

Màster en Nanociència i Nanotecnologia

Universitat de Barcelona

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UNIVERSITAT DE
BARCELONA

WHAT IS NANOSCIENCE?

The word **Nanoscience** refers to the study, manipulation and engineering of matter, particles and structures on the nanometer scale (one millionth of a millimeter, the scale of atoms and molecules). Important properties of materials, such as the electrical, optical, thermal and mechanical properties, are determined by the way molecules and atoms assemble on the nanoscale into larger structures. Moreover, in nanometer size structures these properties often differ from those on macroscale, because quantum mechanical effects become important.

WHAT IS NANOTECHNOLOGY?

Nanotechnology is the application of nanoscience leading to the use of new nanomaterials and nanosize components in useful products. Nanotechnology will eventually provide us with the ability to design custom-made materials and products with new enhanced properties, new nanoelectronics components, new types of “smart” medicines and sensors, and even interfaces between electronics and biological systems...

These newborn scientific disciplines are situated at the interface between physics, chemistry, materials science, microelectronics, biochemistry, and biotechnology. Control of these disciplines therefore requires an academic and multidisciplinary scientific education.

WHY STUDY NANOSCIENCE & NANOTECHNOLOGY?

Nanoscience and nanotechnology are at the forefront of modern research. The fast growing economy in this area requires experts who have an outstanding knowledge of nanoscience in combination with the skills to apply this knowledge in new products. A multidisciplinary scientific education is crucial to provide industry and research institutes with top quality experts who have a generic background in the different subdisciplines such as electronics, physics, chemistry, material science, biotechnology..., and at the same time be experts in one particular field. This is what is offered in this master programme.

In the **Master of Nanoscience and Nanotechnology**, you will learn the basics of physics, biology, chemistry and pharmacy at the nanometer scale. The combination of a solid multidisciplinary scientific basis and an individual high level specialization in a certain area of Nanoscience is the philosophy of the program.



Prof. Dr. Guillem Aromí Bedmar

Director of IN²UB

What is the Mission of the IN²UB ?

A Centre of Reference for the **Creation of Knowledge** in Nanoscience and Nanotechnology, for **Education** through **Research** and for the **Transfer of Knowledge**.



Participation of 5 different Faculties from UB:



- **110 permanent research staff**
- **35 PostDocs, 65 PhD Students**
- **48 Research groups from 6 faculties**

Research Outputs 2019

321 peer reviewed scientific papers
(Scimago Journal Ranking)

- **79.43%** in the first quartile (Q1)
- **46.41%** in the first decil (D1)

- Collaborations with 42 companies



- >70 Patents
- 5 spin-offs companies created



- Collaborations with 42 companies



XIV BUSINESS FORUM

Faculties of Physics, Chemistry , Mathematics and Computer Science,
Earth Sciences and Biology

Fira d'Empreses | <https://www.ub.edu/portal/web/ciencies-enginyeries/fira-empreses>

- >70 Patents
- 5 spin-offs companies created



Research Lines of the IN²UB

- 1) **NanoModeling, Simulation and Nanoscopic Methods (NanoMet)**
- 2) **Nanobioscience, Nanobiomechanics and BioNanotechnology (NanoBio)**
- 3) **Nanopharmaceutics and Nanomedicine (NanoPharmaMed)**
- 4) **Nanomagnetism and Spintronics (NanoMagnetics)**
- 5) **Nanoelectronics, Nano-optics and Nanophotonics (NanoPhotoElectro)**
- 6) **Nanostructured materials (NanosMat)**
- 7) **Nanoenergy: Production and Storage (NanoEnergy)**



IN2UB

Ofertas/Formación

- Si desea información específica actualizada del Master Oficial de la UB en Nanociencia y Nanotecnología, por favor cliquee [AQUÍ](#)
- Si desea información específica de los contenidos, líneas de investigación y profesorado del Programa de Doctorado en Nanociencias de la UB, por favor cliquee [AQUÍ](#)
- Si desea información actualizada sobre becas y ayudas, por favor cliquee [AQUÍ](#)
- En el PROGRAMA MÁSTER+ UB DE CAPTACIÓN DE ESTUDIANTES PARA CURSAR UN MÁSTER UNIVERSITARIO E INCENTIVAR LAS VOCACIONES CIENTÍFICAS EN EL SENO DE UN GRUPO DE INVESTIGACIÓN Curso 2020/2021, el IN2UB ha convocado 2 becas **NUEVO**

Convocatoria. Hasta: 22/06/2020

A continuación podéis consultar las propuestas de TFM

- **Propuestas de TRABAJOS FIN MASTER IN²UB:** [TFM_IN2UB](#)

- Oferta TFM "[Iron_Gold_Nanorods](#)" coordinado por los grupos: **Group of Magnetic Nanomaterials and Laboratory of Nanostructured and Nanocomposite Materials**
- [Oferta TFG trabajo fin de grado](#) (Grado de Química)
- [PROPUESTA TFM/DOCTORADO](#) en el grupo **Cellular responses to xenobiotics**
- [PROPUESTA TFM/DOCTORADO](#) en el grupo **Supramolecular Systems in Nanobiomedicine**
- [PROPUESTA TFM/DOCTORADO](#) en nanopartículas magnéticas con diferentes aplicaciones-
- Ofertas TFM coordinadas con el IREC: [Master Thesis IREC-UB_I](#), [Master Thesis IREC-UB_II](#), [Master Thesis IREC-UB_III](#)

OFERTAS EXTERNAS

Atomic Force Microscopy (AFM) biotechnician ([Offer](#))

3rd PSI-FELLOW Postdoctoral ([Offer](#))

<https://www.ub.edu/in2ub/in2ub-fellowships-at-convocatoria-de-beques-masterub-2022/>



Master Program

Advanced Degrees & Engineering

Biology *Material engineering*
Pharmacy *Chemical engineering*
Physics *Electronics engineering*
Medicine *Chemistry*

Block of fundamental topics 15 ECTS

- *Nanomaterials*
- *Nanobiotechnology*
- *Manipulation and characterization at the nanoscale*

Block of additional topics 25 ECTS

- *Material Technology and Fabrication*
- *Characterization techniques*
- *Chemistry and Physics at the nanoscale*
- *Chemistry of nanosystems*
- *Nanoengineering for Environment, TIC, and Energy*
- *Nanopharmacotherapy*
- *Nanobiotechnology*

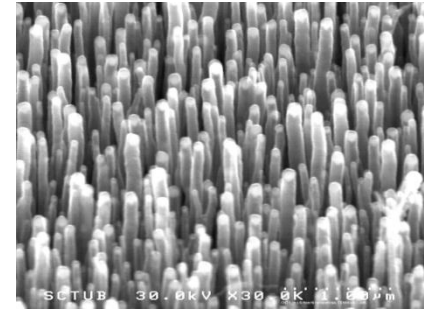
Master Thesis 20 ECTS



60 ECTS

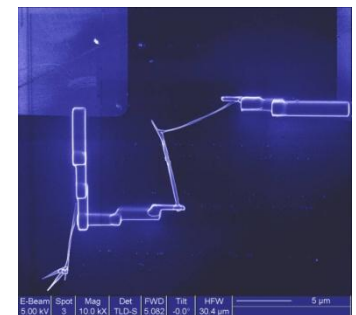


- **Fundamentals of Nanotechnology (3×5 ECTS)**
 - **Nanomaterials**
 - **Nanobiotechnology**
 - **Characterization and manipulation at the nanoscale**



COURSE MODULES

1. **Fabrication and Technology of Nanomaterials**
2. **Characterisation techniques**
3. **Chemistry and Physics at the nanoscale**
4. **Chemistry of Nanosystems**
5. **Physics and nanoengineering for TIC**
6. **Nanopharmacotherapy**





Fundamentals of Nanotechnology

Nanomaterials	OB	5
Nanobiotechnology	OB	5
Characterization and manipulation at the nanoscale	OB	5

Fabrication and Technology of Nanomaterials

Synthesis and processing of nanomaterials	OPT	2.5
Nanomanufacturing and nanoprocessing in clean room environment	OPT	5

Characterization techniques

Analytical and high resolution Transmission Electron Microscopy	OPT	2.5
Magnetic Techniques: Spectroscopies and Imaging	OPT	2.5

Chemistry and Physics at the nanoscale

Nanoscale phenomena	OPT	2.5
Surface Analysis and Science	OPT	5
Modelling and simulation	OPT	2.5

Chemistry of Nanosystems

Nanocatalysis	OPT	2.5
Colloidal systems and supramolecular devices	OPT	5

Nanoengineering for information technologies, energy and environmental

Nanoelectronics	OPT	2.5
Nanomagnetism and Spintronics	OPT	2.5
Nanosensors	OPT	2.5
Nanophotonics	OPT	2.5
Nanoenergy	OPT	2.5

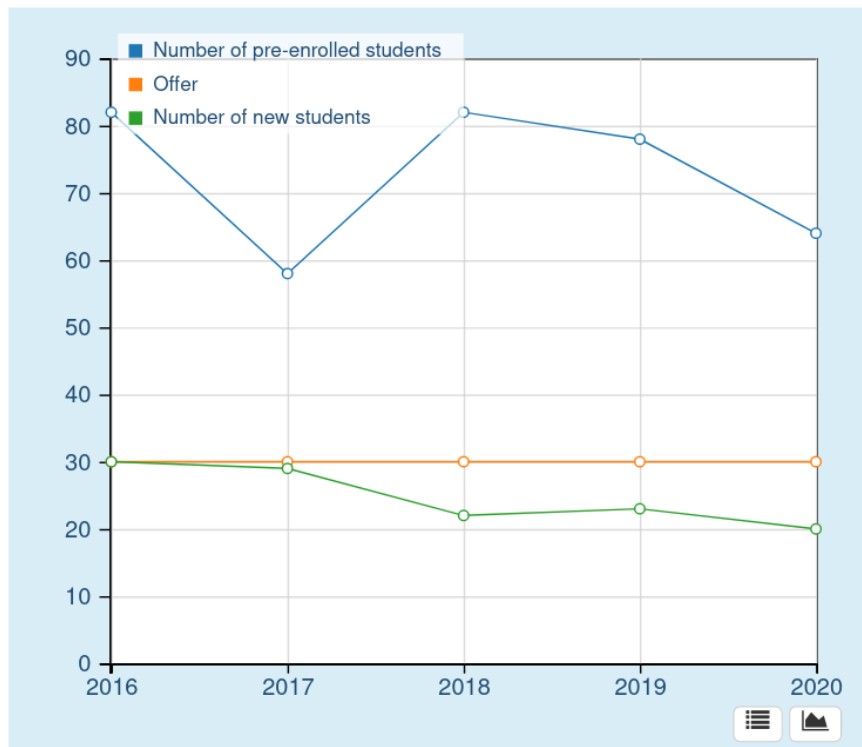
Nanopharmacotherapy

Nanosystems for medical diagnosis	OPT	2.5
Bioavailability, efficacy and toxicity. In vitro in vivo evaluation	OPT	2.5
Pharmaceutical Nanotechnology	OPT	2.5
Nanosopic systems for drug delivery	OPT	2.5

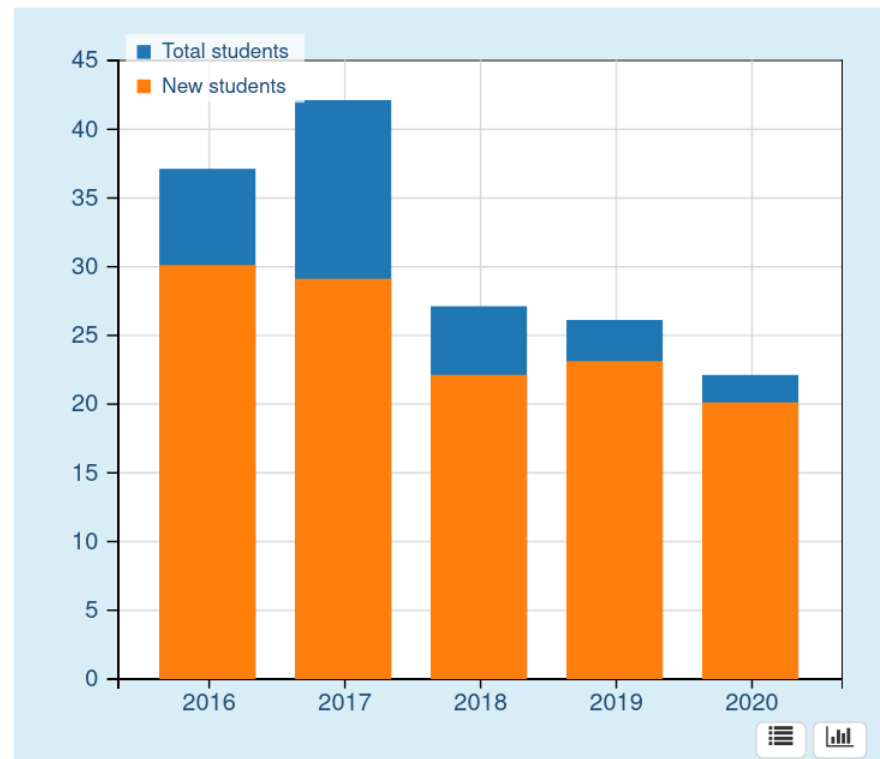


Pre-enrolment and enrolment

Pre-enrolment



Enrolment



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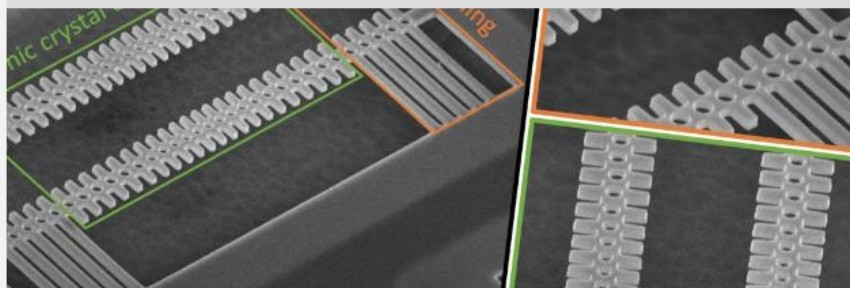
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Nanoscience and Nanotechnology

About the master's degree

- Introduction
- Objectives and competences
- Admission and pre-enrolment
- Course curriculum
- Placements
- Teaching methodology and assessment system
- Career opportunities
- Support for studying
- Enrolment
- Calendar, timetables, classrooms and assessment
- Course plans and teaching staff
- Course details

Introduction



Pre-enrolment

Nanoscience and nanotechnology are disciplines at the cutting-edge of scientific knowledge. They combine aspects of basic and applied sciences applied to specific fields, such as biotechnology, medicine, chemistry, pharmaceutical sciences, physics, materials engineering, sciences and electronic engineering. Nanoscience and nanotechnology are therefore key areas of interdisciplinary research and development, in which activity is increasing across the globe.

The master's degree in Nanoscience and Nanotechnology at the University of Barcelona is taught in English and intended for students with an academic background in science.

The aim of the master's degree is to provide students with professional competences in the field of nanoscience and nanotechnology, for industry and science. Students must be capable of addressing problems that require interdisciplinary skills. On completion of the master's degree, graduates will be equipped to work on creative tasks in a new scientific or technological environment and form part of interdisciplinary research groups. The compulsory subjects are designed to bolster this interdisciplinarity. The practical component of the optional

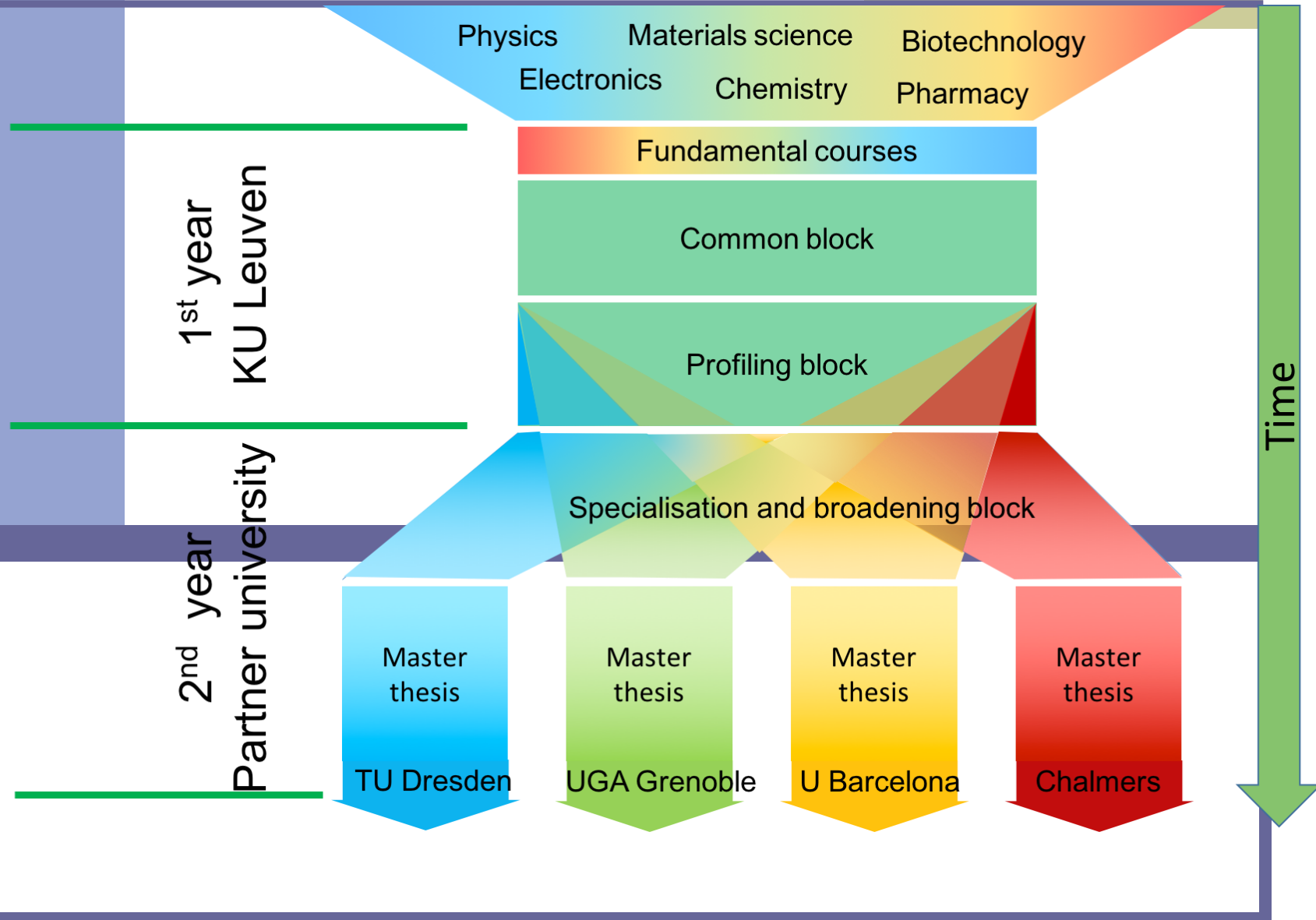


Nanoscience and Nanotechnology direct links

- Guia docent
- Treballs de l'alumnat (TFM)

EMM-Nano Master Program

EMNano+



Erasmus Mundus Master Nanoscience and nanotechnology (120 stp)

Nanoscience and nanotechnology fundamentals (0-12 ects, KU Leuven)

Quantum physics - 3 ects
 Semiconductor physics - 3 ects
 Semiconductor devices - 3 ects
 Atomtheory, chemical periodicity and chemical bond - 3 ects
 Structure synthesis and cellular function of macromolecules - 3 ects
 Electronic components, circuits and sensors - 3 ects
 Basics of Pharmacology - 3 ects

General interest courses (6-9 ects, KU Leuven)

Courses chosen from an extensive list of general interest courses

Core courses (36 stp, KU Leuven)

Material physics and technology for nanoelectronics - 6 ects
 Nanostructured biomacromolecules - 6 ects
 Chemistry at nanometer scale - 6 ects
 Technology of integrated systems - 6 ects
 Mesoscopic physics - 3 ects
 Lectures on nanoscience and nanotechnology - 3 ects
 Practical design for nanotechnology or Project work nanoscience - 6 ects

Nanomaterials and nanochemistry		Quantum computing and nanoelectronics				Bionanotechnology and Nanomedicine		
Option Nanomaterials U Barcelona	Option Nanochemistry UGA Grenoble	Option Organic and molecular electronics TU Dresden, Chalmers	Option Quantum computing Chalmers	Option Quantum and nanoscale engineering UGA Grenoble	Option Nanoelectronics TU Dresden	Option Biophysics TU Dresden	Option Bionanotechnology JFU Grenoble	Option Nanopharmacotherapy U Barcelona
Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven	Specific Courses 15 ects compulsory + min 6 ects electives KU Leuven
Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives	Broadening courses 15 ects electives
Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)	Master thesis (30 ects)



Thank you for your attention