La grammatica dell'acqua

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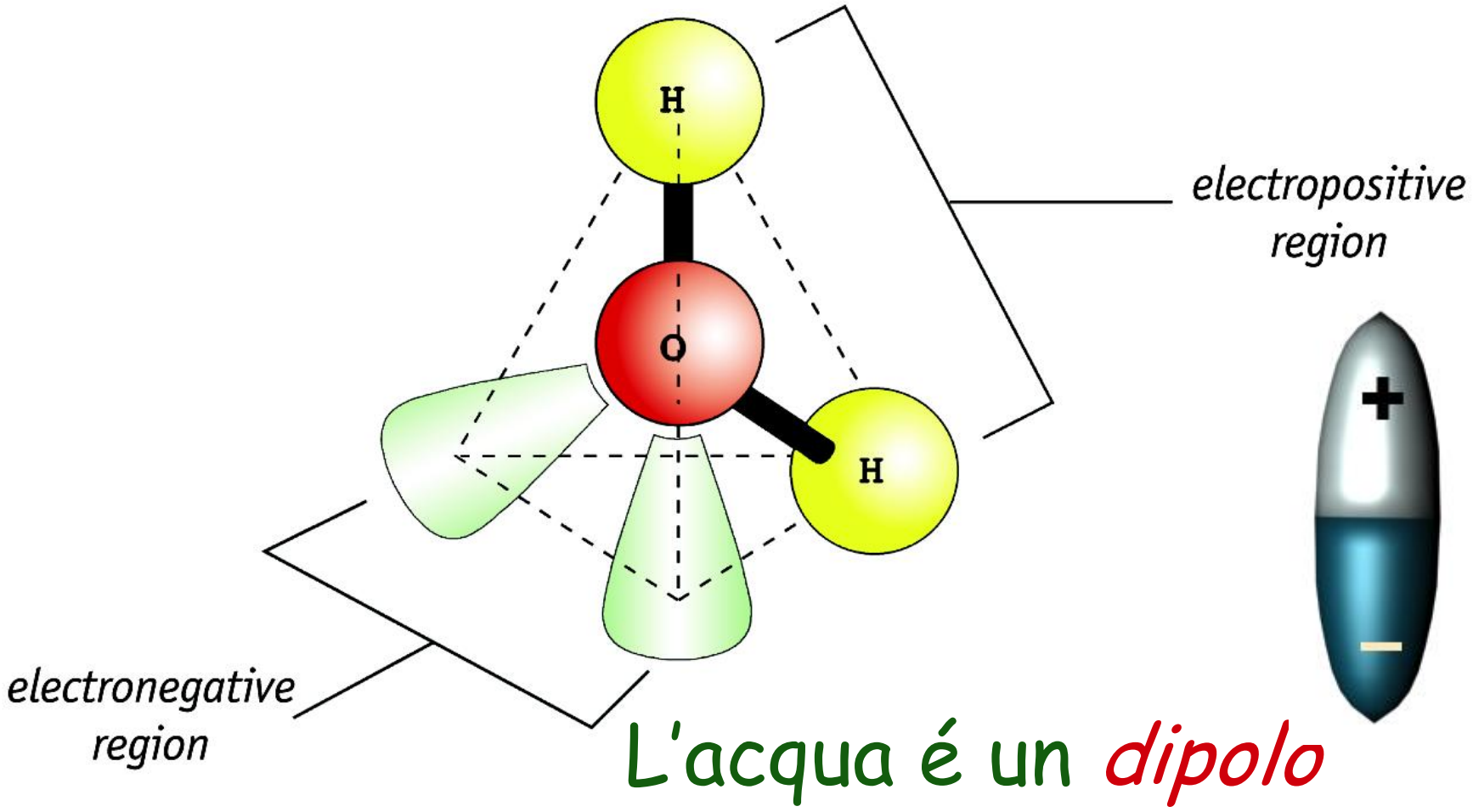
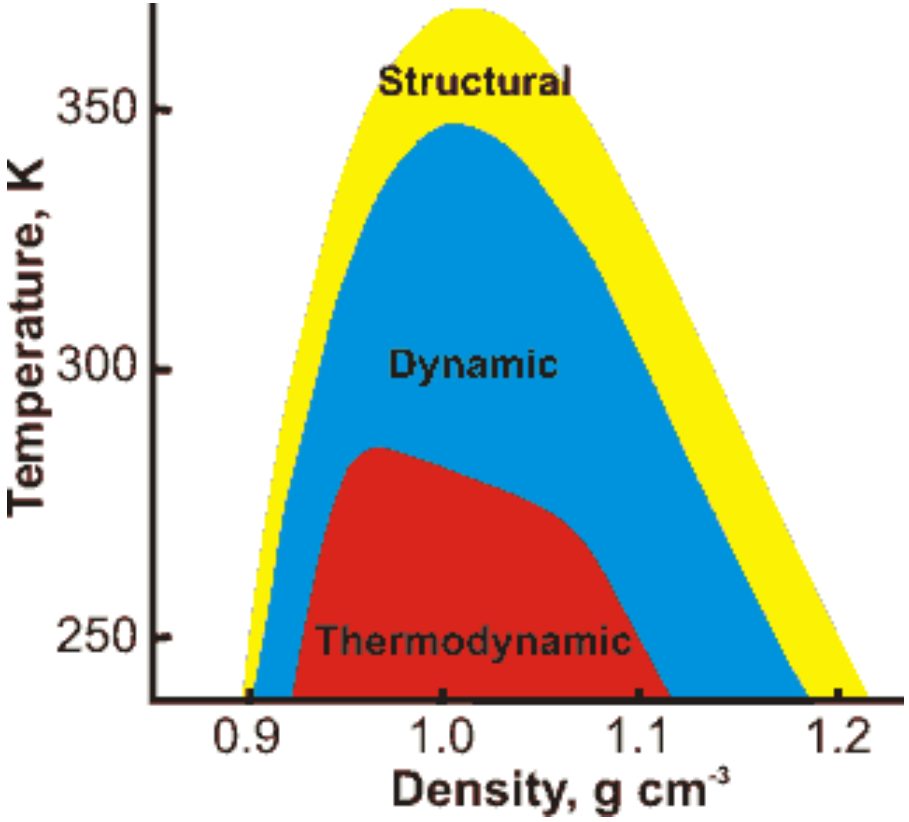
FONDAZIONE IRCCS
ISTITUTO NAZIONALE
DEI TUMORI

L'acqua e l'ambiente nella prevenzione oncologica – Erba 14 Novembre 2014



L'acqua é un *dipolo*

Perché l'acqua é così *strana* ?



Nell'acqua liquida si verificano moltissime "anomalie":

a) Anomalie strutturali: l'ordine aumenta all'aumentare della compressione,

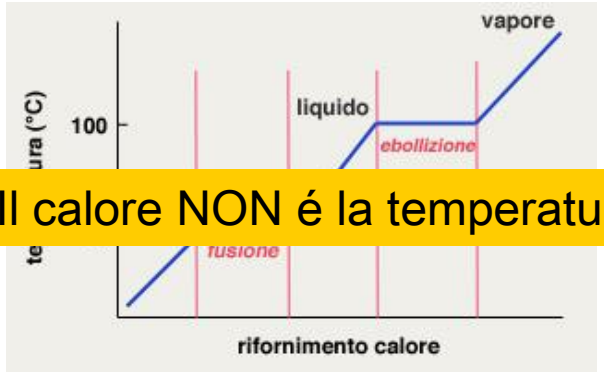
b) Anomalie diffusive: la diffusione aumenta con la compressione

c) Nomalie termodinamiche: la densità diminuisce con il raffreddameto a pressione costante.

http://www./~martin.chaplin/anmlies.html
Errington and Debenedetti Nature (2001) 409, 318-321

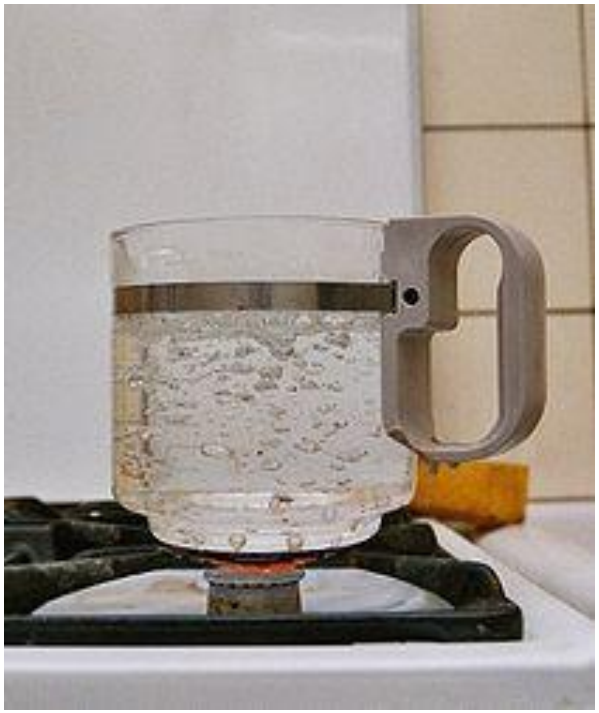
Densità dello stato solido rispetto allo stato liquido

Calore di fusione e di evaporazione estremamente elevati



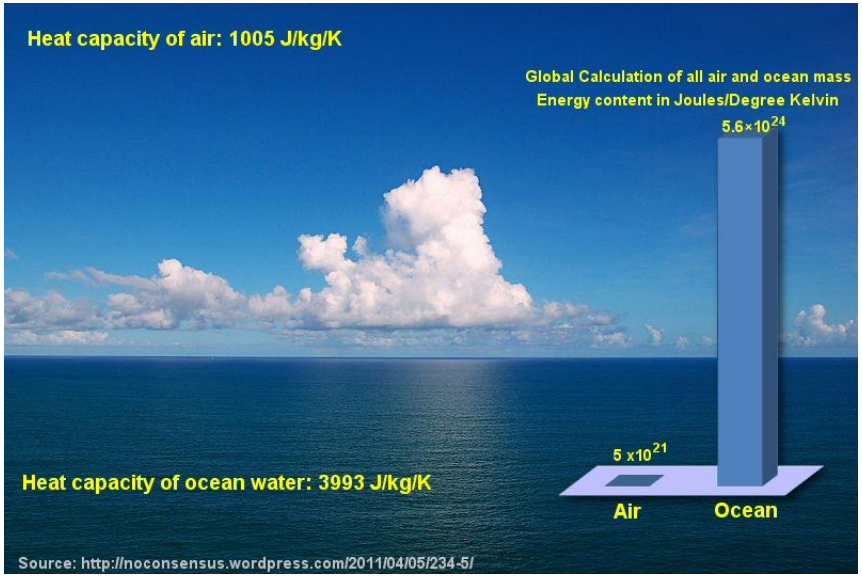
Il calore NON é la temperatura

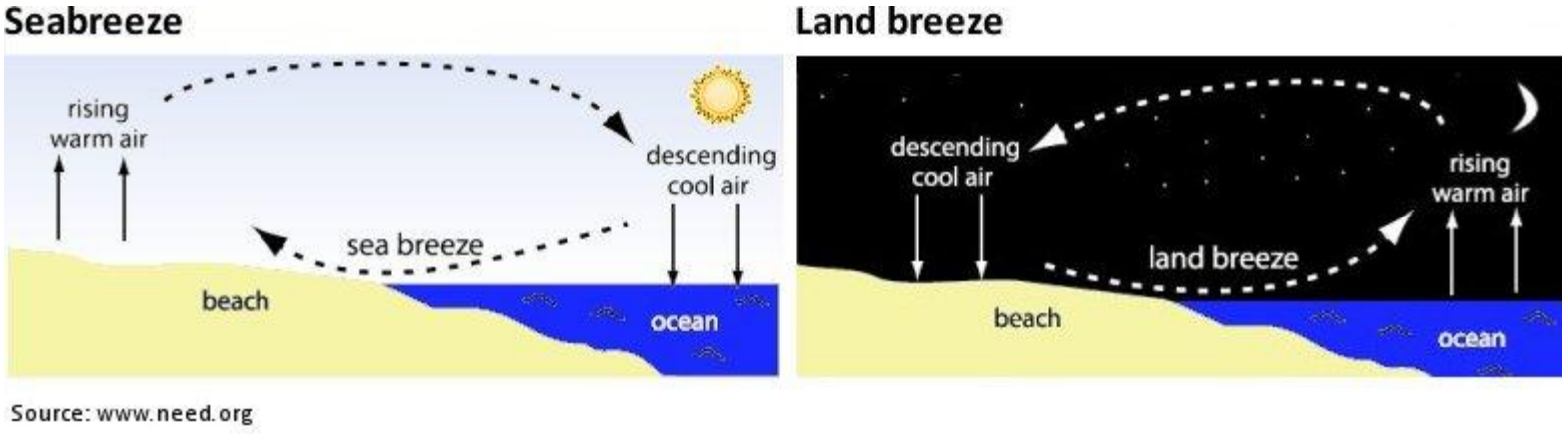
Caretteristiche importanti sul piano climatico ed ecologico



Tensione superficiale estremamente alta

Calore specifico molto elevato

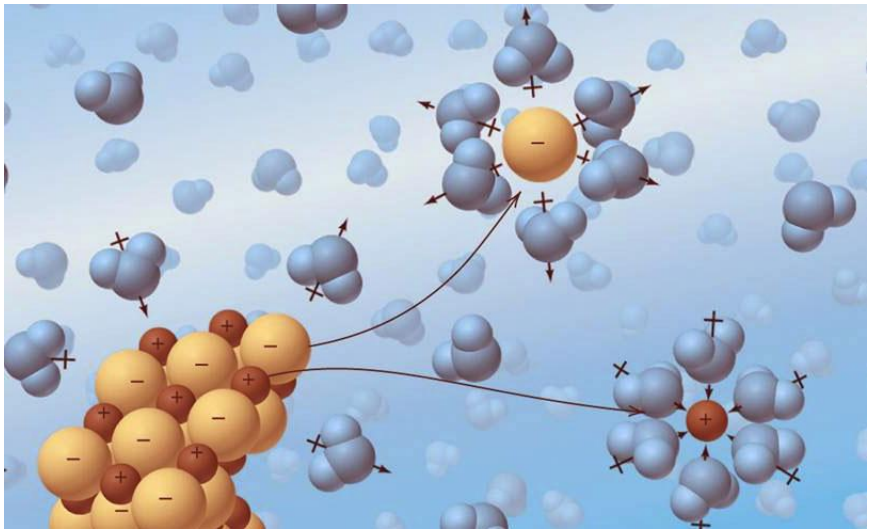


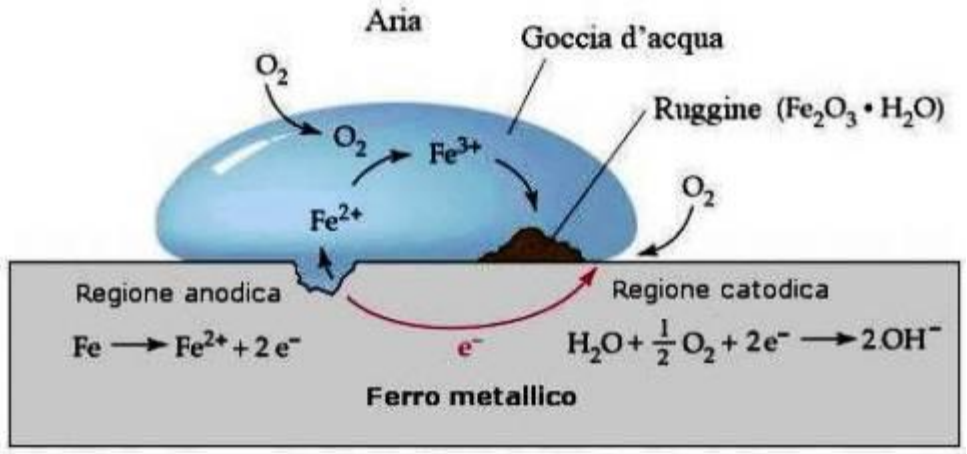


Source: www.need.org

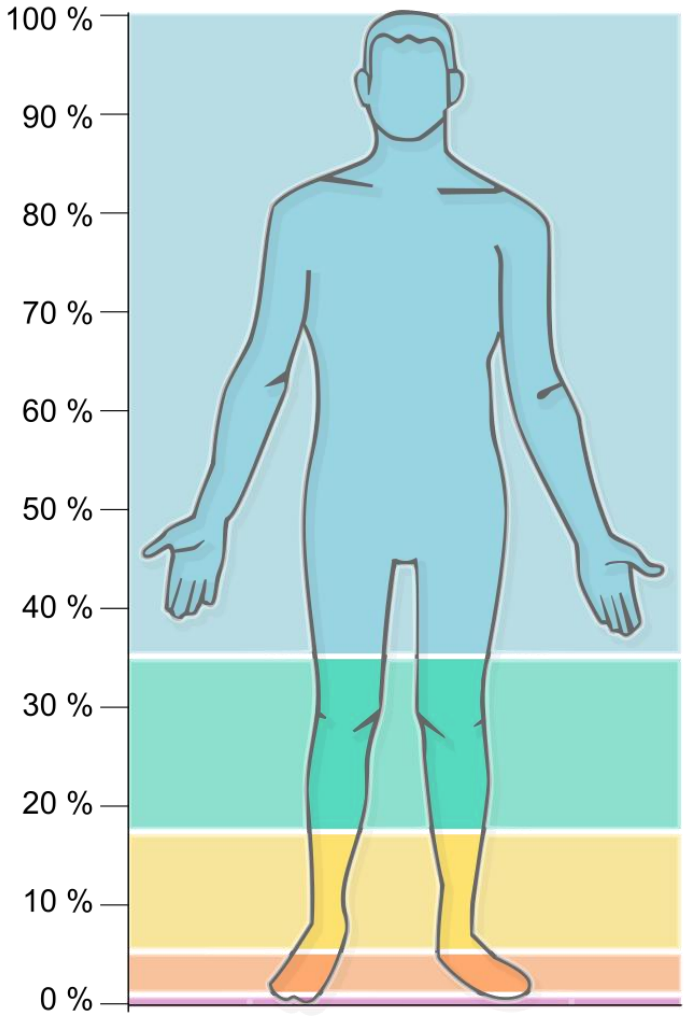
Ottime proprietà solventi

Capacità reattive straordinrie





L’acqua e la vita



Acqua: 65%

Proteine: 16%

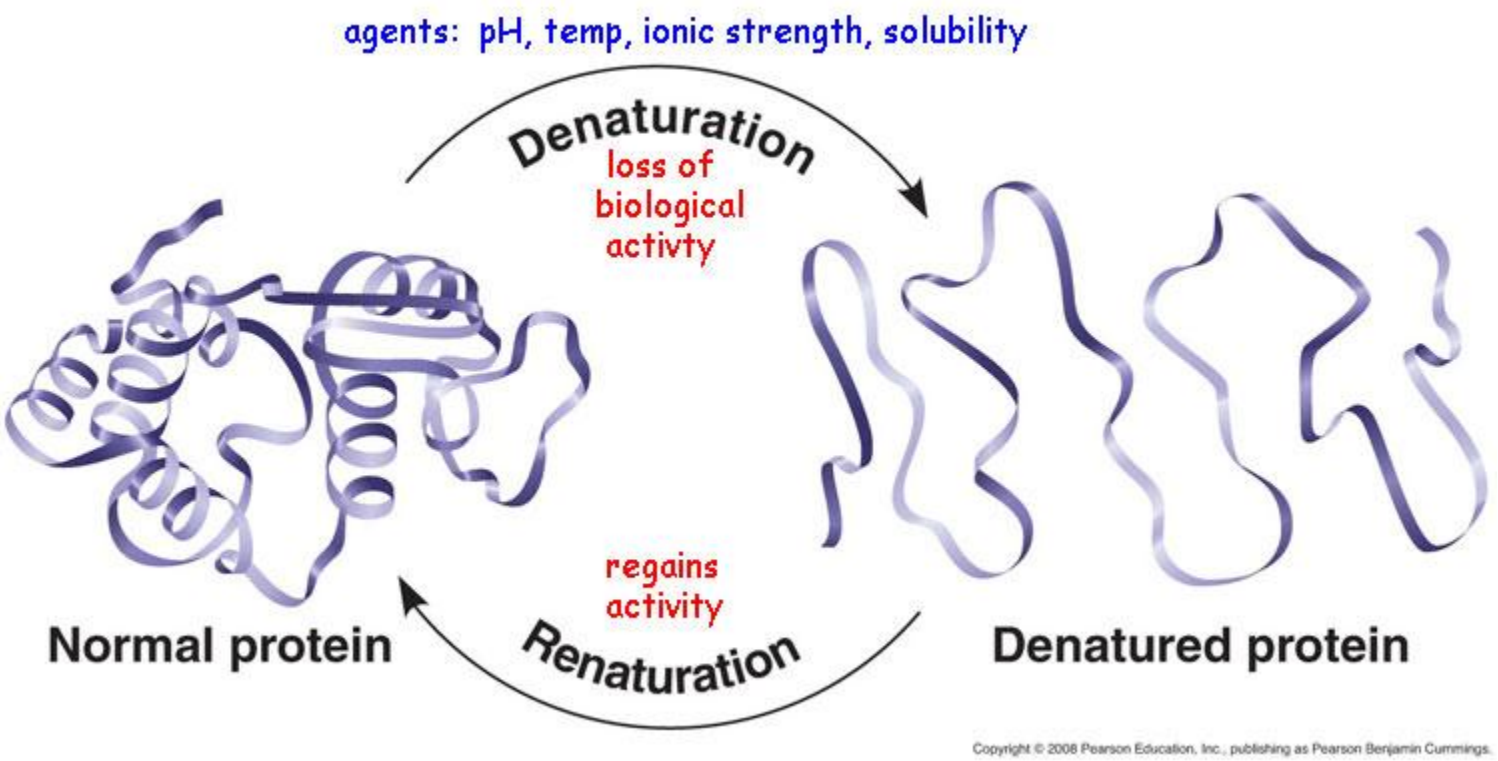
Lipidi: 13%

Sali minerali: 5%

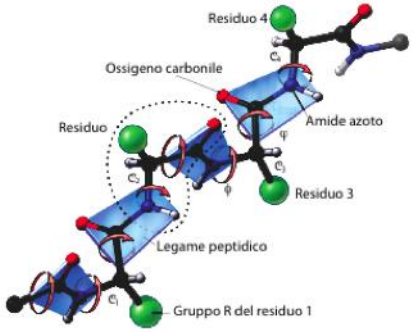
Glucidi: 1%

Vitamine: tracce

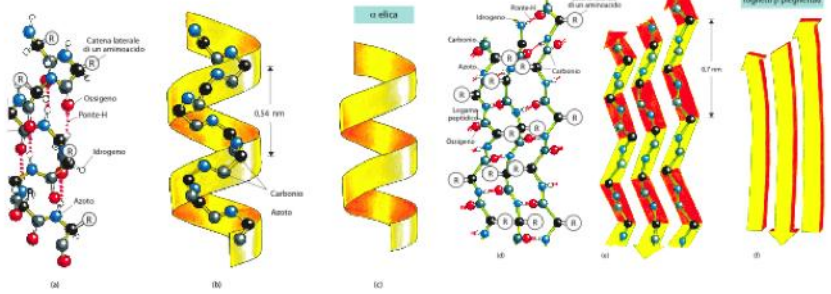
Acidi nucleici ed enzimi necessitano dell'acqua per la loro funzionalità



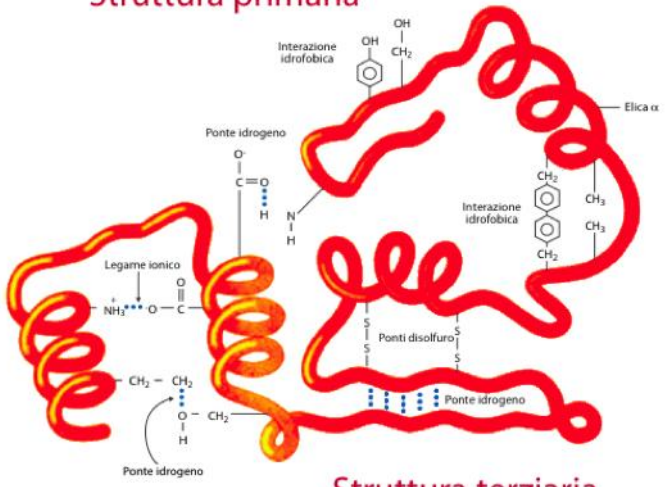
Struttura delle proteine



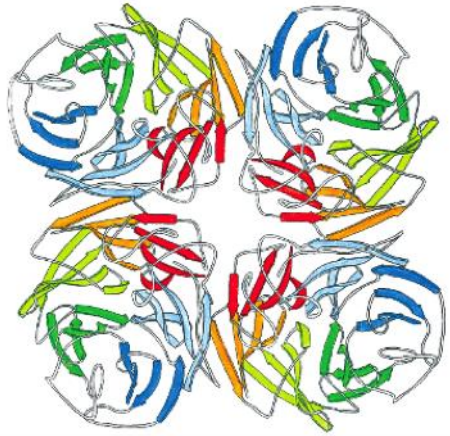
Struttura primaria



Struttura secondaria

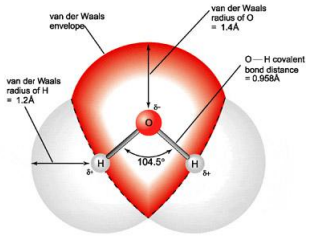


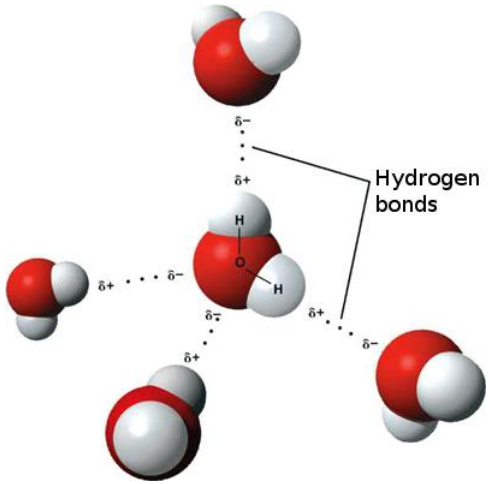
Struttura terziaria

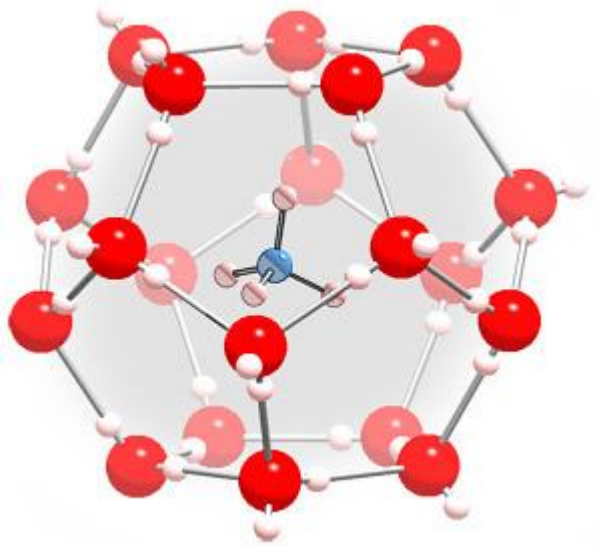


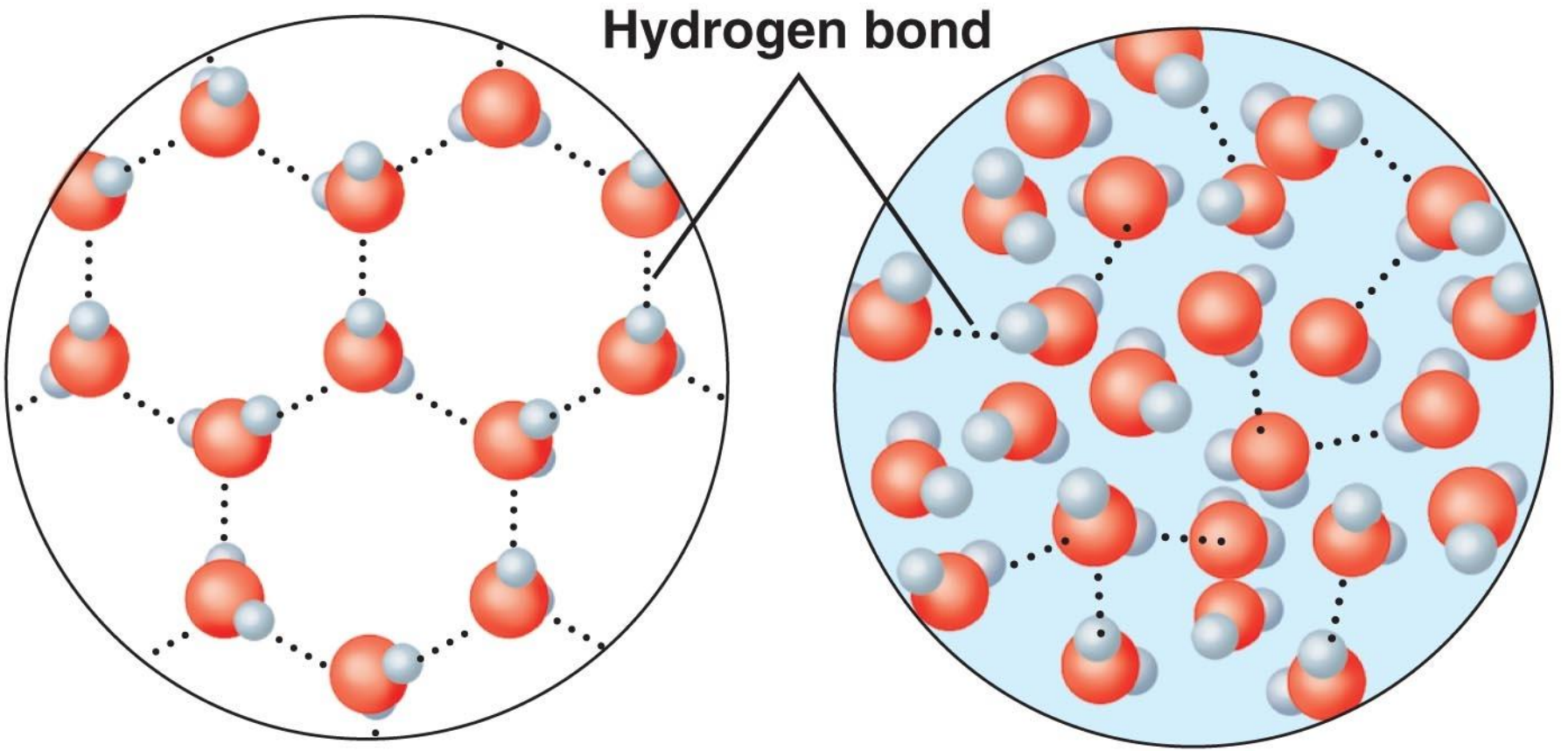
Struttura quaternaria

Possibilità di organizzazione sovramolecolare



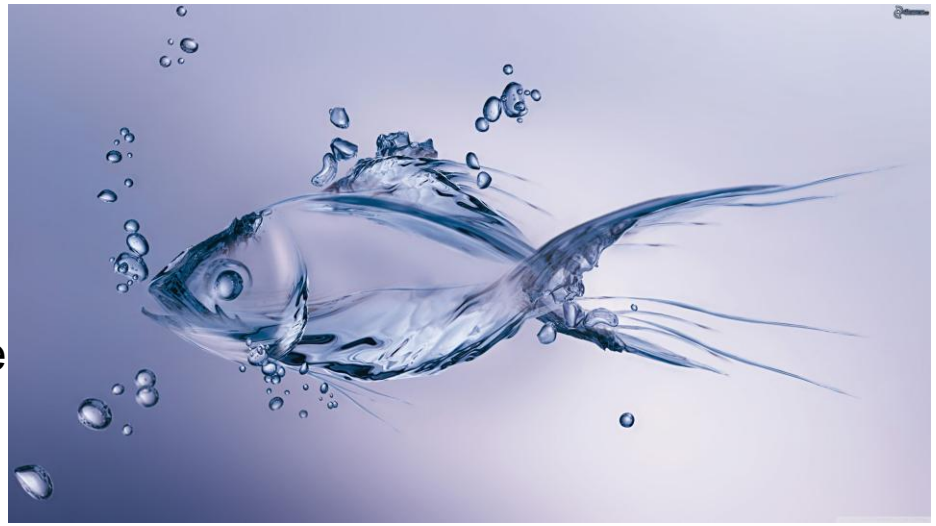




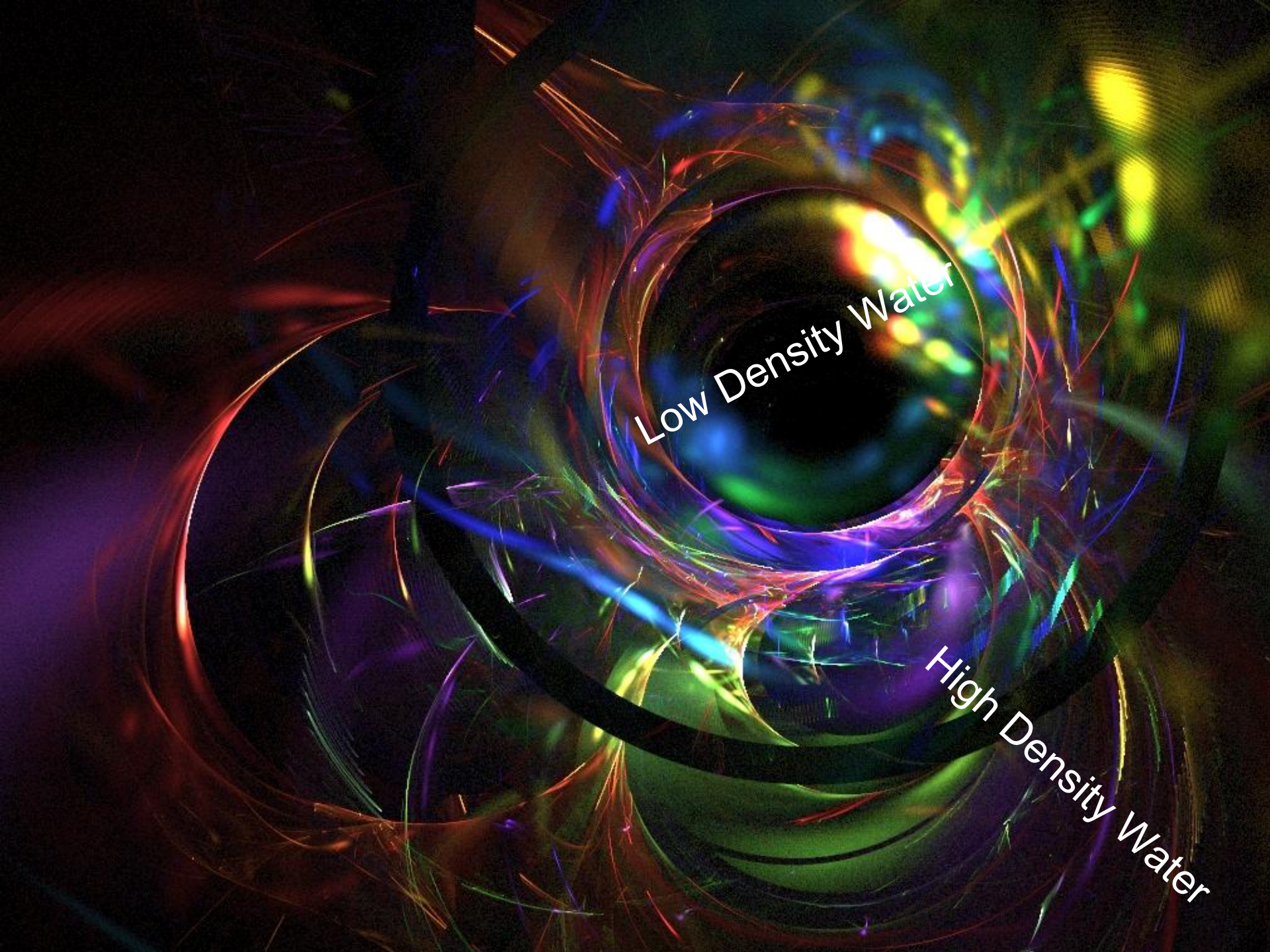


La storia delle teorie dell'acqua

- Röngten - 1892 – modello a due fluidi
- Bernal and Fowler – 1933 – il primato della termodinamica
- Linus Pauling -1950 – l'osservazione della tavola periodica degli elementi
- Il modello continuo – la supremazia de calcolo sull'esperimento
- Le perplessità dei biologi – *the flickering cluster model*



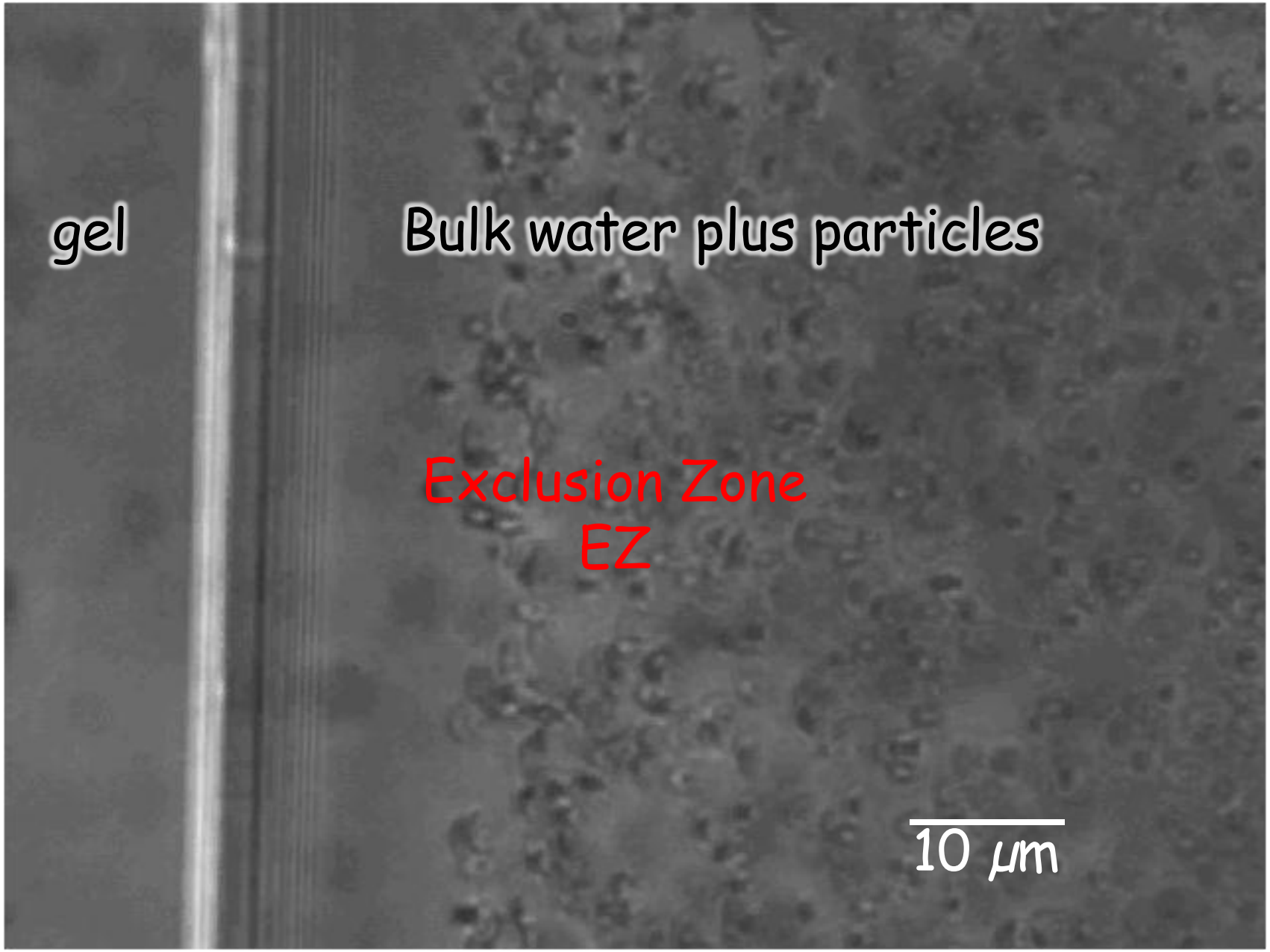

L’acqua é un fluido a due componenti !!!


Low Density Water
High Density Water

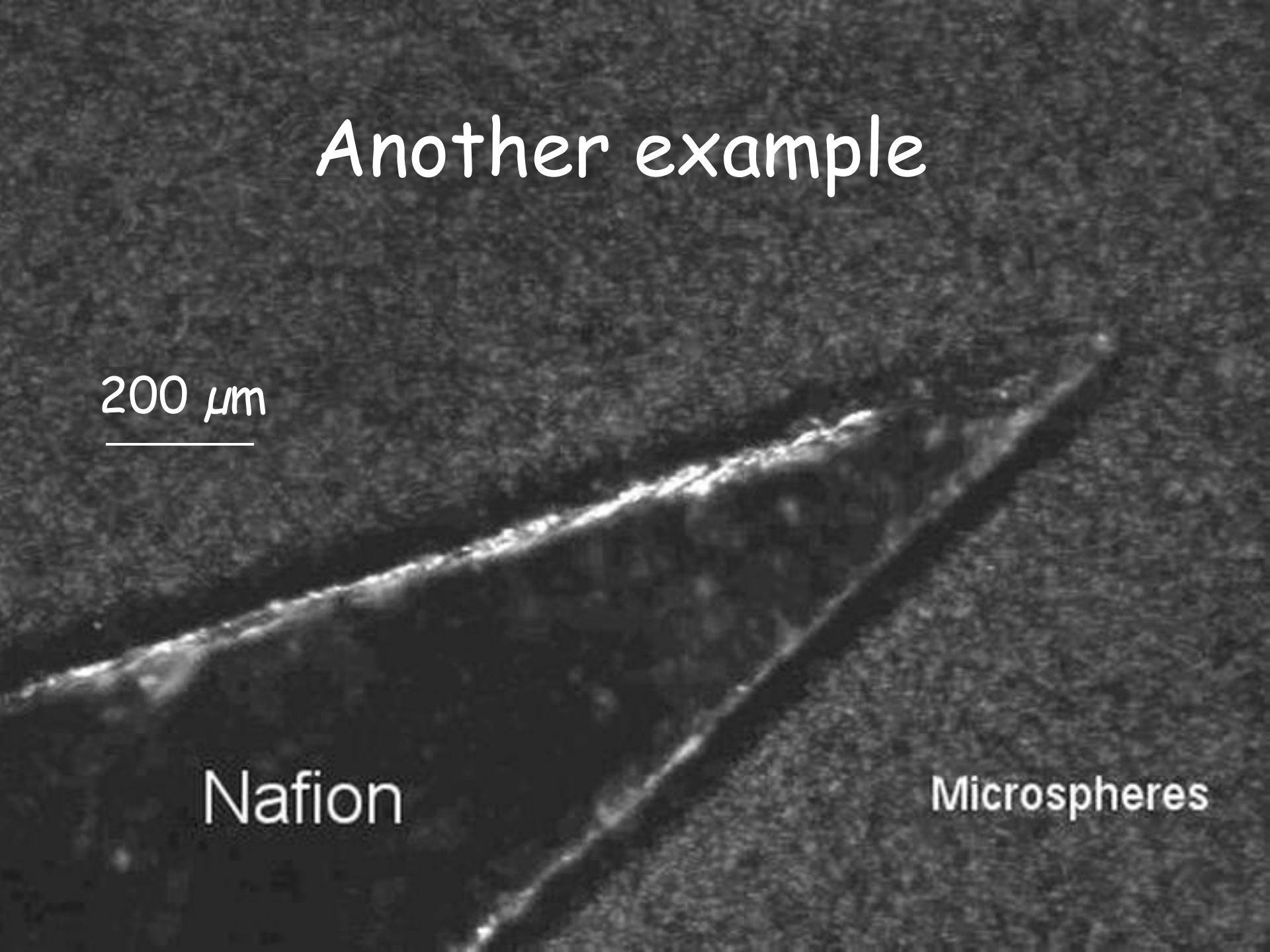

Emilio Del Giudice
Coherent Oscillation of Molecules between
and Excited State
ground state
excited state

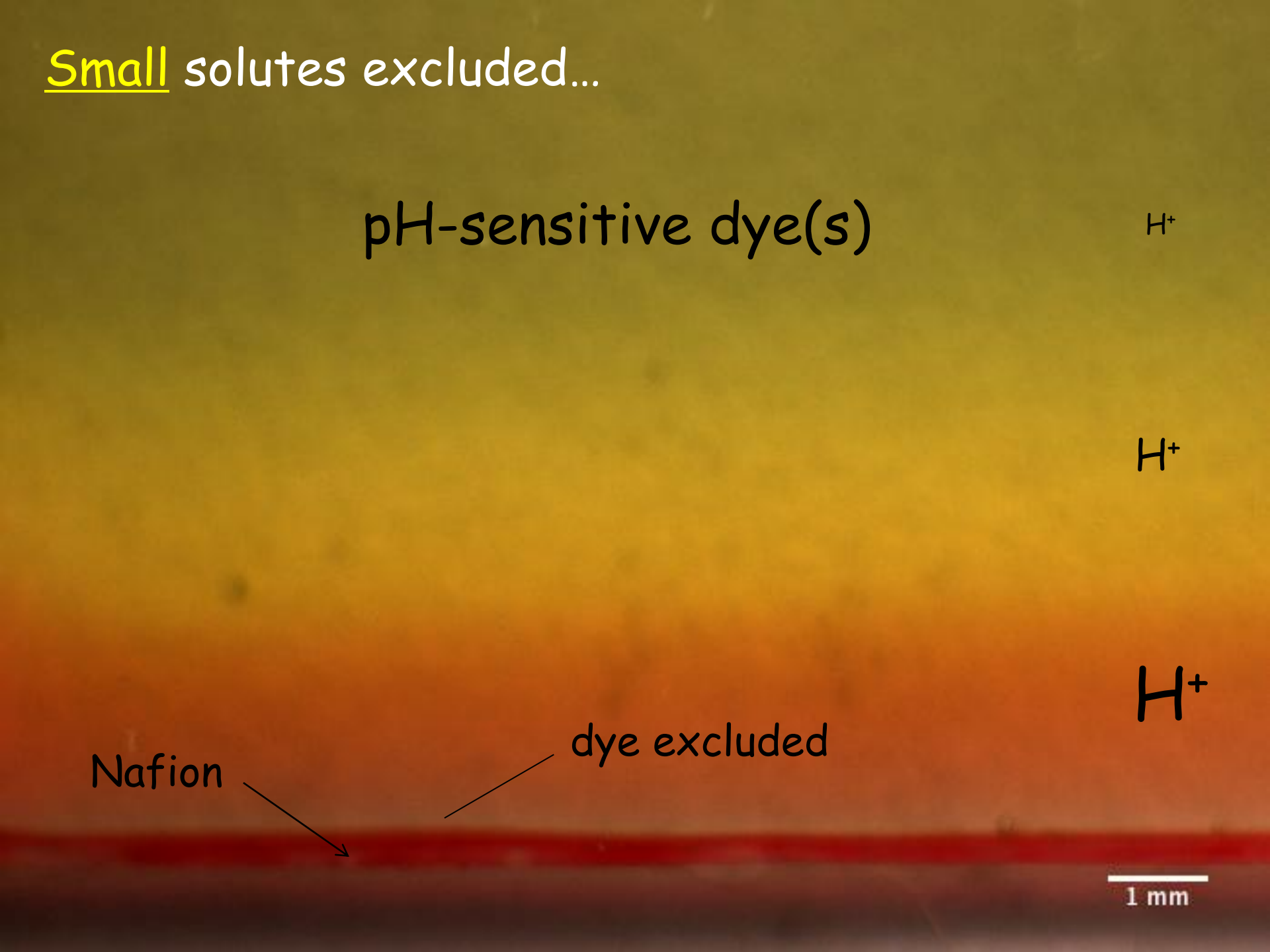
Qual'é il ruolo della struttura sovramolecolare dell'acqua in tutte queste sue strane proprietà ?

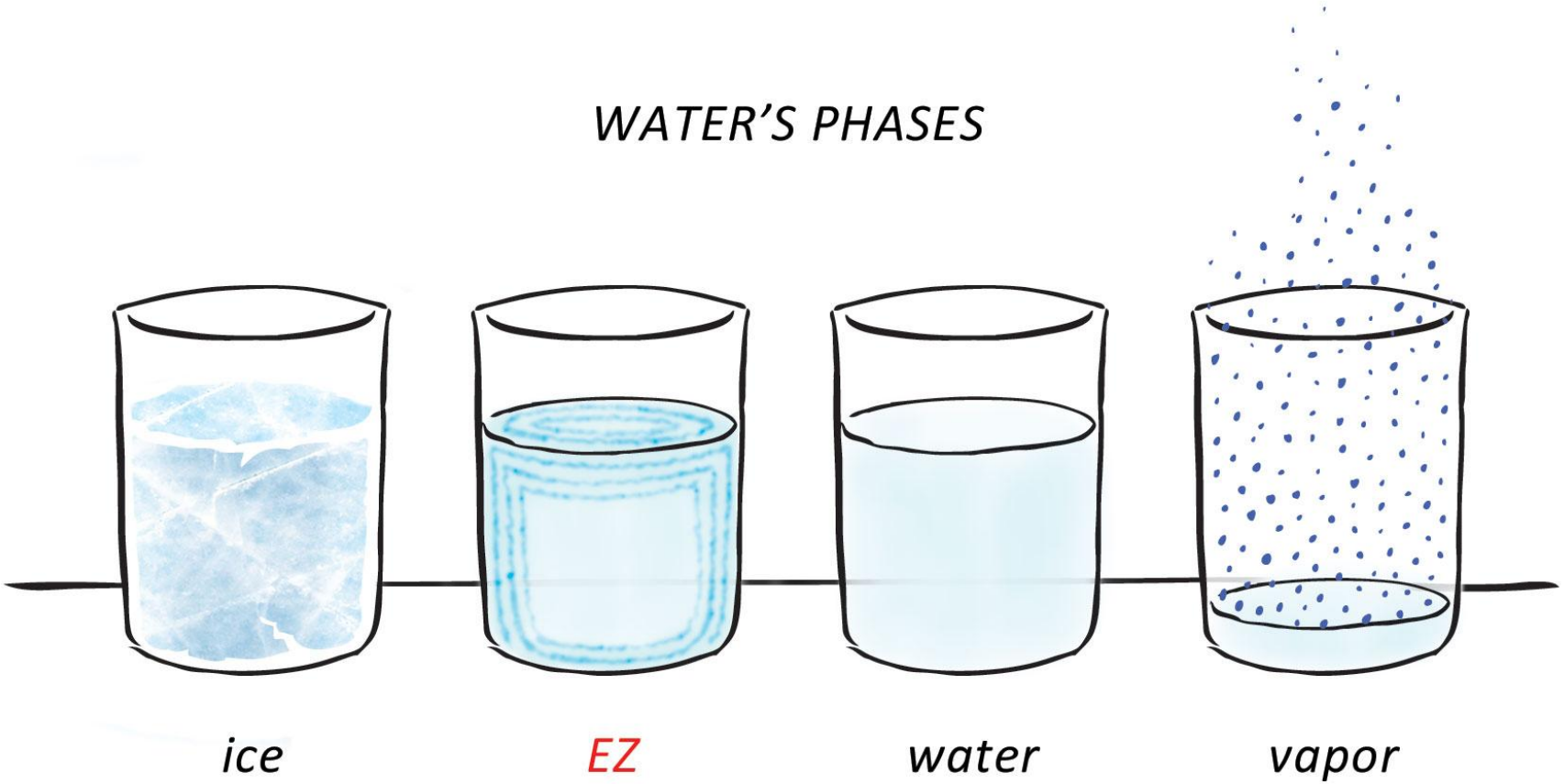
1. Da cosa dipende la distribuzione delle due fasi?
2. Si modifica in relazione all'ambiente ?
3. Si può stabilizzare preferenzialmente una fase e cosa implica?
4. Qual'é il ruolo dell'acqua nei processi biofisici ?


gel
Bulk water plus particles
Exclusion Zone
EZ
10 μm

Another example




Small solutes excluded…
pH-sensitive dye(s)
H+
H+
H+
dye excluded
Nafion
1 mm


WATER'S PHASES
ice
EZ
water
vapor

Effetti biologici delle soluzioni ultradiluite

(Jaques Benveniste direttore di ricerca all'INSERM (Clamart), capo dell'unità di immunologia)

Degranulazione dei basofili umani, indotta da alte diluizioni di un anti-siero anti-IgE
Nature, 28 giugno 1988

memoria dell'acqua = fenomeni idroisteretici

Nanoaggregati nelle soluzioni ultradiluite

Alexandr Konovalov capo della Scuola Kazaca di chimica, direttore dell'Istituto di chimica organica del centro di ricerche kazaco dell'Accademia delle Scienze di Russia)

Formation of the Nano-sized Moleculare Ensambles in High Diluted Aqueous Solutions. Effect of ultra-low concentrations and Electromagnetic Fields.

antioxidants

plant growth regulators

neuromediators

vitamins

hormones

anticeptics

anxiolitics

compounds with known and unknown biological properties

75%

Roumiana Tsenkova
Dipartimento di Agricultural Engineering
dell'università Di Kobe, Giappone

Aquaphotomics: dynamic spectroscopy of aqueous and biological systems describes peculiarities of water

aquaphotomics

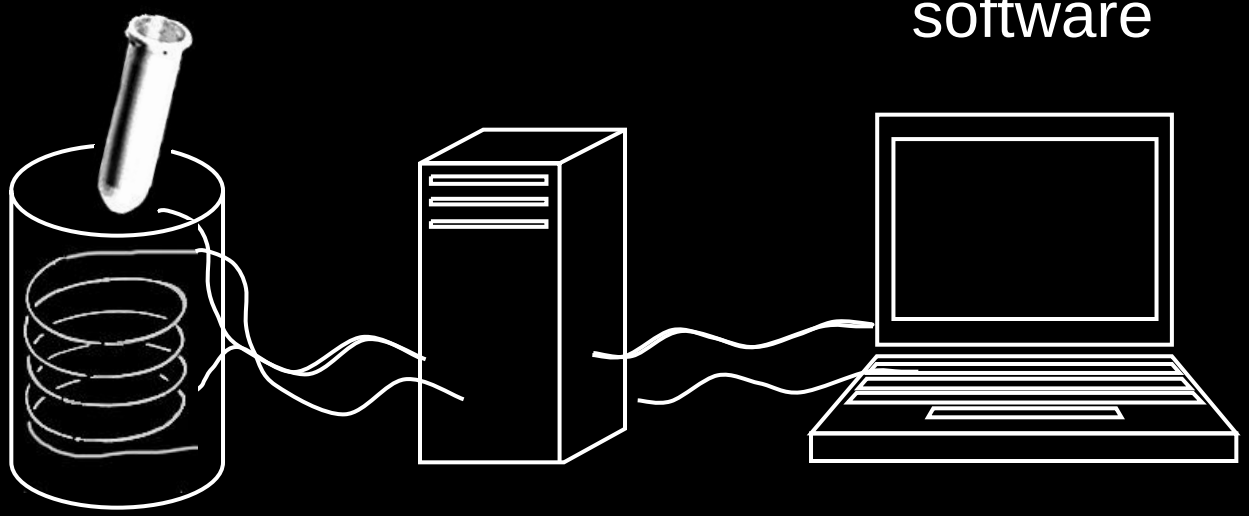
Molecular recognition without close contact (by waves and resonance)

Capture of the signals

Sample

X 500

Signal Analysis software



Sensor coil

Amplifier

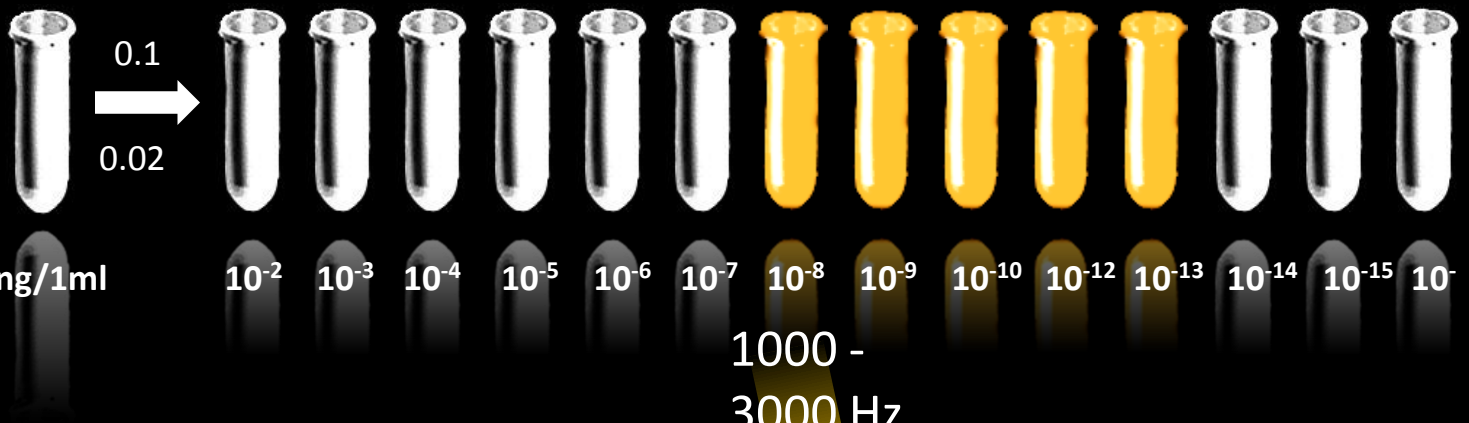
Computer

FACTS

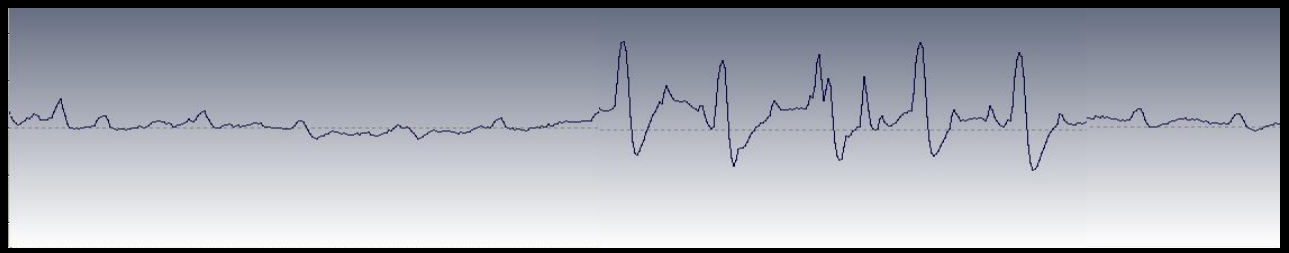
Detection of Ultra Low Frequencies Waves (ULF 500-2000 hertz) in certain dilutions of filtrates (100nM, 20nM, 15nM) from cultures of micro-organisms (virus, bacteria) or from the plasma of humans infected with the same agents.

7-100 Hz

Filtrati

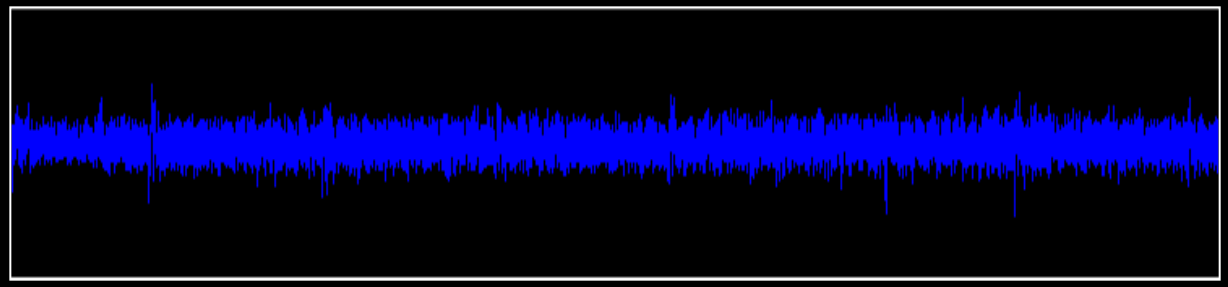


1000 - 3000 Hz

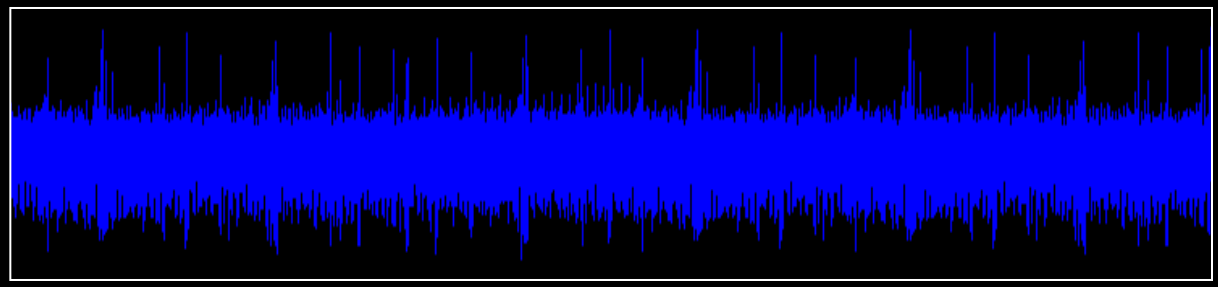


Amplitude

Noise

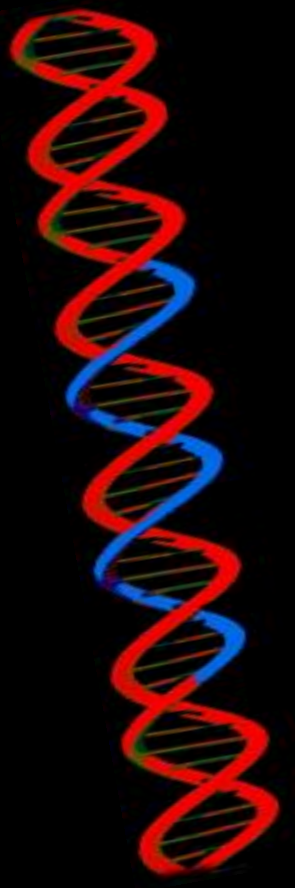


(+)



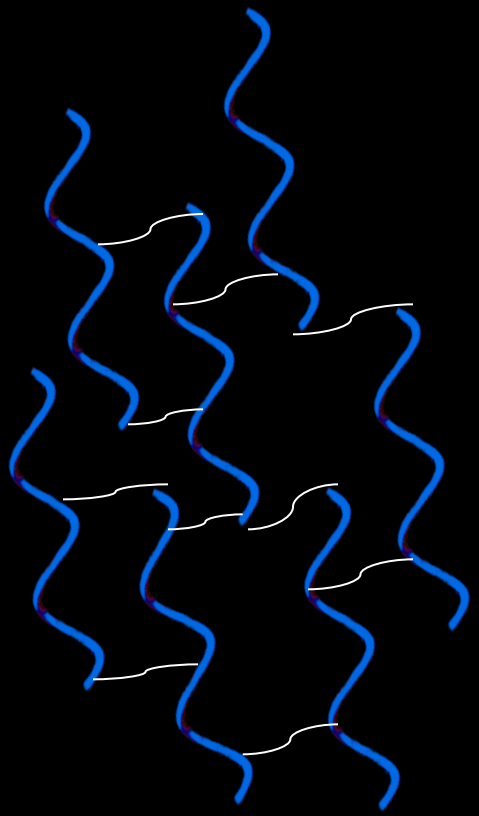
Time (sec)

Interpretation



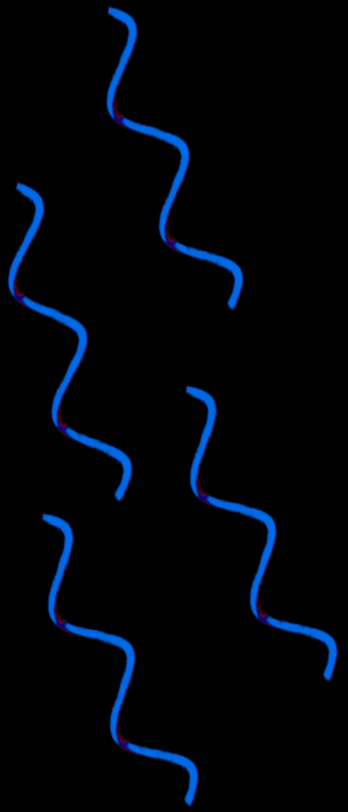
DNA

10^{-2}



Water excited state
crystal like gel
no EMS

10^{-9}



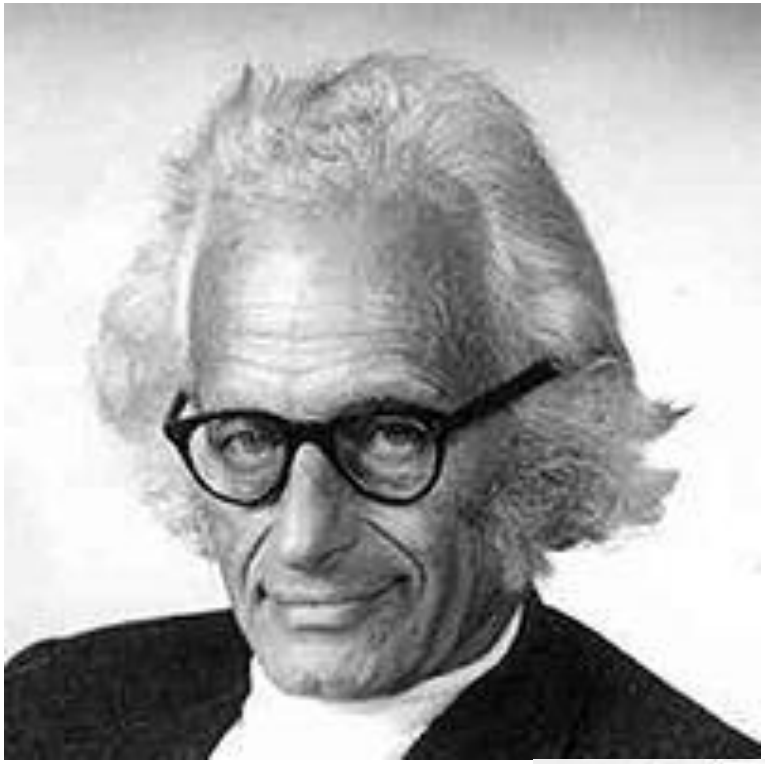
Free polymer
self maintained
by EMS

I – DNA’s emit EMS

II – EMS are produced by water nanostructures (naneons)

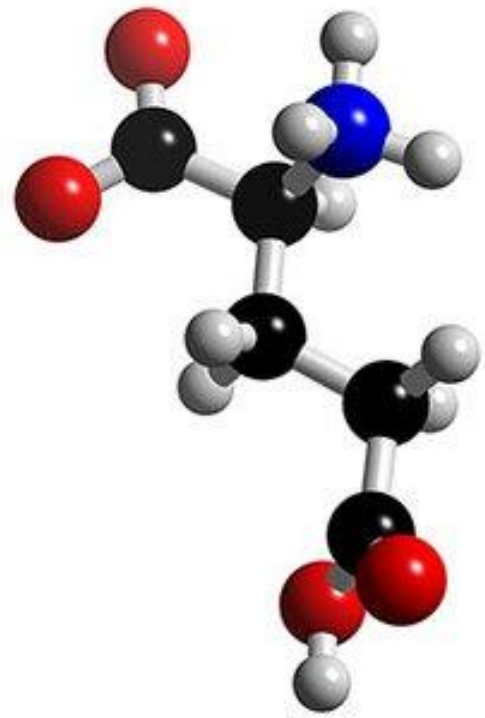
III – EMS are producing naneons

IV – Naneons and EMS carry specific DNA information



Le interazioni nella materia vivente sono mediate dai campi elettromagnetici

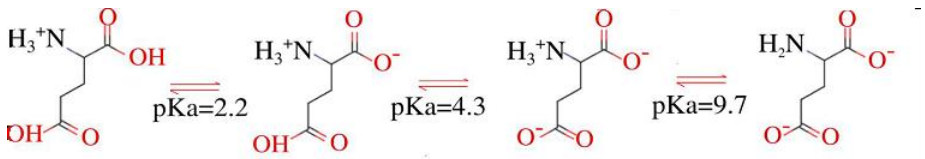
Glutamic acid



- pH<3.2 both carboxylic and amine groups are protonated and its ionic charge is -1
- deprotonated species appear increasing pH
- isoelectric point = 3.2 pH, its ionic charge is 0
- above pK_a=9.7 the amino acid is fully deprotonated and its ionic charge is +2

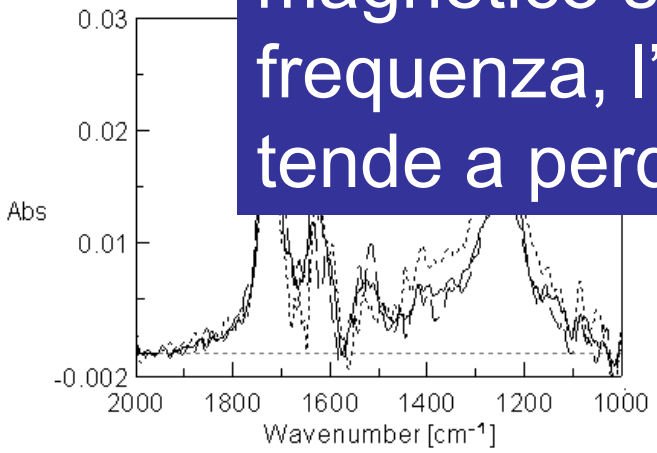
Glutamic acid speciation scheme

pH

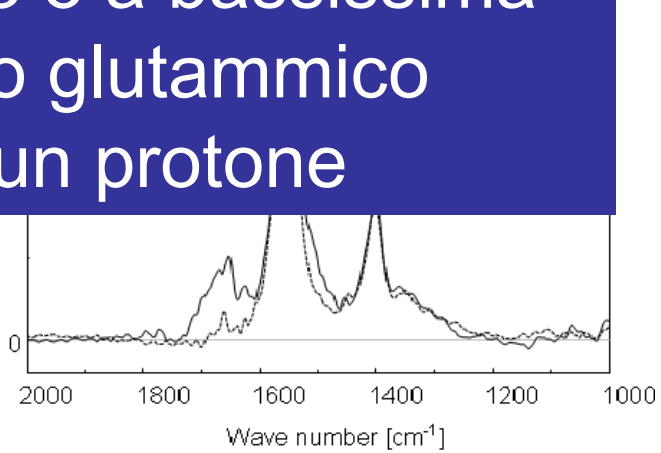


The electric cha n scheme.

Esposto ad un debole campo magnetico statico o a bassissima frequenza, l'acido glutammico tende a perdere un protone

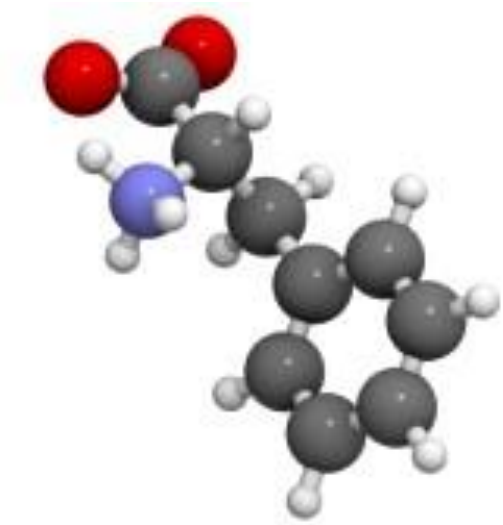


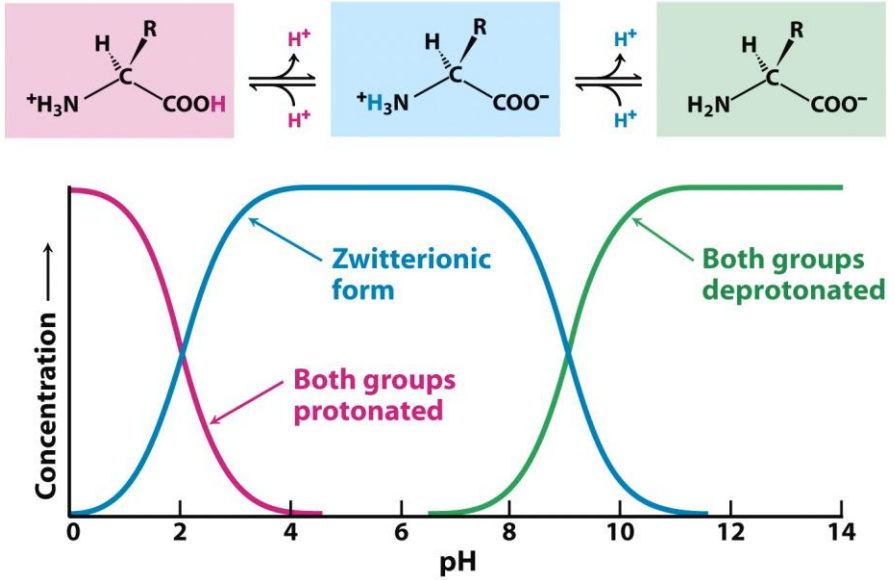
pH=1.5



pH=11.8

Phenylalanine





L’esposizione ad un debole campo magnetico statico sposta l’equilibrio acido-base

Phenylalanine

L’effetto é simile a quello della radiazione IR NIR che è nota per modificare le proprietà di idratazione delle molecole

- Exposure to a static magnetic field 1 Gauss – 30 minutes

1. La distribuzione delle due fasi dell'acqua non dipende soltanto dalla temperatura
2. L'ambiente esterno influenza la struttura dell'acqua
3. Una fase può essere "stabilizzata"

Sono possibili quindi diversi tipi di
seconda dell'ambiente est
L'acqua liquida ha
assumere
tr
.ggio.
grado di
dall'esterno e
un significato e quindi in un

L'acqua supporta una grammatica, cioè un insieme di regole che consentono di costruire un messaggio dotato di significato

Grazie per l’attenzione