

**Biomedical
Engineering
Department**



Canary Islands Institute of Technology (ITC)



Technology and Innovation for a Sustainable Development

itc INSTITUTO TECNOLÓGICO
DE CANARIAS



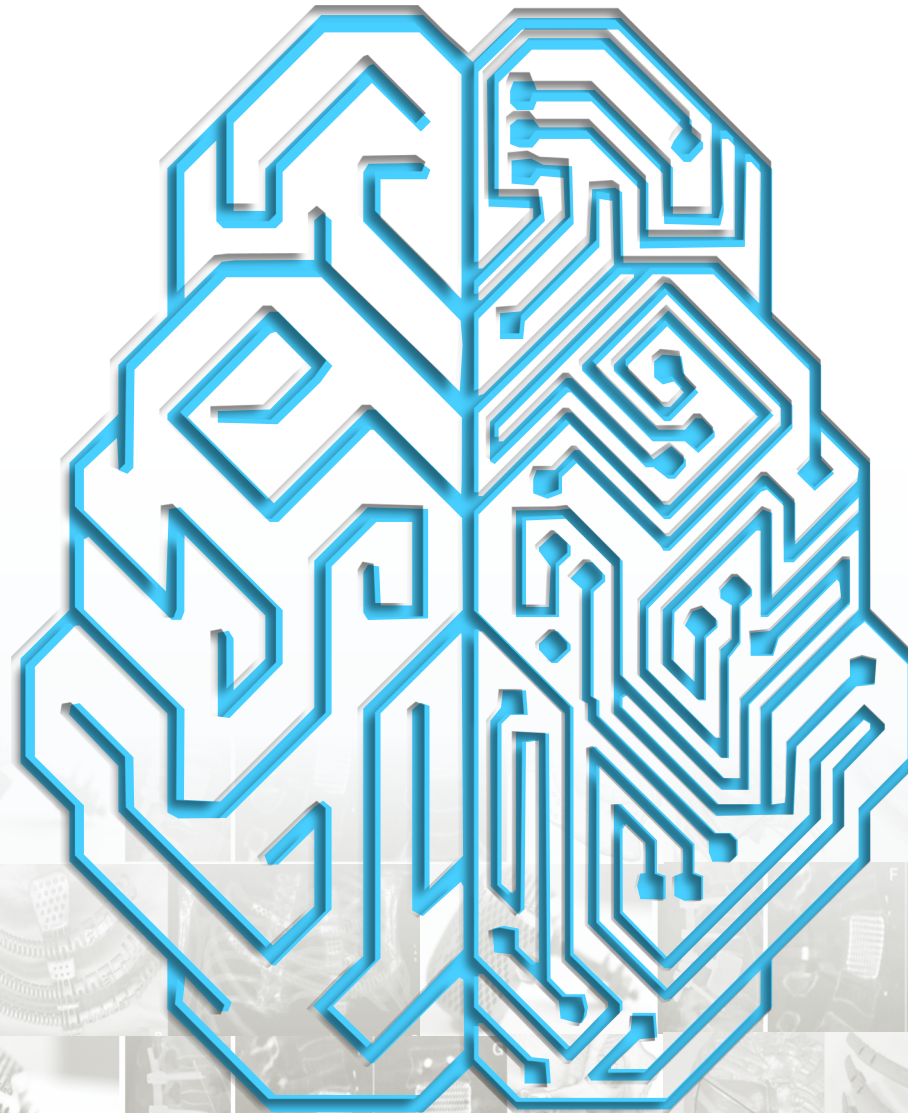


Biomedical Engineering

Diversifying the industrial fabric of the Canary Islands creating a virtuous cycle between Health and Industry

Origins

We were created with the purpose of **providing engineering support to the R&D&i** of the regional health service and promoting new clinical applications that could help **diversify the industrial fabric of the Canary Islands** in economic activities of **high added value, intensive in scientific knowledge and with clear commercial vocation** in the global market



Objectives

To develop R&D&i activities in translational medicine and high added value services for **surgical treatment in reconstruction and regeneration of bone and cartilage tissue.**

To offer **computer-aided engineering support** to other industrial sectors in need of **advanced design and manufacturing capabilities**

Activity since 1999

Biomedical Engineering Department

We are committed to **innovation** applied to orthopaedic surgery and neurosurgery



Teamwork with **training and experience** in 3D modelling and additive manufacturing technologies

Creation of the spin-off **Osteobionix**

Budget 2021: € 0,5 M

R&D&I lines...
in bone and cartilage **reconstruction and regeneration** with highly porous titanium scaffolds ...

... in the manufacture of **resorbable biopolymer scaffolds** for tissue engineering and regenerative medicine

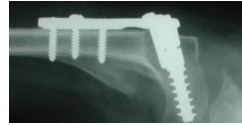
... and in the development of new **minimally invasive** surgical techniques

Milestones

2004

First exploitation of biomedical patents

The HUMIC plate was designed for the fixation of hip osteotomies in children and adolescents, and was installed for the first time in 1999; since then, more than 200 units have been implanted.



2005

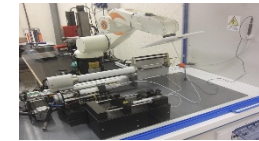
CADCAM Laboratory for Computer Aided Design and Manufacturing: First Prosthetic Prototypes



Since 2005, the Canary Islands Institute of Technology has been providing companies with various technological services in design and advanced manufacturing for the mechanical sector (CADCAM - Computer Aided Design Computer Aided Manufacturing)

2009

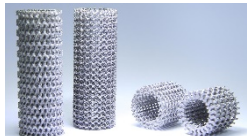
Biomechanics Laboratory: development of new processes and devices for tissue regeneration. Manufacture of the first nanofibers in the Canary Islands



The Canary Islands have been a pioneer in the applications of regenerative medicine for the reconstruction of various tissues (bone, nervous, cartilage and vascular) with the use of three-dimensional supports for cell adhesion (scaffolds)

2010

First 3D printer (titanium) by electron beam melting of the Canary Islands: manufacture of the first prototypes of porous structures

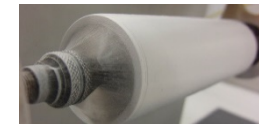


The acquisition of the first 3D printer by electron beam melting (Titanium) in the Canary Islands allowed the development of new implantable devices and specific instruments for orthopedic surgery, both in humans and animals. These porous implants have an elastic behavior similar to that of bone.

2009

Manufacture of the first nanofiber scaffolds

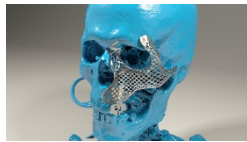
Manufacture of the first nanofiber scaffolds in the Canary Islands in the biomechanics laboratory. Development of new processes and devices for tissue regeneration



2012

First custom implants performed in humans in Canary hospitals

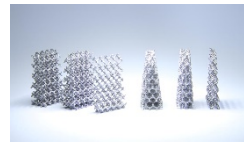
Maxillofacial reconstruction in patients, in collaboration
with the Canary Islands University Hospital (HUC)



2012

Launch of the first serial product for veterinary surgery

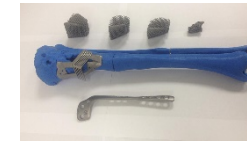
Development of a bone intervention technique for the
treatment of cranial cruciate ligament tears in dogs, based on
the fixation of the bone fragment of the tibia



2013

First custom-made bone implants in Spain

Based on the approval obtained by the ITC for the
manufacture of custom implants in humans, a new hospital
service was developed to improve the typology of prostheses
and respond to tumor recessions, a pioneer in Spain and with
very few analogies in Europe.



2018

Creation of the Osteobionix Spin-off

Creation of the Osteobionix spin-off based on scientific
and technological knowledge in biomedical engineering



2014

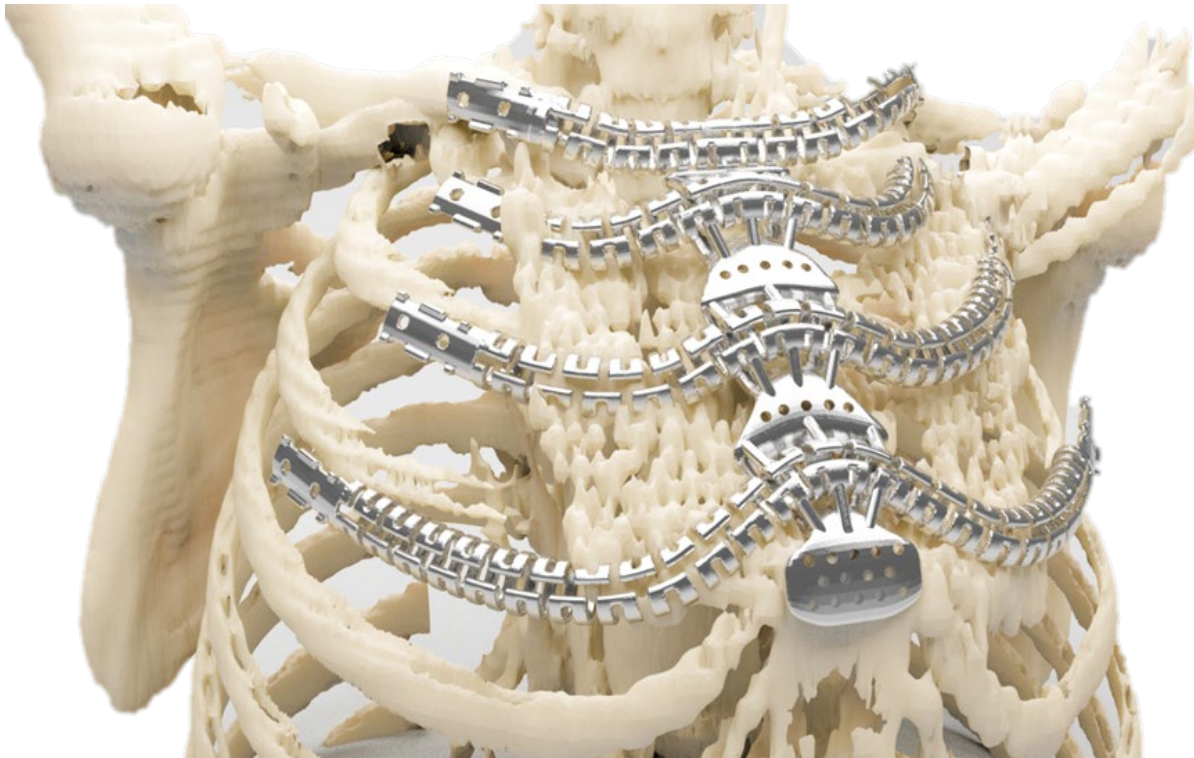
First custom implants abroad: Italy, Argentina, Colombia

ITC begins exporting designs and implants abroad, expanding
international destinations.



Milestones

Large bone defects reconstruction



CADCAM

Computer Aided Design - Computer Aided Manufacturing
Agüimes

Custom implant **approval**

Advanced design

Additive metal fabrication and **CNC**

White room

Regenerative medicine

Approval for custom implants

Development of new processes

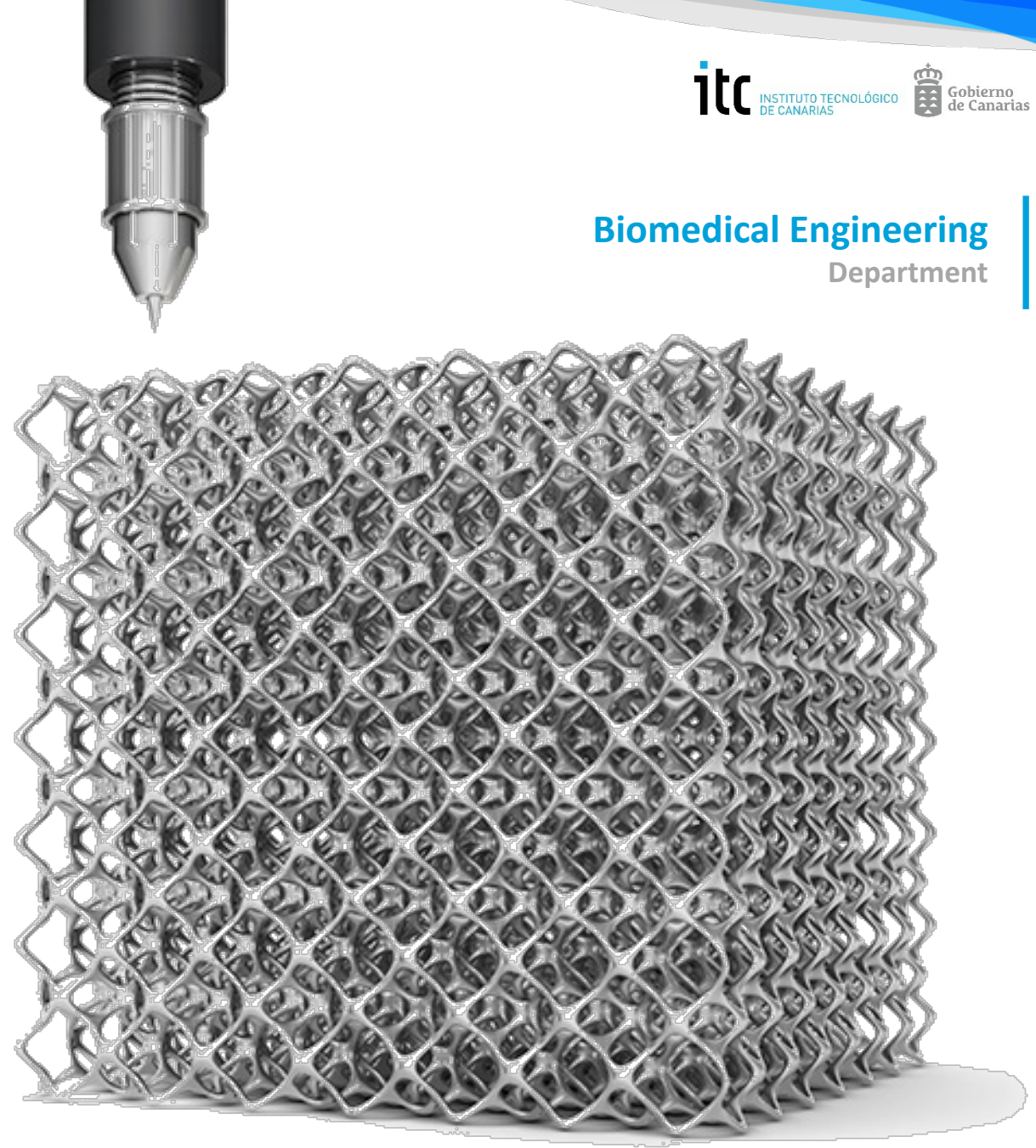
Electromechanical **integration**

Scaffolds with biopolymers

Surface finishes

BIOMECHATRONICS AREA

Santa Cruz de Tenerife



Product features

Porous structures



Inert structure
Biomimetic surface
Biodegradable filler
Millimeter scale
Electron Beam Melting

Bioreactor



Cells
Nutrients
Chemical factors
Stimuli
↓
Functional bioreactor
(Scaffold)
↓
Tissue

Biodegradable Scaffolds

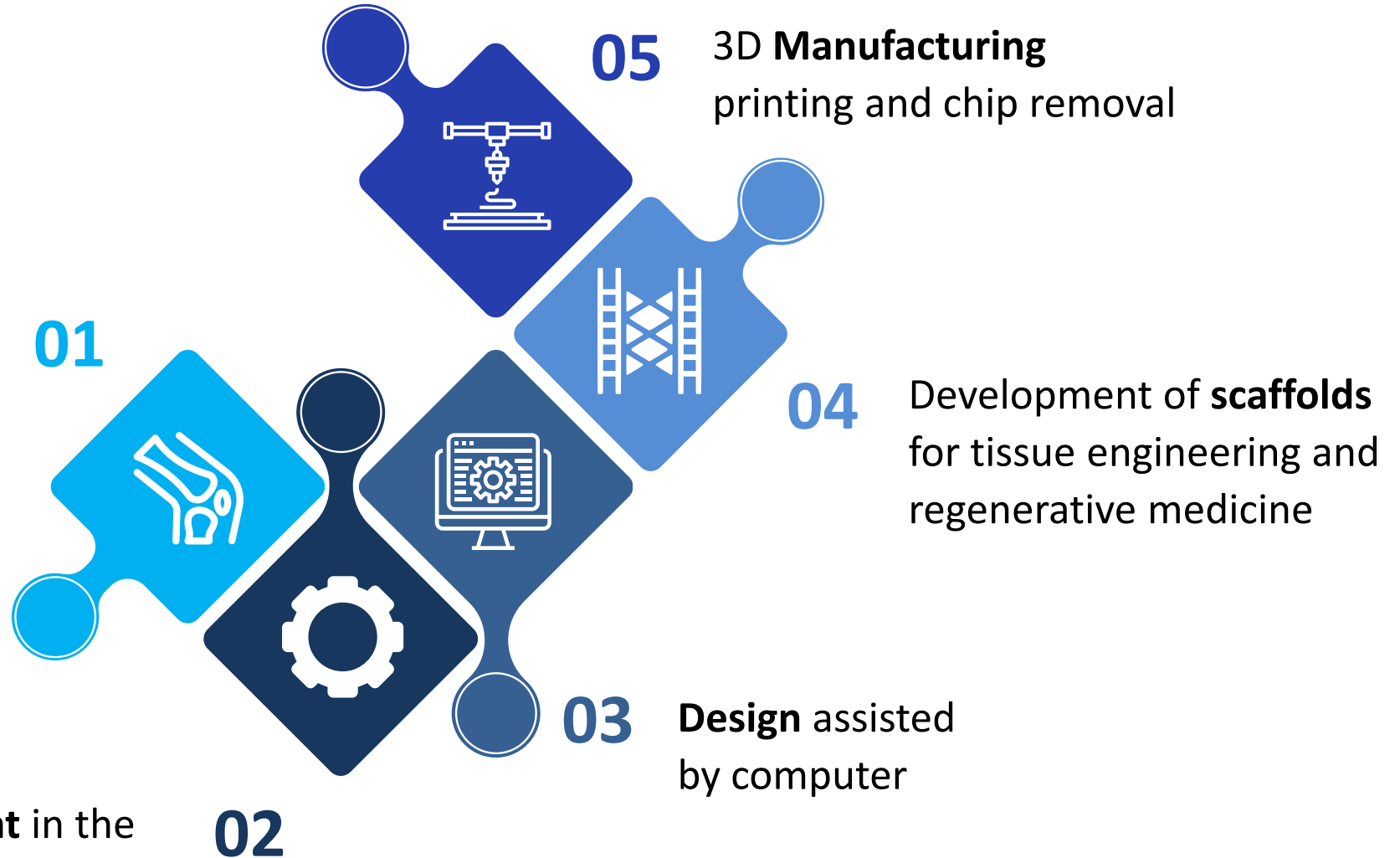


Biodegradable structure
Growth factors
Micro/nano scale
2D Electrospinning
3D fused deposition

Technological Services

Custom implants for bone and cartilage reconstruction with applications in orthopedic, cranio-maxillofacial, thoracic and spinal surgery

Product development in the mechanical-electromechanical sector



Equipment

- » Optical scanner for reverse engineering
- » Machine tools by numerical control chip removal, lathes and milling machines
- » Metal, polymer and resin 3D printers
 - » Laser cut
 - » Laser engraving
- » Surface finishing by abrasion

- » CREO software platform with CAD, CAM, FEM modules, for solids and surfaces
 - » 3D Studio MAX
 - » Fusion 360
 - » Geomagics
 - » Magics
 - » 3D CLOUD

Software



Specifically...

**+ 250 custom
implants in humans**

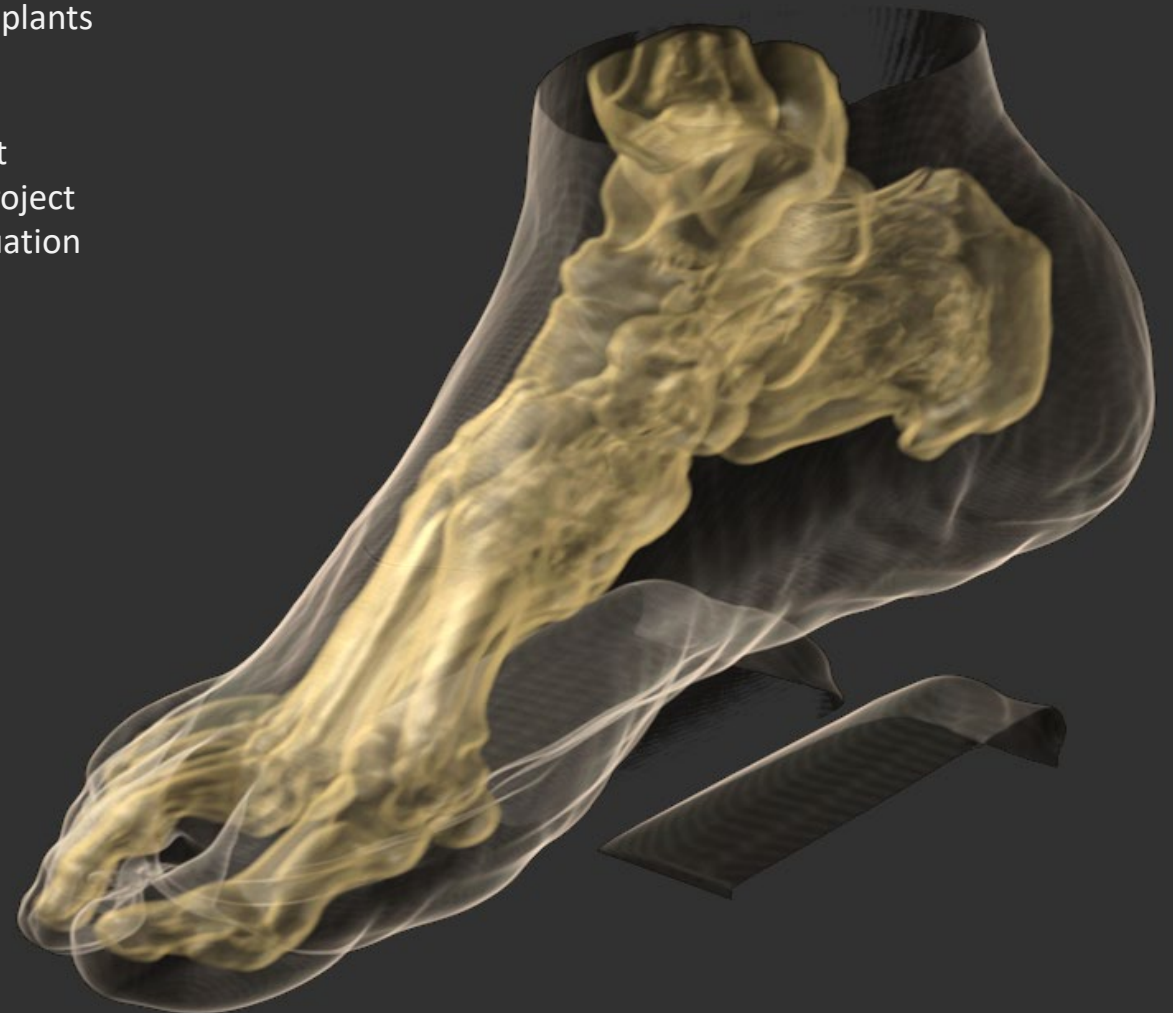
- 20% in international reference centers (Italy, Argentina, Colombia)
- Pioneers in highly porous implants
- 9 related scientific articles
- 1 new patent application
- 1 Interreg MACbioIDi project
- 1 H2020 NANOVERTEBRA project
- 1 H2020 project under evaluation

**+ 10.000 implants
in animals**

- Leaders in Spain of porous TTA
- Leaders in salvation of vital members
- 15 communications in congresses
- 1 scientific article
- 8 national training courses, 2 in master's degrees

Spin-off creation

- 4 new jobs
- 3 new projects
- 2 European brands



INTERNATIONAL PATENTS

PCT/ES2003/599 fixing device for hip osteotomies
PCT/ES2003/598 external wrist-fixing device
PCT/ES2003/597 intramedullary nail
PCT/ES2005/302 surgical needle holder for stitch suturing
German patents under evaluation process (2019): dynamic thoracic implant structure for chest wall reconstruction

ADVISED COMPANIES

more than 50

Biomedical Engineering Department

PROJECTS IN PARTNERSHIP

MULTISCAFF - Multicomponent scaffolds for osteoarthritis treatment, CIBER-BBN
CoaTReg-3D - Bioactive coatings to promote Tissue regeneration and ingrowth into 3D custom-made porous titanium endoimplants CIBER-BBN

CONFERENCES, SEMINARS AND ORGANIZED COURSES

10 conferences, 80 seminars on surgical techniques in regional, national and international hospitals, **40 courses** on veterinary surgical techniques

PEOPLE HISTORICALLY TRAINED WITH THE AREA'S ACTIVITY

10 PhD Theses, 25 final degree projects; 4 projects TORRES QUEVEDO

CONTRACTS FOR TECHNOLOGY TRANSFER TO COMPANIES

IBK 13-741- BIOSCAD – Raomed;
PCT/ES2003599 to ACETUM INGENIERIA BIOMÉDICA 2003;
PCT/ES2003599 to OSTEOFARMA in 2009;
Know-How to OSTEOBIONIX spin off in 2018

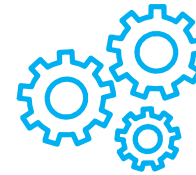
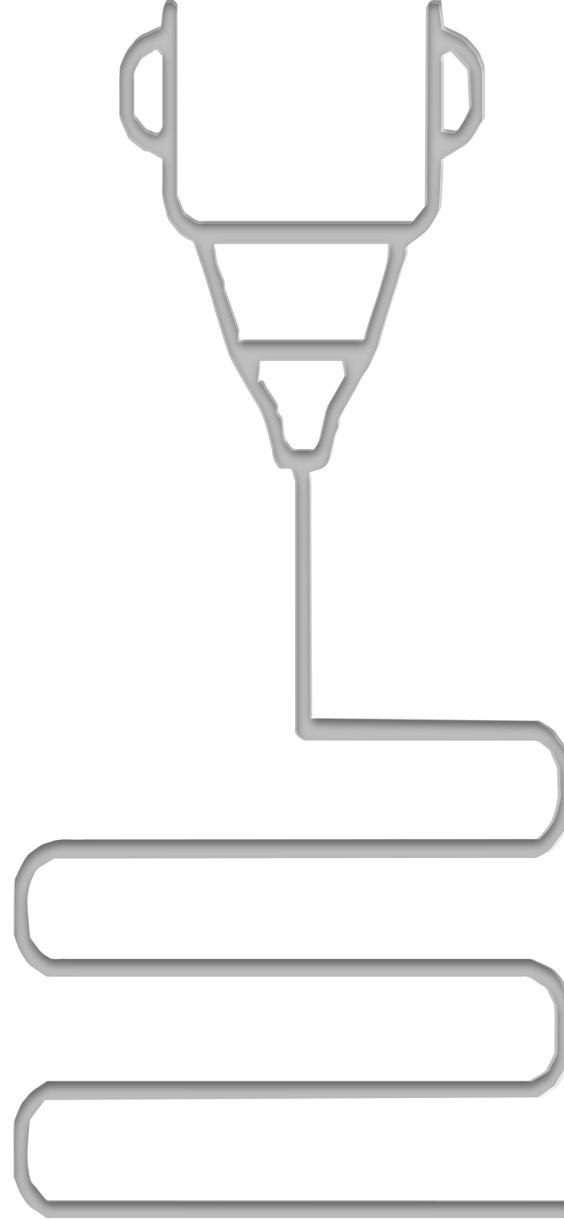
Trajectory

Challenges

Introduction in new
international
markets: Germany,
England, USA



Presence in the
European Research
Area



Industrial impact search with
serial implant line



Strengthening regional manufacturing
environment in the mechanical and
electromechanical sectors



Manufacture according
to ISO: 13485





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