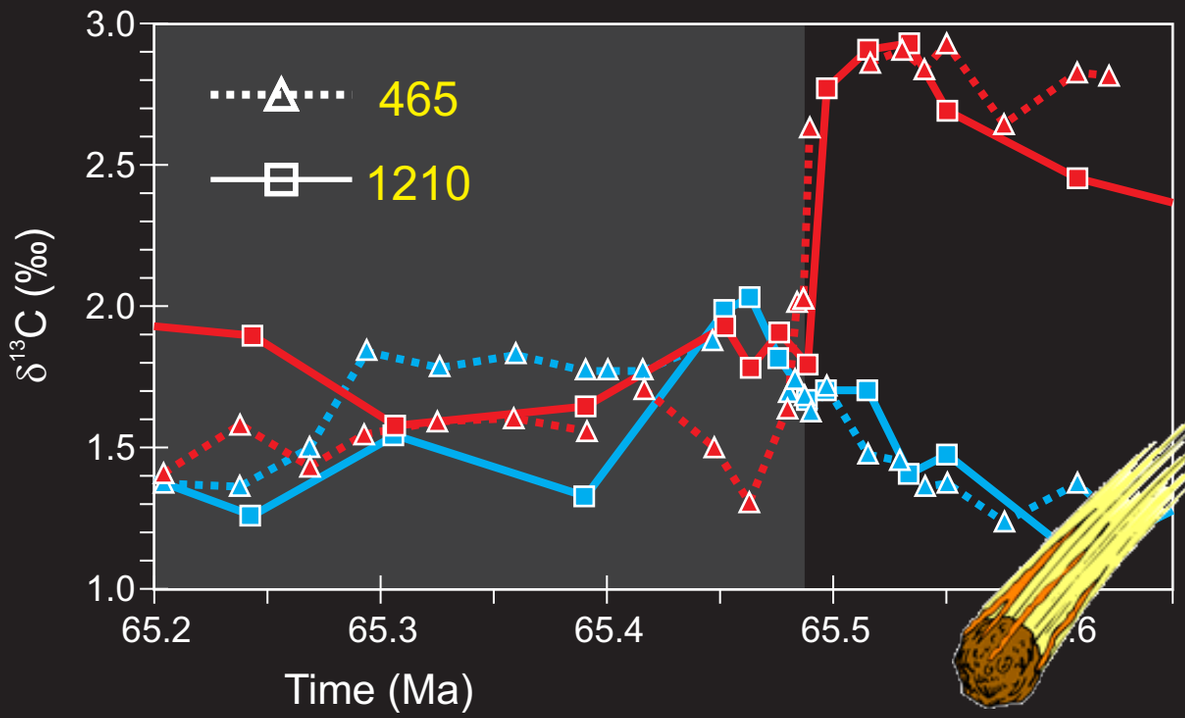

Changes in physical (e.g. temperature, circulation) and biogeochemial (e.g. nutrient, acidification) environment will affect ecosystem composition and drive selection.

In turn: the composition of marine ecosystems and strength of the biological pump will affect nutrient inventories, ocean oxygenation, and atmospheric pCO_2 and climate.

'K-Pg'

time

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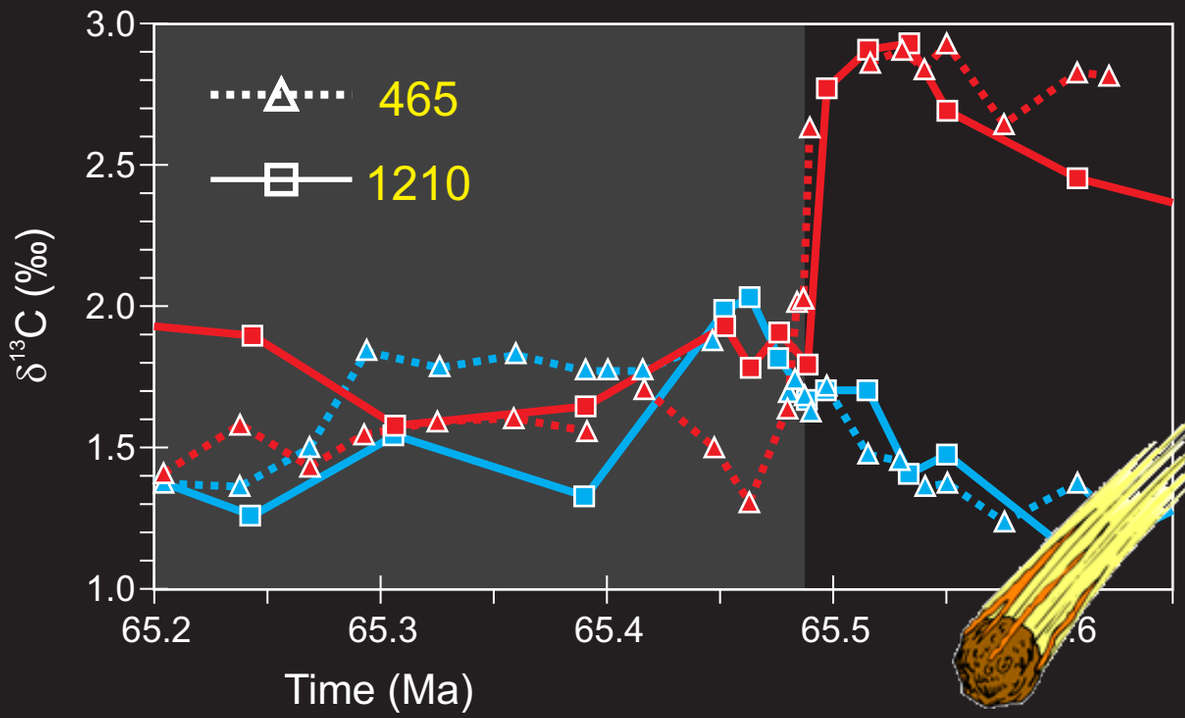

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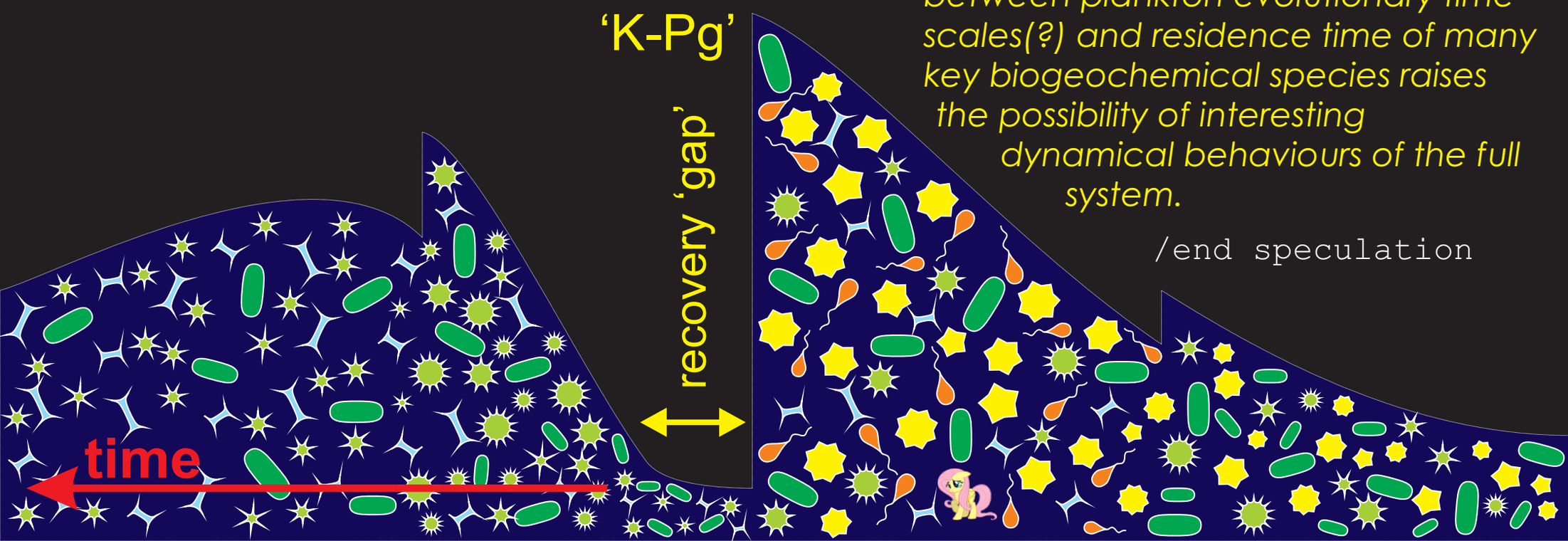
In turn: the composition of marine ecosystems and strength of the biological pump will affect nutrient inventories, ocean oxygenation, and atmospheric pCO_2 and climate.

The approximate coincidence between plankton evolutionary time-scales(?) and residence time of many key biogeochemical species raises the possibility of interesting dynamical behaviours of the full system.

`/end speculation`



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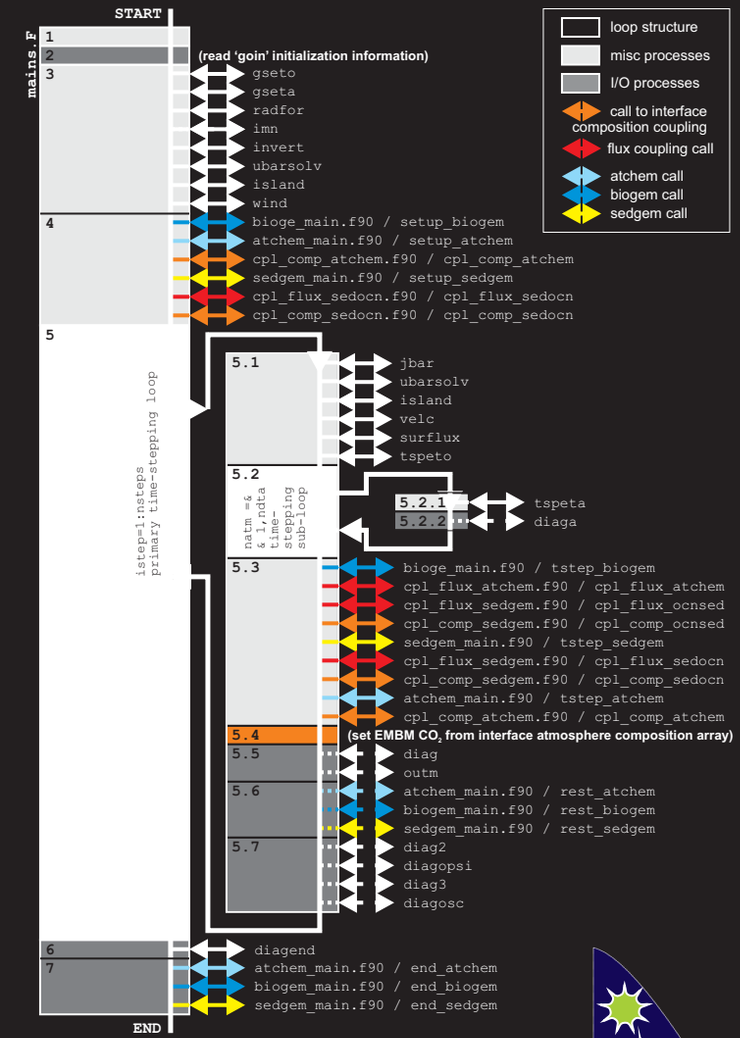
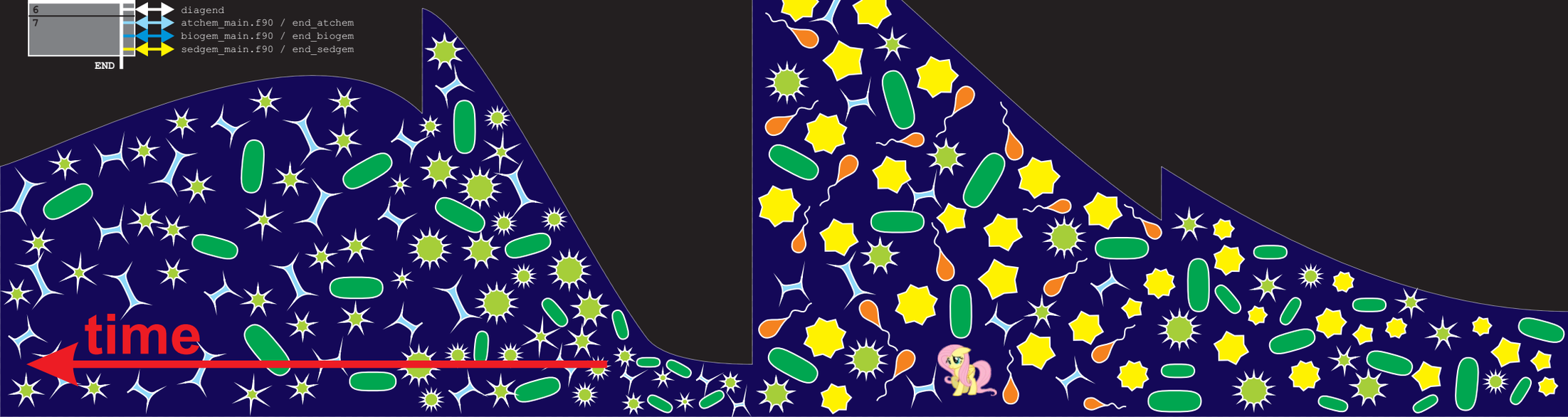
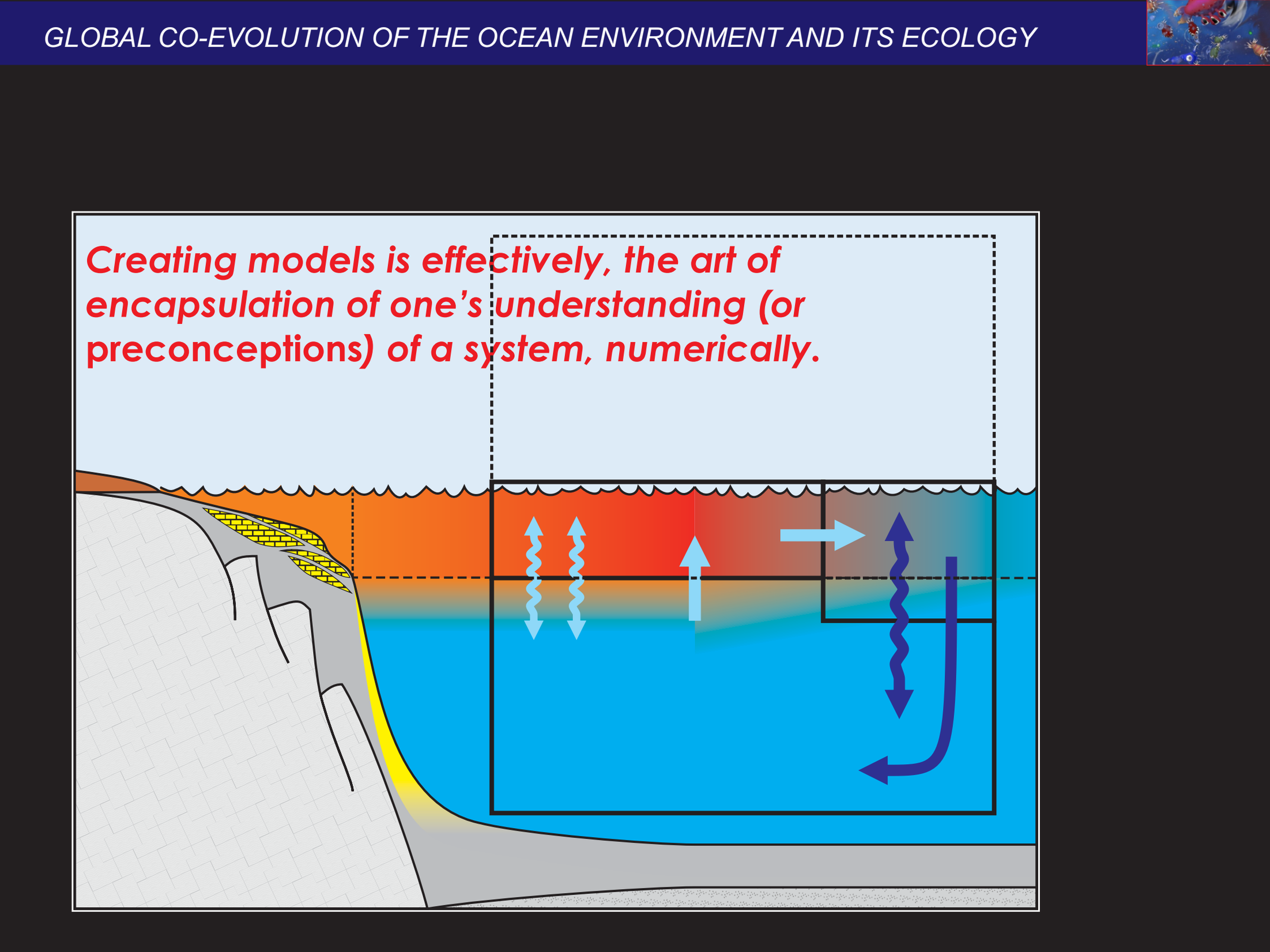
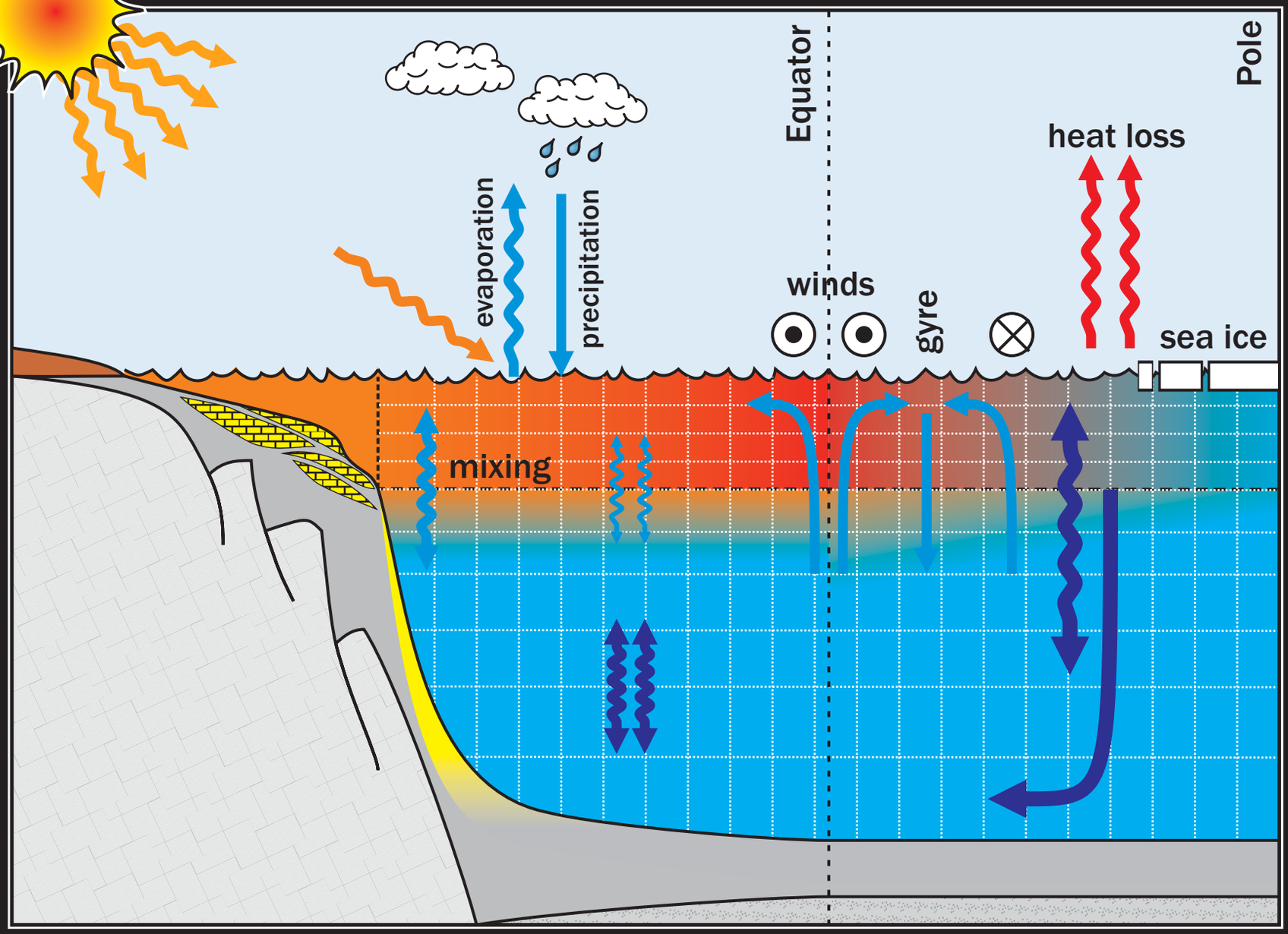


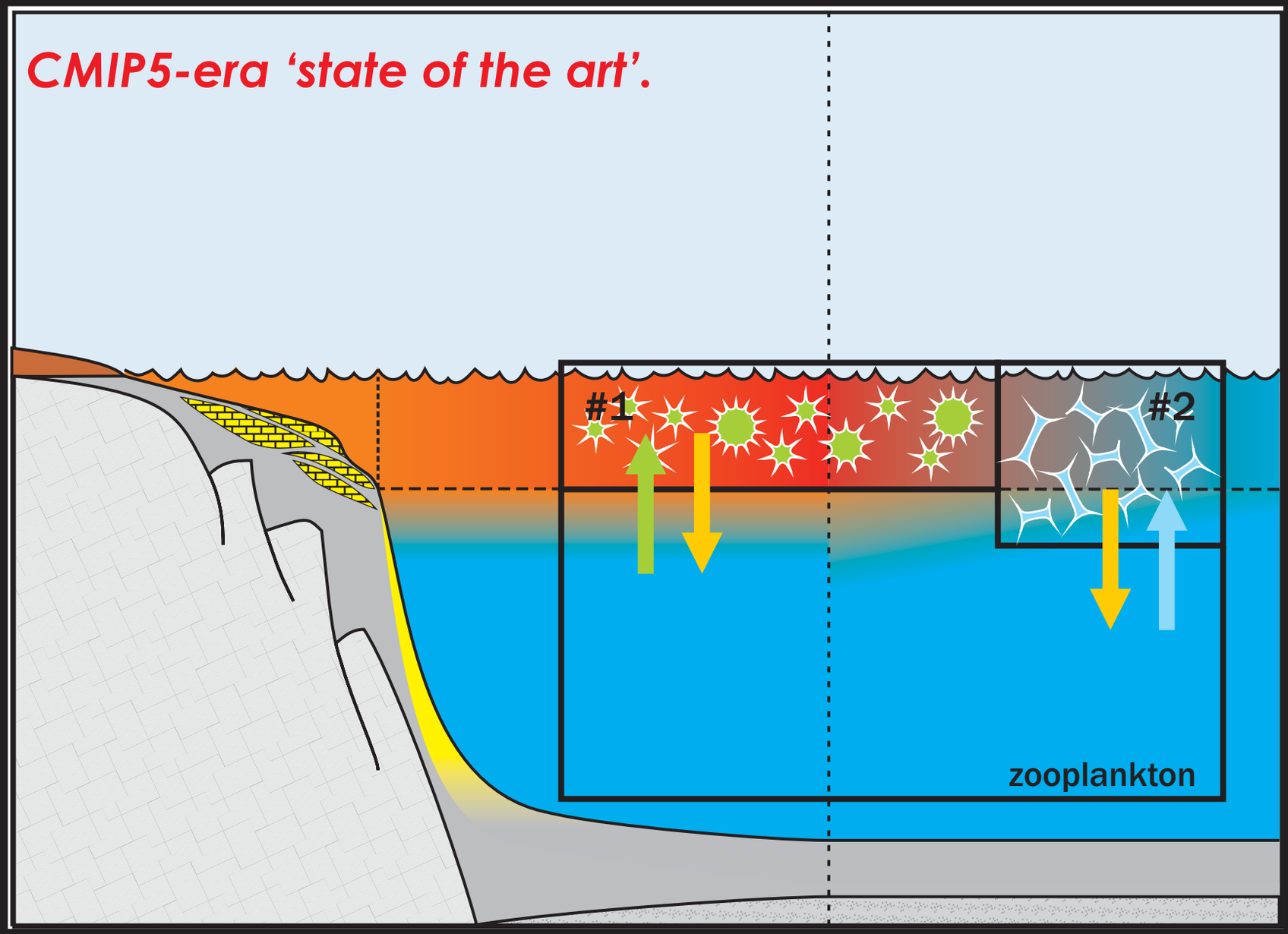
numerical models?



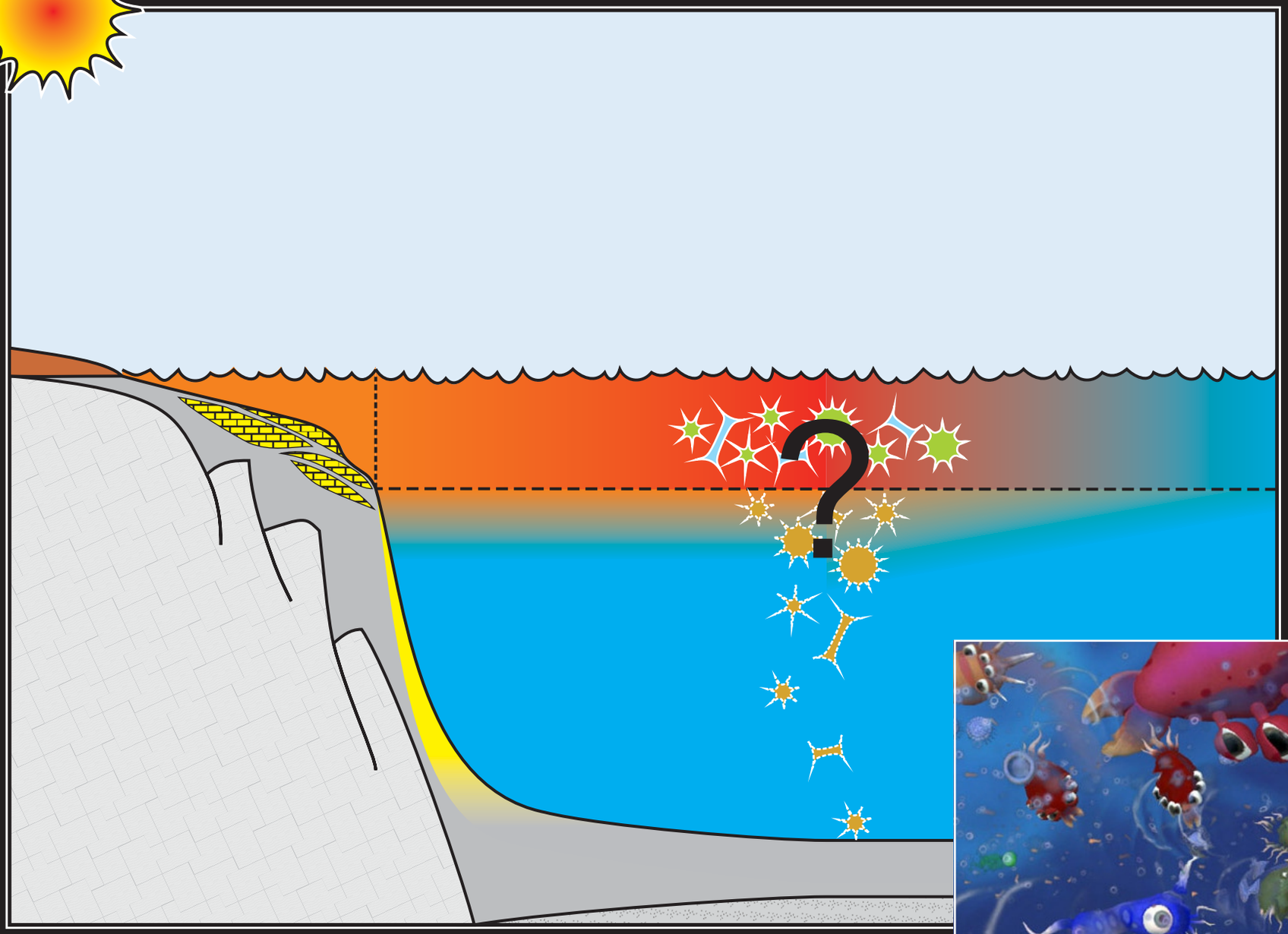

Creating models is effectively, the art of encapsulation of one's understanding (or preconceptions) of a system, numerically.

In GCMs: Ocean circulation becomes an emergent rather than prescribed property of the system.




CMIP5-era 'state of the art'.
#1
#2
zooplankton

(Ocean) General Ecological-Evolutionary Models? (O-GEEMs?)



Format and aims (aside from whatever is self-assembling):

- The answer is `101010` ...

... but what are the specific questions and associated testable hypotheses regarding observed biotic-environmental relationships and interactions in the past?
Can we usefully collate events and responses in a single framework rather than picking at individual events in isolation.

- Given testable hypotheses, can we develop the tools (models) to test them (or can additional laboratory and/or paleo data suffice)?

- Outcomes of the workshop could include one (or more) review papers, new collaborations (/grant proposals). (Ultimately new models?)

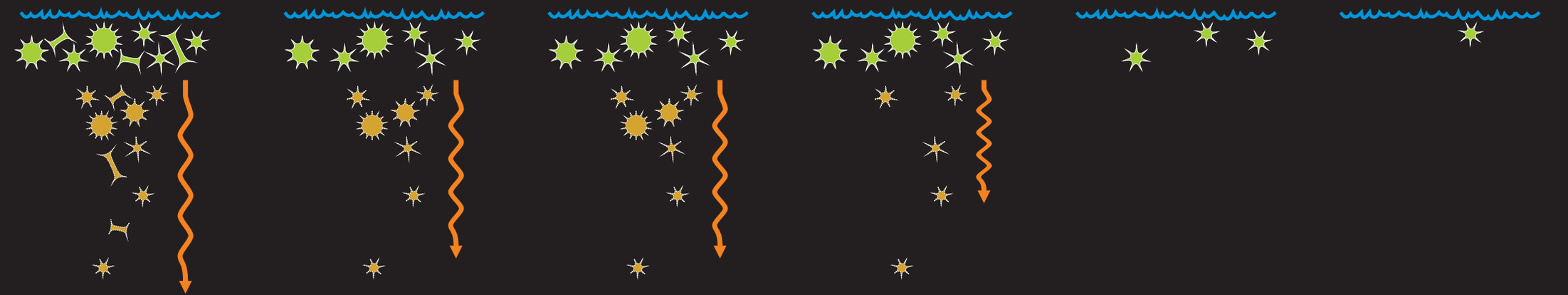
- Meta organize primary interests by differentiating fundamentally different 'types' of question?

A useful working division for discussion and deliverables(?):

- 'Type I' problems – 'deep time' & a fundamentally different biosphere / sparse shallow water record / fundamental biophysical evolutionary innovations / costs and benefits more obvious but less predicable and tractable in models? (Patricia's Royal Soc workshop for follow-on?)
- 'Type II' problems - 'shallow time' & modern-like ecology / spatially resolved open-ocean record / species trait and ecological trends and disruptions / costs and benefits less obvious but more predicable and tractable in models? (follow-on @ ICP12?)

type II

type I



'PALEOGENiE' workshop: Format & Aims ('self-assembling')

Monday		
09:00	A. Ridgwell	*Welcome and Introduction*
09:30	P. Falkowski	*Reconstructing the "wiring diagram" for Earth's biogeochemical cycles*
10:30	**Coffee**	***15 minutes***
10:45	R. Rickaby	*Feedback between the environment and algal photosynthetic strategies*
11:15	P. Cermeño	*PaleOcean fertilization and organic carbon sequestration*
11:45	**Discussion**	***45 minutes***
12:30	**Lunch**	***1 hour***
13:30	K. Hendry	*The role of the marine silicon cycle in climate change over the Cenozoic*
14:00	D. Schmidt	*Does the environment influence foraminiferal calcification and if so which parameter?*
14:30	**Discussion**	***30 minutes***
15:00	**Coffee**	***15 minutes***
15:15	Z. Finkel	*Evolutionary patterns in elemental stoichiometry*
15:45	P. S.-Baracaldo	*Co-evolution of cyanobacteria and the biosphere: a phylogenomic approach*
16:15	T. Lenton	*Biogeochemical transformations in the history of the ocean*
17:15	**Discussion**	***≤ 45 minutes***

Talks will be immediately followed by 'technical questions' (time allowing).
Longer/leading and more discussion-like questions to be left for the Discussion section.

'PALEOGENiE' workshop: Format & Aims ('self-assembling')

Tuesday		
09:00	J. Young	*Is the evolution of calcareous plankton linked to global change?*
09:30	P. Hull	*From foraminifera to pelagic ecosystems: a consideration of what can be extrapolated*
10:00	E. Marañón	*Environmental control of phytoplankton size structure and growth rate*
10:30	**Coffee**	***15 minutes***
10:45	E. Litchman	*Constraints of phytoplankton evolutionary response to changing environmental drivers*
11:15	S. Collins	*Drivers of evolutionary responses to environmental change in picoplankton*
11:45	**Discussion**	***45 minutes***
12:30	**Lunch**	***1 hour***
13:30	C. Klausmeier	*Trait-based approaches to modelling plankton communities*
14:00	B. Sauterey	*Modelling ecological and evolutionary trait dynamics in marine plankton communities*
14:30	**Discussion**	***30 minutes***
15:00	**Coffee**	***15 minutes***
15:15	B. Ward	*The ecological and biogeochemical role of marine mixotrophs*
15:45	E. Galbraith	*Fishy Biogeochemistry: do large animals matter for biogeochemical cycling?*
16:15	M. Follows	*Is there just enough iron in the ocean*
16:45	M. Moore	*A framework for a multi-nutrient ocean*
17:15	**Discussion**	***≤ 45 minutes***

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'PALEOGENiE' workshop: Logistics

Logistics:

- Hotel?
- Dinner this evening (Monday).
- Wifi?
- Travel claims.
- Other?

Contact: Fanny Monteiro, Ben Ward
Thank: the above + ERC
Blame: Andy Ridgwell

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