Module Soil Ecology SS 2018

Rhizosphäre

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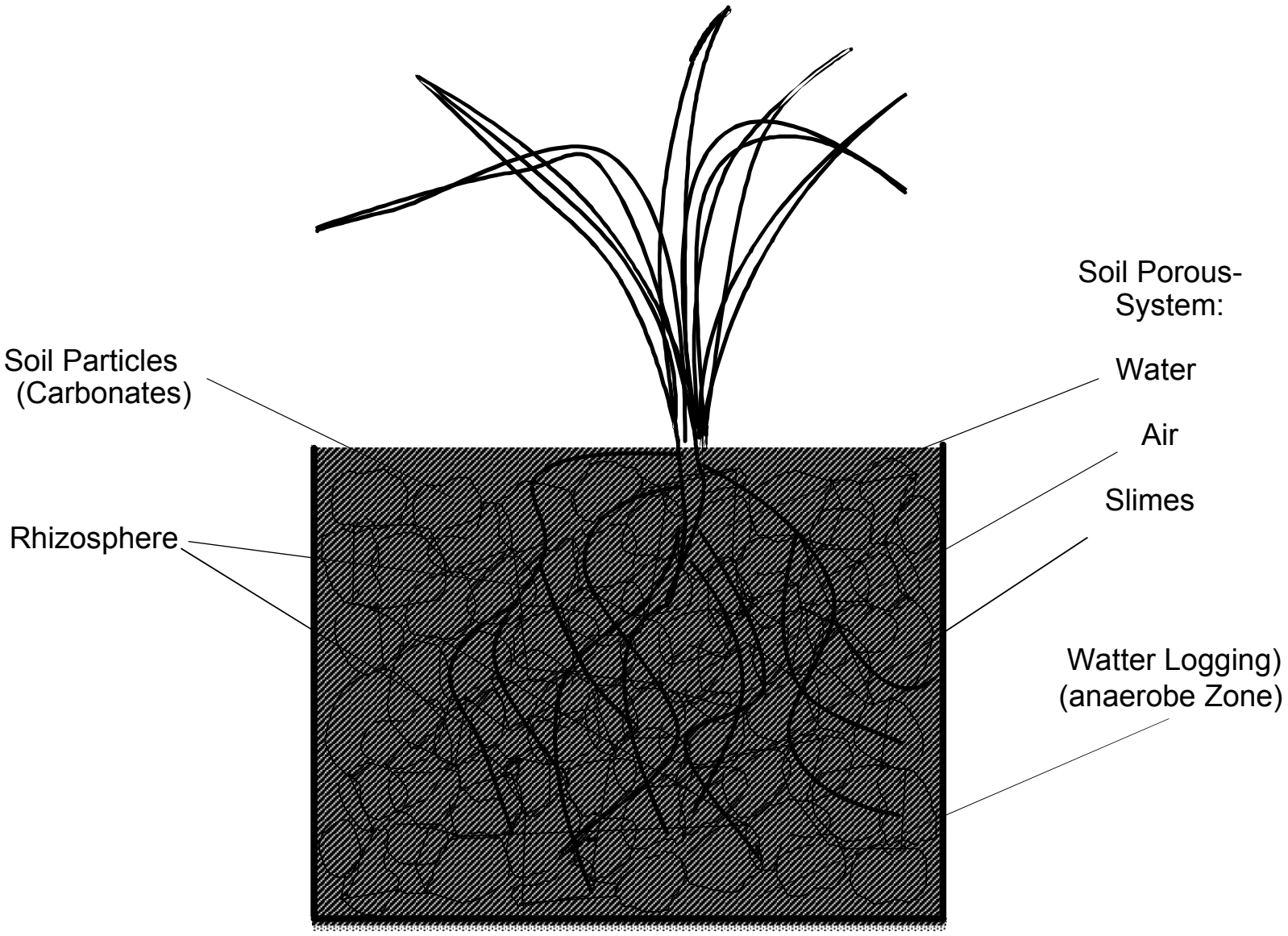
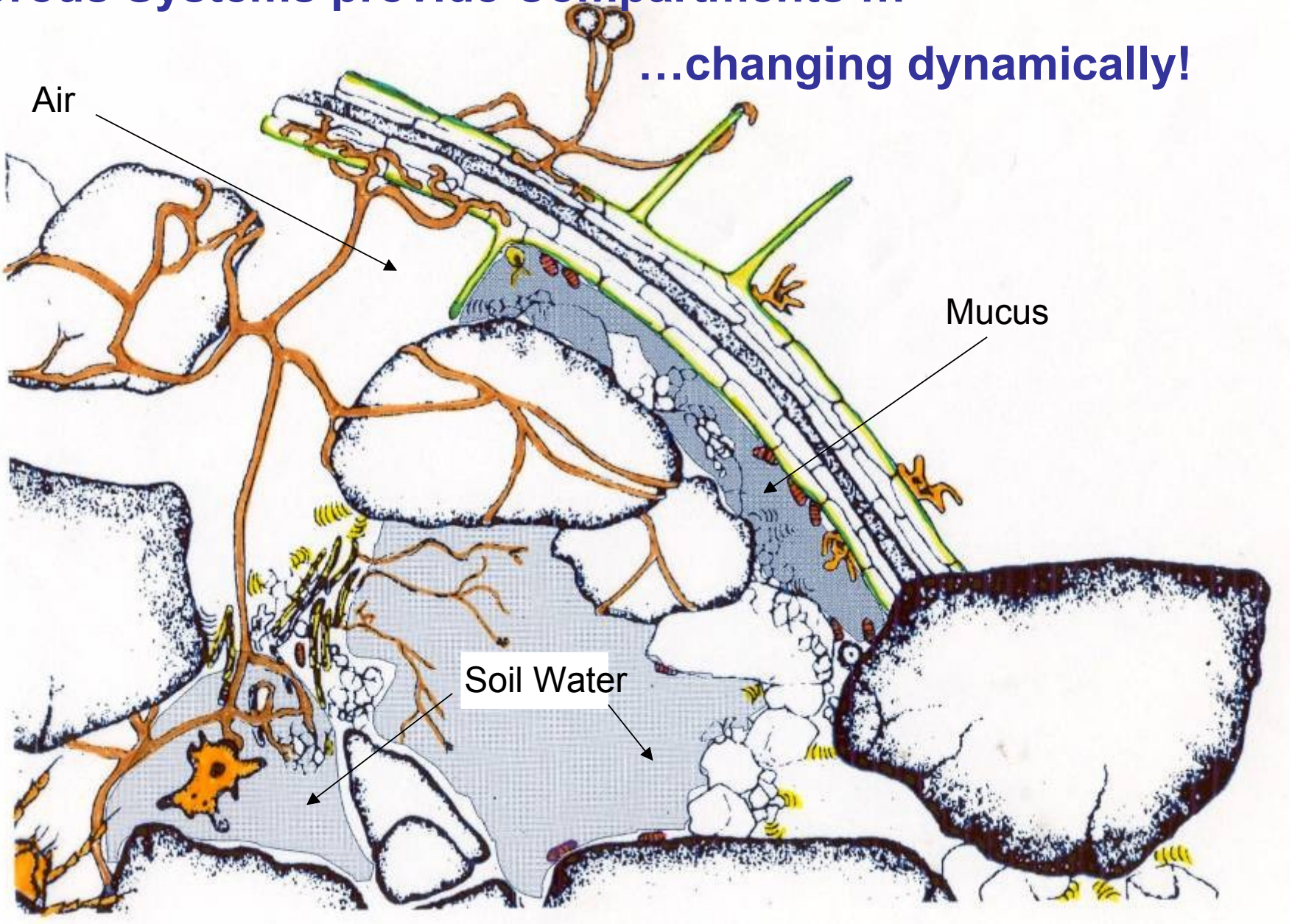
Microhabitates in Soil



Porous Systems provide Compartments …

…changing dynamically!



Definitions: Soil Systems Ecology, Bioactivity

Bodenökologie

Rhizosphere	Densely rooted Soil s.s. Soil directly influenced by Roots.
Rhizoplane	Root Surface, inhabited by Organisms.
Rhizosphere Organisms	Organisms living in the Rhizospheree Zone.
Rhizodeposition	Deposition of dissolved and particular Matter by Roots
Root Exudation	ActiveSsezernation of Substances by Roots
Bioactivity	Presently measurable Activity of Organisms or Enzymes .
Biomass	Living or decomposing Biomass (g or g Biomass Carbon).
Potential Bioaktiviy	Maximal Substrate induced Biomass.
Species Abundance	Amount of Individua of a single Species in a given Area or Volume.
Species Richness	Number of different Species in a given System
Species Diversity	relative Abundance of Species or Genomes related to a System….(Shannon Weaner..
Relative Importance Value	Dominance od Species or functional Groupsin relation to theior Coorganisms .
Pool Size	Amount of single Metabolites .
Flow /Transfer	Transfer Rates of Metabolites.
Energy Flow	Translokation of potetial biochemical Energy e.g. ATP/NADH + H.
Mass Transfer	Translokation of Substance, s.s. potential Biosubstrates.
Residence Time	Relative Time a Substance may remain in a System.
Turnover Time	Periode of complete Rezyklierung of a Substance in a System.
Source_Quelle	Energy- or bzw. CN-Source
Sink_Senke	Compartment/Location of Production or Imobilization

Definitions: Soil ecological Methods, Bioaktivität

Soil Respiration, CO_2

Soil Air	Air in the Soil Pores. CO2
Soil CO_2 - Emission	Biogenic or abiogenic CO2 produced in Soils
Basal Soil Respiration (BR)	Sum, of CO2 Emission
Root Respiration	Root produced CO_2
Microbial Respiration	Mikroorganismal CO2
SIR	Substrate induced soil Respiration
Initial point of respiratory response	Timepoint of complete soil air removal and Measurement of biogenic CO2
Response RESP	SIR – BR.
Response % BR	RESP in Percent of basal Respiration
Increase of Biomass	Amplification of RESP in mg CO_2 per kg Soil per h in the linear range
Biomass C	SIR derived Biomasse C (Anderson /Domsch).
Respiratory Quotient	Gramm Biomasse-C per g Bsasal Resp.-C.

Methods to analyse "microbial Biomass"

Infra red spectroscopy	Measurement of IR Absorption (Absorption spektra) of a Substance.
IRGA	Infra Red Gas Analyse (URAS... Ultra Red Scribe) of (Soil) Air.
Isermeyer	CO_2 Measurement by alcaline Absorption and Titration.
Anderson/Domsch	Biomass -C Calculation from SIR.
Fumigation/Extraktion	Extraction of Biomass-C or N after Chloroform Fumigation.
Isoenzyme activities	Analysis of the maximum substrate utilization of a Soil
Direct Count	Staining and Cunting of single Organisms.

Chemical -physiological Analysis

Low Molecular
Organic Compounds

Sugars
Amino Acids
Organic Acids

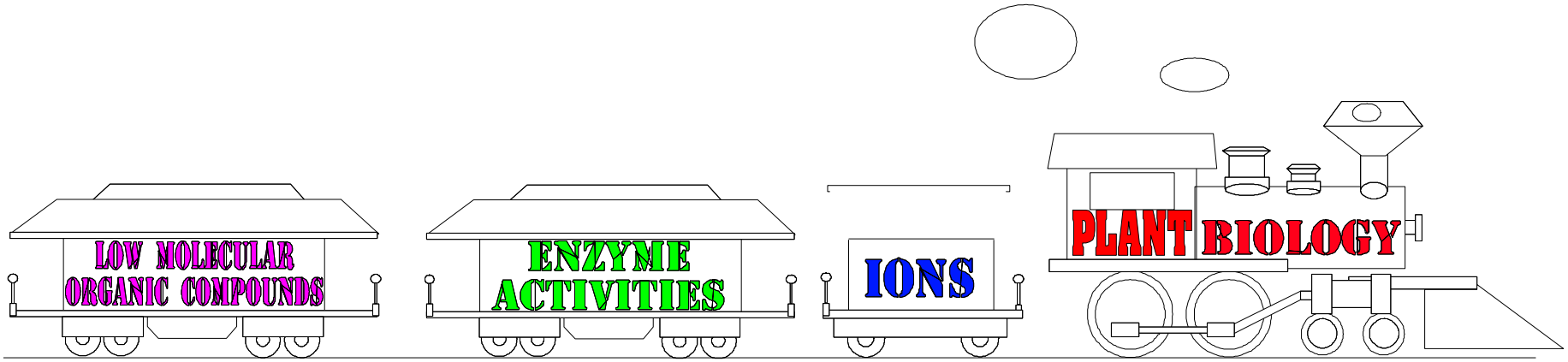
Enzyme akctivities

Decarboxylases
(SIR, Soil Respiration))
Invertases
Dehydrogenases

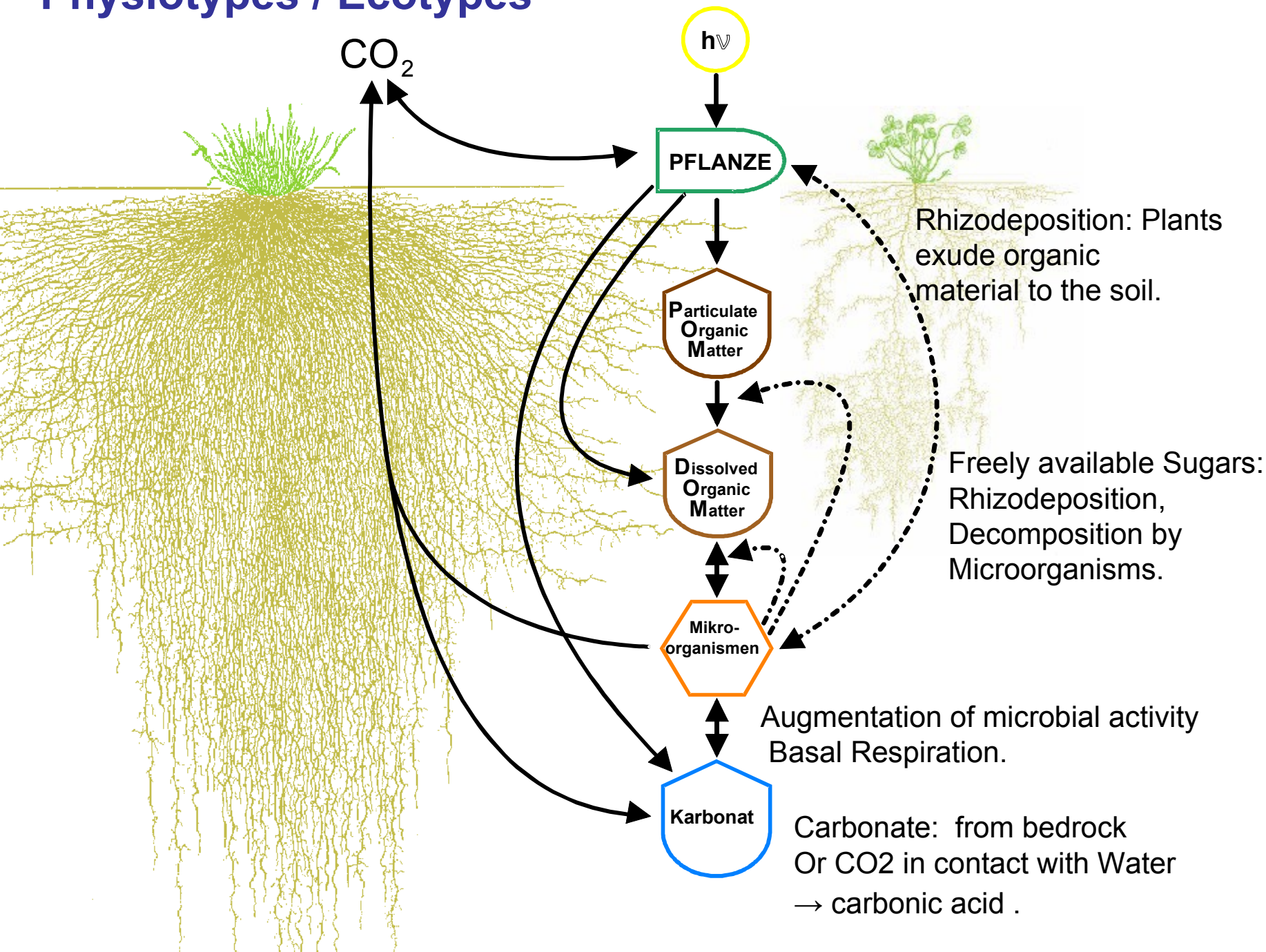
Proteases
Ureases
Phosphatases

Minerals

Protones (pH)
Na, K, Mg, Ca
P, S, N, C



Physiotypes / Ecotypes



Rhizodeposition Strategies of Plant Species

high biomass production

- keeping a reserve for remineralisation by slow decomposers (K-strategy)

high exudation of low molecular weight organic substances

- quick substrates for fast remineralizing microorganisms (R- strategy)

<u>Combinations (extremes) and their impact on ecosystems</u>

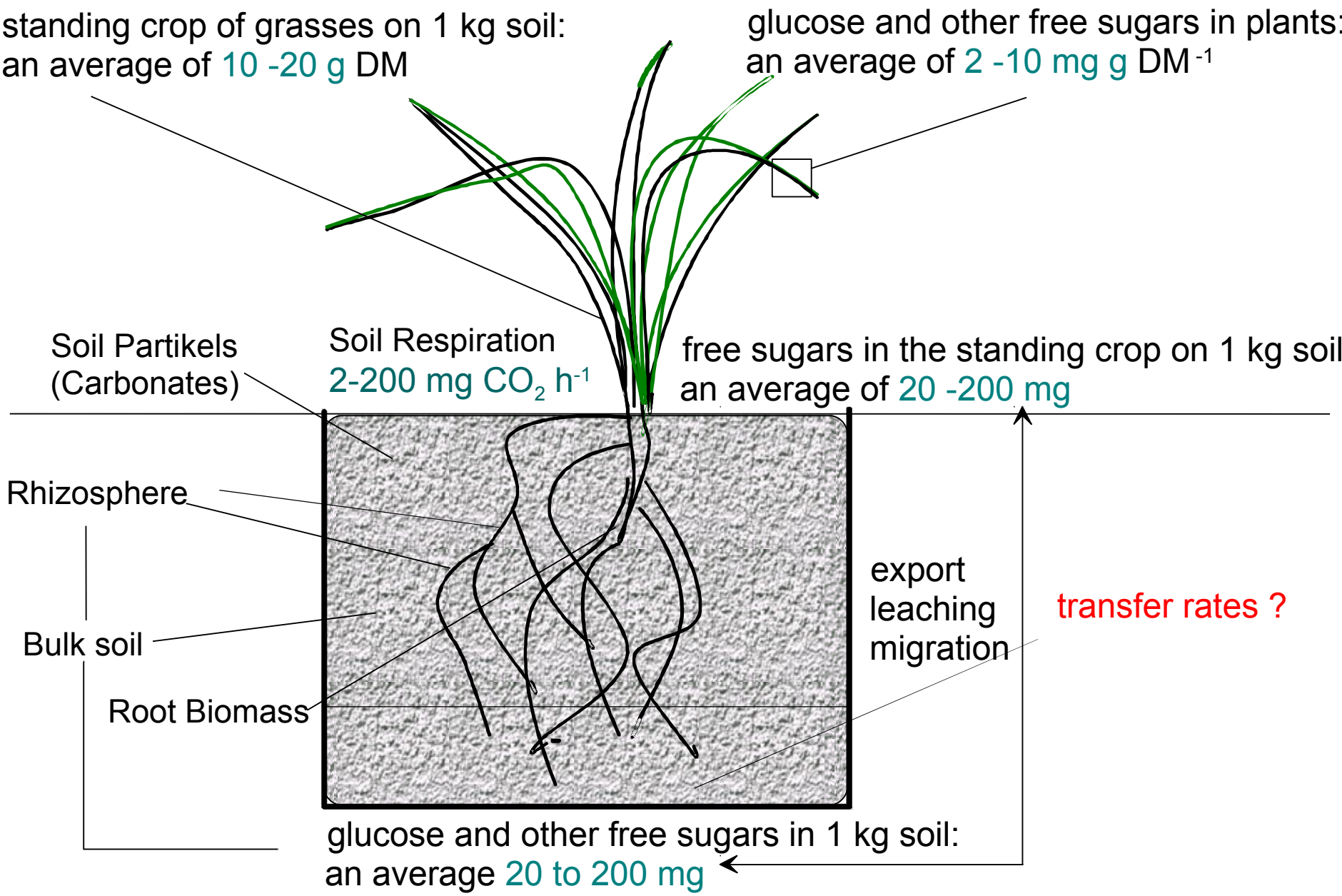
high biomass and **high** exudation high turnover, steady state or shift?

high biomass and **low** exudation steady state, slow shift of biodiversity

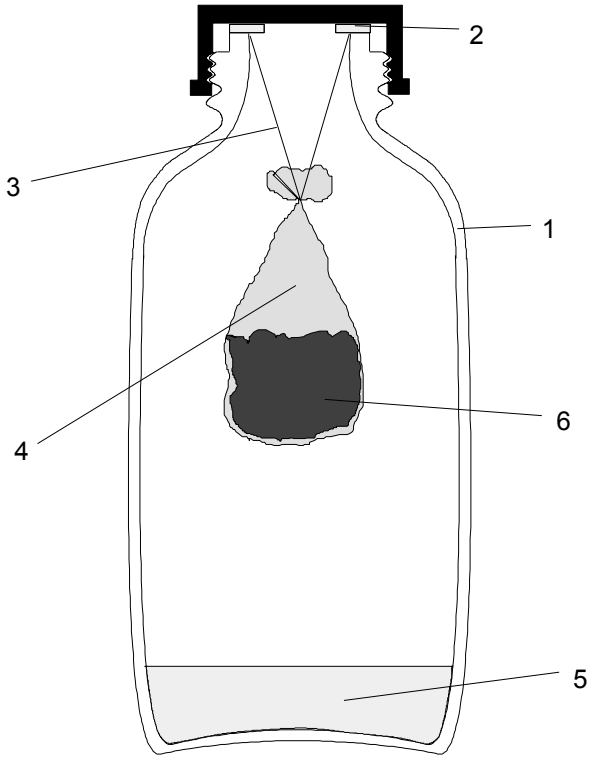
low biomass and **high** exudation quick depletion of nutrients, degradation?

low biomass and **low** exudation steady state, slow turnover rates

CO_2 Sink: Free Sugars in Plant and Soil

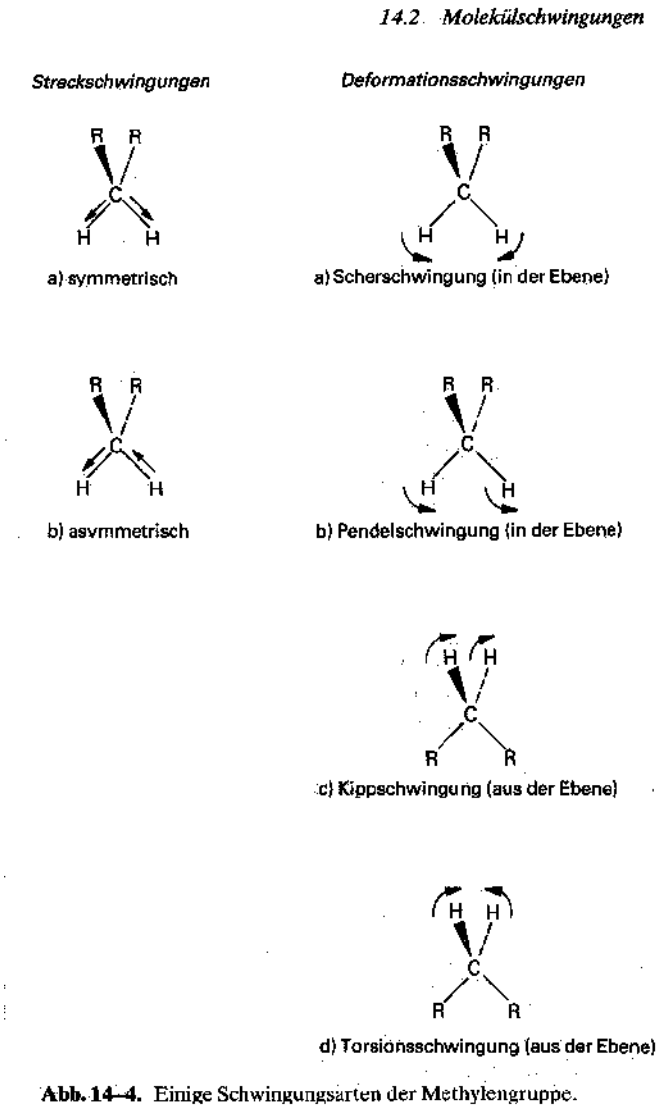


CO2 Titration
Isermeyer (1952)

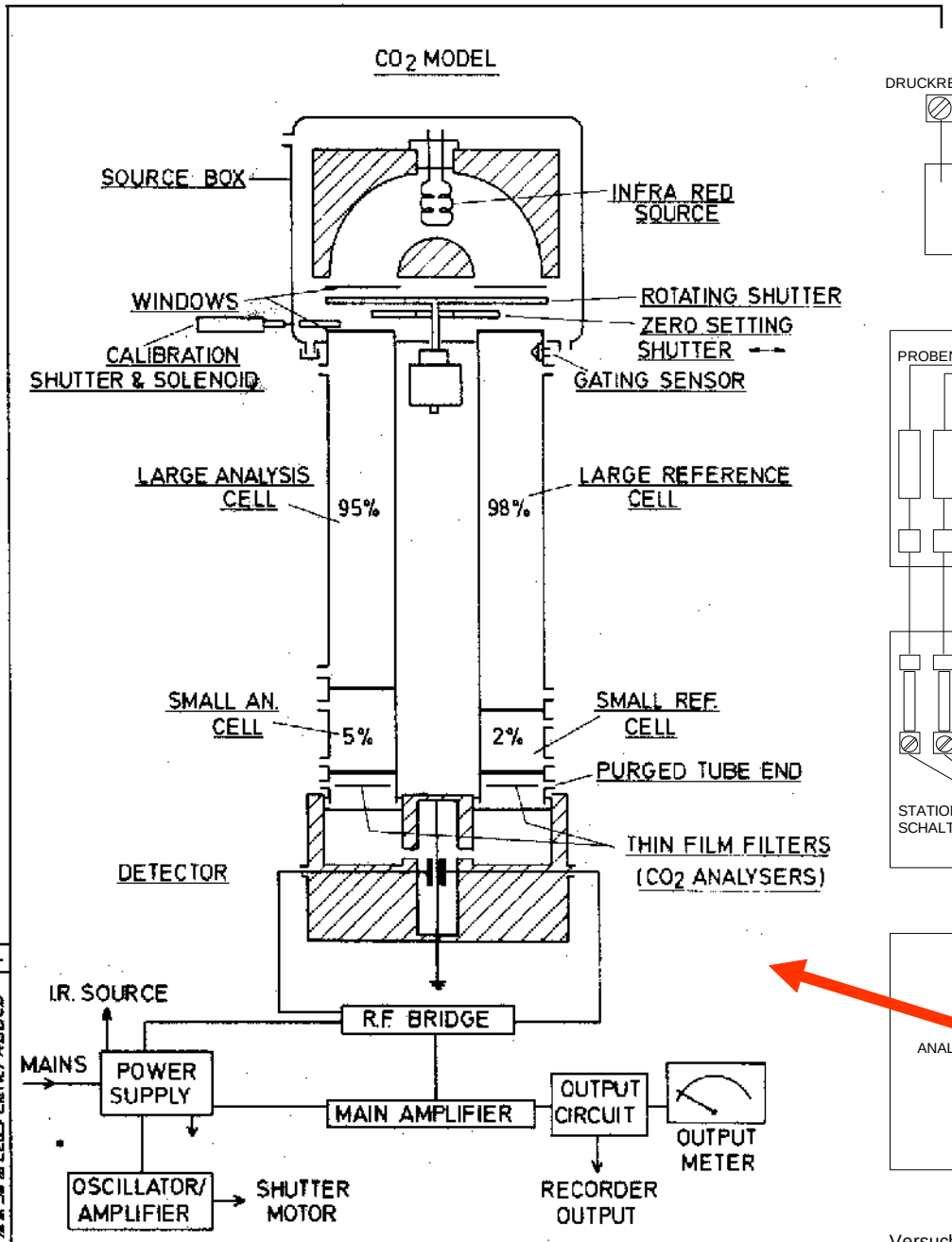


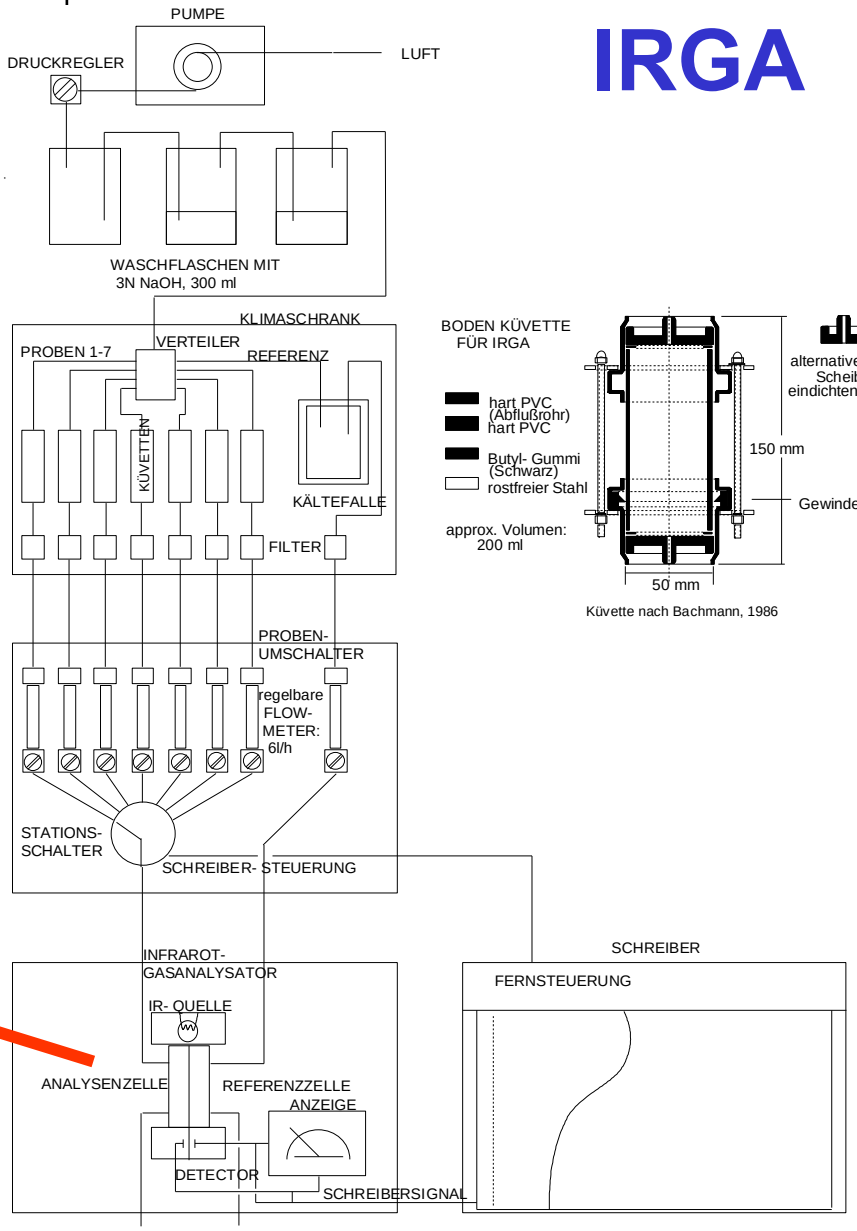
1... Schott- Flask
2... Sealing
3... Nylon Thread
4... Small Bag from Nylon Mesh
5... Sodiumhydroxide
6... Soil

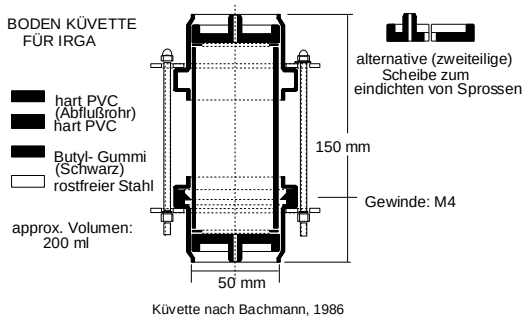
IRGA
(Infra Red Gas Analysis)



IRGA



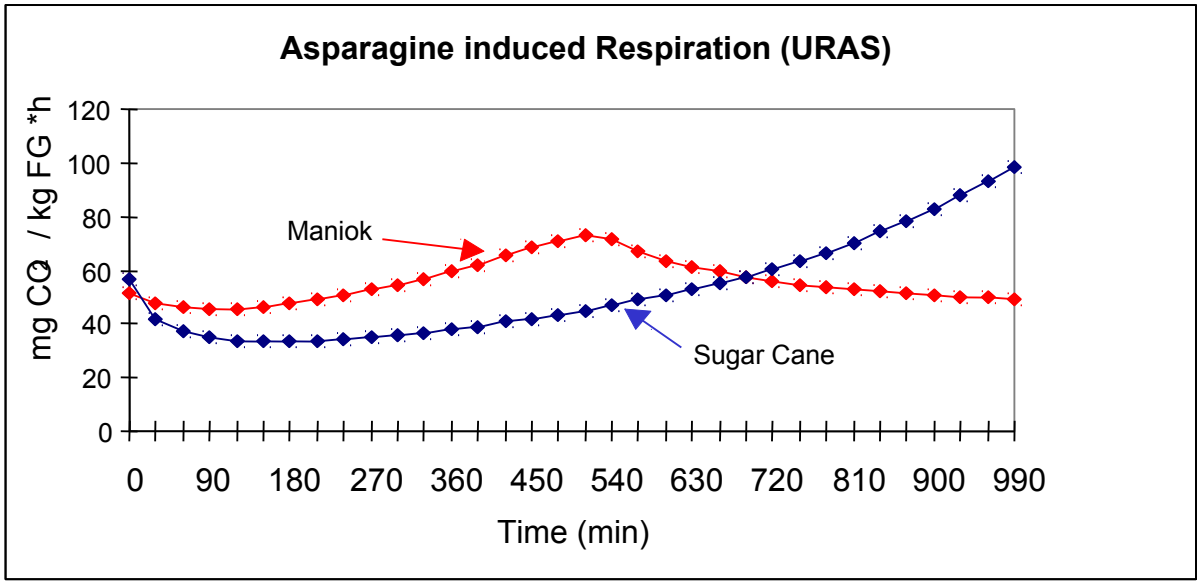


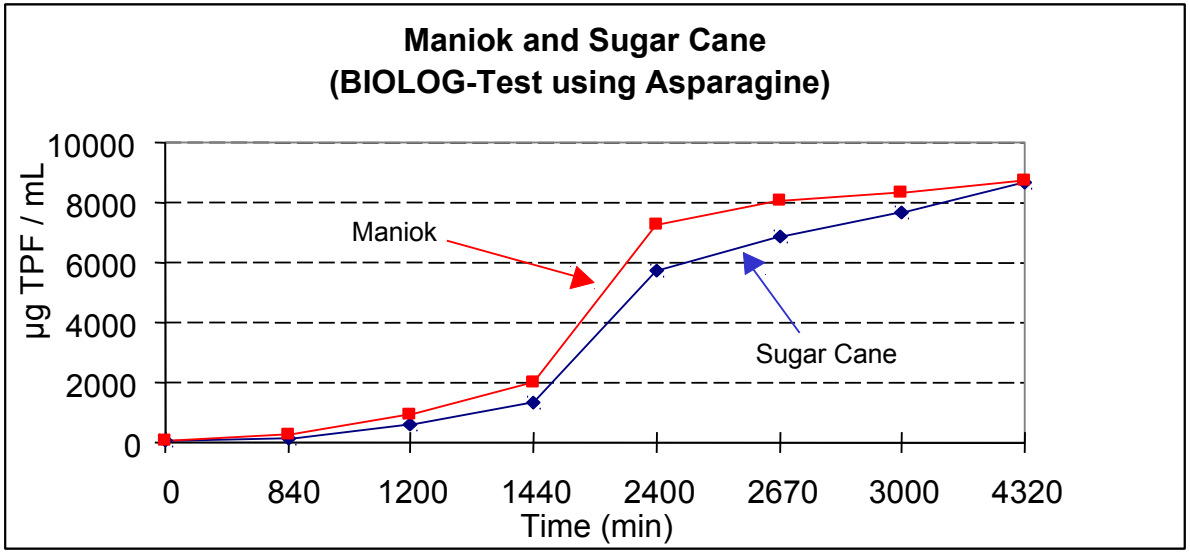


Küvette nach Bachmann, 1986

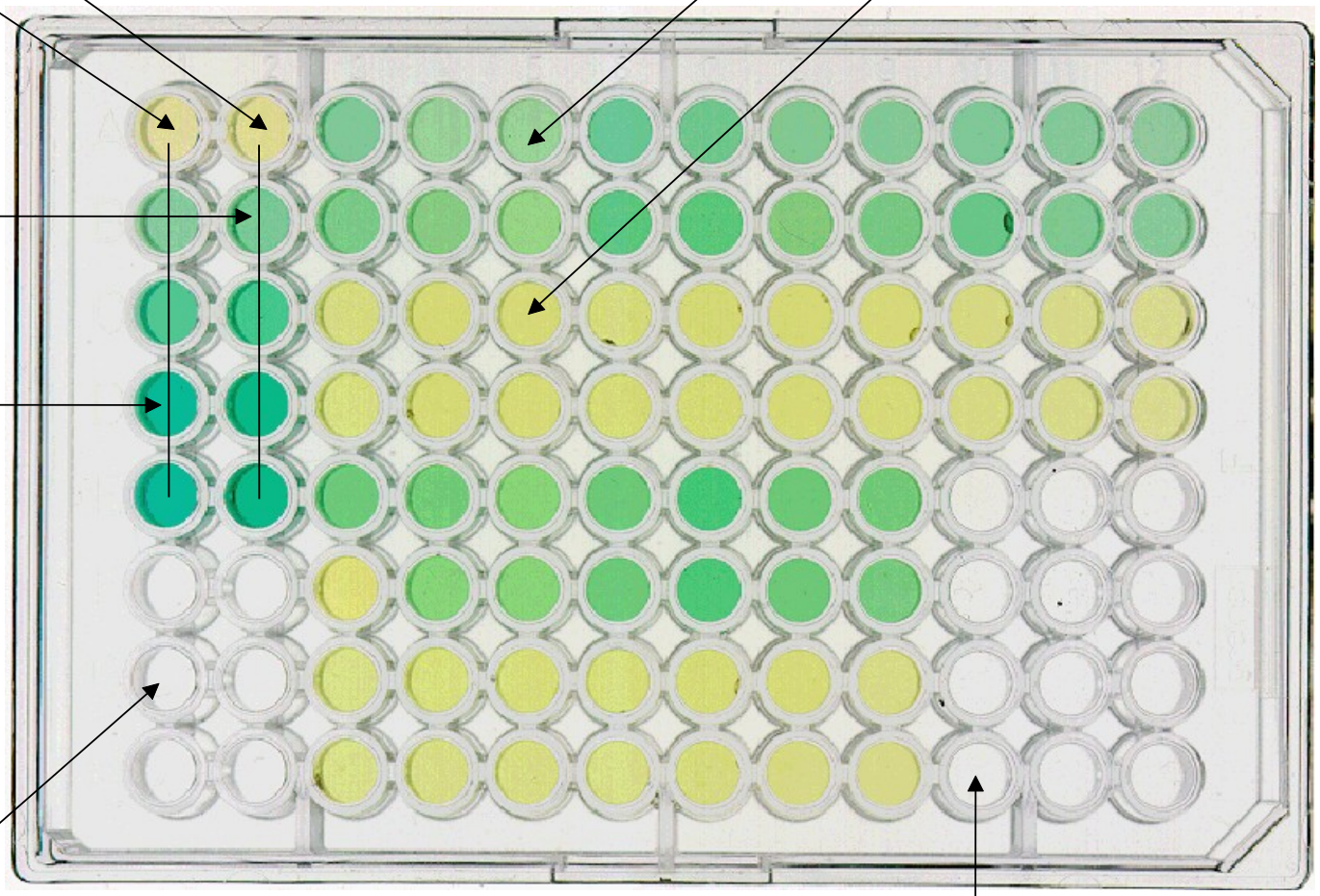
Versuchsanordnung nach Bachmann und Baumgarten, 1986

Substrate activation, induction, resource limitation

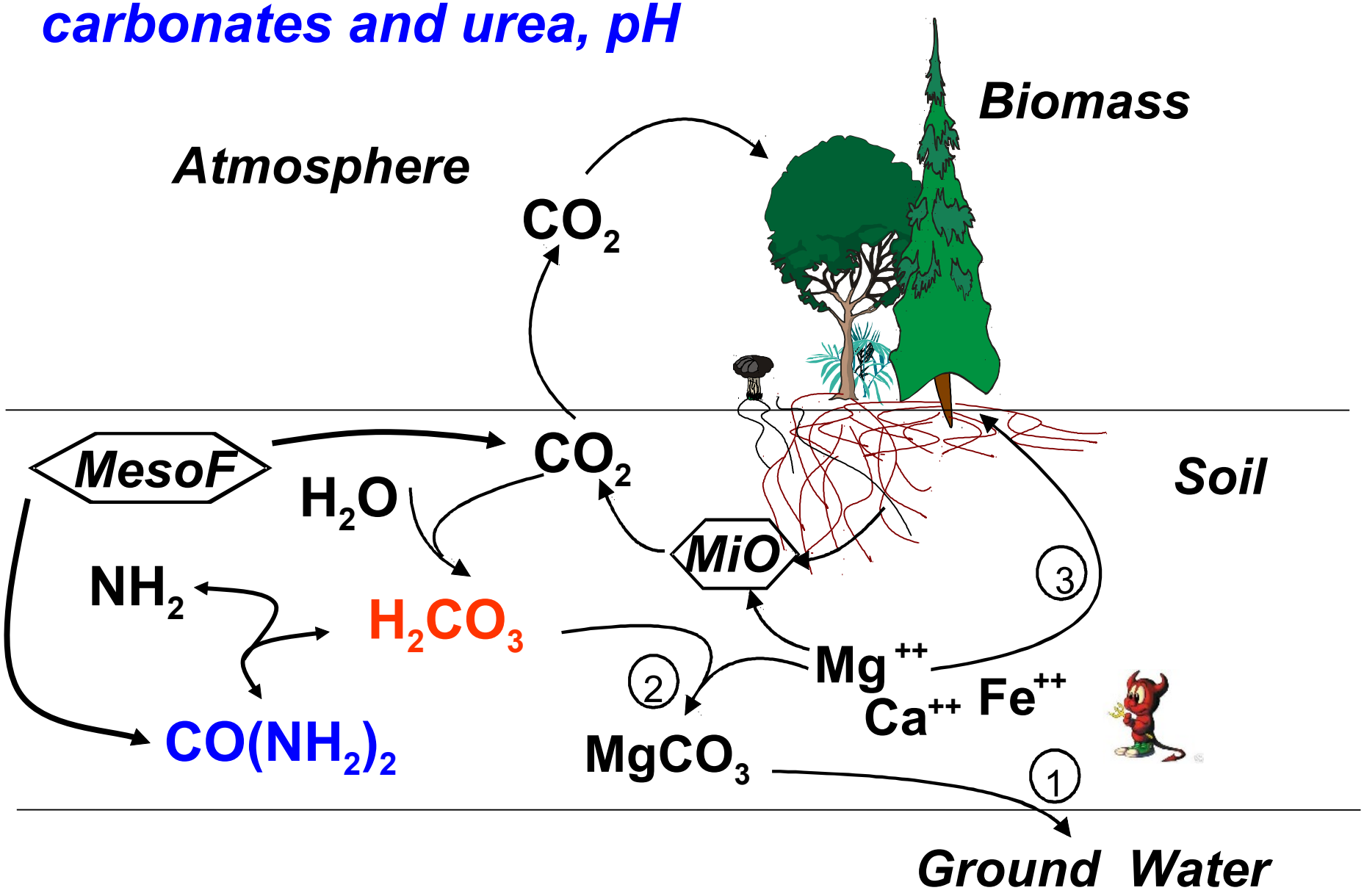




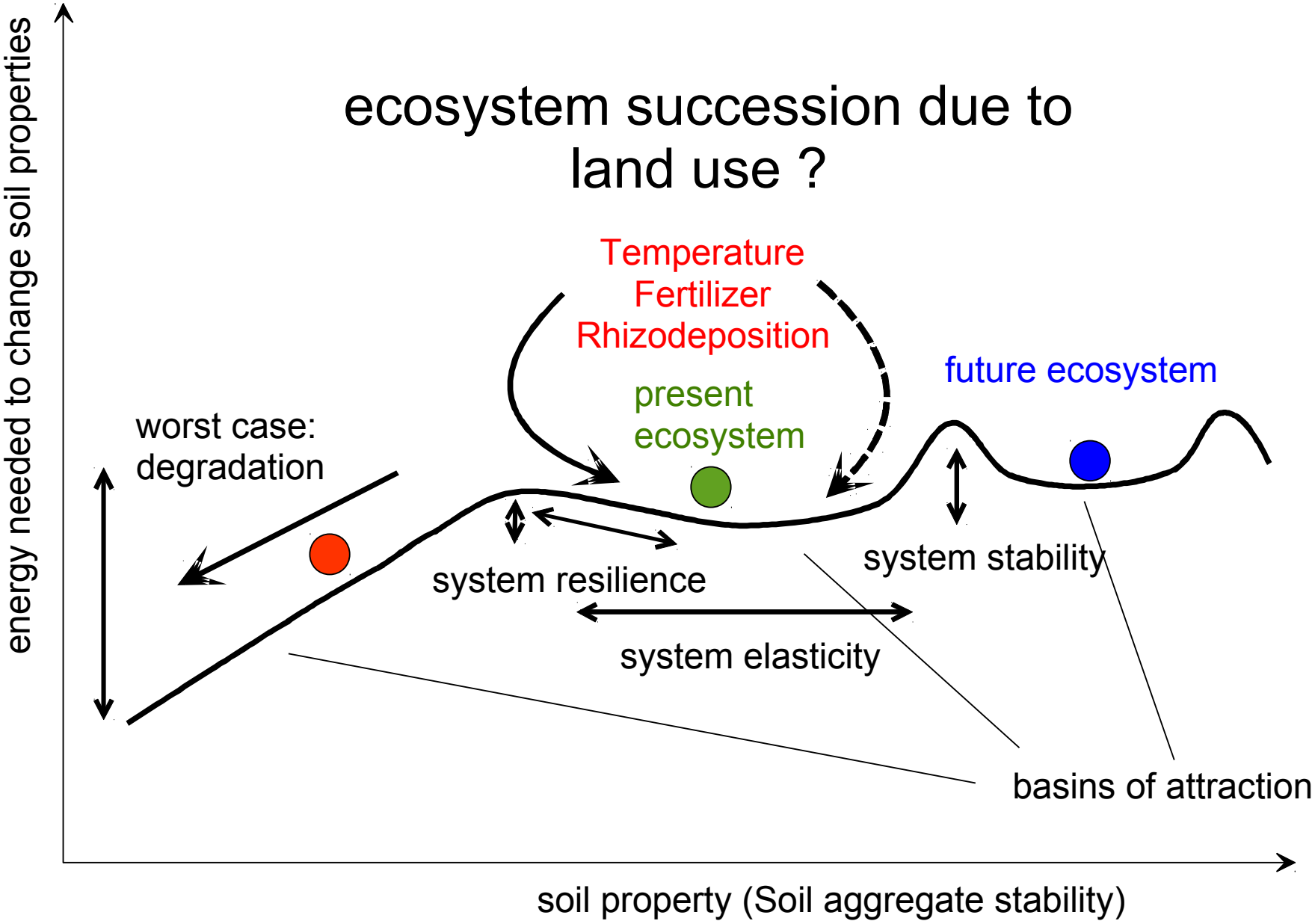
Microplate Photometer, Enzyme tests (Urease)



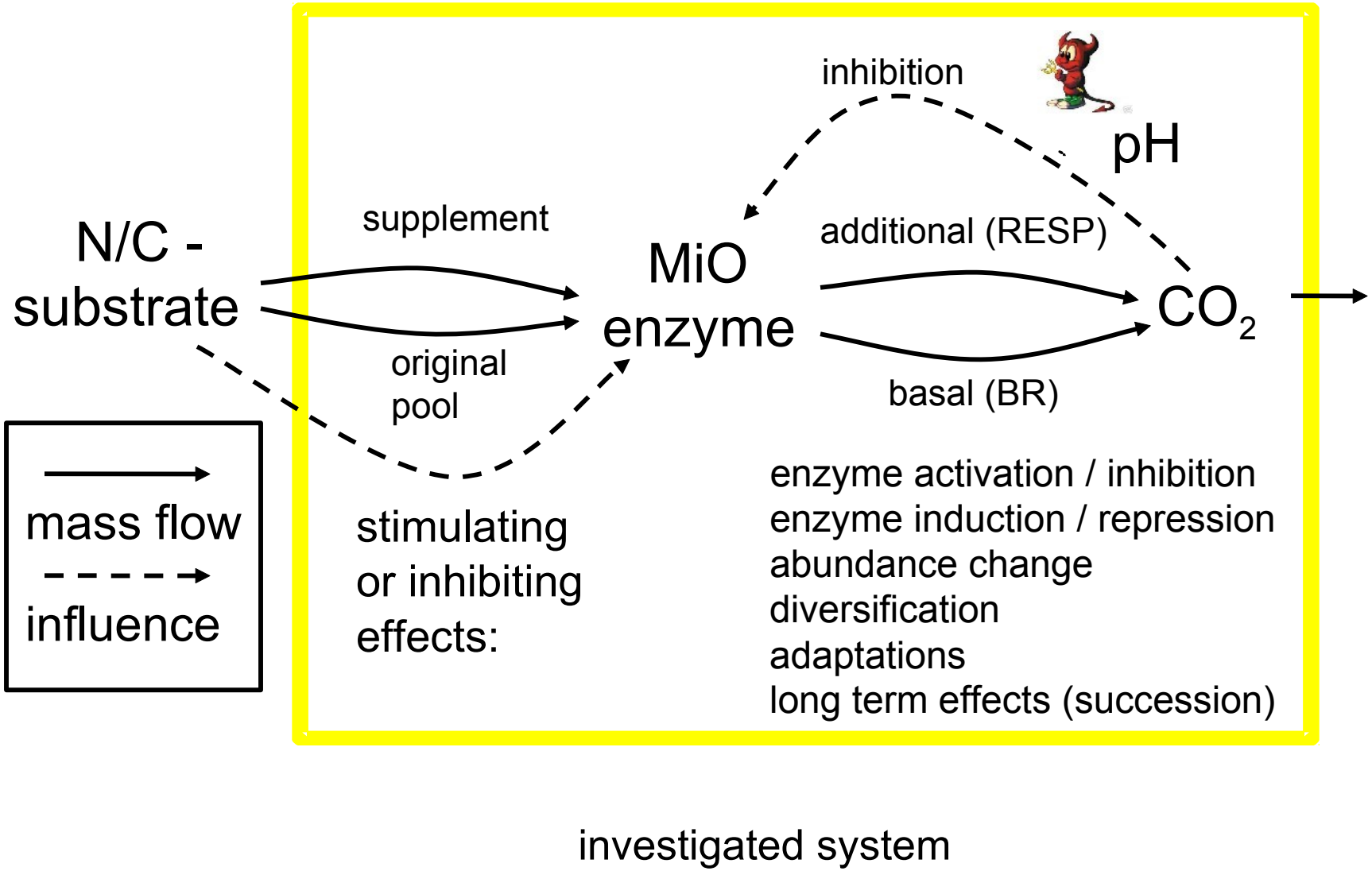
basal C/N transfer mechanisms in the soil system: *carbonates and urea, pH*



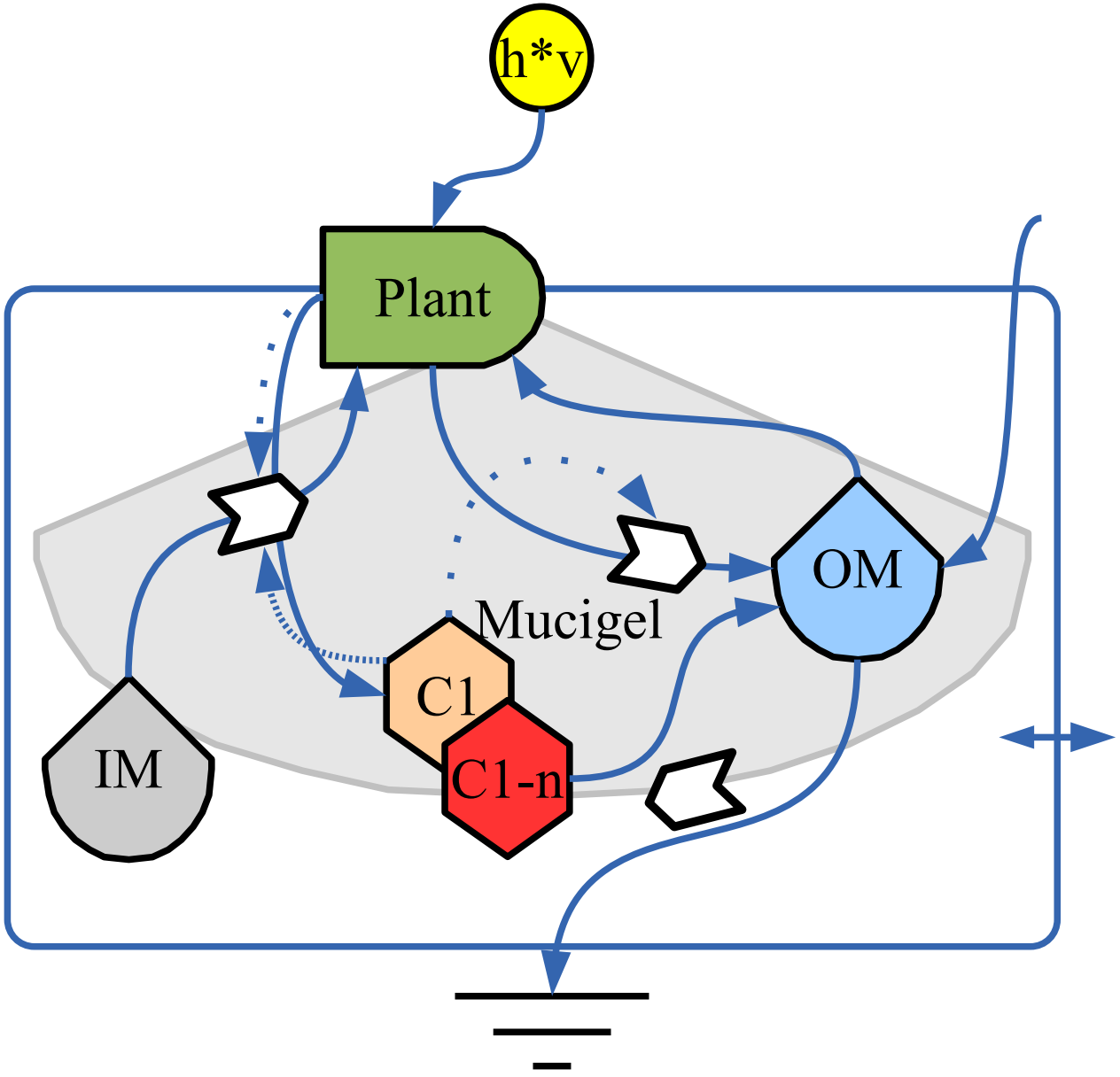
Stability of Soil Systems



Level of Impact



investigated system


h*v
Plant
OM
Mucigel
C1
C1-n
IM

THERE'S TREASURE EVERYWHERE