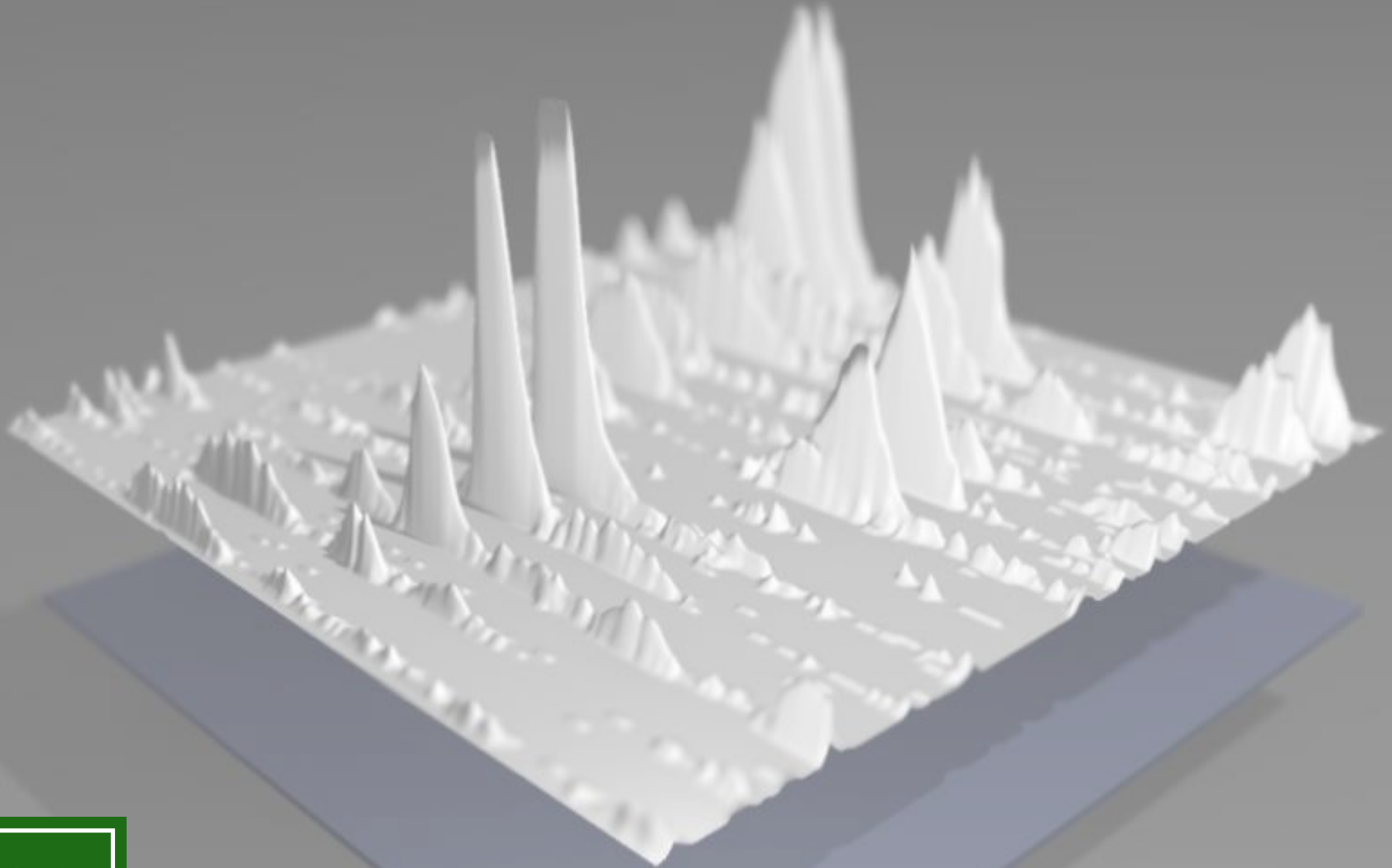


What is proteomics good for?



Introduction

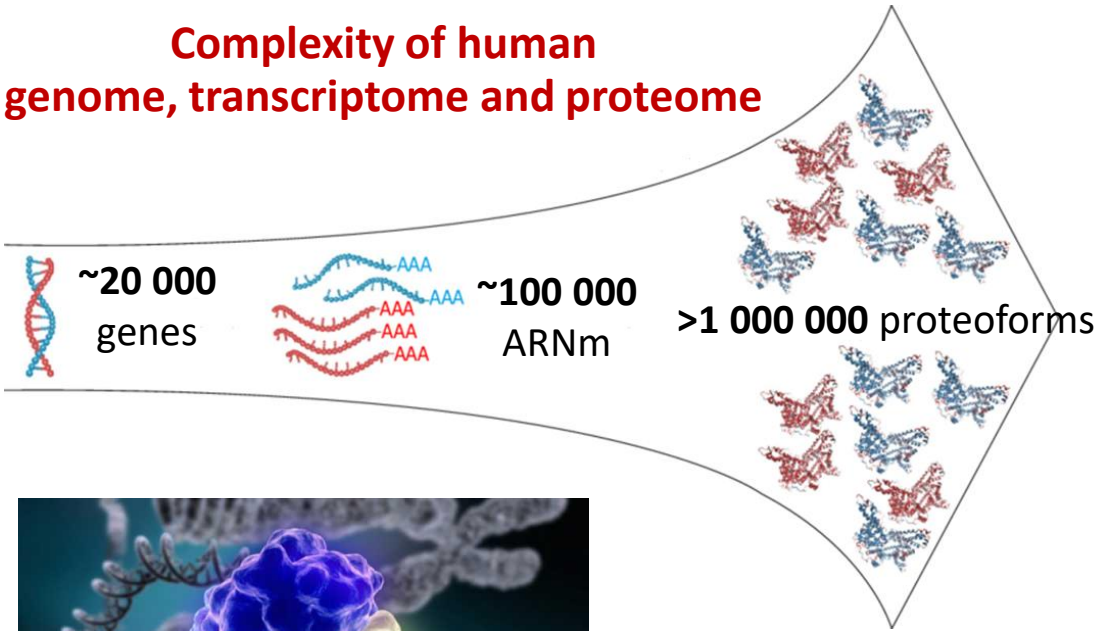
What is proteomics? What is the complementarity with other omics?

➤ THE PROTEOME :

“The entire protein complement expressed by a genome, or by a cell or tissue type.”

Wilkins. *et al.* 1996

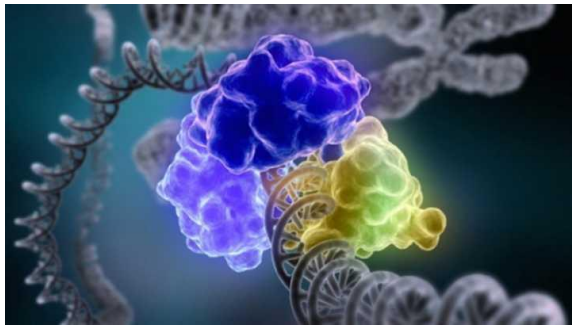
Complexity of human genome, transcriptome and proteome



Same genome...

...different proteomes

The proteome is very dynamic



Proteins are cells effectors

➔ central players in pathologies: cancer, infections, etc...

➤ PROTEOMIC ANALYSIS:

Identify, characterize and quantify the proteins in given conditions

Introduction

What information can we get from the proteome?

► GENOME VS PROTEOME:

“The genome might enable us to predict the proteins that can potentially be generated but not where, when or at what level ”

E. H. Fischer (1997)

“If the proteome was a cake then the genome would be recipe” David Bouyssié 2019 😊



With the same ingredients but different conditions we can obtain very different cakes!



The proteome (as the lipidome and the metabolome) reflects the state of studied biological system

Introduction

What can we do with proteomics?

➤ SYSTEMATIC ANALYSIS:

Characterize the set of proteins present in a given biological system

➤ STRUCTURAL ANALYSIS (Native MS, Top-Down, HDX)

Study the 3D structure of proteins and their association in molecular complexes

➤ FUNCTIONAL ANALYSIS:

➤ DIFFERENTIAL/QUANTITATIVE ANALYSIS

Comparison of proteomes obtained in different conditions

➤ *e.g.: drug effect, biomarker discovery in biological fluids*

➤ PROTEIN/PROTEIN INTERACTIONS (INTERACTOMICS)

Characterization of protein partners implied in the creation of a molecular complex having a functional role

➤ POST-TRANSLATIONAL MODIFICATIONS

Identification, localization and quantification of proteins having post-translational modifications (PTMs).

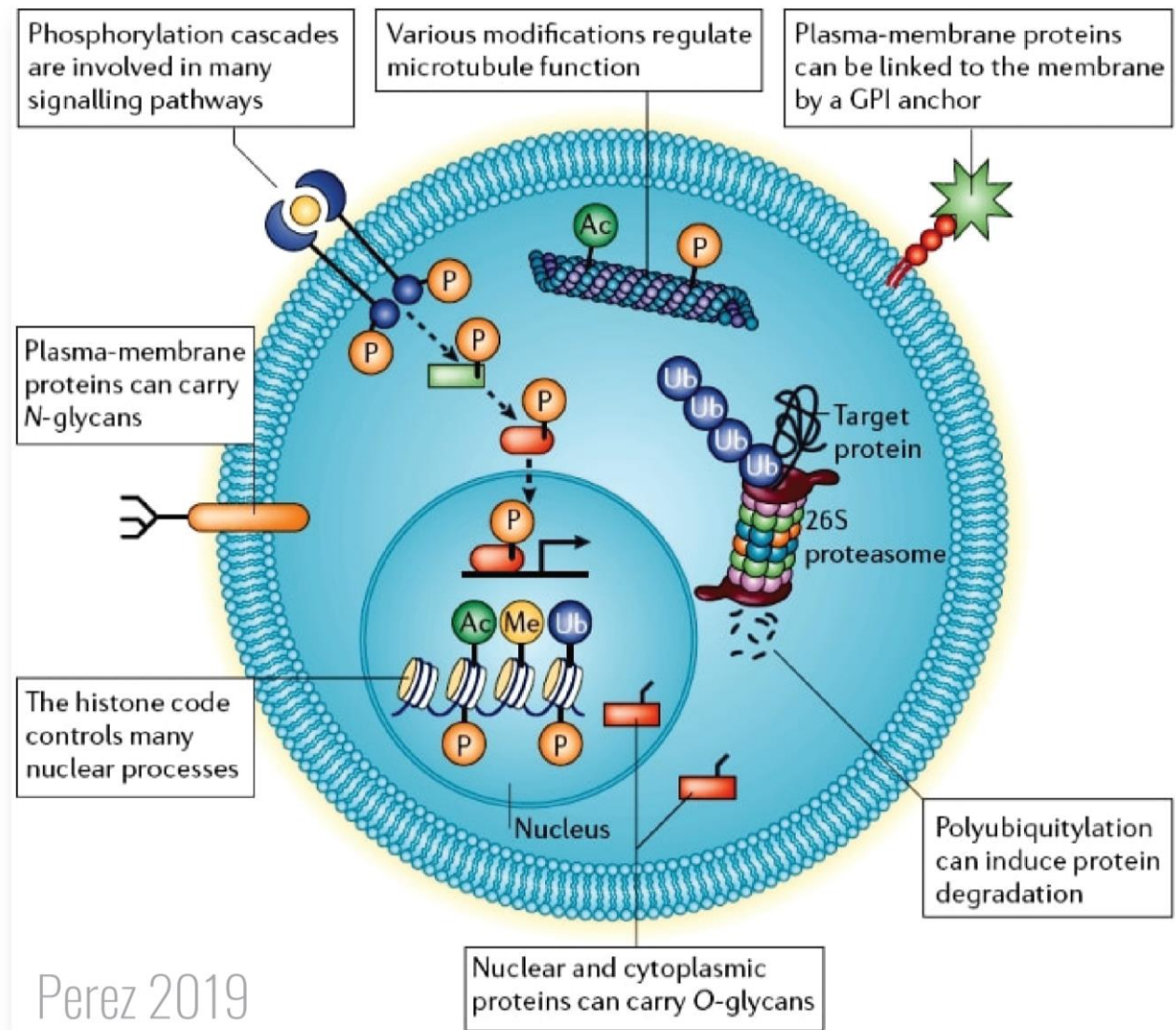
➤ *e.g.: phosphoproteome*

Introduction

Functional analysis focus: post-translational modifications

PTMs functions:

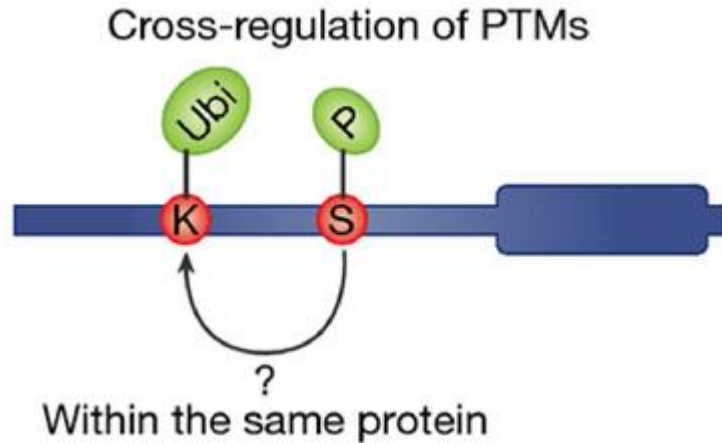
- Signal transduction
- Gene expression
- Protein turnover
- Regulation of protein and cell-cell interactions
- Metabolism and coupling of metabolism and gene expression
- Host-pathogen interactions



Introduction

Functional analysis focus: post-translational modifications

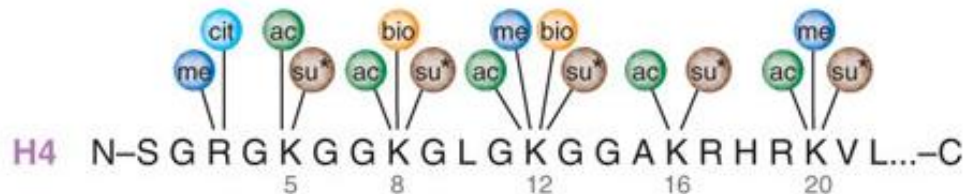
Question: is there a PTM « cross-talk »?



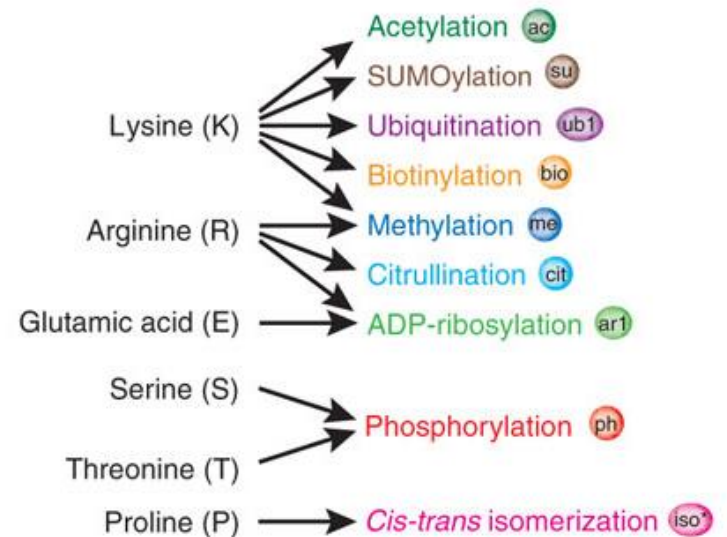
Functional consequences of
[Ubi + Phospho] *versus*
Ubi or Phospho alone
Synergy? Inhibition?

Beltrao P, et al. Mol Syst Biol. 2013

Example of highly modified protein: Histone H4



PTMs <-> amino acids relationships



Introduction

What information can we get from the proteome?

