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ABSTRACT

The aim of the project is to promote in High School innovation with modern Nanoscience activities in digital IBSE e learning: from elements of Nanotechnology History to modern research in different fields. Protagonist students as researchers have realized integrated and multidisciplinary itinerary about social impact of Nanotechnology: health discovers, environmental utilities for smart cities. HEALTH IMPACT OF Nanotech researches on Human life: interconnection between Nanoscience and Neuroscience, some results of nanomaterials researches on neuroplasticity. Elements of social impact of Graphene' discovery, application in different fields with safety impacts and modern nanotoxicology researches, nanoeconomy impacts in international relationship . Innovative teaching and learning itinerary to guide High School students, identifying some pictures about Natural Nanomaterial and Synthetic Nanomaterials in "Nanoscience image research work". From international literacy about modern Nanotech to scientific knowledge phase: "Interactive reflecting communication".

KEY WORDS: graphene, fullerene interdisciplinarity education, STEM didactic, Nanotechnology history, social impact Cooperative learning, IBSE methodology

INTRODUCTION

MISSION OF PROJECT

The mission of didactic Digital project was develop innovative strategic activities for learning Elements of NANOSCIENCE in High School. Modern didactic and communication for working as didactic researcher - teacher with protagonist students as "active scientific community" to present also modern concepts about HISTORY AND EVOLUTION OF NANOSCIENCE . This didactic IBSE project has created elements of MULTIDISCIPLINARY education process about bases of nanoscience with history experimental analysis.

DIDACTIC QUESTIONS FOR TEACHERS

*What could be STEM strategies for a scientific itinerary of NANOSCIENCE about for high school students?
*Which elements shall be considered important in interdisciplinarity educational process about bases of NANOSCIENCE" and "modern researches" with articles and experimental analysis ?

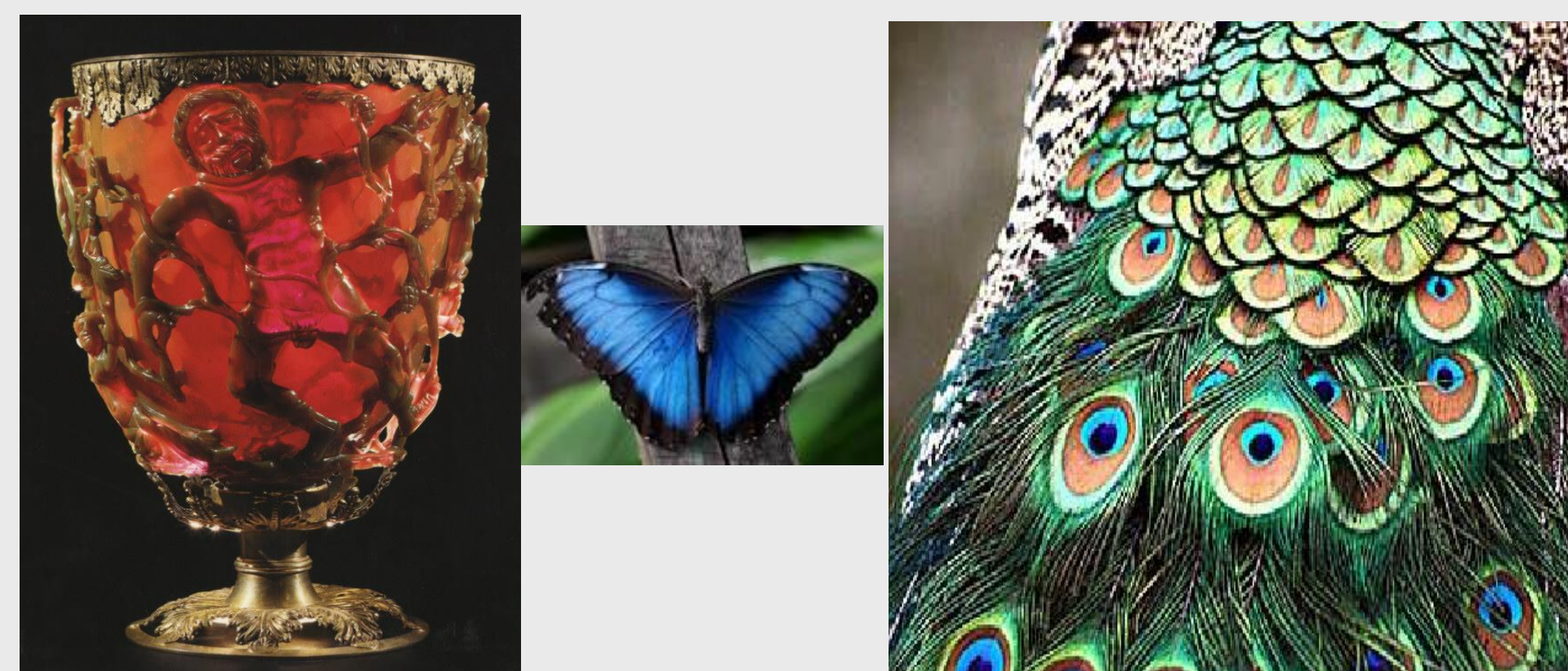
SCIENTIFIC QUESTIONS FOR STUDENTS

*What are nanomaterials?
* Which elements of Richard Feynmann' lesson in 1959 "There is Plenty of Room at the Bottom" do you prefer and why?
*What is useful of Nanotechnology for Society? What social impact?
*In which way do you think is possible to involve your community in Nanotech evolution?

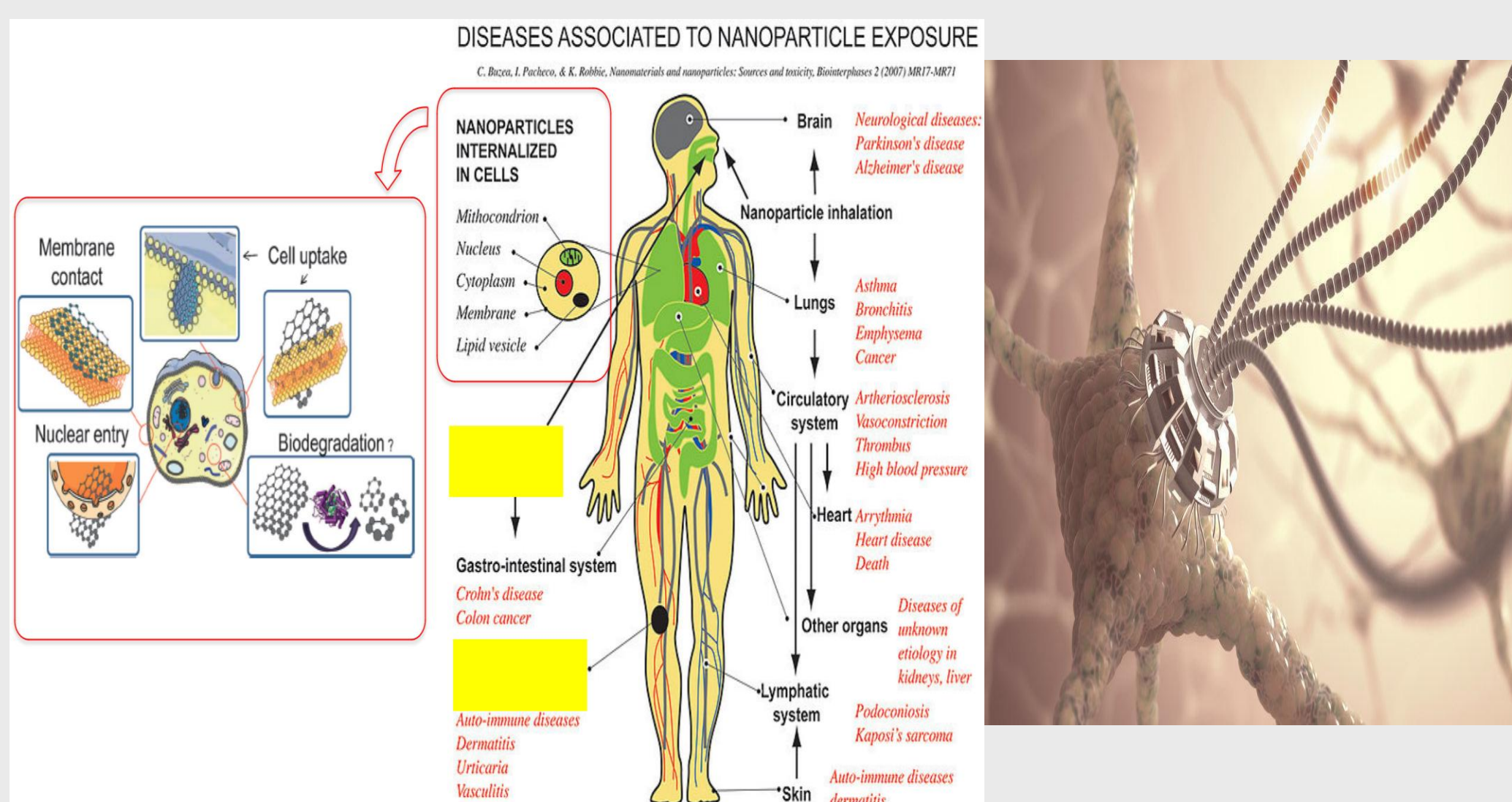
DIDACTIC METHODS AND MATERIALS ACTIONS WITH STUDENTS

1. TO DRAW GLOSSARY FOR NANOSCIENCE IN COOPERATIVE LEARNING.

2. NANOSCIENCE IMAGES WORK (Natural Nanomaterials for Synthetic Nanomaterials)



3. NANOSCIENCE AND NEUROSCIENCE FOR HEALTH SAFETY



RESULTS

RESULTS

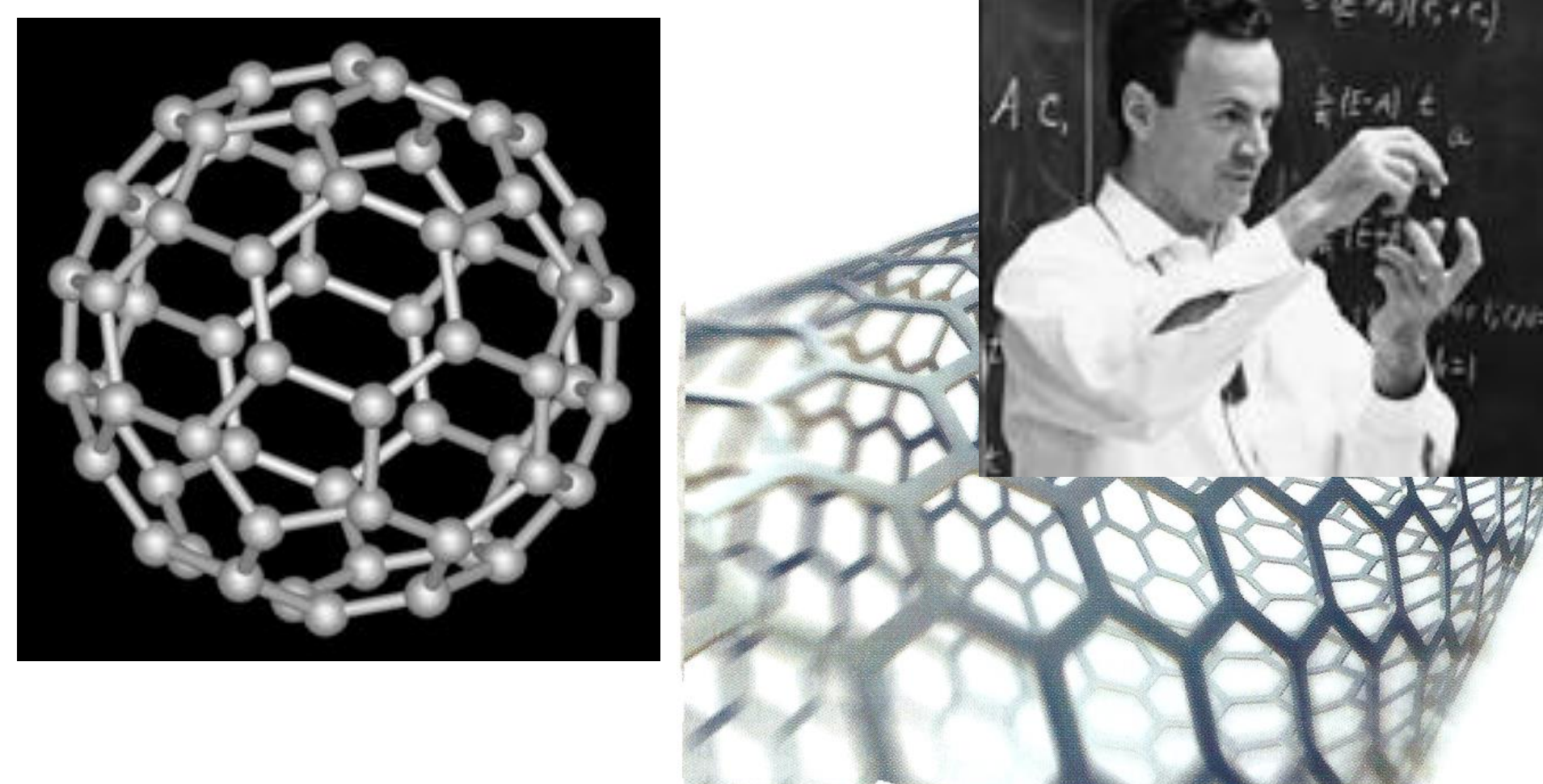
Didactic products: in all activities we have worked with inquiry- based learning

*ACTIVITIES AS RESEARCHERS – STUDENTS: HISTORY AND SAFETY OF NANOSCIENCE

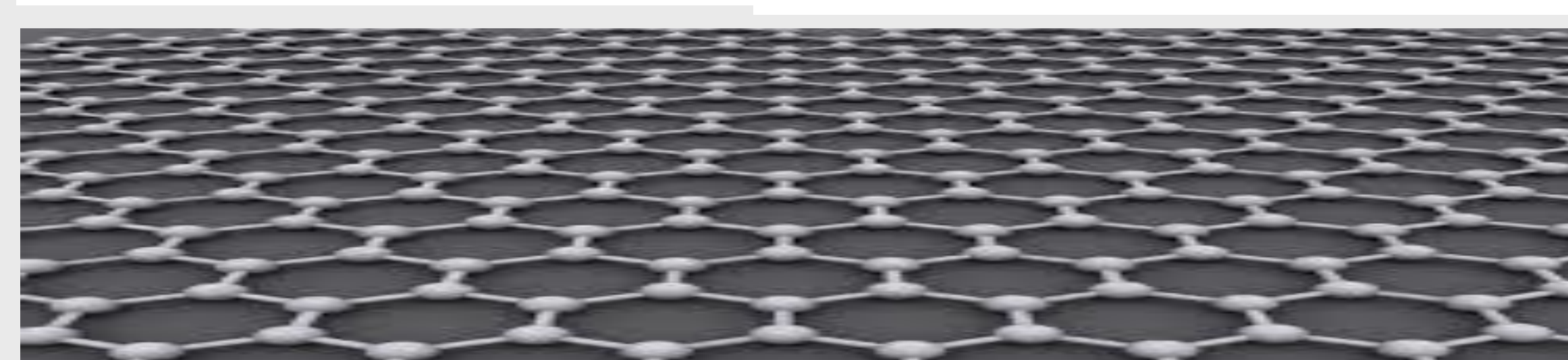
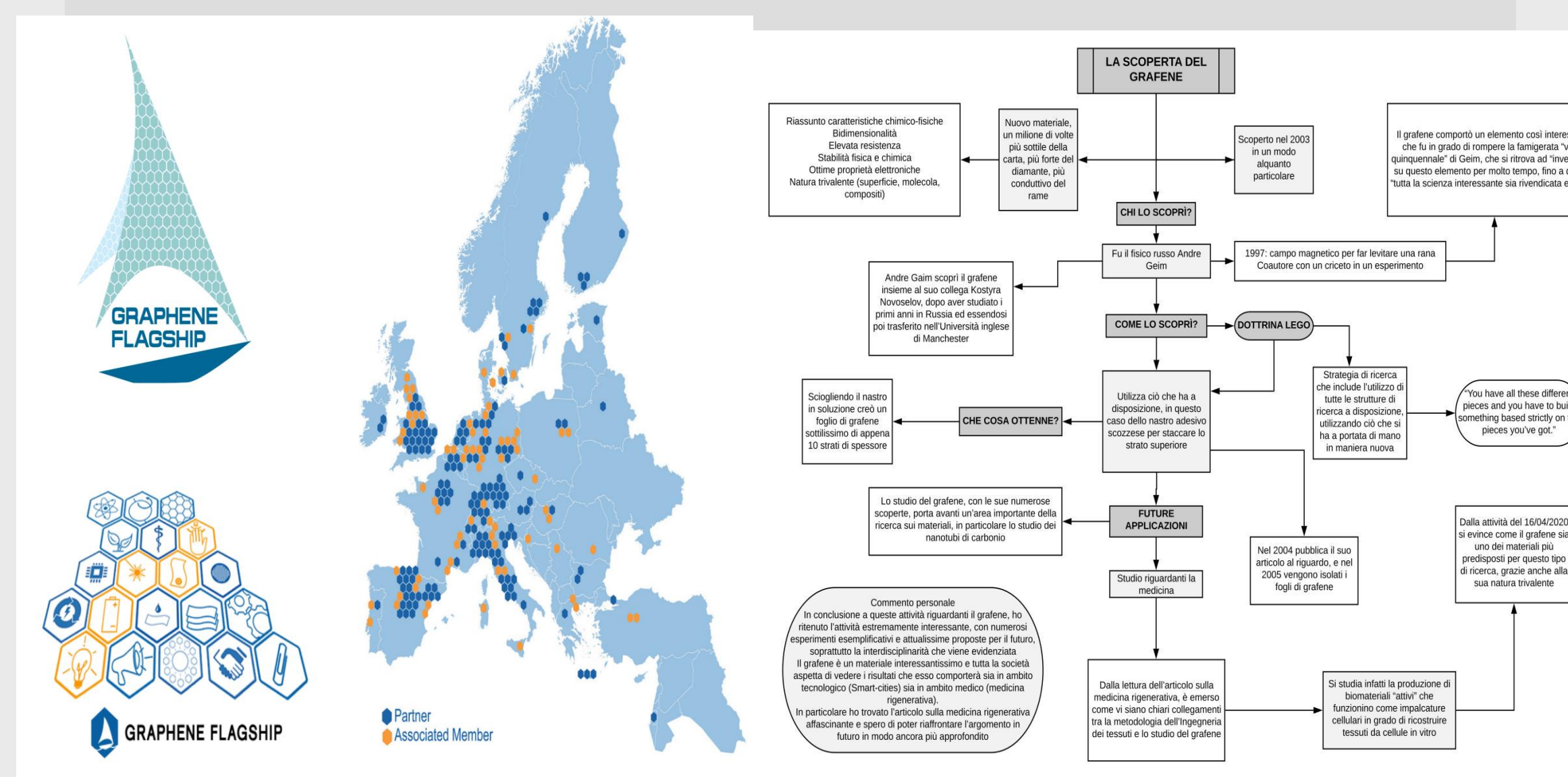
*INTERACTIVE AND COOPERATIVE WORK ABOUT APPLICATION FIELDS OF NANOSCIENCE

*DEBATE ABOUT GRAPHENE IN NANOSCIENCE

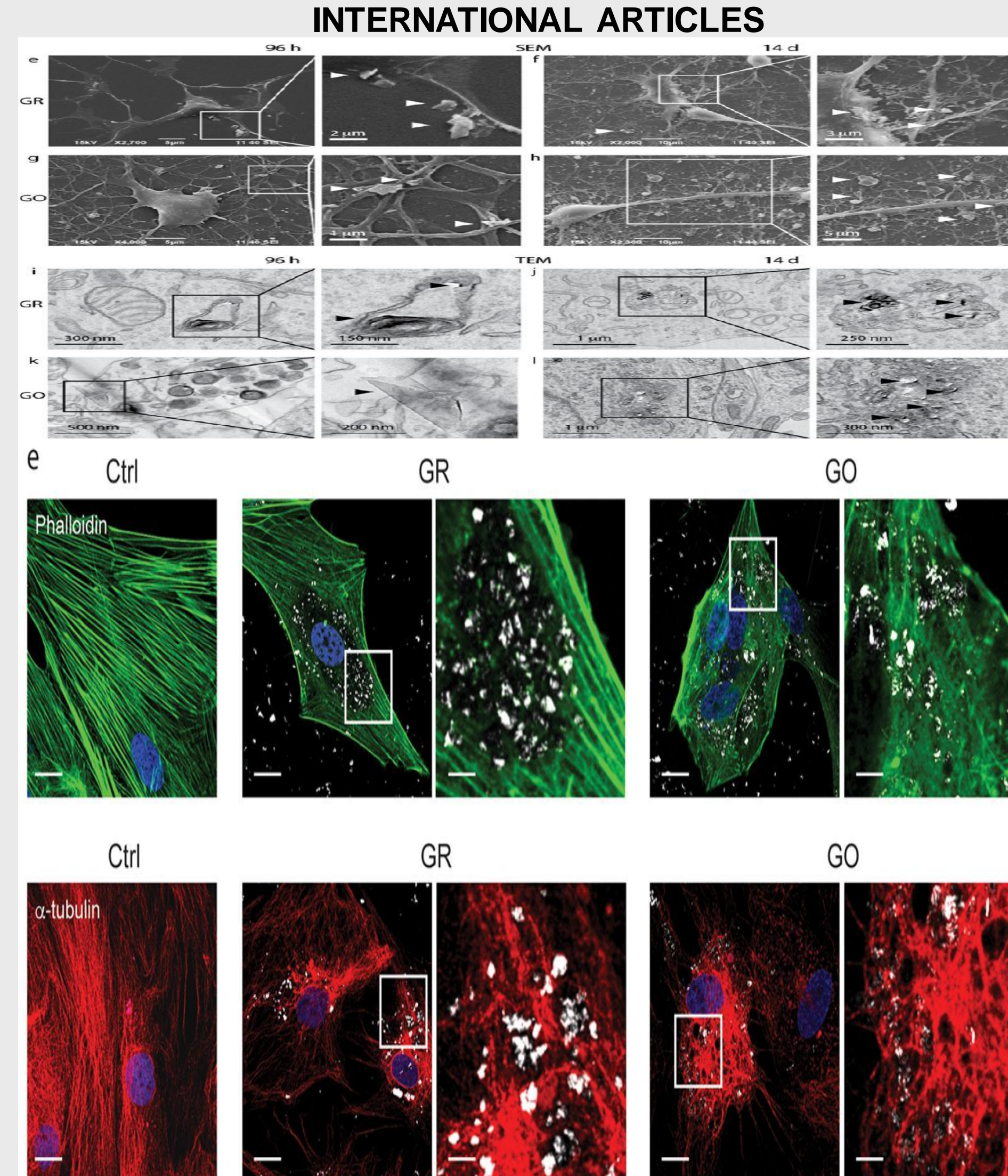
*LEARNING ACTIVITIES ABOUT "LABORATORY OF IDEAS NANOTECH "



GRAPHENE WITH STUDENTS



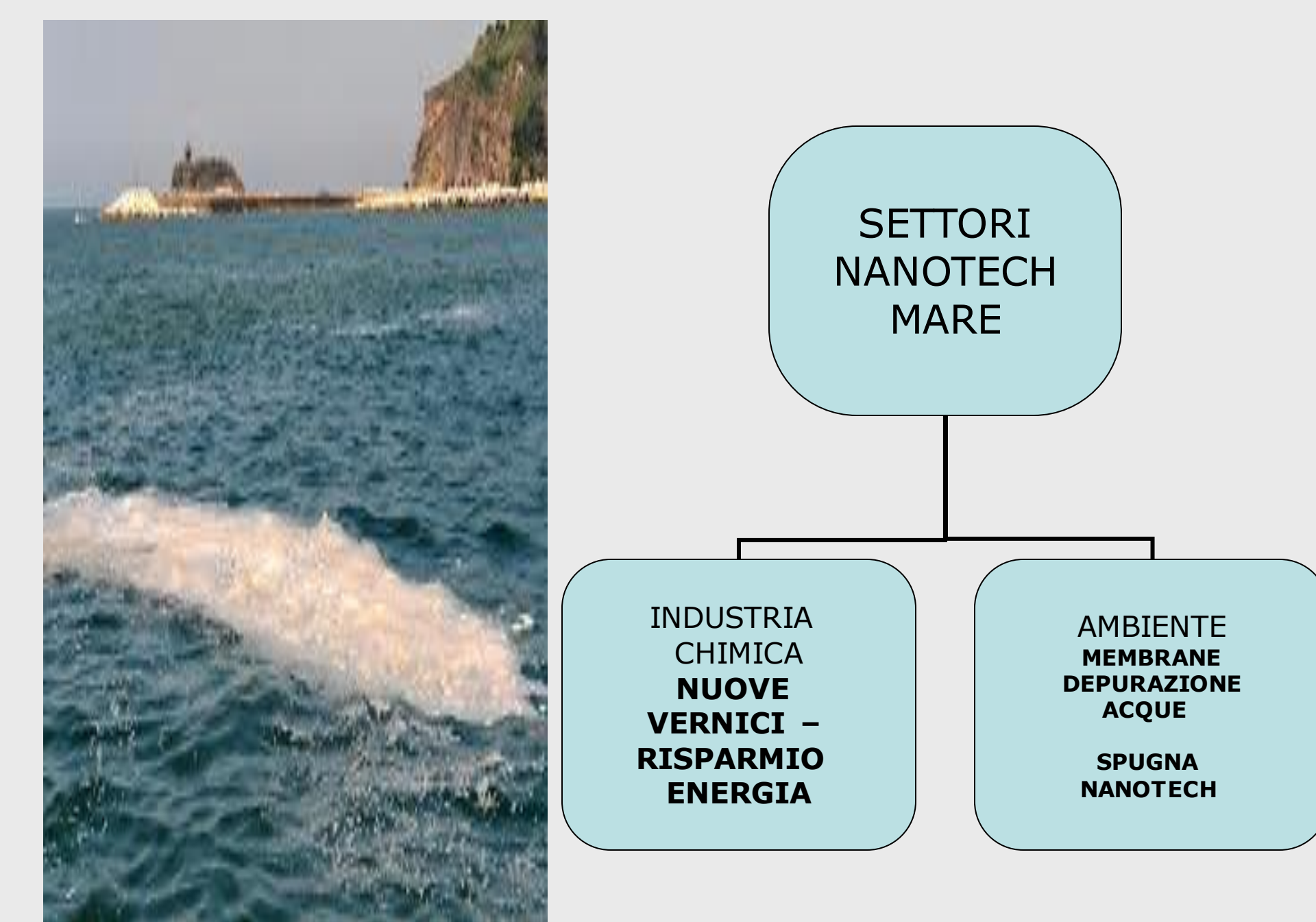
GRAPHENE INTERACTION WITH THE SNC: IMAGES FROM INTERNATIONAL ARTICLES



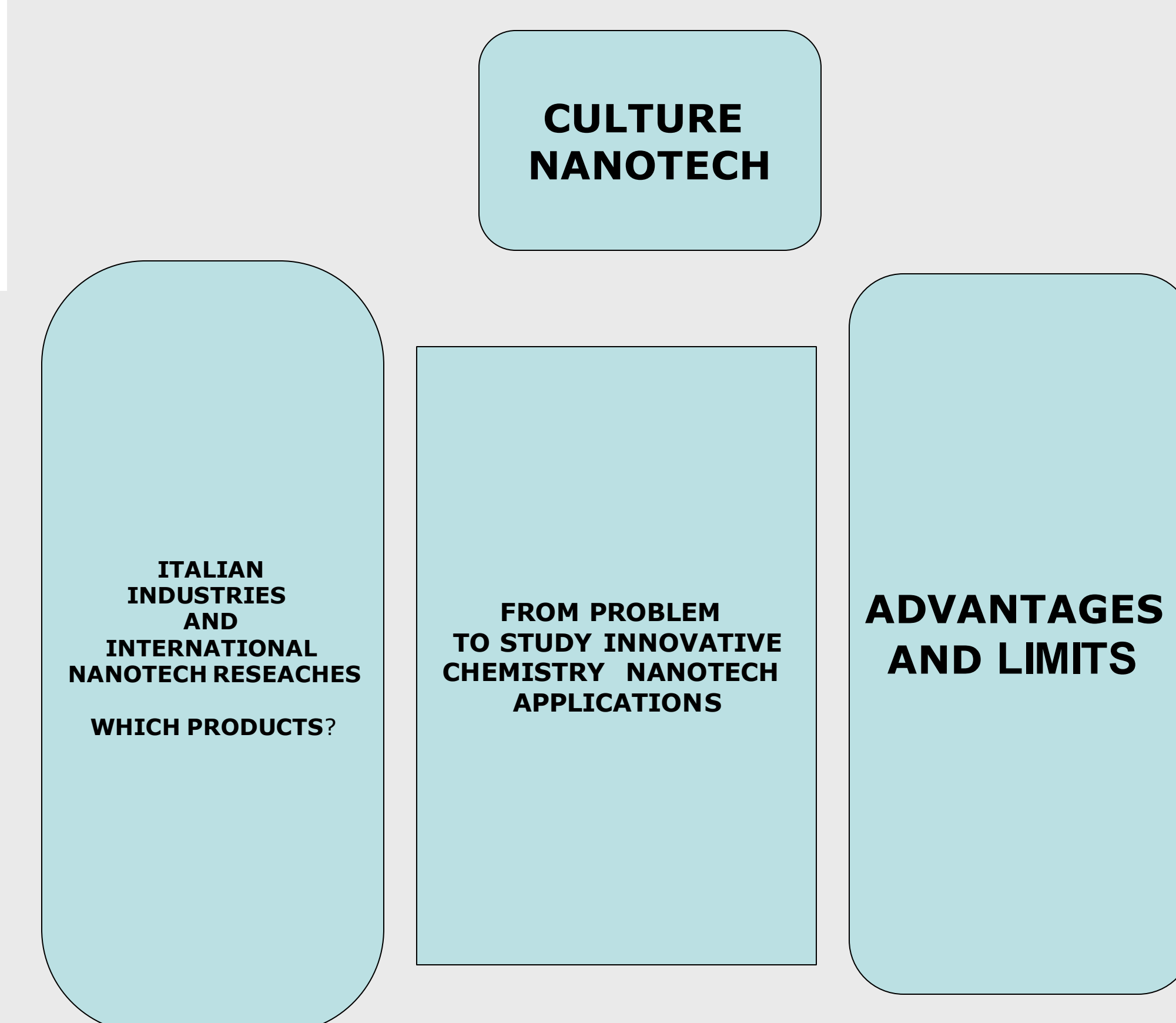
DISCUSSION

Different phases in this project were useful to promote active nanoscience learning by doing with innovative ideas in realizing "scientific community" into classes. From bioenglish informatic glossary for Nanoscience to neuroscience activities about interpretation and representation the social impact of Nanotech Products on Human Life . In "NANOSCIENCE communication" phase questions of didactics researcher - teacher about "NANOTECH CONVERSATION: INTERACTIVE REFLECTING COMMUNICATION" in international modern researches.

FROM THE PROBLEM TO NANOTECH RESEARCHES AND SOLUTIONS



CONCLUSIONS



INTERACTIVE REFLECTING COMMUNICATION

*What is relationship between Nanoscience and Smartt cities?

*Is Society conscious to be already Nanotech?

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