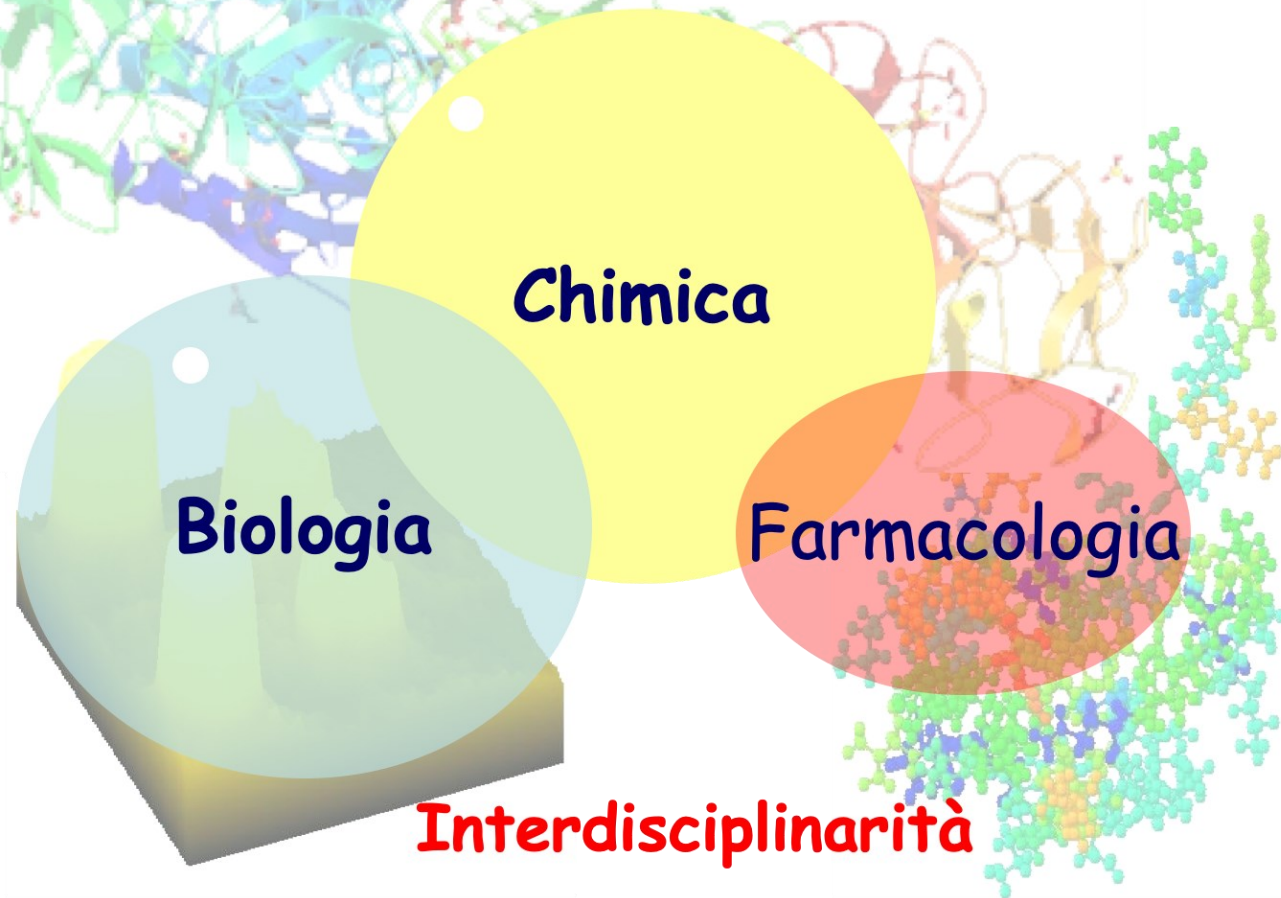


Corso di studi magistrale in Scienze Chimiche (LM54-SC)
Curriculum in Chimica Biomolecolare (CABLE)



Referente curriculum CABLE: Graziella Vecchio, graziella.vecchio@unict.it

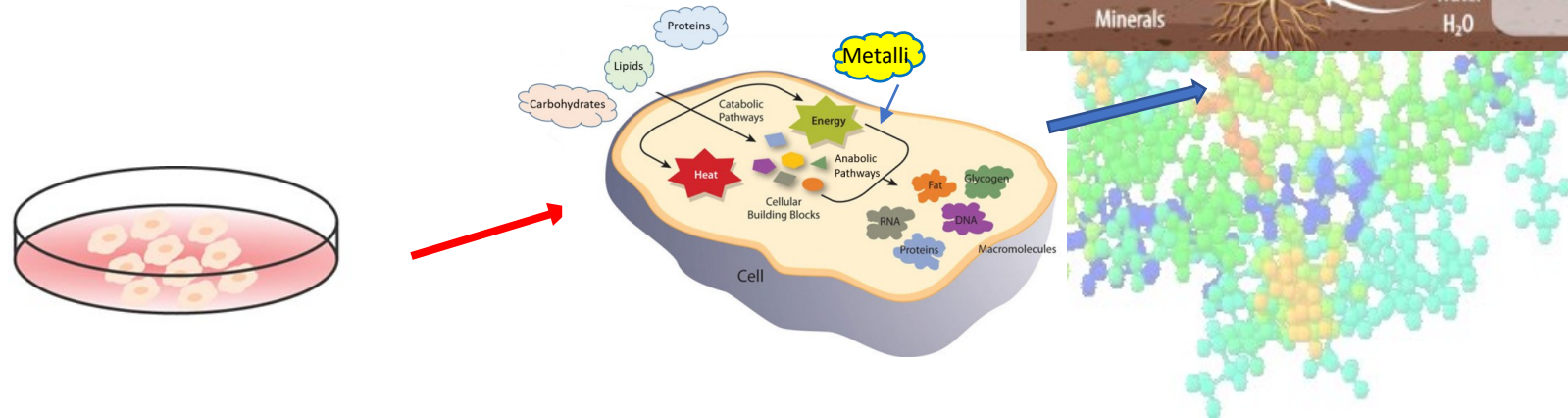
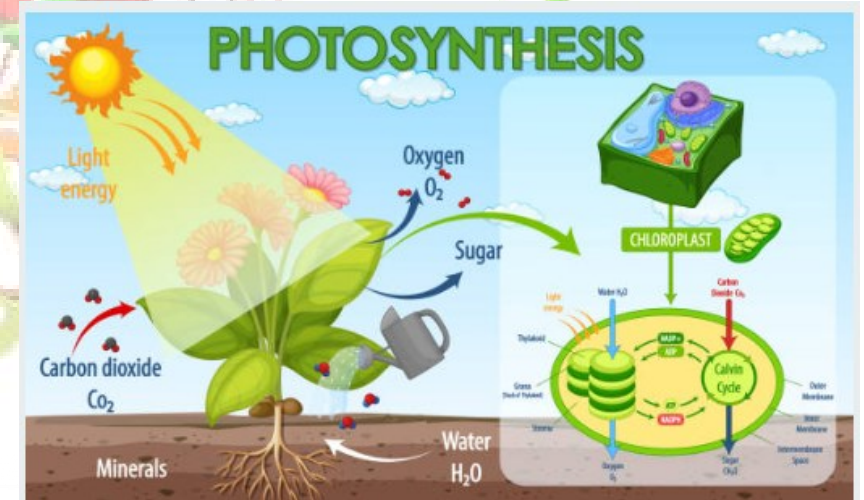
Laurea Magistrale in Scienze Chimiche

curriculum

Chimica Biomolecolare

Le cellule sono

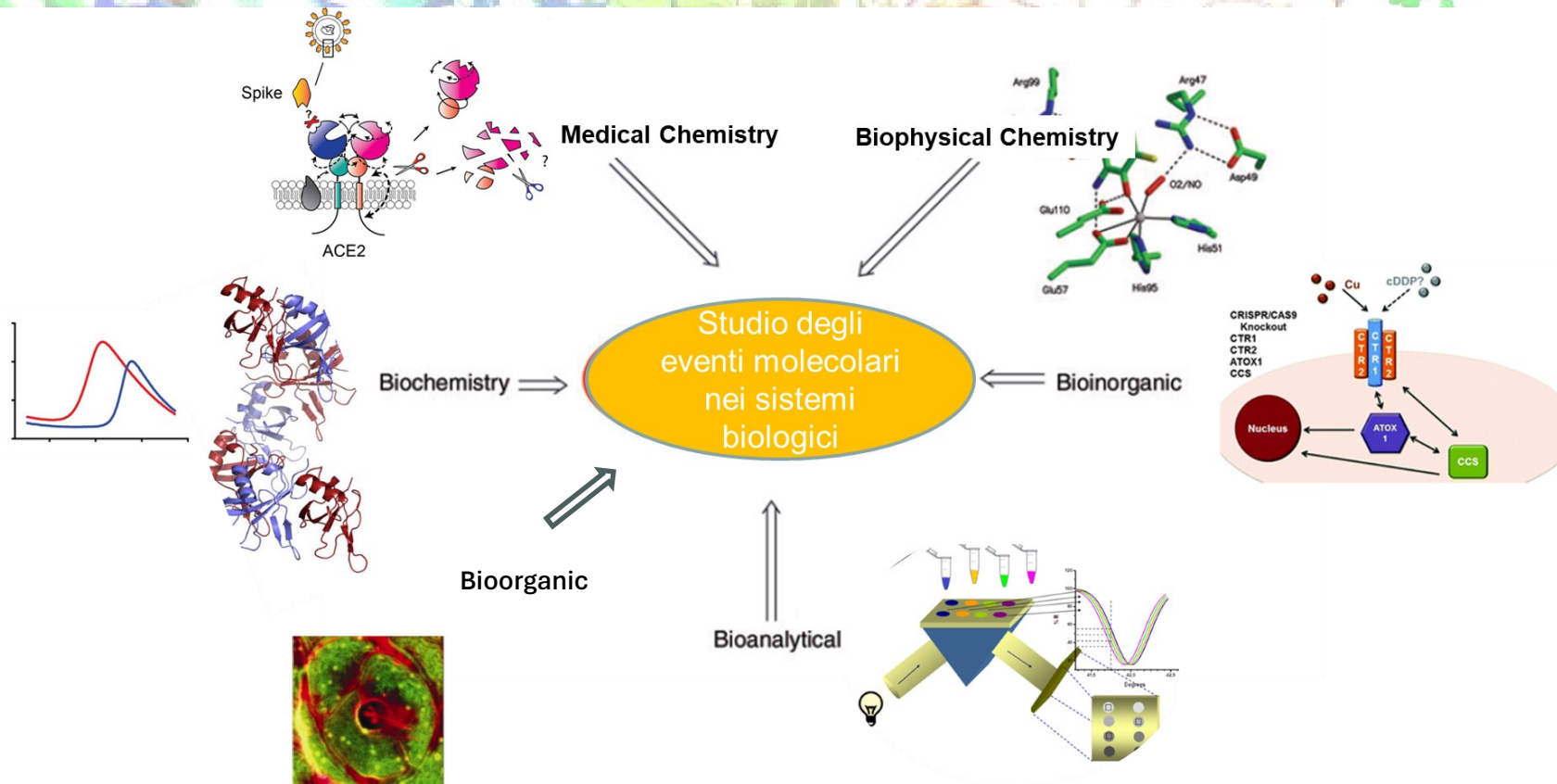
un nano-laboratorio chimico



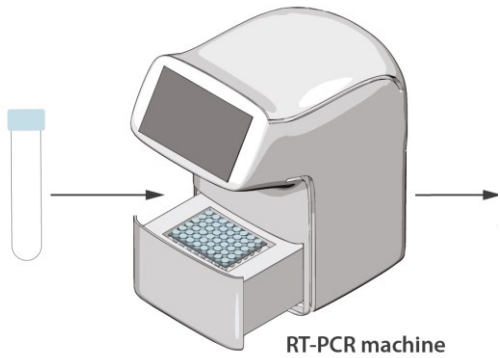
Laurea Magistrale in Scienze Chimiche

curriculum

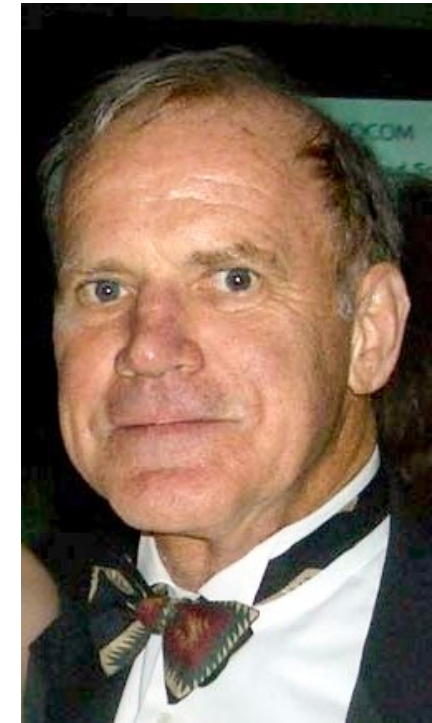
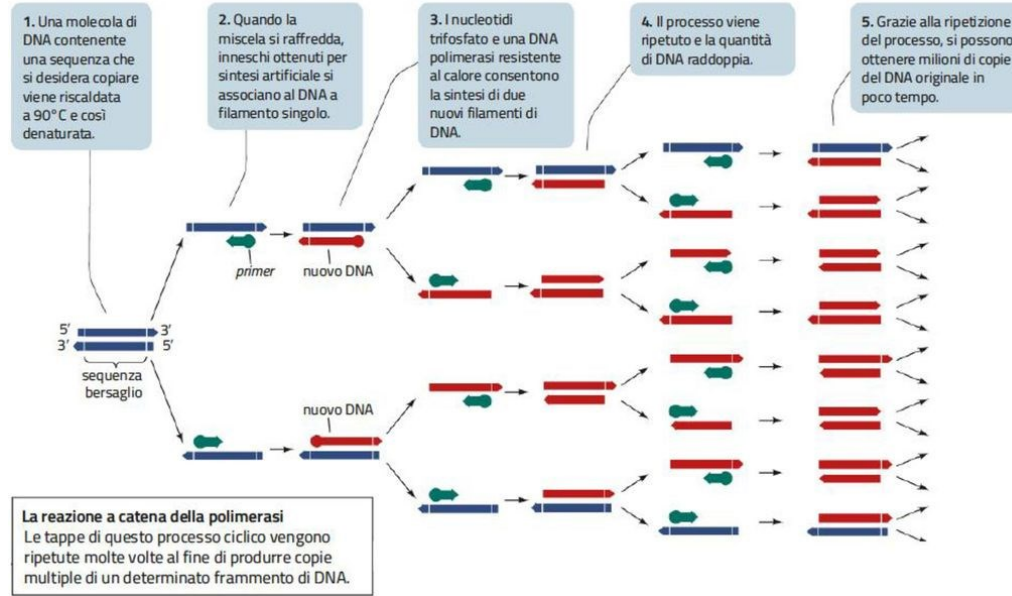
Chimica Biomolecolare



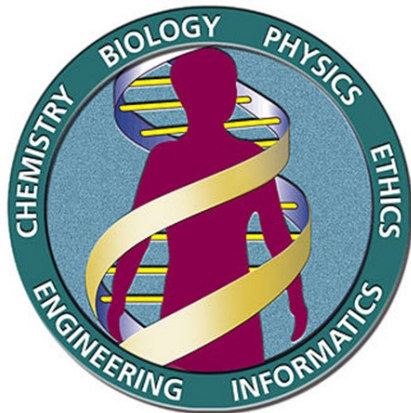
Qualche esempio



La reazione a catena della polimerasi



Kary B Mullis



Premio Nobel per la Chimica 1993

NOBELPRISET I KEMI 2022
THE NOBEL PRIZE IN CHEMISTRY 2022

KUNGL. VETENSKAPS AKADEMIEN
THE ROYAL SWEDISH ACADEMY OF SCIENCES



Carolyn R. Bertozzi
Stanford University
USA



Morten Meldal
University of Copenhagen
Denmark

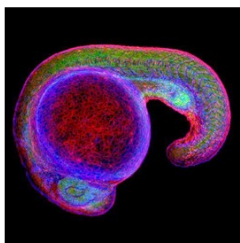
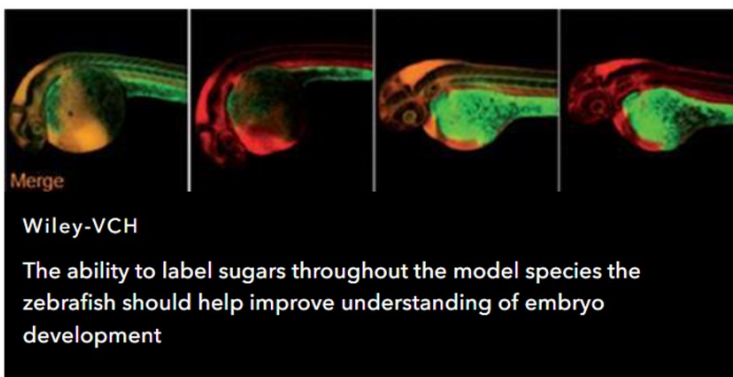


K. Barry Sharpless
Scripps Research
USA

"för utveckling av klickkemi och bioortogonal kemi"
"for the development of click chemistry and bioorthogonal chemistry"

prize

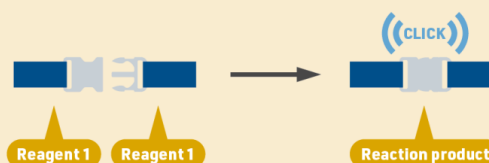
THE NOBEL PRIZE



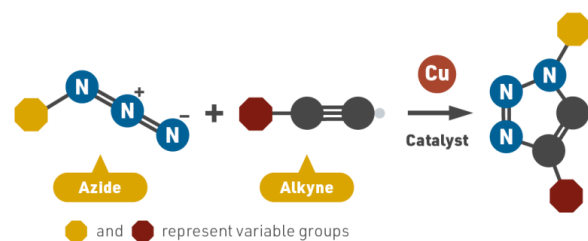
Immagini in vivo dell'embrione dello zebra fish

2022 NOBEL PRIZE IN CHEMISTRY

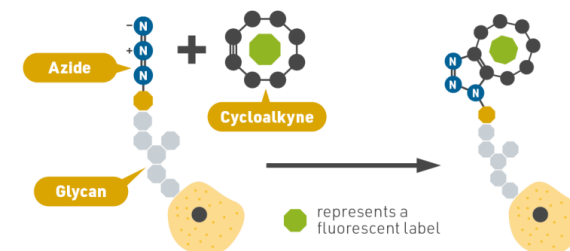
The 2022 Nobel Prize in Chemistry was awarded jointly to **Carolyn R. Bertozzi**, **Morten Meldal** and **K. Barry Sharpless** for their development of click chemistry and bioorthogonal chemistry.



Barry Sharpless coined the concept of "click" chemistry in 2001: the idea of reactions that efficiently snap together small molecular building blocks using easily achieved reaction conditions, avoiding unwanted byproducts.



Independently, **Barry Sharpless** and **Morten Meldal** developed the first click reaction: a reaction in which an azide is added to an alkyne with a copper catalyst. The two reagents click together to form a single cyclic product, with the copper catalyst making the reaction quick and selective. Chemists could add useful groups onto the azide and alkyne to change the product formed by the reaction.



Carolyn Bertozzi introduced the concept of bioorthogonal chemistry – chemical reactions that happen in cells without affecting their normal chemistry – in 2003. Copper is toxic to living cells, so she modified the original click reaction to produce a copper-free version. She used this reaction to track molecules called glycans on cell surfaces, which she had been investigating since the early 1990s.

WHY DOES THIS RESEARCH MATTER?

Additional click chemistry reactions have been developed, useful in the synthesis of new drugs. Bioorthogonal reactions allow researchers to study biological molecules and help identify targets of new drugs, and are also being trialled to produce 'clickable' antibodies to target cancerous tumours.

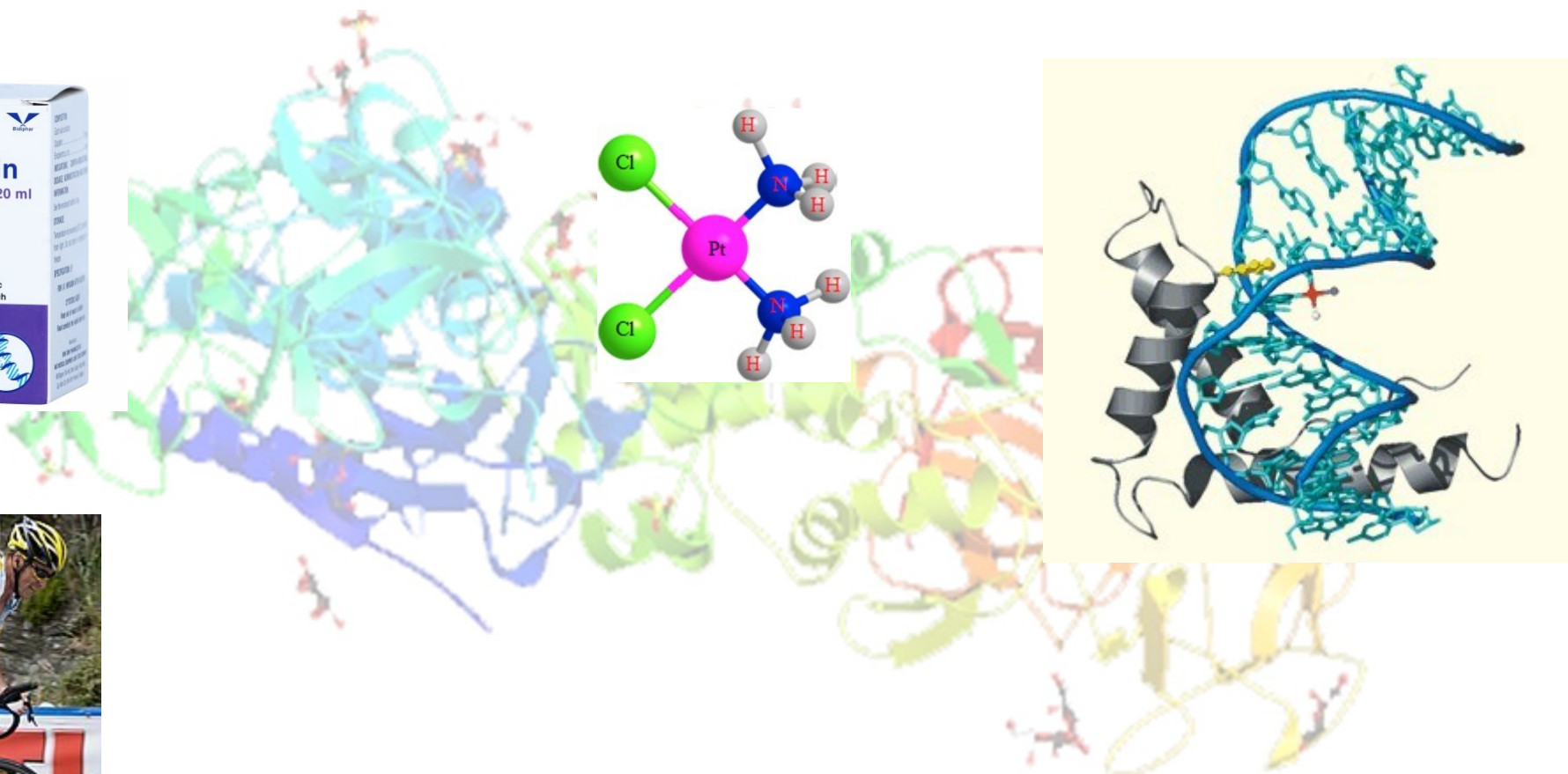
Nobel Prize in Chemistry press release: <https://www.nobelprize.org/prizes/chemistry/2022/press-release/>



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L'interdisciplinarietà del team di Rosemberg nel 1964



Lance Armstrong: Giro d'Italia 2009

Laurea Magistrale in Scienze Chimiche

curriculum

Chimica Biomolecolare

Semestre

I anno

Materie comuni + Materie curricolari	CFU
-Metodi analitici avanzati, biosensori e <i>lab-on-chip</i> G. Spoto	6
-Metodi per lo studio di sistemi bioinorganici G. Vecchio	6
- Biologia cellulare e molecolare S. Reina	6 (5+1L)
- Progettazione razionale del farmaco S. Guccione	6
-A scelta dello studente	6

1°

2°

II anno

-Chimica Fisica dei sistemi biologici e delle biointerfacce Modelli matematici (Modulo 1) C. La Rosa, C. Satriano Teranostica e nanomedicina (Modulo 2)	6 6 (3+2 E +1 L)
-Chimica bioinorganica G. Vecchio	6
- Tecniche biochimiche e biomolecolari con laboratorio V. Barresi <i>oppure</i>	6 (3+3L)
- Biochimica avanzata V. Nicoletti	6
-A scelta dello studente	6
-Altre attività formative e professionalizzanti	2
- PROVA FINALE	34

1°

2°

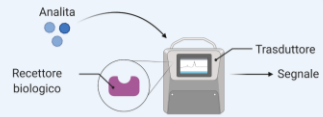
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Chimica Biomolecolare

Metodi analitici avanzati, biosensori e lab-on-chip

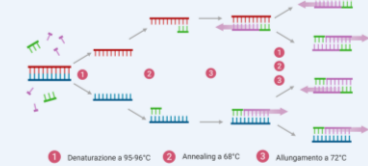
- Metodi che sfruttano dispositivi microfluidici per integrare operazioni di trattamento dei campioni con quelle di rivelazione (lab-on-chip).
- Rivelazione di sistemi biomolecolari mediante biosensori.



Biologica cellulare e molecolare

Basi della genetica nei procarioti e negli eucarioti:

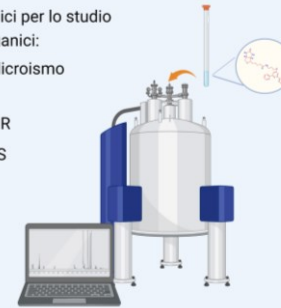
- Struttura e funzione del gene
- Duplicazione e trascrizione del DNA
- Regolazione dell'espressione genica
- Mutazioni



Metodi per lo studio di sistemi bioinorganici

Metodi spettroscopici per lo studio dei sistemi bioinorganici:

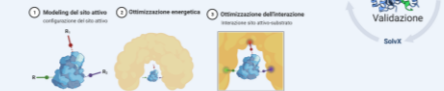
- Spettroscopia di dicroismo circolare
- Spettroscopia NMR
- Spettroscopie XAS



Progettazione razionale del farmaco

Principi dell'interazione farmaco recettore e sviluppo del farmaco:

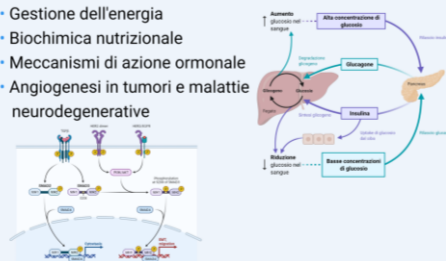
- Chemioinformatica
- Chemiometria
- Similitudine molecolare
- Dinamica molecolare



Biochimica Avanzata

Rapporto struttura-funzione dei meccanismi molecolari dei fenomeni biologici e della loro regolazione:

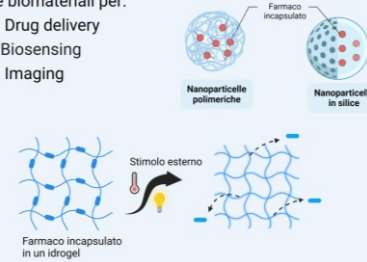
- Gestione dell'energia
- Biochimica nutrizionale
- Meccanismi di azione ormonale
- Angiogenesi in tumori e malattie neurodegenerative



Chimica fisica dei sistemi biologici e delle biointerfacce

Introduzione ai concetti di biointerfacce e biomateriali per:

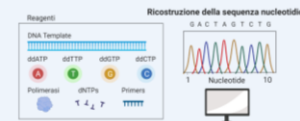
- Drug delivery
- Biosensing
- Imaging



Tecniche biochimiche e biomolecolari

Saggi per l'analisi del ciclo cellulare e preparazione dei campioni di DNA e RNA:

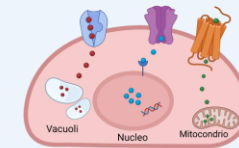
- Valutazione dei polimorfismi
- Analisi dei trascritti e delle modificazioni epigenetiche
- Tecniche di ibridazione e sequenziamento



Chimica bioinorganica

Ruolo dei metalli nei sistemi biologici:

- Uptake
- Storage
- Trasporto
- Omestasi



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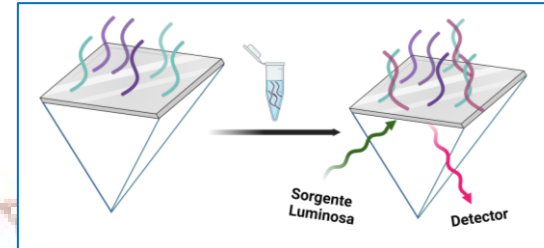
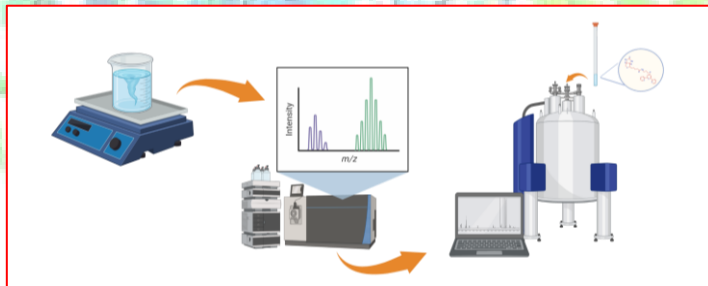
curriculum

Chimica Biomolecolare

Progetti di Tesi

Progettazione di bioconiugati ad attività biologica:

- Drug carrier
- Inibitori di metallo-enzimi
- Enzima-mimetici

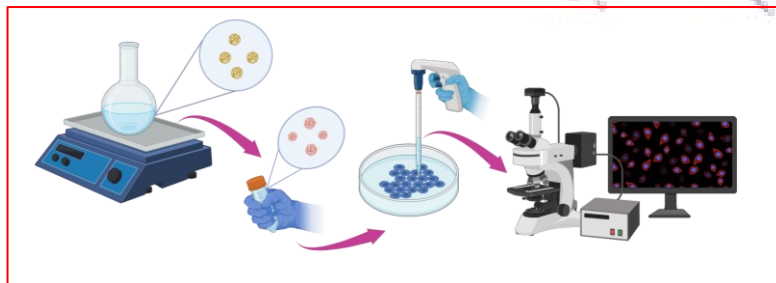
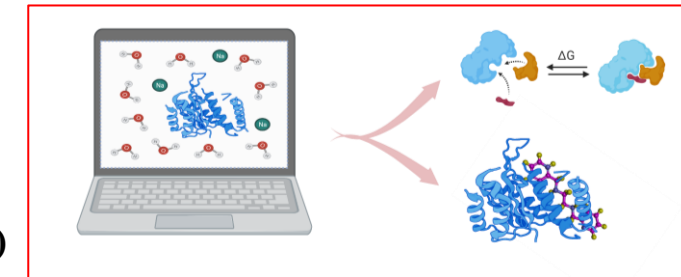


Applicazioni di tecniche analitiche quali SPR per la diagnostica

<https://ultraplacad.eu/>

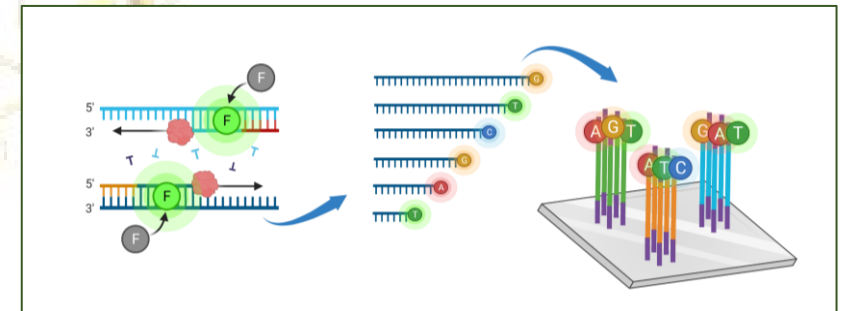
Modeling molecolare:

- Dinamica molecolare
- Affinità di legame (Docking)



Sintesi di nanoparticelle a diversa attività:

- Terapia
- Diagnosi
- Imaging



Analisi genomiche e trascrittomiche in tumori sfruttando PCR e microarray

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curriculum

Chimica Biomolecolare

Dottorandi del DSC provenienti dal Curriculum in
Chimica Biomolecolare:

Alice Foti

Gabriele Zingale

Roberta Panebianco

Pascal Tomasella

