Introduction to Ecosystems

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Why study ecosystems?

- Central concept in Ecology
- The 'scientific study of the interactions that determine the distribution and abundance of organisms' (Krebs 1972).
- Ecology is a synthetic science (Odum 1977)
- Draws from a wide range of other disciplines.
- Concepts used in ecology such as "ecosystems" have also been adopted by other fields.

What is an ecosystem?

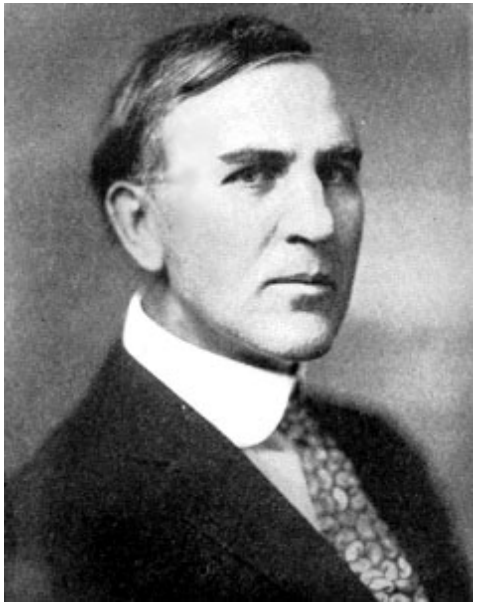
- Text book definition - “An ecosystem is a community of living organisms in conjunction with the nonliving components of their environment, interacting as a system” (Chapin 2002)
- An ecosystem is an interaction structure of organisms and their inorganic environment, which is open and, to a certain degree, capable of self- regulation.’ ’ (Klotzli 1993)
- An ecosystem consists of living organisms in some abiotic environment. What makes it a system is the fact that there exist specific dynamic relationships between these constituents. What makes it cybernetic is the existence of coordination, regulation, communication, and control in these relationships.’ ’ (McNaughton and Coughenour 1981)

Which concepts are involved?

- Interactions between biotic and non biotic components
- Nutrient cycles and energy flows
- Feedback loops and cycles.
- Homeostasis
- Fragility vs stability
- Food chains, food webs, trophic cascades
- Keystone species

How did the concept evolve?

- Tansley developed the concept as a counterpoint to the ideas of Clements

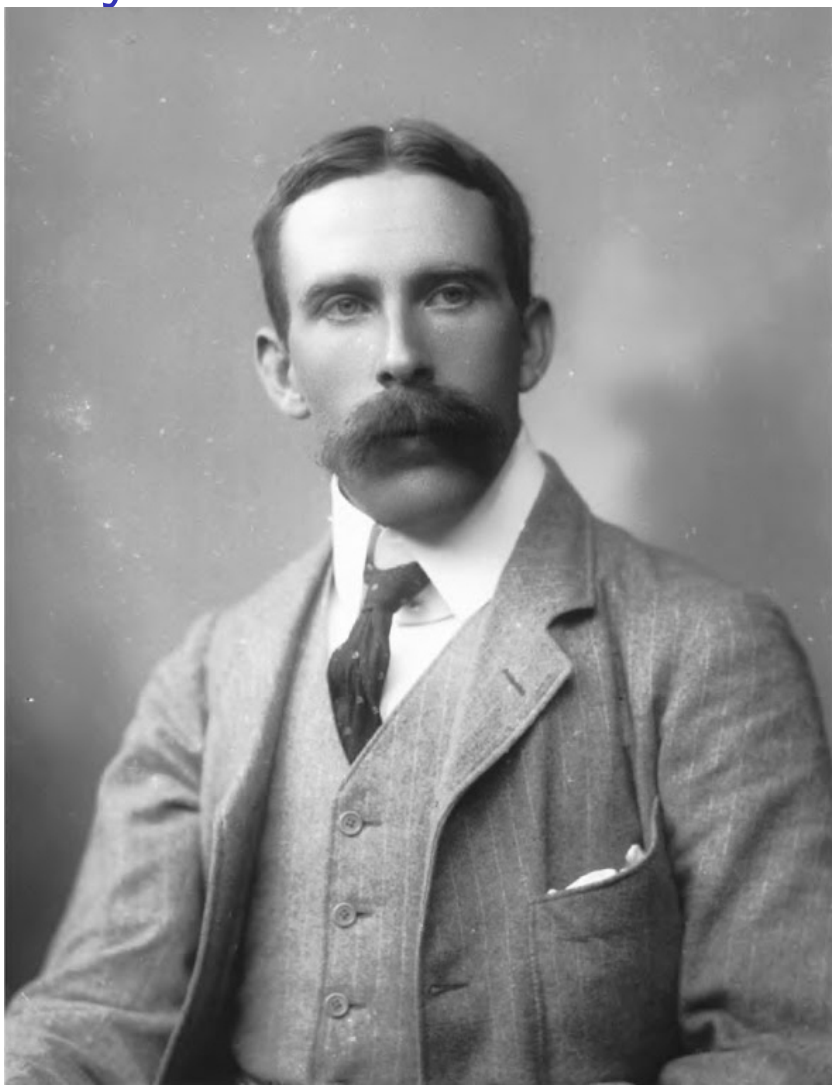


https://people.wku.edu/charles.smith/chronob/CLEM1874.htm

Who was Clements and why were other concepts needed?

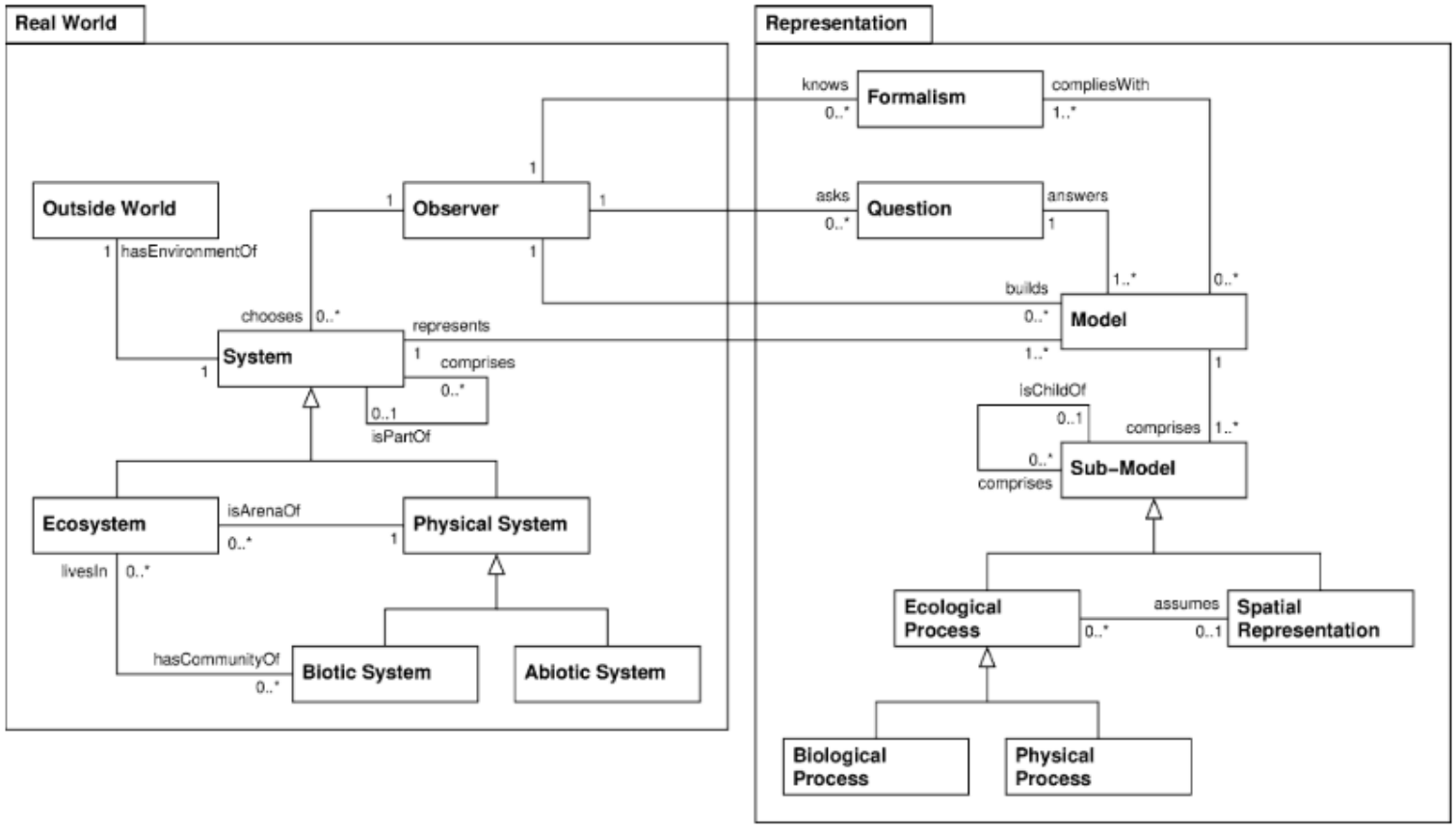
- Frederic Clements was a very influential American ecologist/botanist/taxonomist
- Considered to be rigid and dogmatic
- Believed in Lamarkian evolution and teleological processes (goal centred)
- Orderly progression of succession towards a “climax” community
- Many American ecologists are still influenced by Clements
- Clements’ ideas still influential in the climate debate

Tansley



I have already given my reasons for rejecting the terms ''complex organism" and ''biotic community''. Clements' earlier term ''biome" for the whole complex of organisms inhabiting a given

Reality and models



Concepts

Objects and concepts of the real world	
System	A part of the world isolated from the *outside world* for the purpose of study
Outside world	The part of the world not included in the *system*
Observer	The person deciding to define a *system*
Physical system	A *system* studied and described using the vocabulary, tools, methods of physics
Biotic system	A *physical system* displaying the properties characteristic of life: a finite life span and the ability to reproduce
Abiotic system	Any *physical system* not displaying the properties of life: a finite life span and the ability to reproduce
Ecosystem	A *system* made of a community of {0..n} *biotic systems* within a unique *physical system* container known as the arena
Objects and concepts of the representation world	
Question	The reason for sampling or modelling an ecosystem
Formalism	A formal body of knowledge
Model	An intellectual construct build by an *observer* in compliance with one or more *formalisms* in order to answer a *question*. A model is a representation of a real-world *system*
Sub-model	A meaningful subset of a *model*
Ecological process	A *sub-model* describing ecological interactions or functions
Spatial representation	A *sub-model* representing space
Biological process	A *model* characteristic of life, complying with biological *formalisms*
Physical process	A *model* complying with physical *formalisms*

References