BIOINSTITUT

PŮDOOCHRANNÉ ZEMĚDĚLSTVÍ SE ZAMĚŘENÍM NA MEZIPLODINY

Seminář v rámci projektu JDE O PŮDU – JDE O ŽIVOT II

11. října 2018, od 9:00

Střední zemědělská škola a Střední odborná škola Poděbrady, Boučkova 49/355, 290 01 Poděbrady

Mendelova univerzita v Brně

Role meziplodin v osevním postupu
Příručka Úspěšné pěstování luskovin ve směsce s obilovinou
Ing. Jaroslav Záhora, CSc., MENDELU Brno

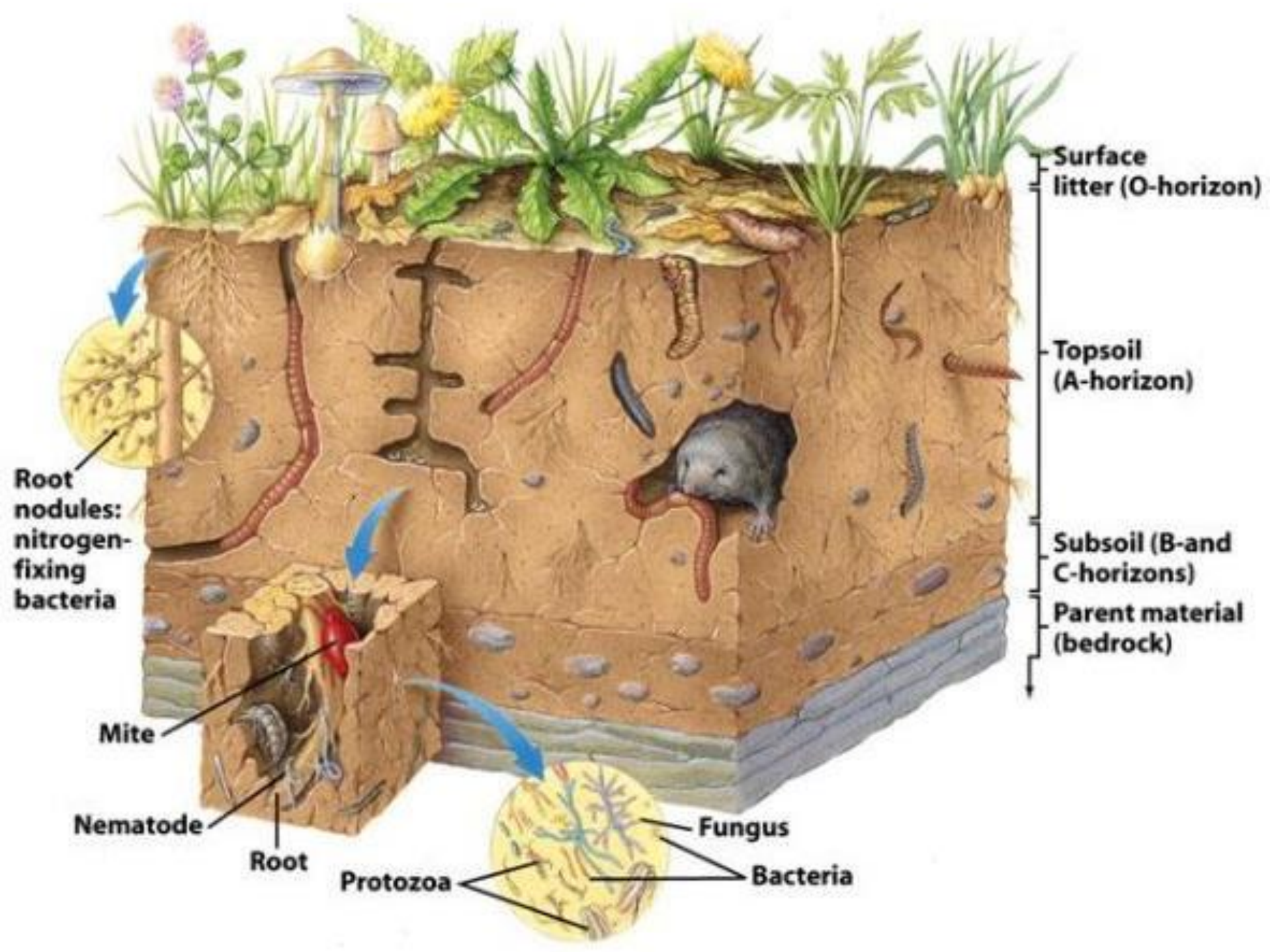
Agronomická fakulta

SONDAR CZ-AT
Soil Strategy Network in the Danube Region

EUROPEAN UNION
European Regional Development Fund

SPOLUPRÁCE CZ - KOOPERATION AT - SPOLU

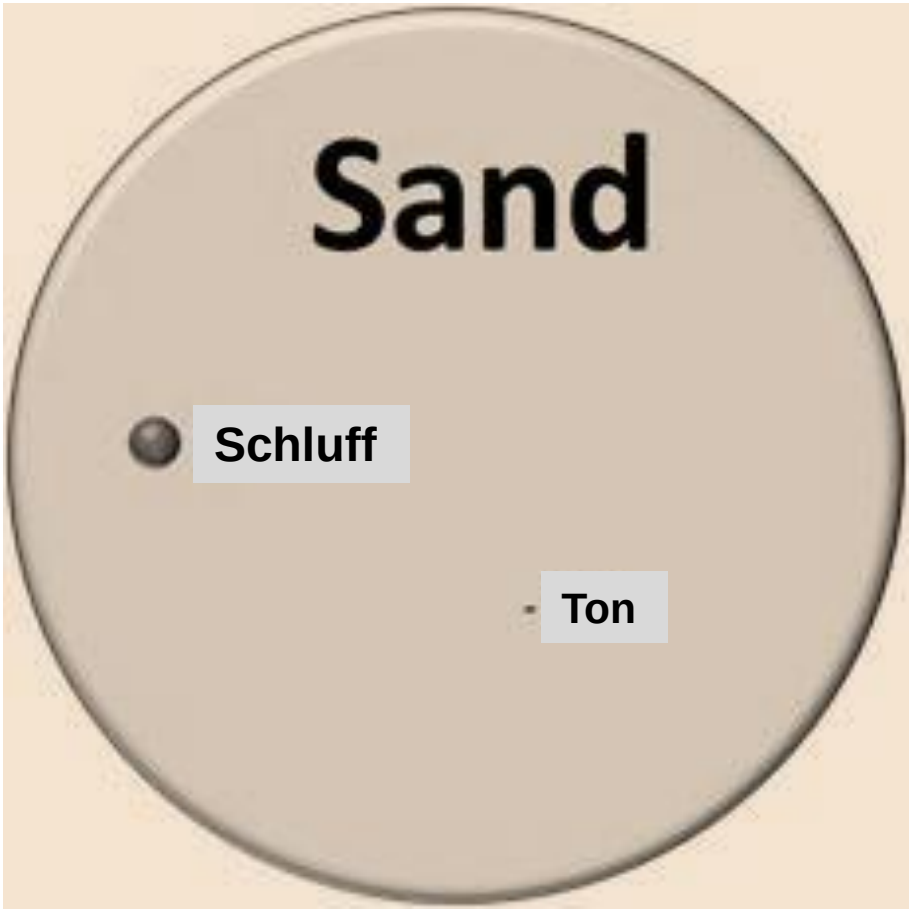
EUROPEAN TERRITORIAL CO-OPERATION
AUSTRIA-CZECH REPUBLIC 2007-2013
Gemeinsam mehr erreichen. Společně dosáhneme více.


Surface litter (O-horizon)
Topsoil (A-horizon)
Subsoil (B-and C-horizons)
Parent material (bedrock)
Root nodules: nitrogen-fixing bacteria
Mite
Nematode
Root
Protozoa
Fungus
Bacteria

Ton
< 2 µm ø

Schluff
2 – 63 µm ø

Sand
63 – 2 000 µm ø



Relative Größen von Sand, Schlauff und Ton

Relative Anteil

→ **Die Bodenarten**

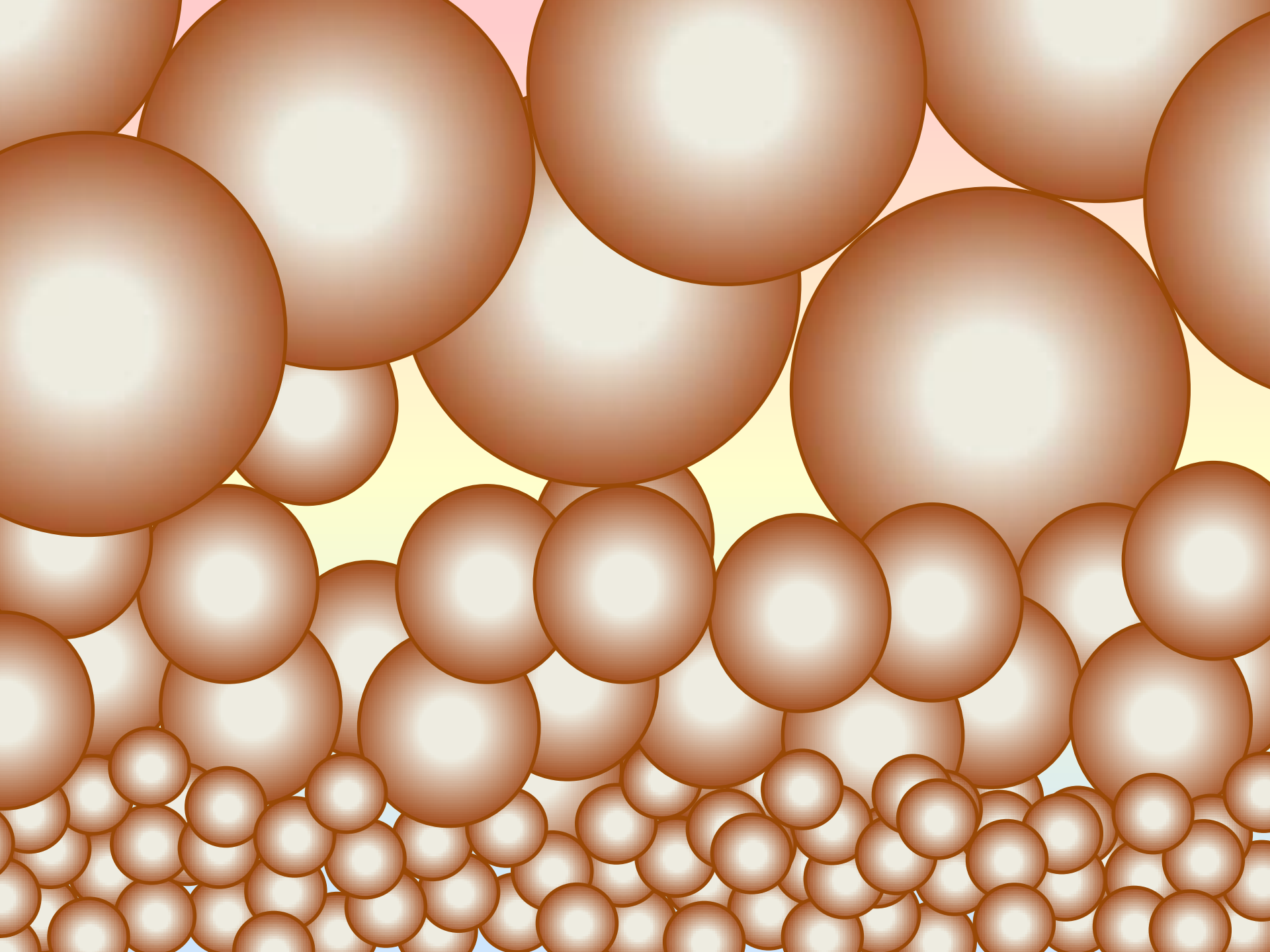
(Zdroj: http://www.greenprophet.com/2010/06/libya-pivot-irrigation/)

Test mit dem Einmachglas

CLAY 5%

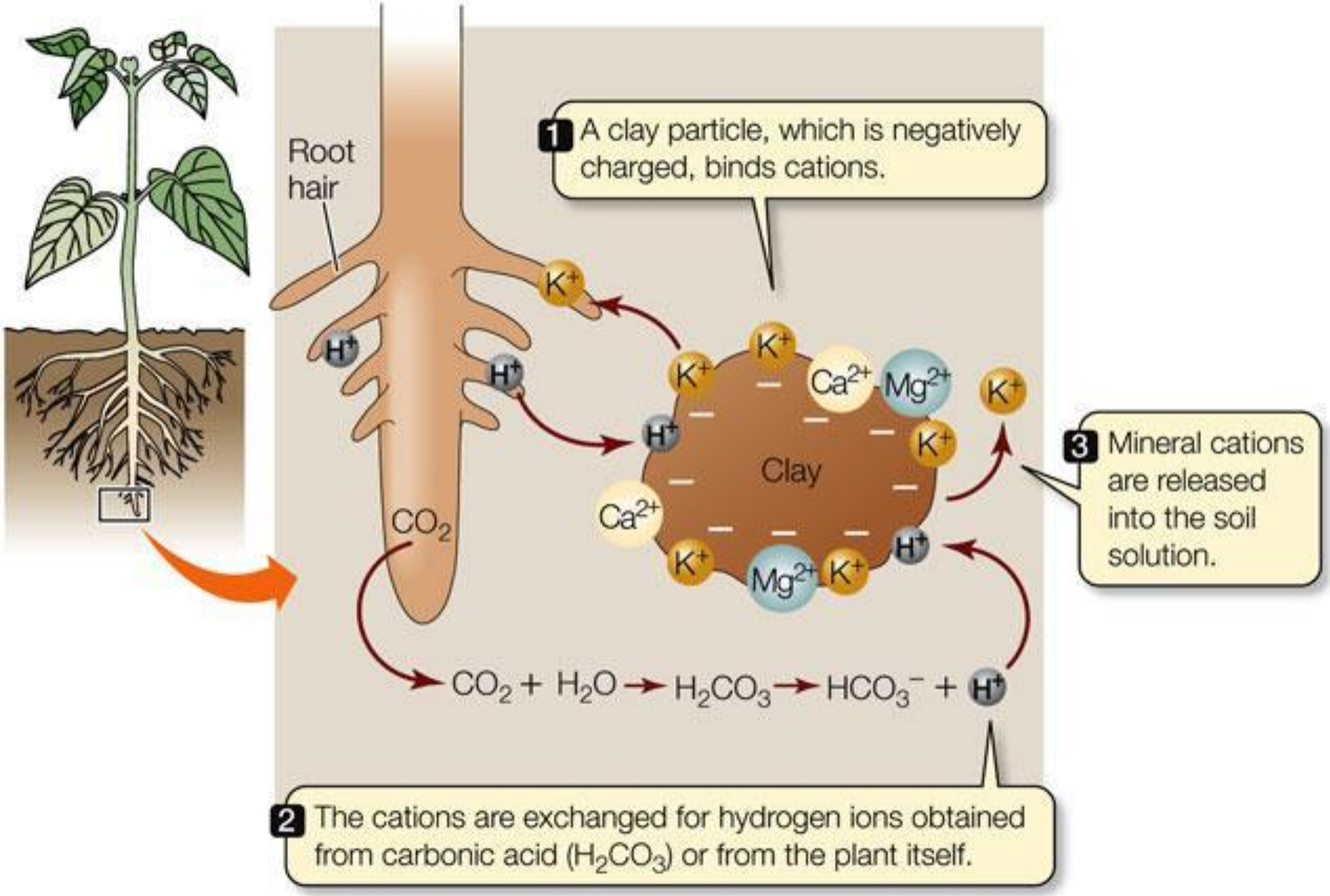
SILT 40%

SAND 55%



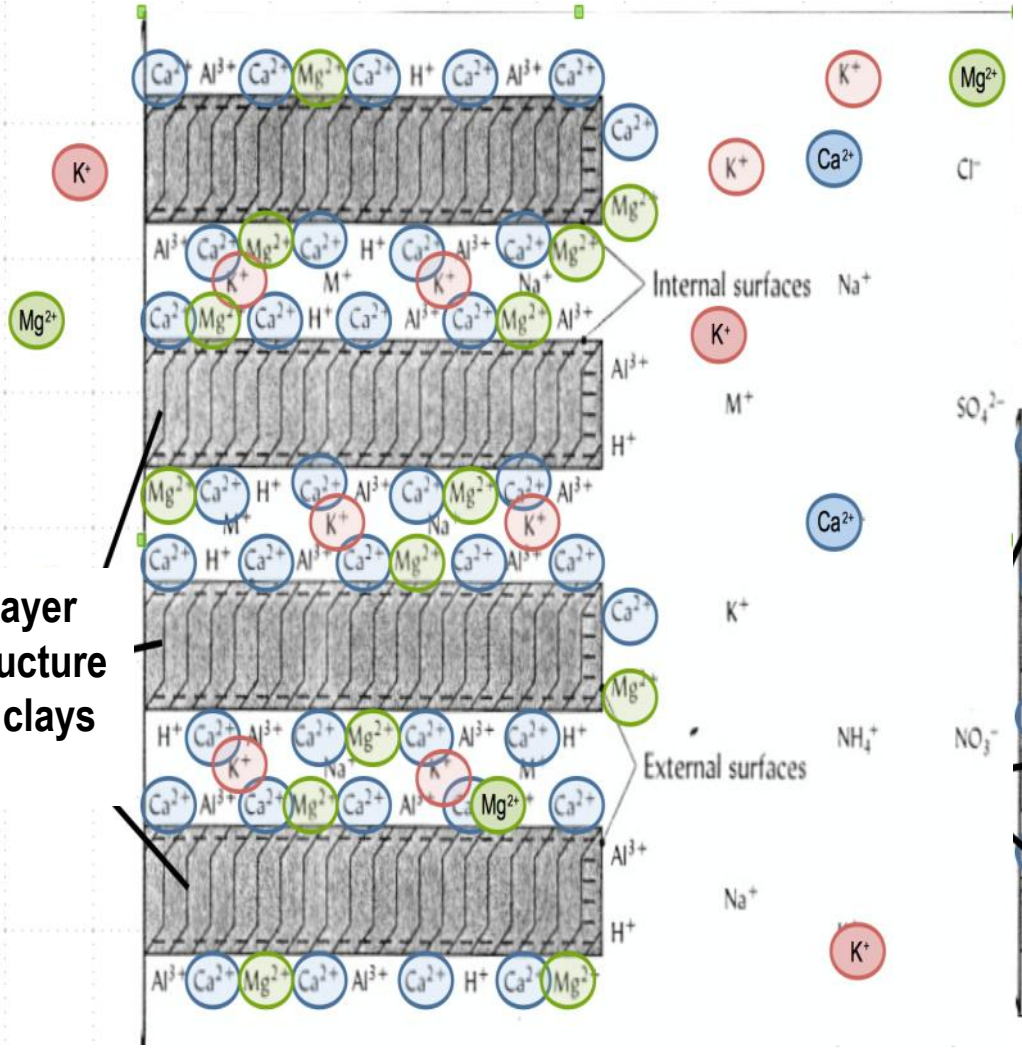
http://lh6.ggpht.com/_6LWjP0sZ22w/S4stTAJy_rI/AAAAAAAAHfY/r8Palg6IaBA/s1600/Mont%20electron%20view%5B4%5D.jpg

This is smectite (specifically montmorillonite), a 2:1 expanding clay

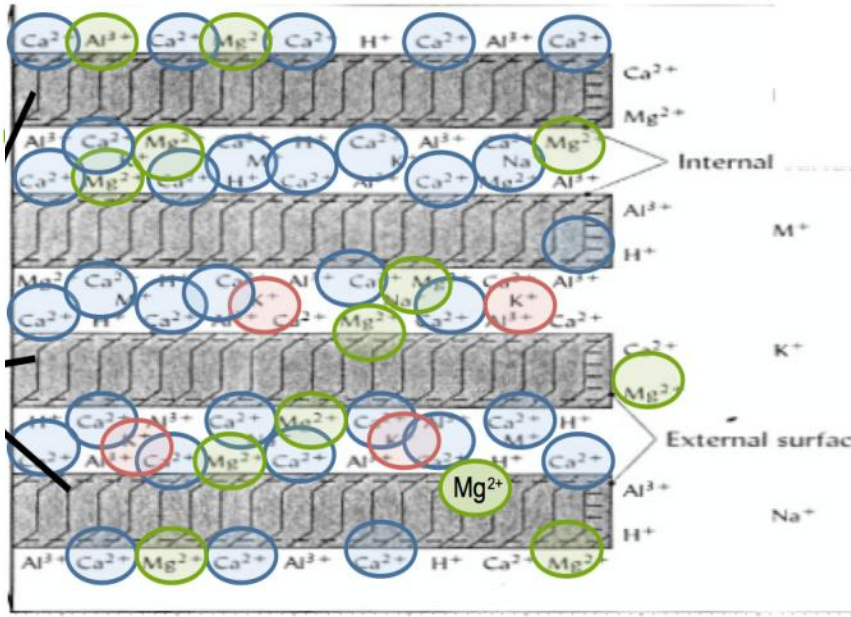


LIFE 8e, Figure 36.6

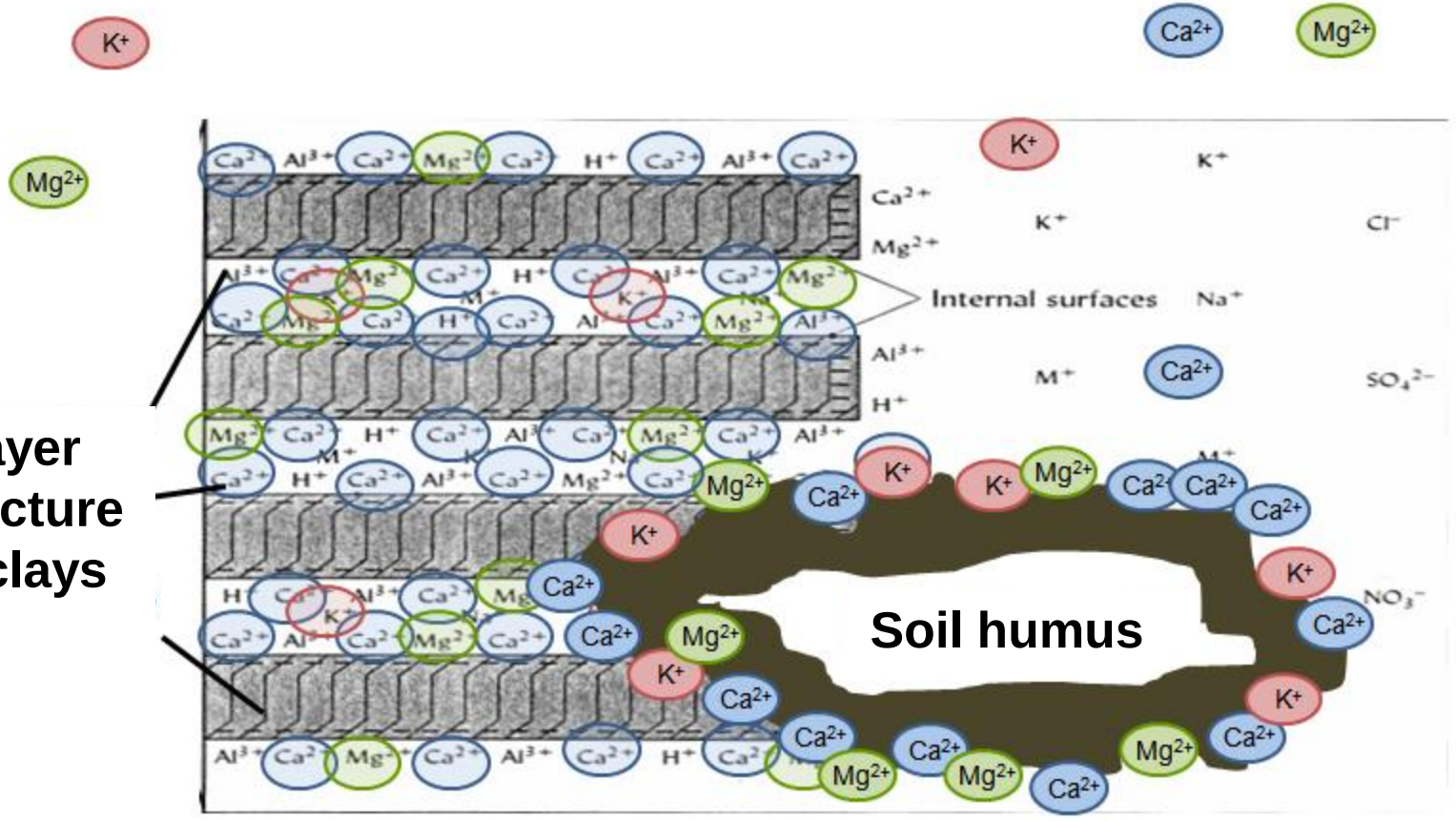
Cation exchange in moist/dry conditions



Layer structure of clays

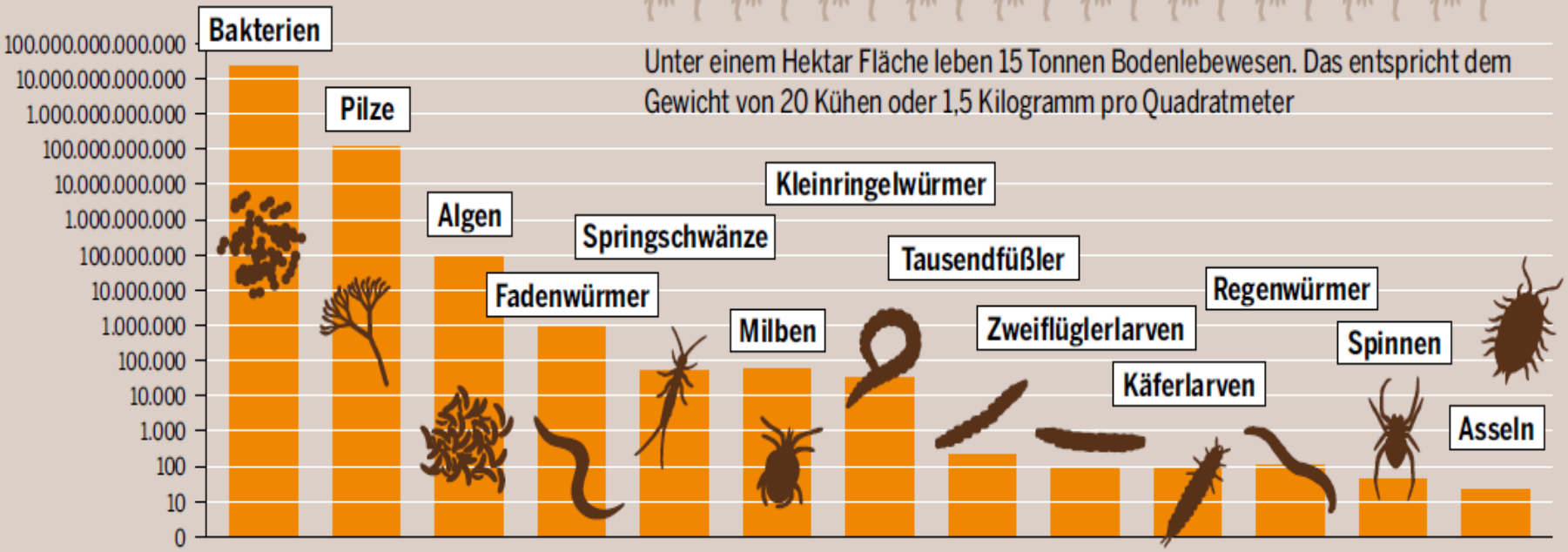


Cation exchange in dry conditions



BEVÖLKERTE BÖDEN

Zahl der Lebewesen im obersten Kubikmeter, in temperierten Klimazonen, logarithmische Skalierung



Unter einem Hektar Fläche leben 15 Tonnen Bodenlebewesen. Das entspricht dem Gewicht von 20 Kühen oder 1,5 Kilogramm pro Quadratmeter

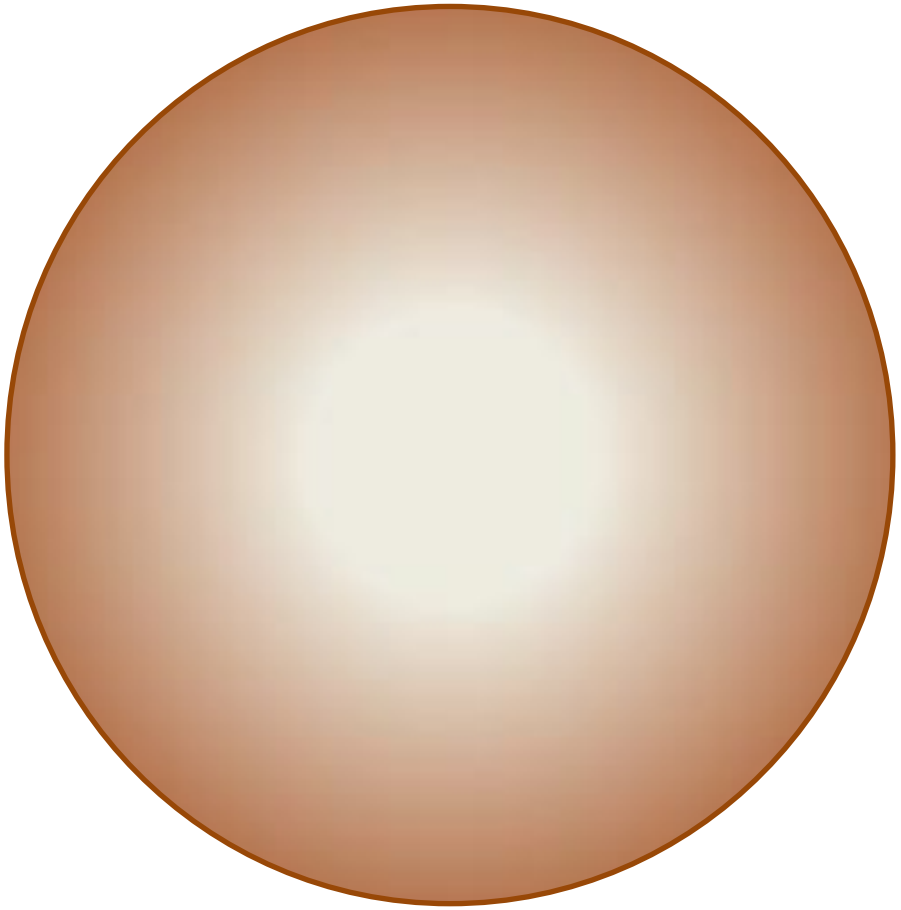
BODENATLAS 2015 / LUA

http://prospect.rsc.org/blogs/cw/wp-content/uploads/2010/05/escherichia-coli.jpg

Jíl
< 2 µm ø

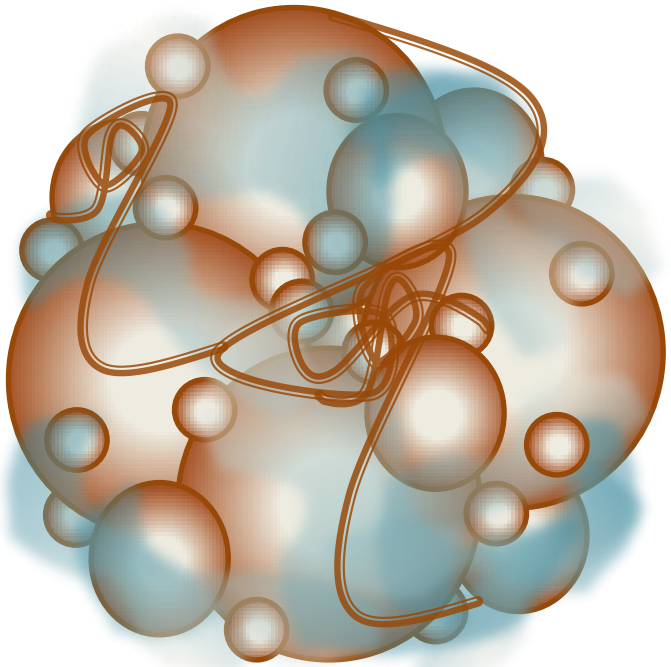
Prach
2 – 63 µm ø

Houbová vlákna

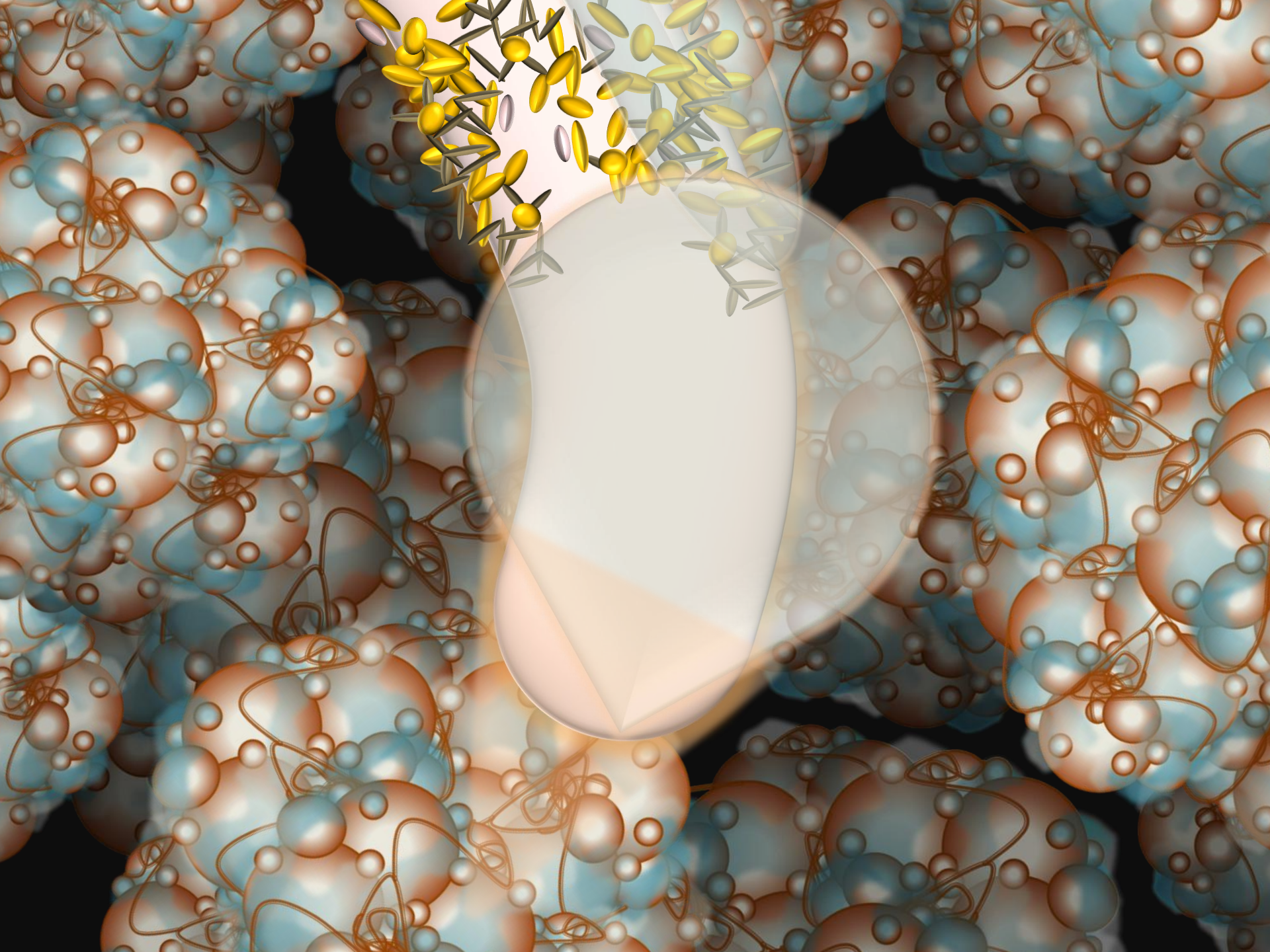


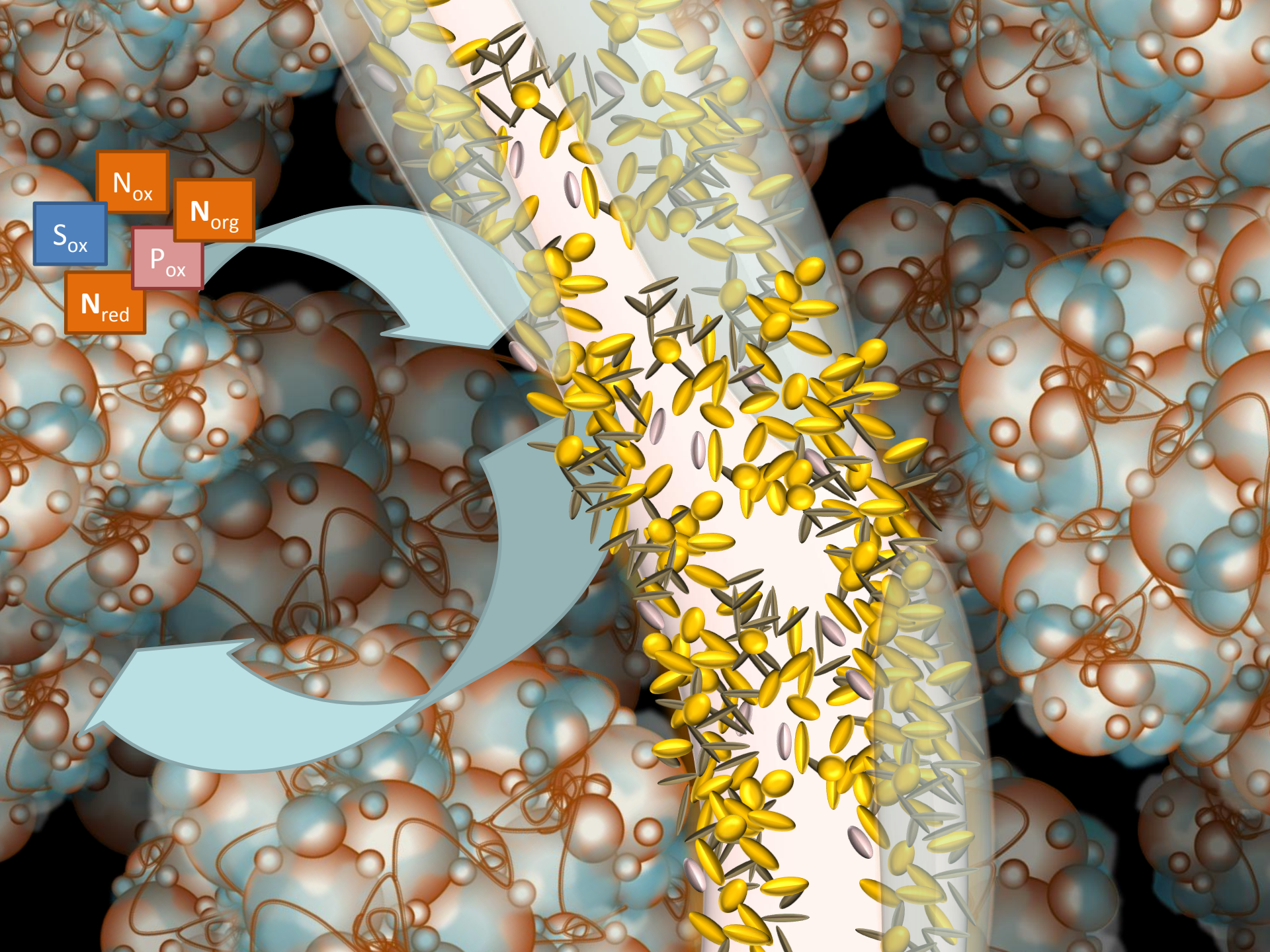
Písek 63 – 2 000 µm ø

Organické tmely

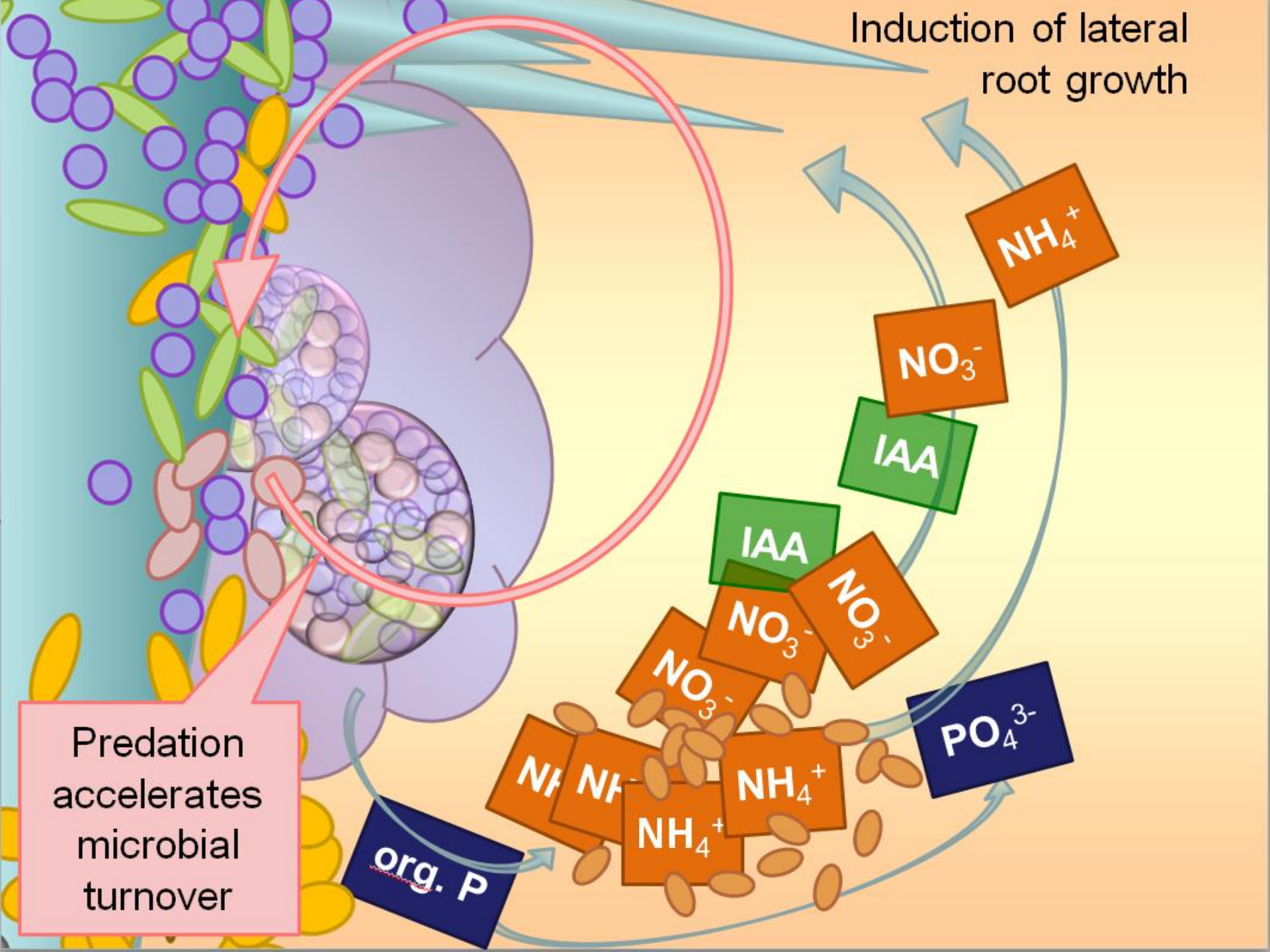


Mikroagregát

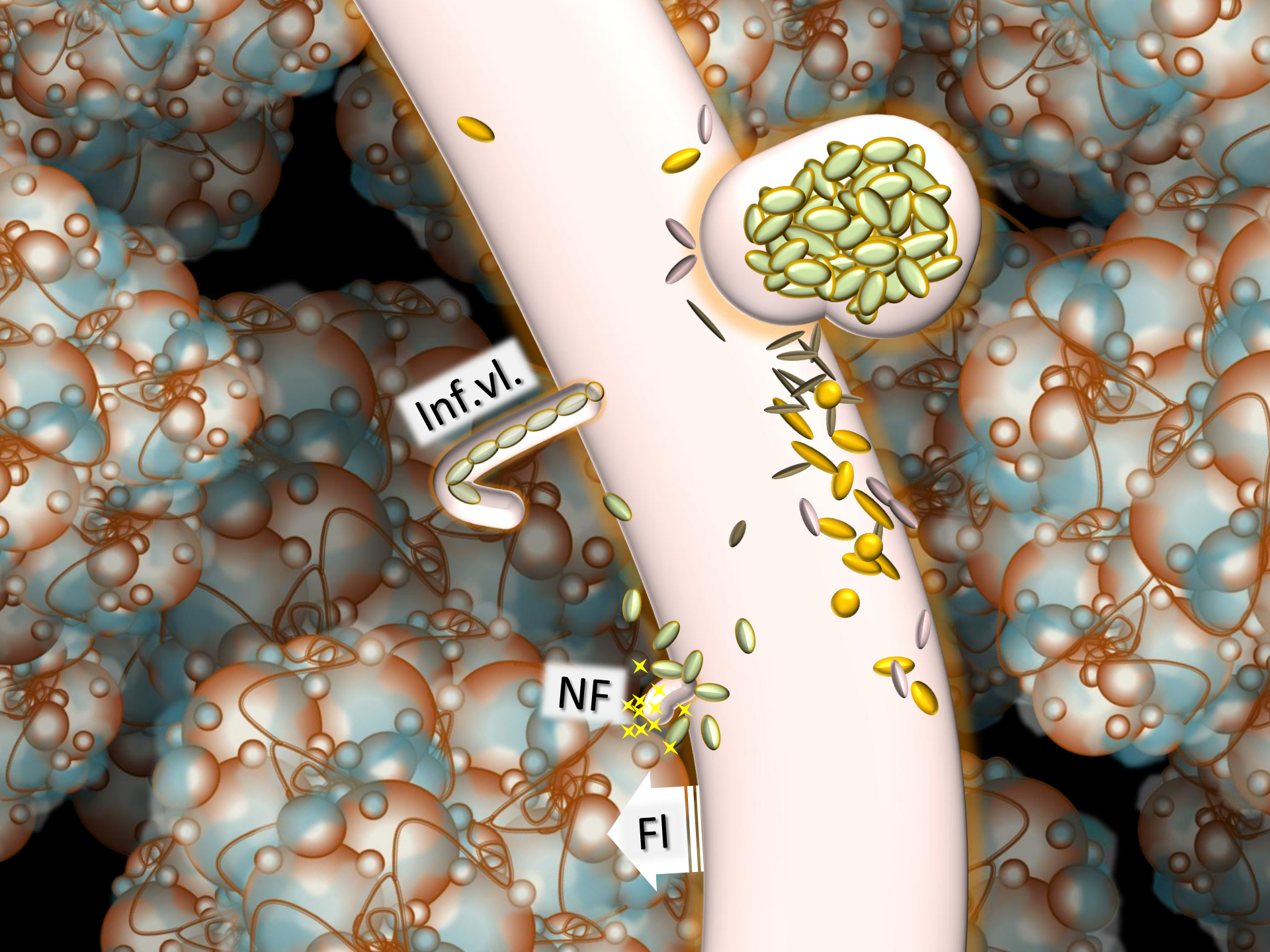


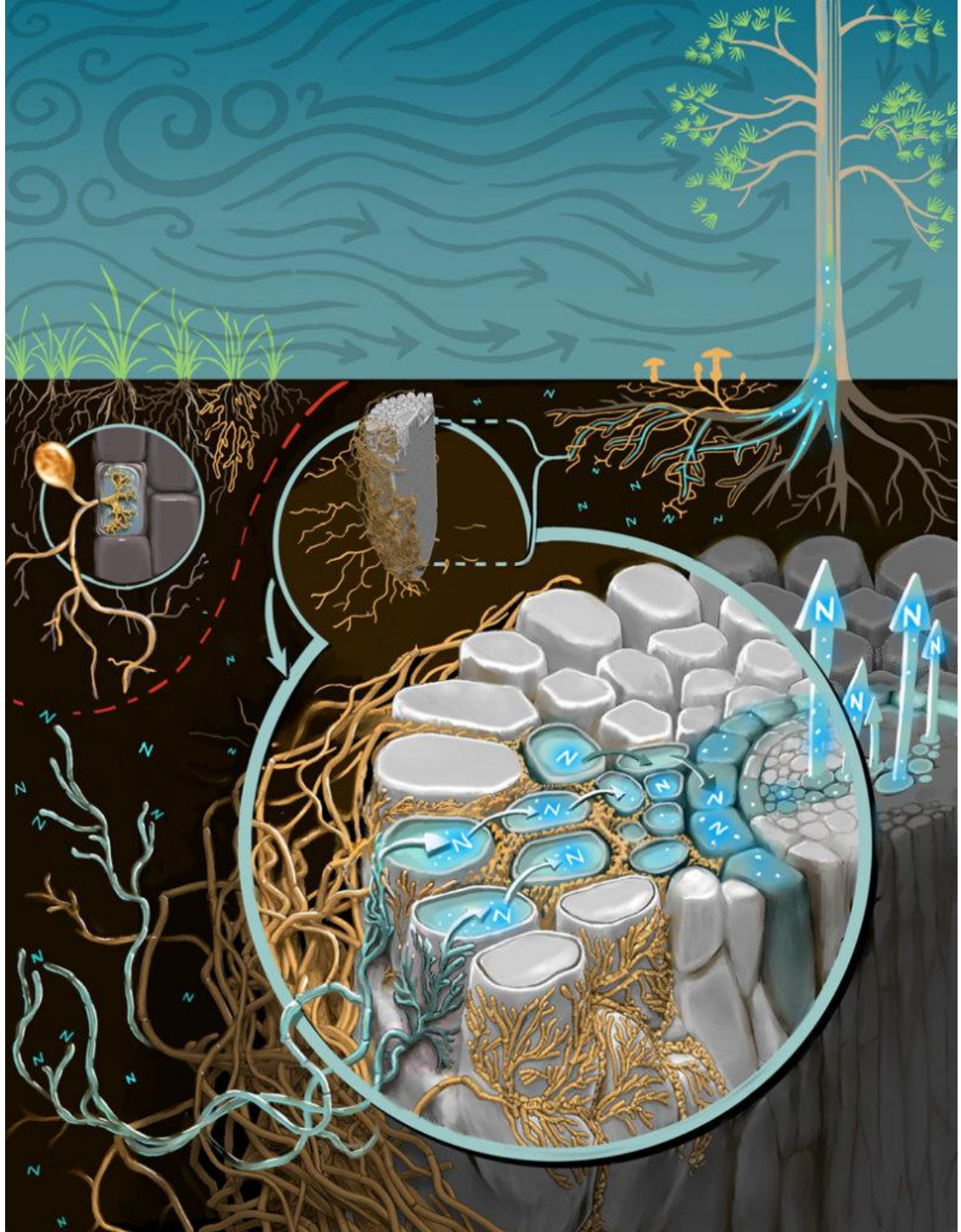

N_{ox}
N_{org}
S_{ox}
P_{ox}
N_{red}


https://word6536.wordpress.com/

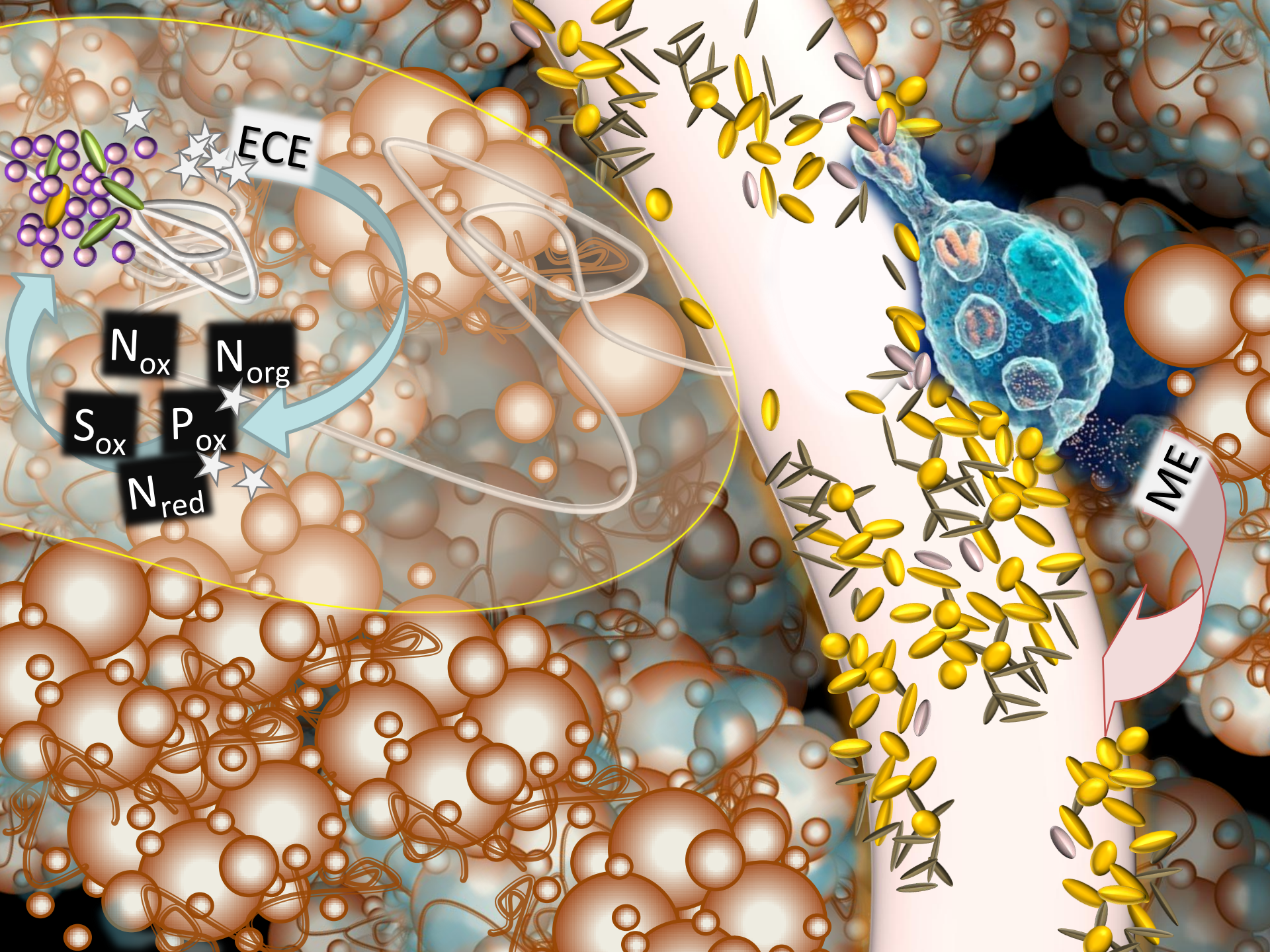

Induction of lateral root growth
NH_4^+
NO_3^-
IAA
IAA
NO_3^-
NO_3^-
NO_3^-
NH_4^+
NH_4^+
PO_4^{3-}
org. P
Predation accelerates microbial turnover


Root nodules: nitrogen-fixing bacteria
Mite
Nematode
Root
Protozoa
Fungus
Bacteria
Surface litter (O-horizon)
Topsoil (A-horizon)
Subsoil (B-and C-horizons)
Parent materia (bedrock)


Inf.vl.
NF
Fl



Ectomycorrhizal fungi (illustrated as the mushrooms connected to the roots of the tree) increase the uptake of nitrogen by the plant, even when that nutrient is only limitedly available in soils. Arbuscular mycorrhizal fungi specialize in taking up phosphorus (P) from the soil, but are more limited in their capacity to take up nitrogen (N). Ectomycorrhizal fungi, in contrast, are limited in their ability to take up P from the soil, but are especially effective in taking up N. Notably, most plants associate with a single mycorrhizal type so there's no need to dig into the soil to find out which mycorrhizal group is dominant in an ecosystem. All herbaceous species are limited to a symbiosis with arbuscular mycorrhizal fungi, while the majority of needle-leaved trees are associated with ectomycorrhizal fungi. Among deciduous trees, some, like maple and cherry, live in symbiosis with arbuscular fungi, while others, like beech and oak, live with ectomycorrhizal fungi. Art by Victor O. Leshyk, www.victorleshyk.com


ECE
N_{ox}
N_{org}
S_{ox}
P_{ox}
N_{red}
ME

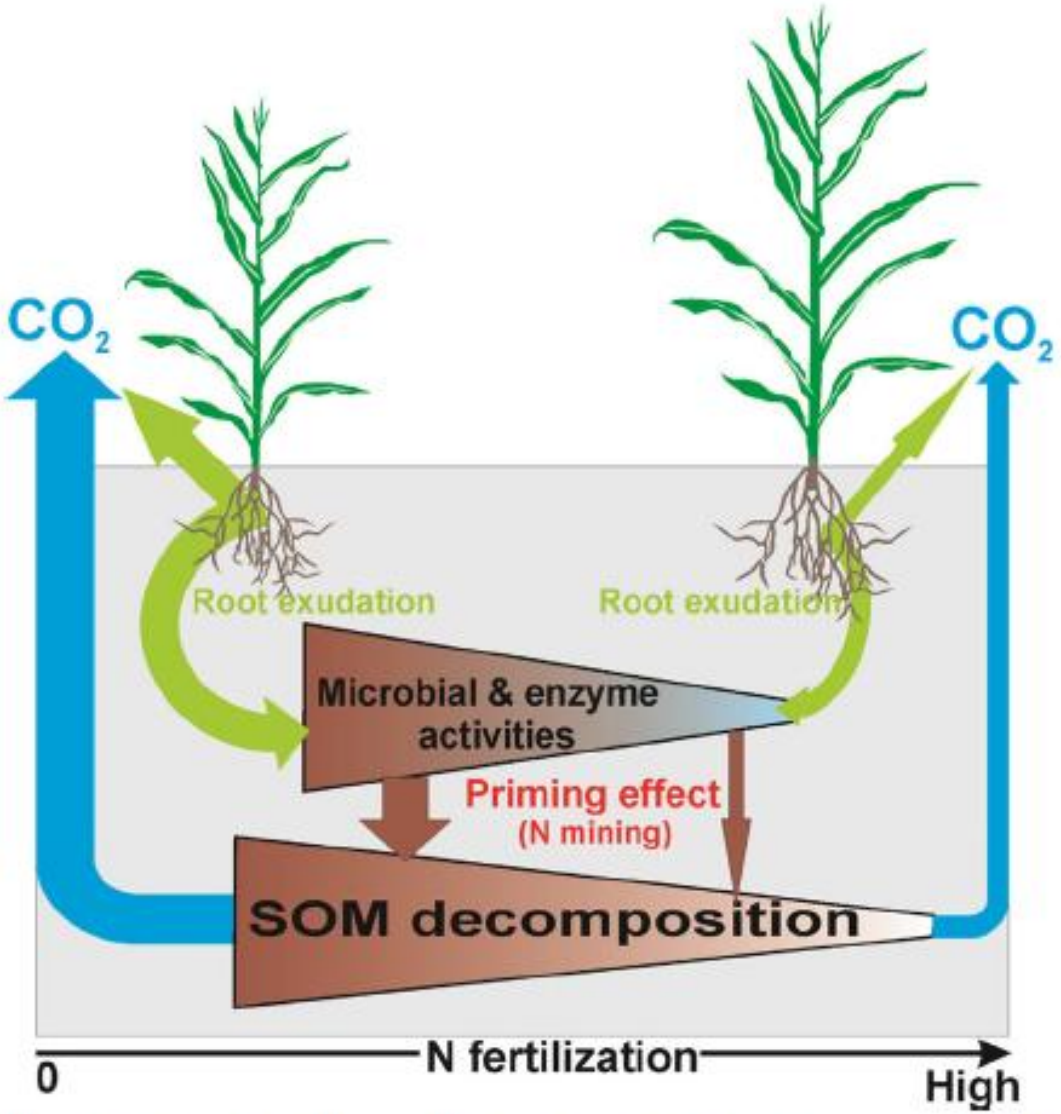


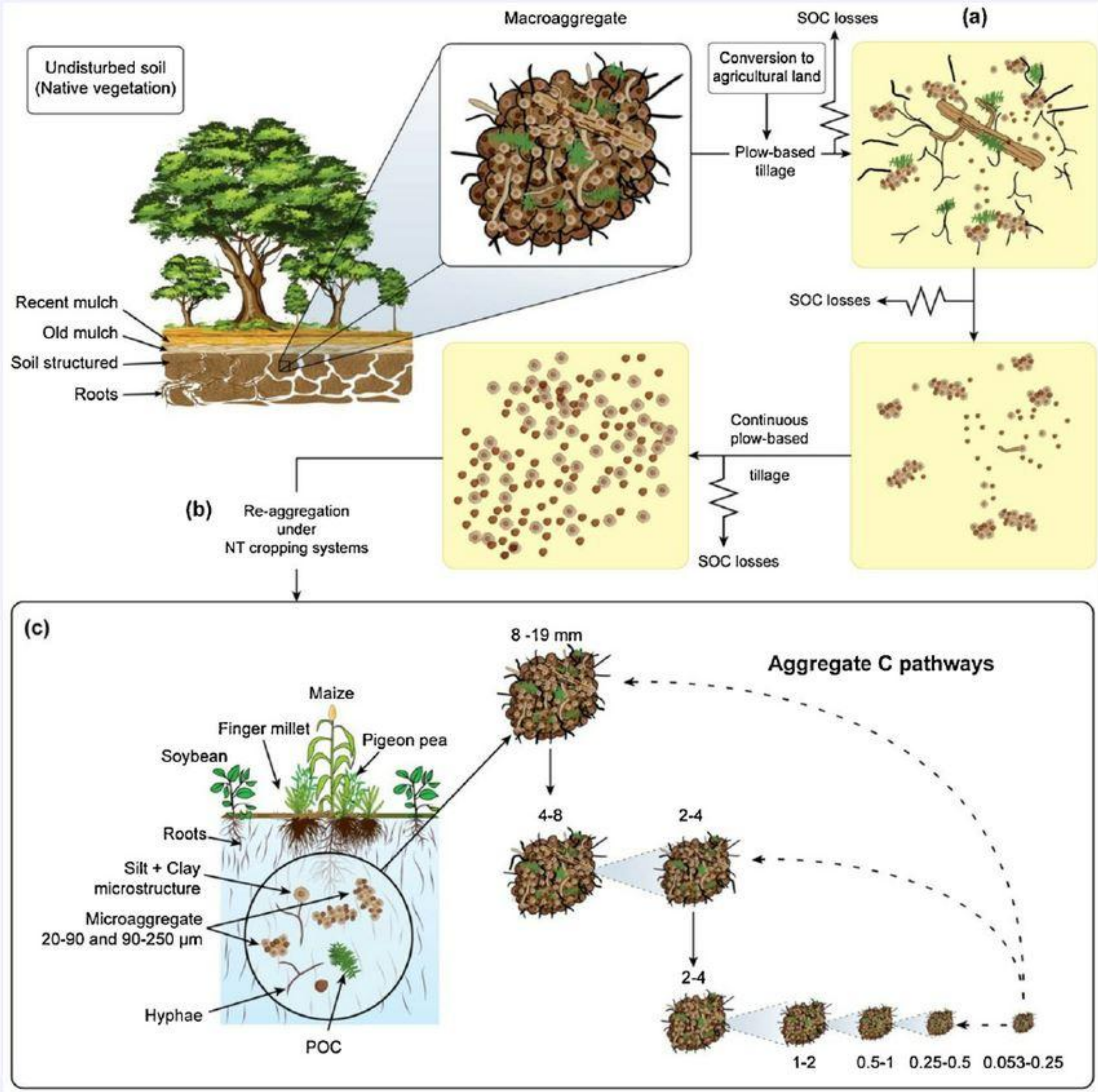
Fig. 7 Conceptual figure showing rhizosphere priming on SOM decomposition accompanied by microbial activation and N mining. Arrow thickness indicates process intensity

Plant Soil (2016) 409:87–97
DOI 10.1007/s11104-016-2953-2

REGULAR ARTICLE

Maize rhizosphere priming: field estimates using ^{13}C natural abundance

Amit Kumar · Yakov Kuzyakov · Johanna Pausch



Soil& Tillage Research126 (2013) 203–218

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Soil & Tillage Research

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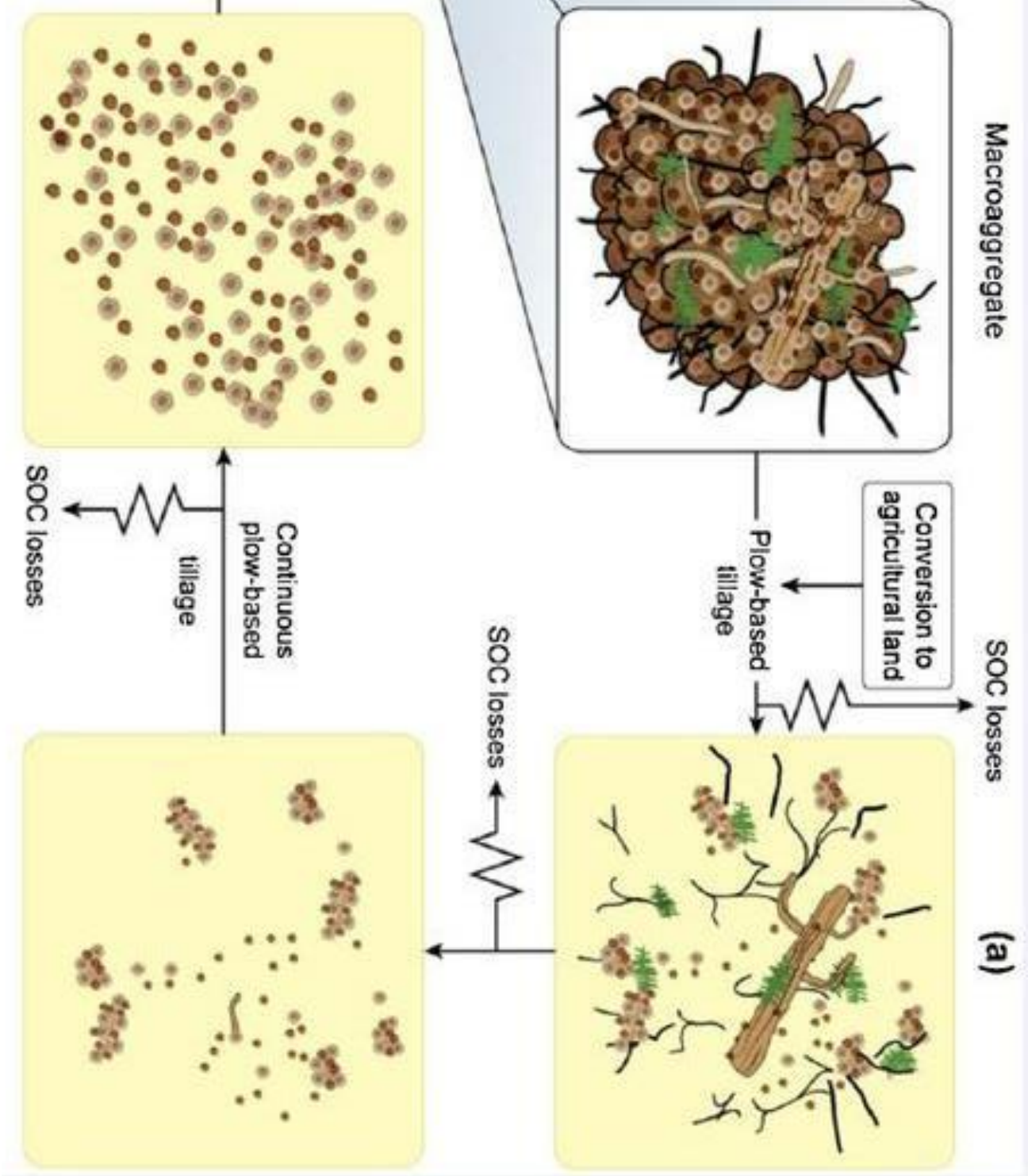
ELSEVIER

Aggregate C depletion by plowing and its restoration by diverse biomass-C inputs under no-till in sub-tropical and tropical regions of Brazil

Florent Tivet[a,c,*], João Carlos de Moraes Sá[b], Rattan Lal[c], Clever Briedis[d], Paulo Rogério Borszowskei[d], Josiane Bürkner dos Santos[d], Anderson Farias[e], Guilherme Eurich[e], Daiani da Cruz Hartman[e], Mario Nadolny Junior[e], Serge Bouzinac[a], Lucien Séguy[a]



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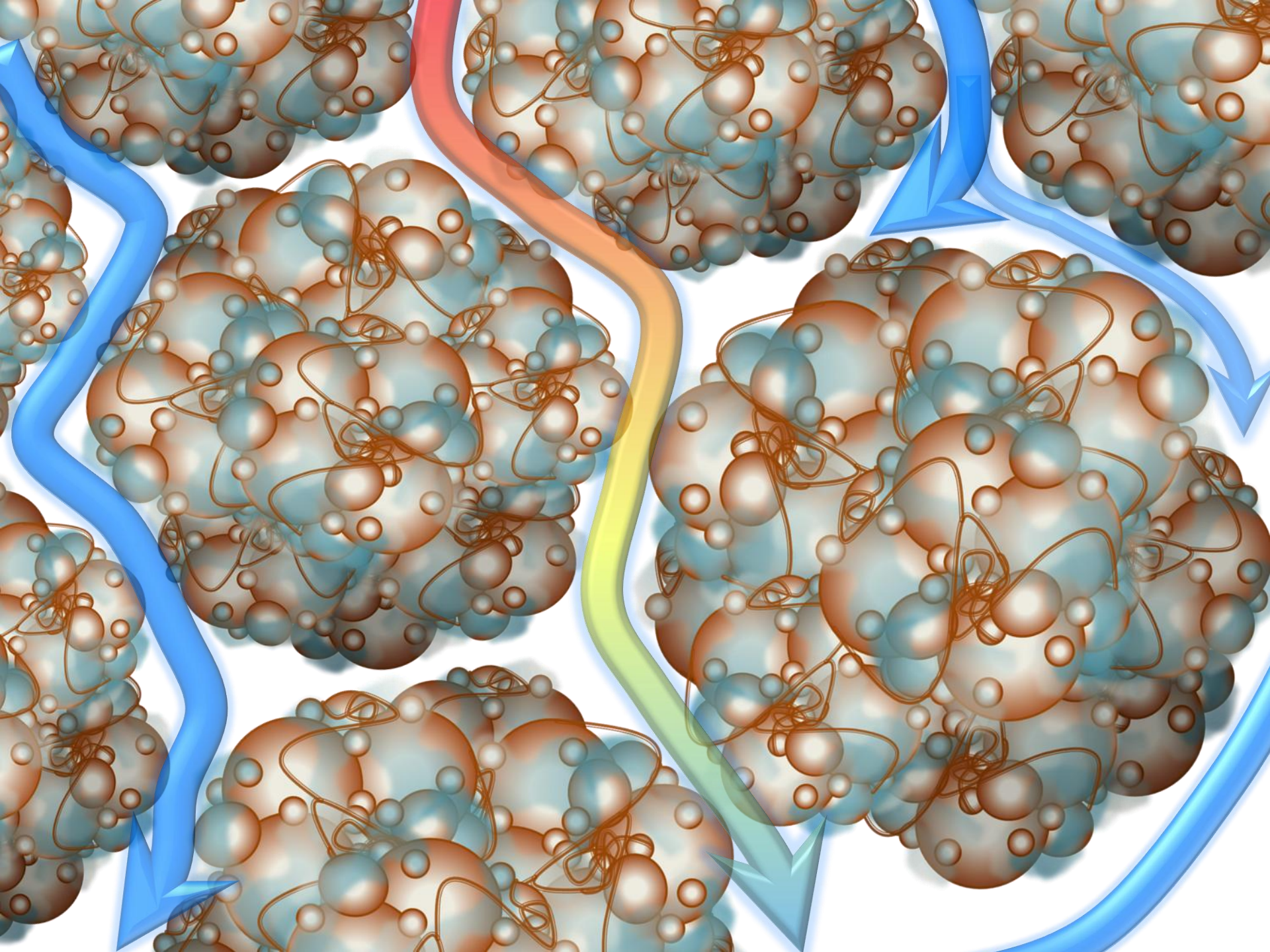
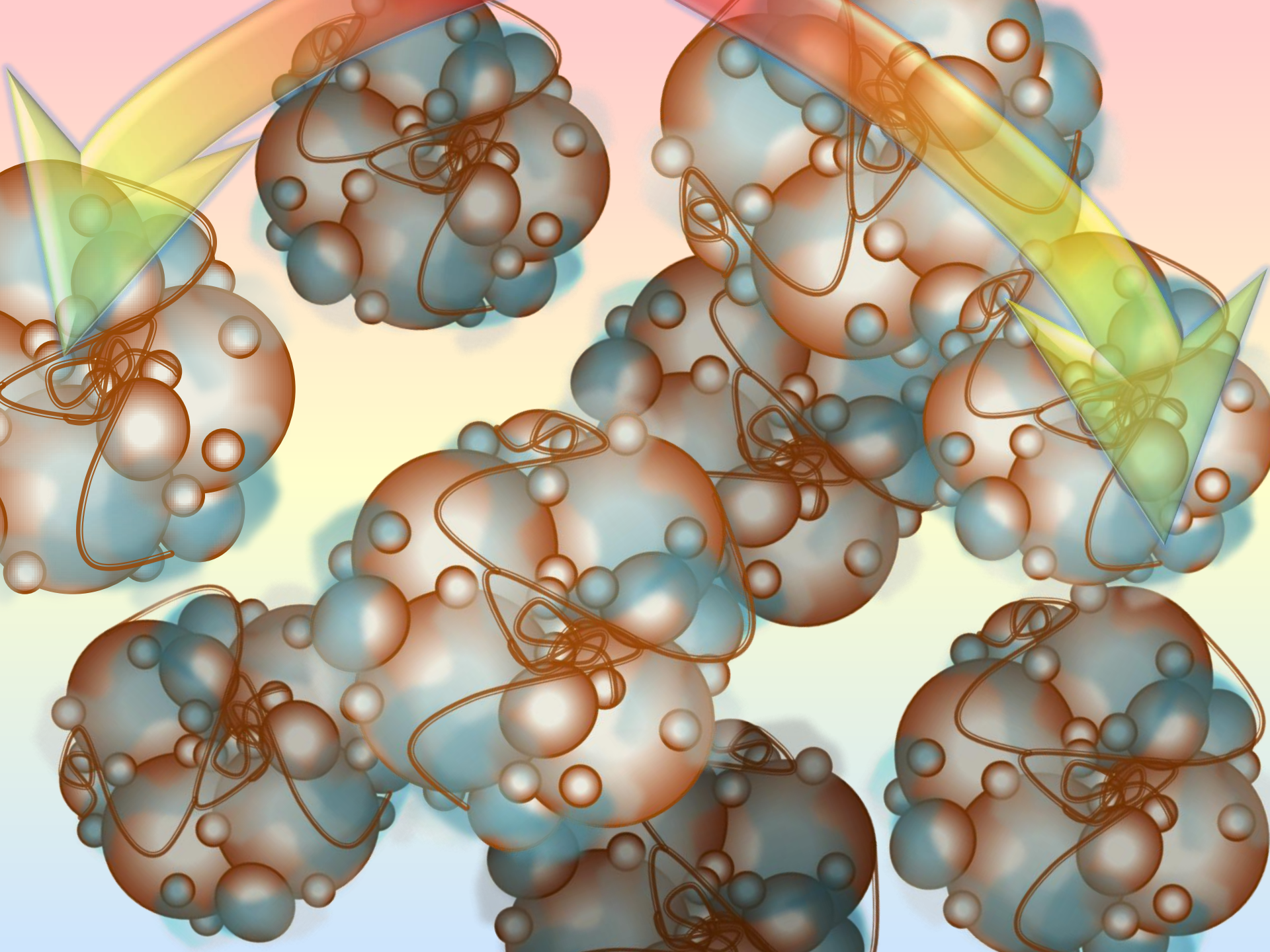
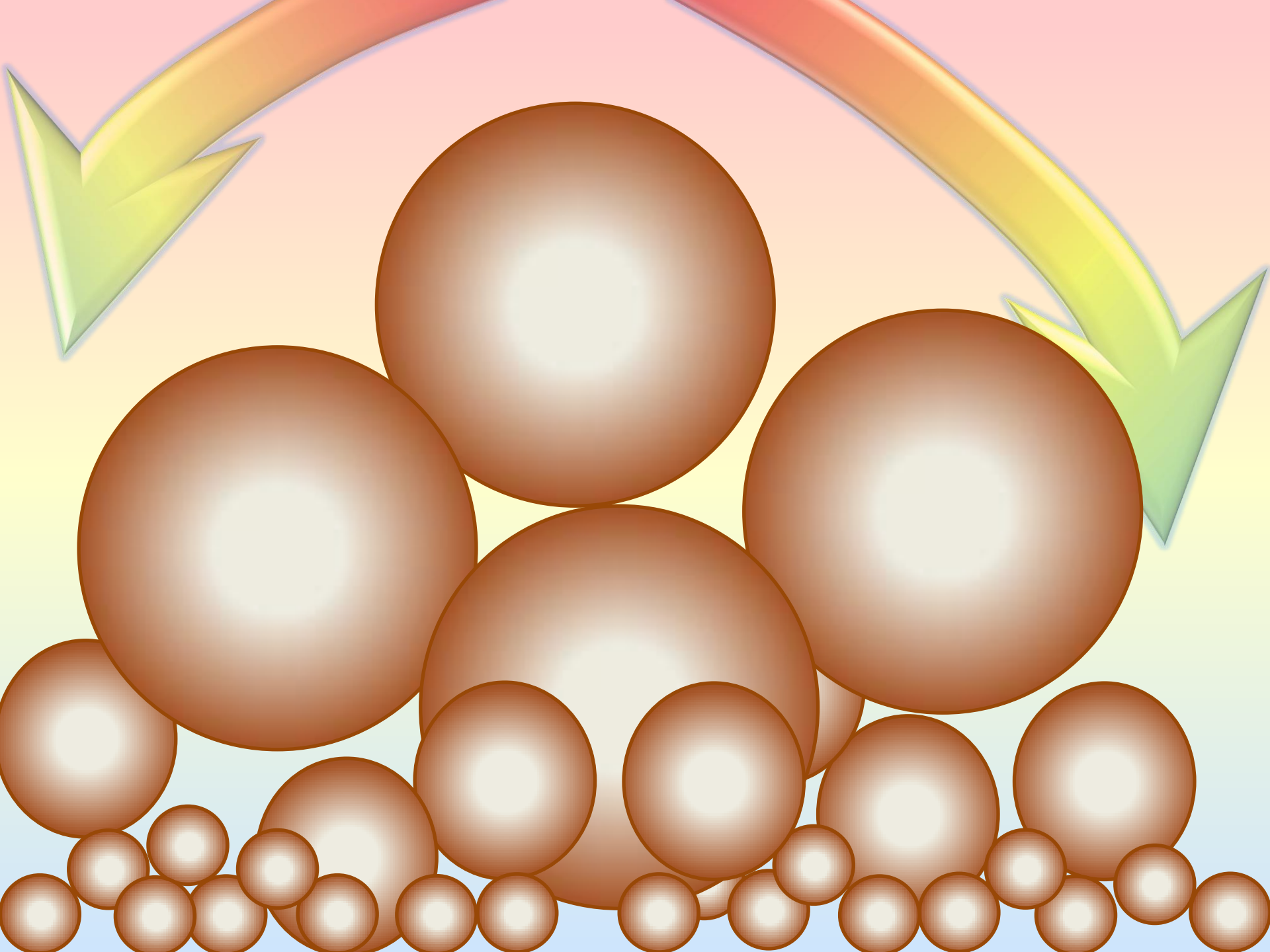
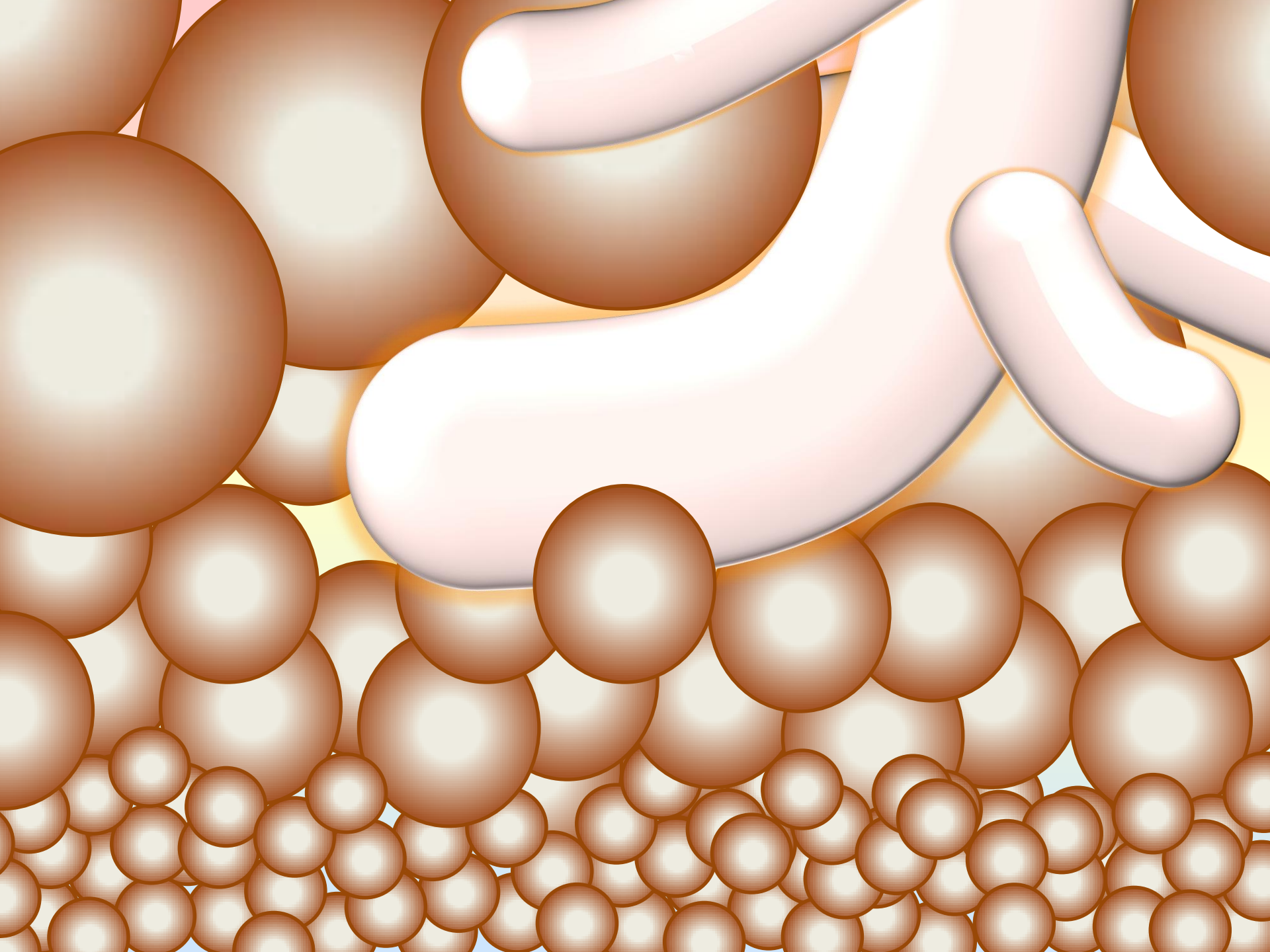
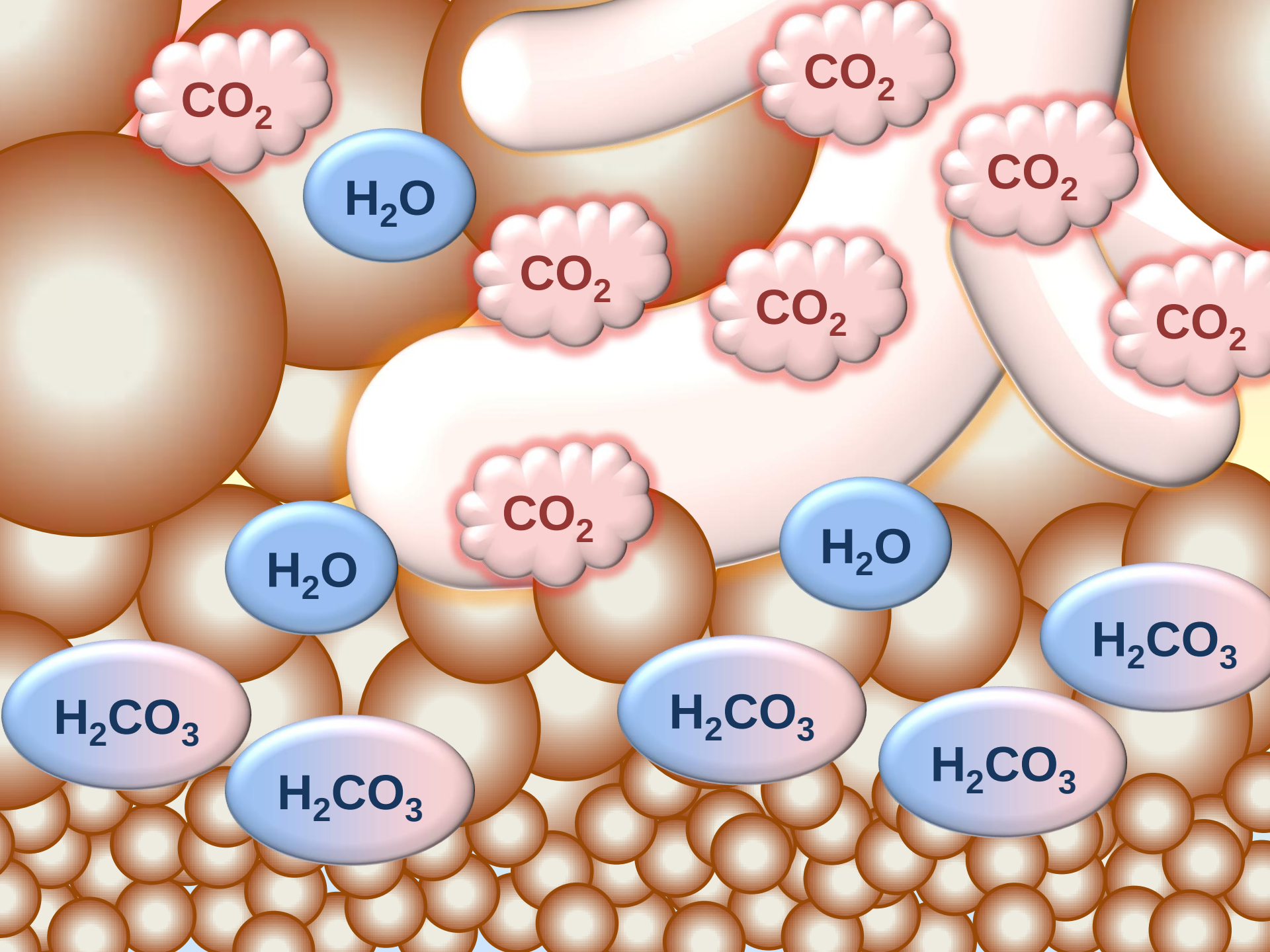
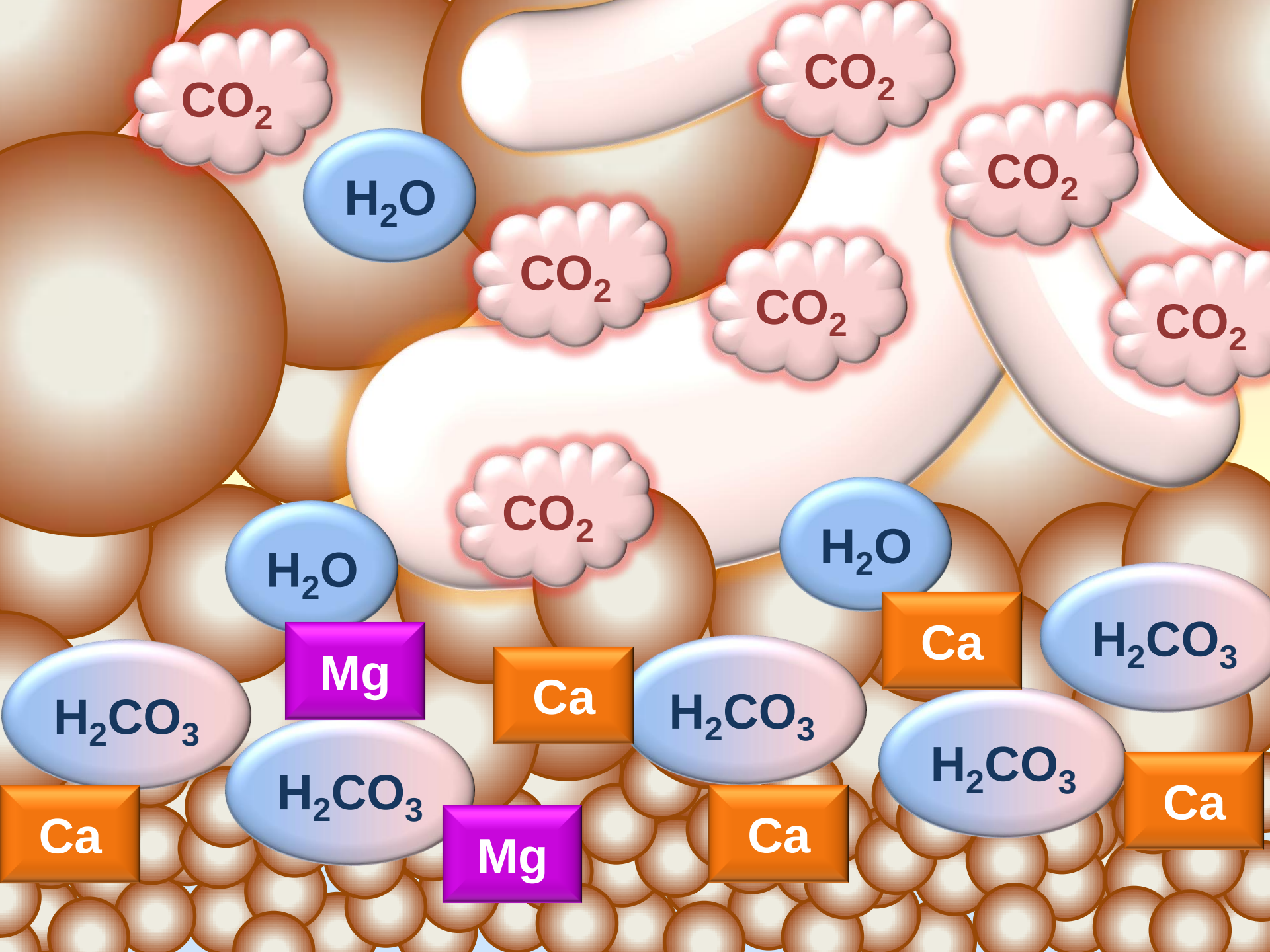


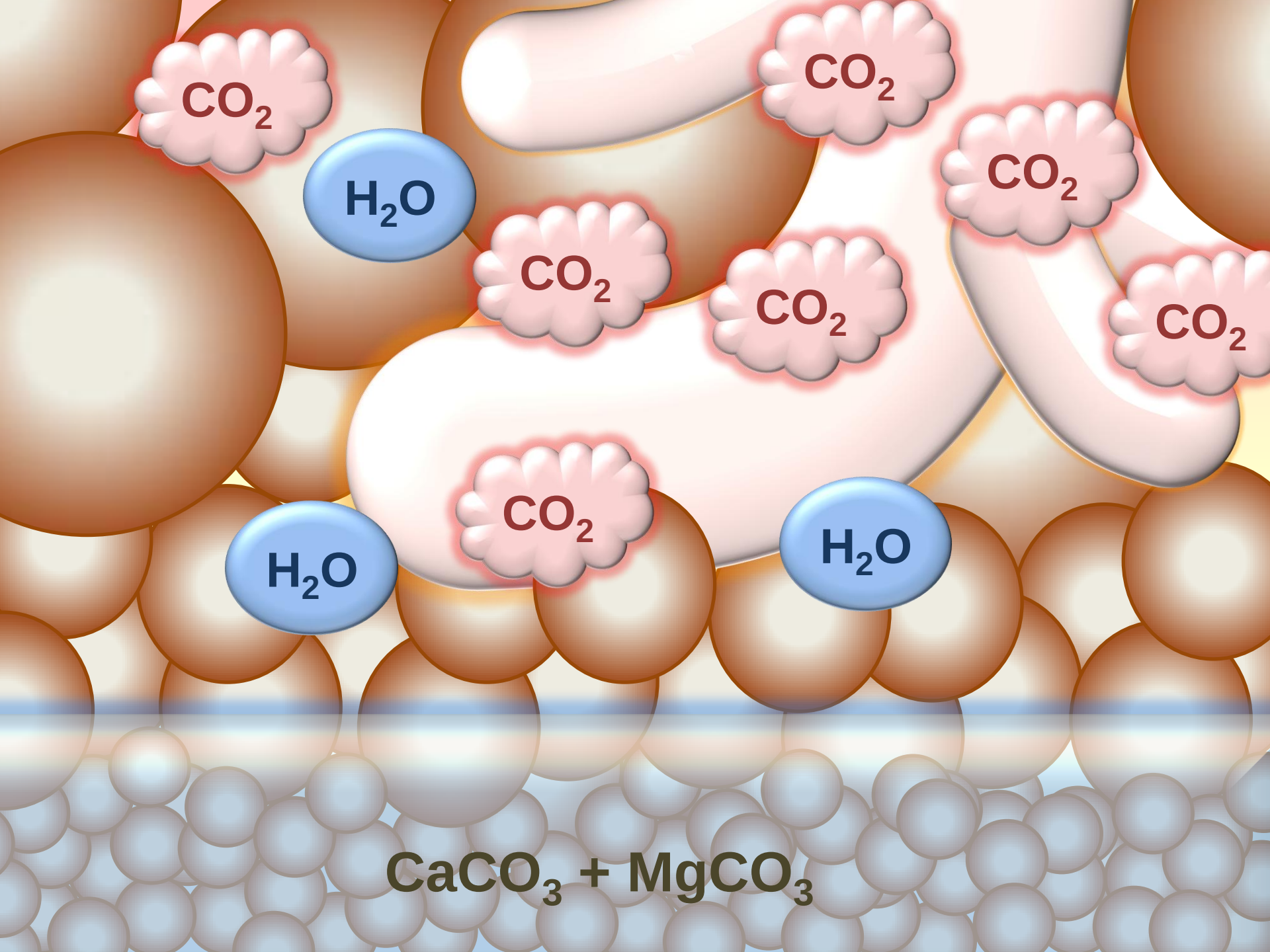




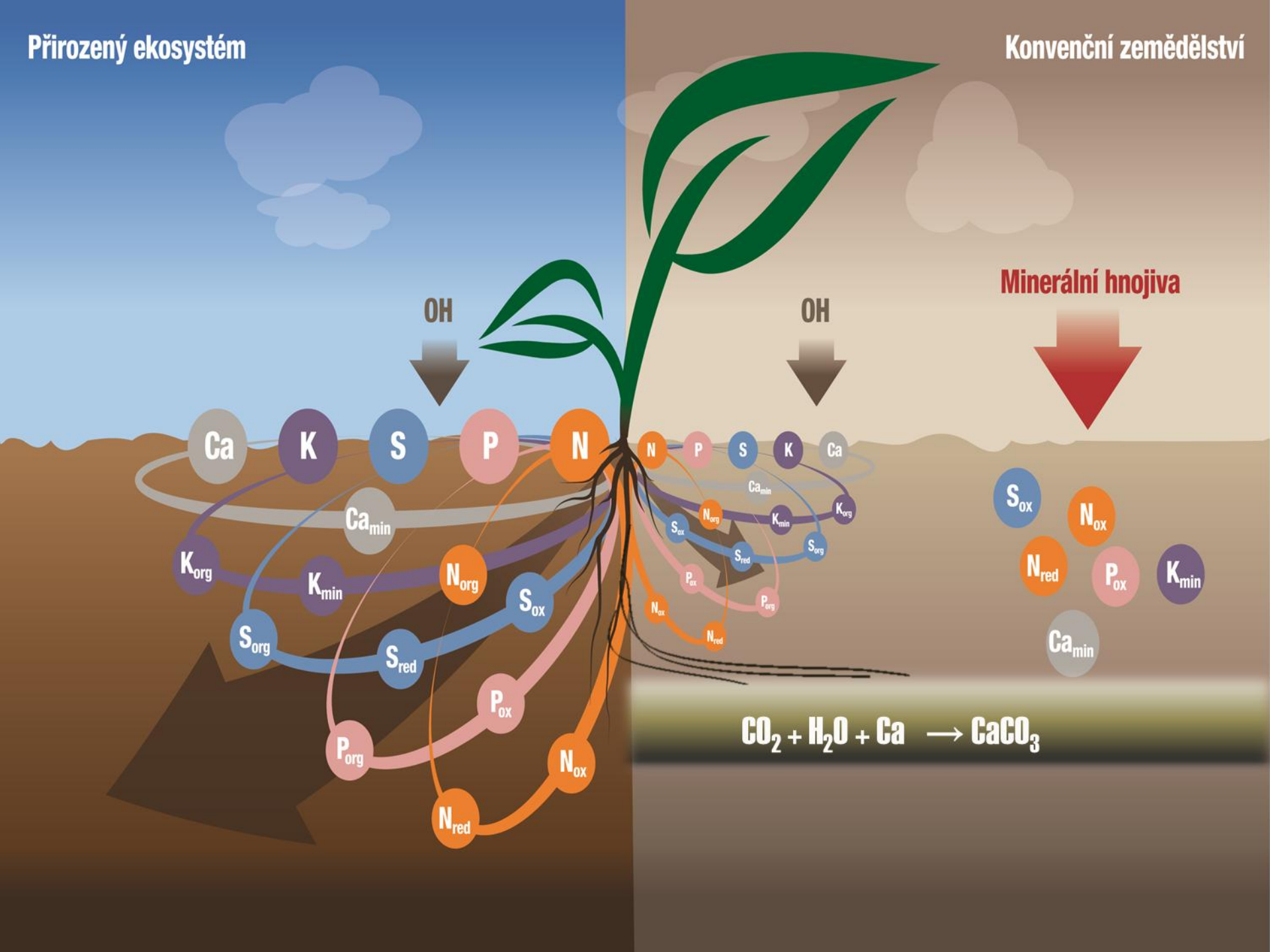


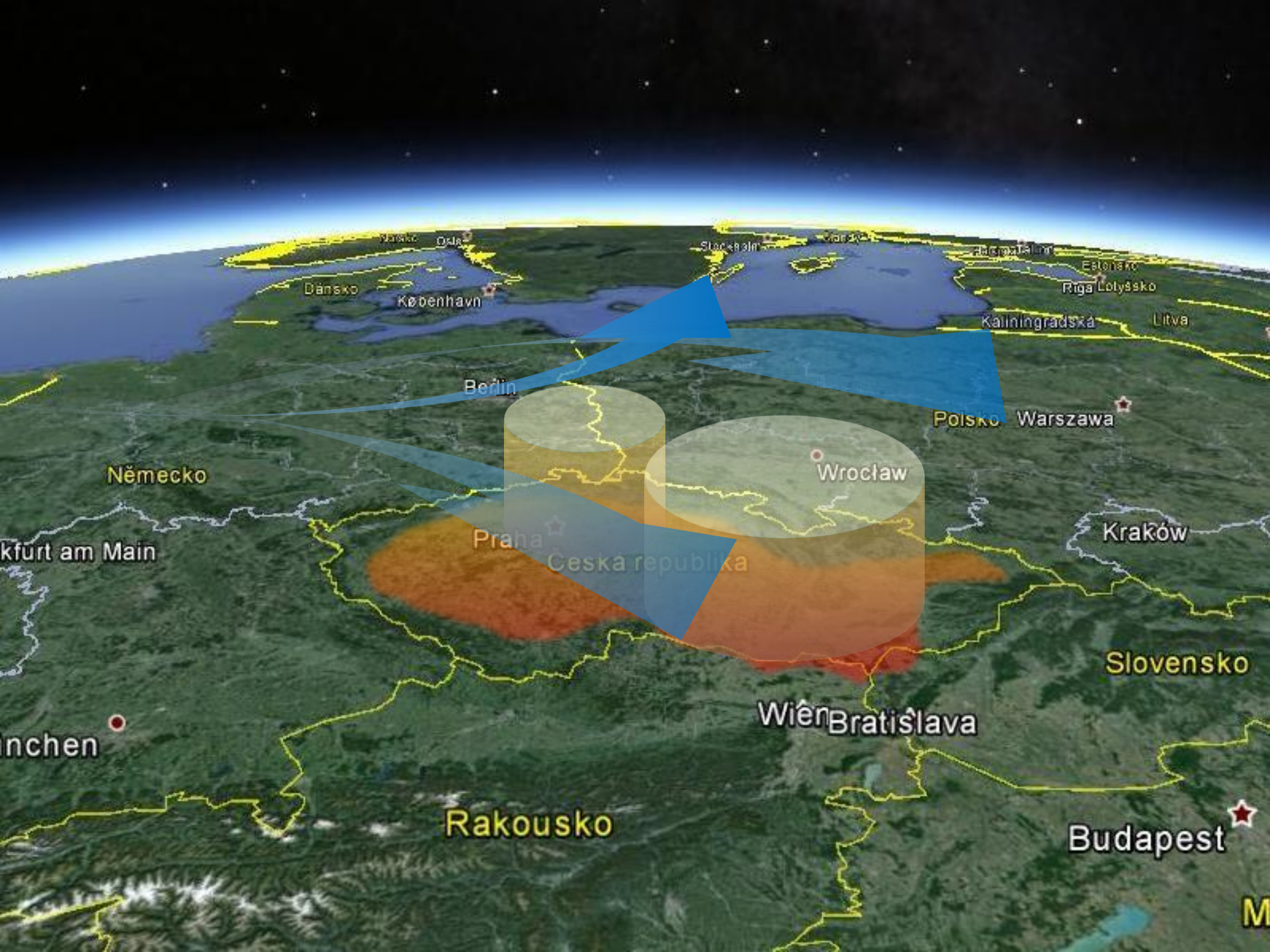

CO_2
CO_2
H_2O
CO_2
CO_2
CO_2
CO_2
CO_2
H_2O
H_2O
H_2CO_3
H_2CO_3
H_2CO_3
H_2CO_3
H_2CO_3

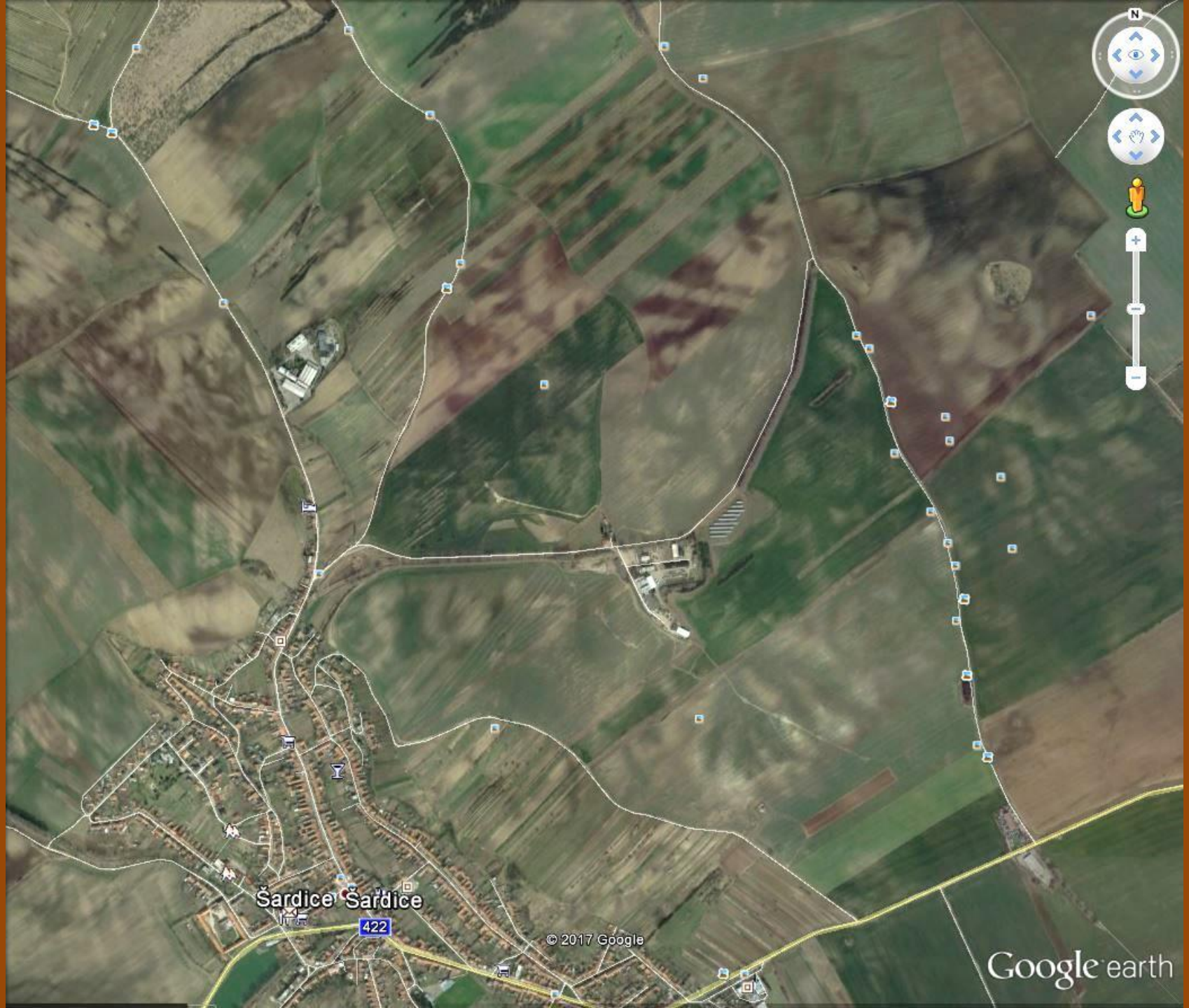

CO_2
CO_2
H_2O
CO_2
CO_2
CO_2
CO_2
CO_2
H_2O
H_2O
Mg
Ca
Ca
H_2CO_3
H_2CO_3
H_2CO_3
H_2CO_3
H_2CO_3
Ca
Mg
Ca
Ca


CO_2
CO_2
CO_2
H_2O
CO_2
CO_2
CO_2
CO_2
H_2O
H_2O
$CaCO_3 + MgCO_3$

Biologická degradace vede ke zhutnění půdy, které urychluje půdní erozi


Přirozený ekosystém
Konvenční zemědělství
OH
OH
Minerální hnojiva
Ca
K
S
P
N
Ca_{min}
K_{org}
K_{min}
N_{org}
S_{ox}
S_{org}
S_{red}
P_{ox}
P_{org}
N_{ox}
N_{red}
S_{ox}
N_{ox}
N_{red}
P_{ox}
K_{min}
Ca_{min}
$CO_2 + H_2O + Ca \rightarrow CaCO_3$

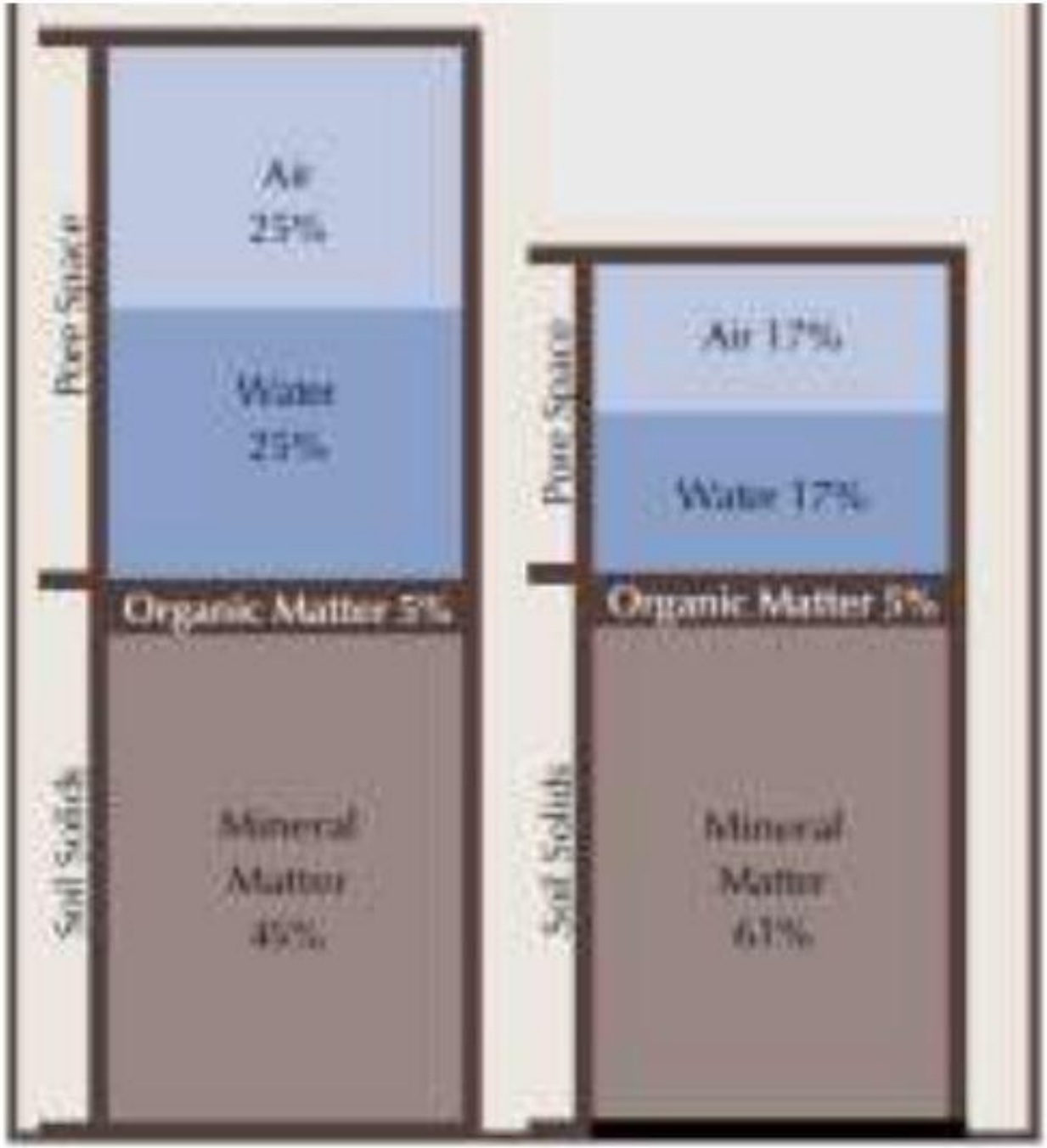

Dánsko
København
Berlín
Polsko
Warszawa
Kaliningradská
Litva
Estonsko
Riga
Lotyšsko
Německo
Wrocław
Praha
Česká republika
Kraków
Slovensko
Wien
Bratislava
Rakousko
Budapest


Šardice
Šardice
422
© 2017 Google
Google earth


© 2016 Google
Image © 2016 DigitalGlobe
Google earth
Průvodce prohlídkou
Datum snímků: 10/6/2014 zem. šíř. 39.900658° zem. dél. -3.077411° výš. 775 m výška pohledu 5.16 km
10:53


250 mm
900 mm


IAAR


Pore Space
Air
25%
Water
25%
Soil Solids
Organic Matter 5%
Mineral
Matter
45%
Pore Space
Air 17%
Water 17%
Soil Solids
Organic Matter 5%
Mineral
Matter
61%


Considerations for No-Till
Tyler Williams
University of Nebraska
Extension Educator
Applied Ag Climatologist

PLFA Soil Microbial Community Analysis

Functional Group Biomass & Diversity

Total Living Microbial Biomass, Phospholipid Fatty Acid (PLFA) ng/g	**2113.78**
Functional Group Diversity Index	**1.611**

Total Biomass	Diversity	Rating
< 500	< 1.0	Very Poor
500+ - 1000	1.0+ - 1.1	Poor
1000+ - 1500	1.1+ - 1.2	Slightly Below Average
1500+ - 2500	1.2+ - 1.3	Average
2500+ - 3000	1.3+ - 1.4	Slightly Above Average
3000+ - 3500	1.4+ - 1.5	Good
3500+ - 4000	1.5+ - 1.6	Very Good
> 4000	> 1.6	Excellent

Functional Group	Biomass, PLFA ng/g	% of Total Biomass
Total Bacteria	**999.83**	**47.30**
Gram (+)	**502.21**	**23.76**
Actinomycetes	150.08	7.10
Gram (-)	**497.62**	**23.54**
Rhizobia	44.93	2.13
Total Fungi	**276.16**	**13.06**
Arbuscular Mycorrhizal	**80.56**	**3.81**
Saprophytes	**195.59**	**9.25**
Protozoa	**20.46**	**0.97**
Undifferentiated	**817.34**	**38.67**

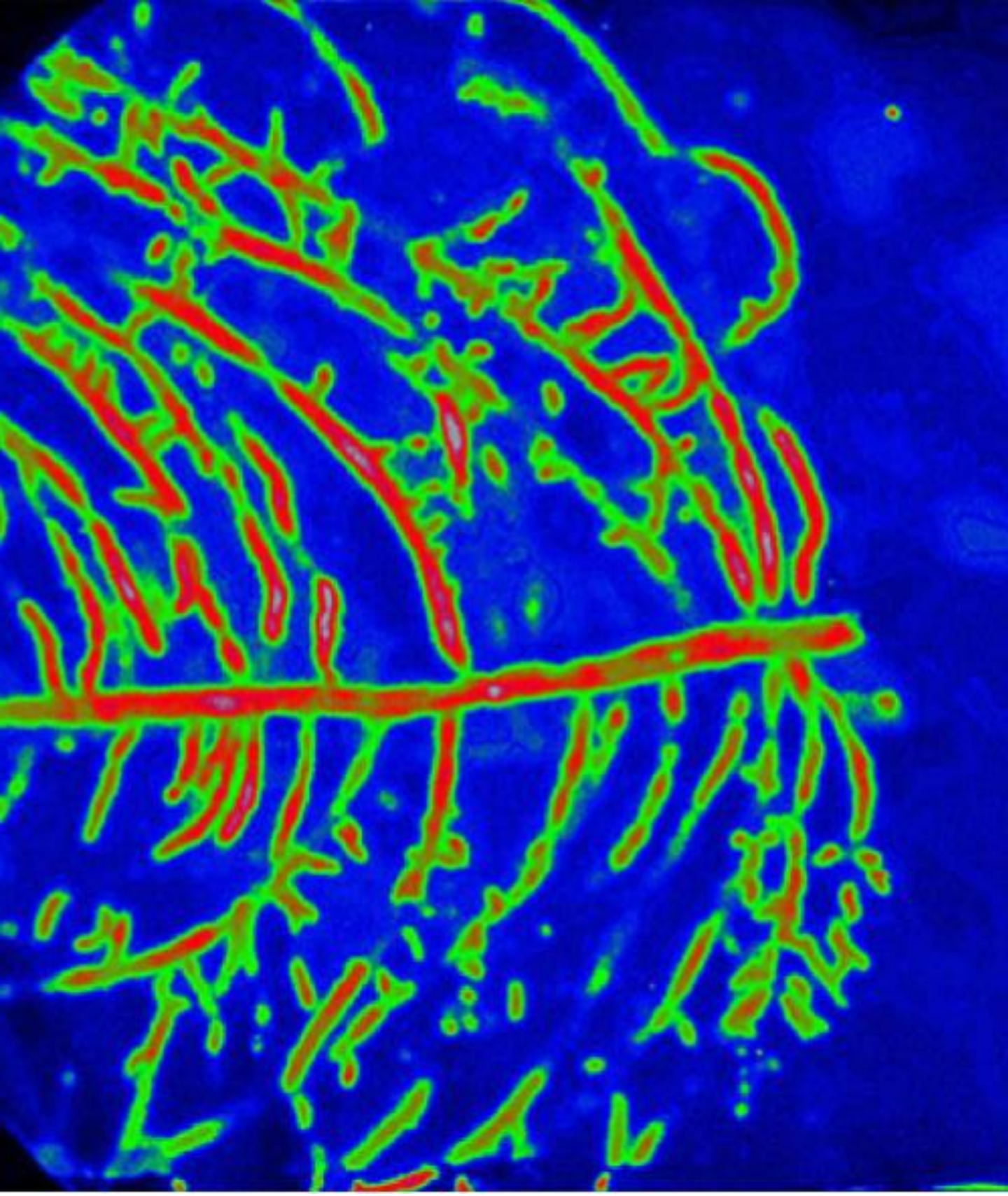
PLFA Soil Microbial Community Analysis

Functional Group Biomass & Diversity

Total Living Microbial Biomass, Phospholipid Fatty Acid (PLFA) ng/g	**540.41**
Functional Group Diversity Index	**1.046**

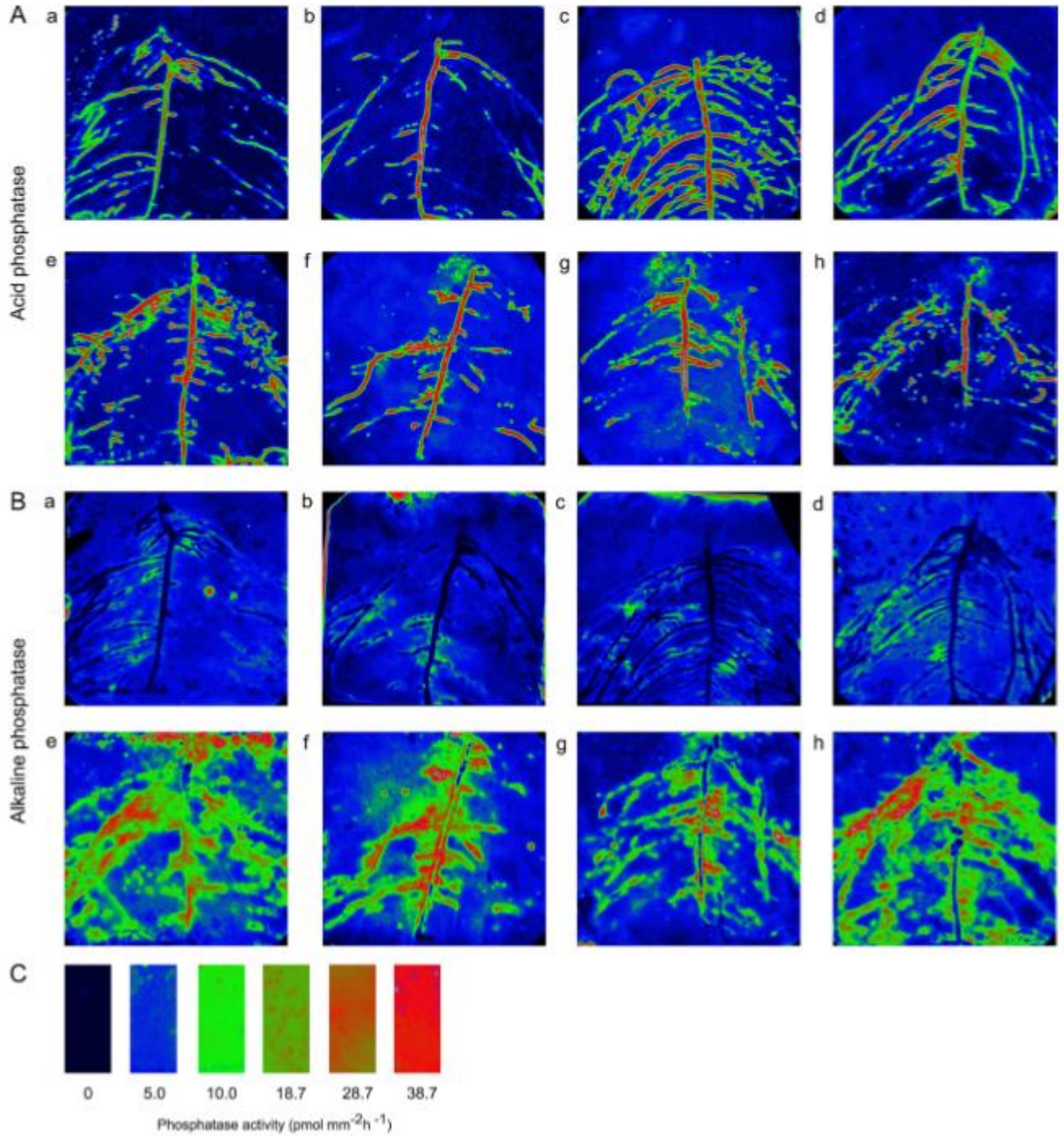
Total Biomass	Diversity	Rating
< 500	< 1.0	Very Poor
500+ - 1000	1.0+ - 1.1	Poor
1000+ - 1500	1.1+ - 1.2	Slightly Below Average
1500+ - 2500	1.2+ - 1.3	Average
2500+ - 3000	1.3+ - 1.4	Slightly Above Average
3000+ - 3500	1.4+ - 1.5	Good
3500+ - 4000	1.5+ - 1.6	Very Good
> 4000	> 1.6	Excellent

Functional Group	Biomass, PLFA ng/g	% of Total Biomass
Total Bacteria	**341.53**	**63.20**
Gram (+)	**298.53**	**55.24**
Actinomycetes	90.31	16.71
Gram (-)	**43.00**	**7.96**
Rhizobia	0.00	0.00
Total Fungi	**14.35**	**2.66**
Arbuscular Mycorrhizal	**0.00**	**0.00**
Saprophytes	**14.35**	**2.66**
Protozoa	**0.00**	**0.00**
Undifferentiated	**184.53**	**34.15**



Activity of acid phosphatase by zymography of lupine roots.

Kuzyakov et al. , University of Göttingen, Germany



Soil + P

Control soil

Soil + P

Control soil

Fig. 2. Zymograms showing acid phosphatase (A) and alkaline phosphatase (B) together with the calibration line (C) that is composed of six calibration membranes. Images a–d show P amended soils and images e–h show control soils.

MERKBLATT

FiBL

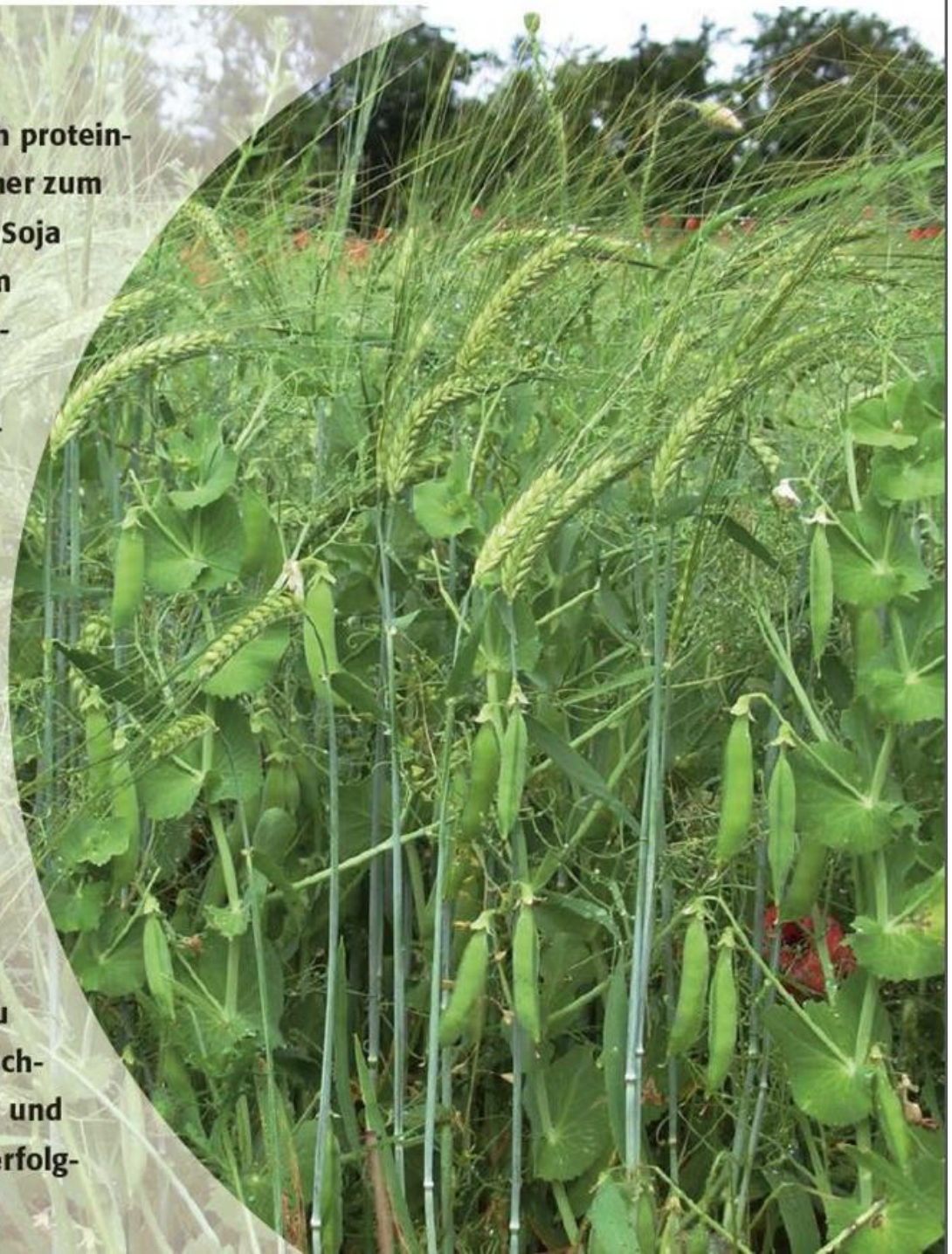
Erfolgreicher Anbau von Körnerleguminosen in Mischkultur mit Getreide

Die wachsende Nachfrage nach proteinreichen Futtermitteln wird bisher zum grossen Teil durch importierte Soja gedeckt. Dies widerspricht dem Nachhaltigkeitsprinzip des Biolandbaus.

Die wachsende Nachfrage nach proteinreichen Futtermitteln wird bisher zum grossen Teil durch importierte Soja gedeckt. Dies widerspricht dem Nachhaltigkeitsprinzip des Biolandbaus.

Der Anbau von Soja und anderen Körnerleguminosen in Reinkultur gestaltet sich in der Schweiz schwierig. Wie Praxisversuche des FiBL zeigen, kann der Anbau in Mischkultur die Ertragssicherheit und die Wirtschaftlichkeit der einheimischen Eiweissproduktion deutlich verbessern.

Das Merkblatt fasst den aktuellen Wissensstand zum Anbau von Körnerleguminosen in Mischkultur mit Getreide zusammen und liefert Empfehlungen für den erfolgreichen Anbau in der Schweiz.



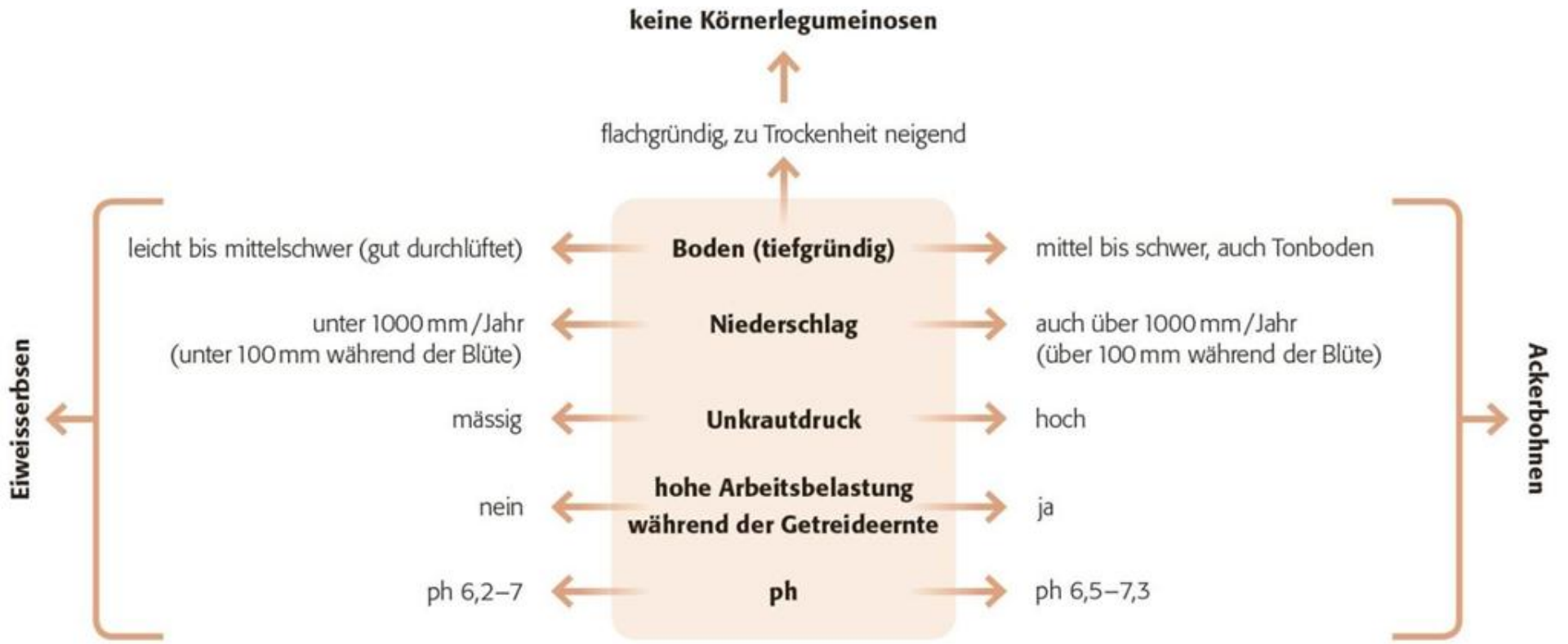
Bewährte Mischungen

Das Gelingen von Mischkulturen setzt unter anderem weitgehend übereinstimmende Erntezeitpunkte der Mischungspartner, eine gute Standfestigkeit der Mischung und eine gute Unkrautunterdrückung voraus.

Die Körnereiweisserbse ist nach Soja die gefragteste Körnerleguminose. Von den bis 2017 untersuchten Mischungen hat sich die Gerste als der agronomisch am besten geeignete Mischungspartner für die Körnereiweisserbse erwiesen. Die Ackerbohne gedeiht am besten mit Hafer. Aber auch Varianten dieser Mischungen haben interessante Vorteile. Der hohe Sättigungsgrad des Schweizer Marktes für Hafer und Gerste verlangt zunehmend nach Alternativen für die beiden Getreide.

Mischung	Saatstärke in % einer Reinsaat		Unkraut-unterdrückung	Abreifezeitpunkt	Standfestigkeit	Proteinertrag	Winterhärte
	Körner-leguminose	Getreide					
Körnereiweisserbse-Gerste	80	40	●◖	●●●	●●	●	●
Futtererbse [1]-Triticale	40	70	●●●	●	●	●	●●●
Ackerbohne-Hafer	80	40	●●	●●	●●	●●	●
Ackerbohne-Triticale	80	40	●◖	●●	●●	●●	●●
Blaue Lupine-Hafer	80	40	●◖	●●	●●	●●●	– [2]

[1] buntblühend, Vollblatttyp, massenwüchsig (EFB33) [2] nur Sommerform


keine Körnerlegumeinosen
flachgründig, zu Trockenheit neigend
Eiweisserbsen
leicht bis mittelschwer (gut durchlüftet)
Boden (tiefgründig)
mittel bis schwer, auch Tonboden
unter 1000 mm / Jahr
(unter 100 mm während der Blüte)
Niederschlag
auch über 1000 mm / Jahr
(über 100 mm während der Blüte)
mässig
Unkrautdruck
hoch
nein
hohe Arbeitsbelastung
während der Getreideernte
ja
ph 6,2–7
ph
ph 6,5–7,3
Ackerbohnen

Links: Körnereiweisserbse in Mischkultur mit Gerste; rechts Körnereiweisserbse als Reinkultur.

Körnereiweisserbse-Gerste

Futtererbse-Triticale


Děkuji za pozornost