MASTER'S SPECIALIZATION IN SENSORY & MOTOR NEUROPROSTHESIS

GENERAL PRESENTATION

Conventional hearing aids are devices that are placed in the auditory canal to amplify sound in deaf patients. However, these devices are only beneficial for patients with sufficient residual hearing. In profoundly deaf patients, the only way to recover some hearing requires the implantation of electrodes into the cochlea to electrically stimulate the auditory nerve fibers. The cochlear implant is a device that converts sound into electrical signals which directly stimulate the auditory nerve. To be efficient, this technique requires a surgeon to implant the device, an audiologist to adjust the threshold level of stimulation and to monitor hearing performance, and a speech pathologist to help the patient to interpret signals as sounds and speech. To reach this goal, we created this master's specialization to bring together deaf patients and these different specialists and to train them to develop a common scientific project to address hearing rehabilitation in children.

This master's specialization is open to otolaryngologists, audiologists and speech pathologists, and aims to create specialists in pediatric audiology able to i) explore hearing function in babies and young children, ii) fit cochlear implants and iii) evaluate the development of language in children using cochlear implants. In anticipation of future developments, we've extended our teaching to include visual and motor neuroprostheses. We believe that our experience with cochlear implants may be useful to health professionals (such as orthotists and physiotherapists) in charge of developing implanted visual and motor devices. Pending their use in routine clinical practice, our training remains strongly focused on hearing devices.

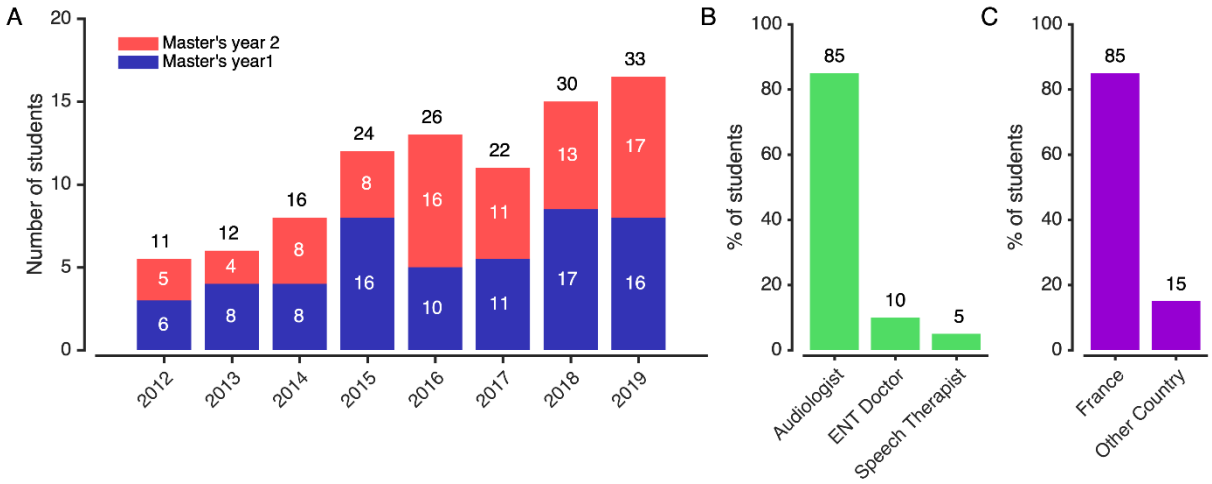

Figure 1: Evolution of the curriculum and distribution of students according to their career objectives. Note the increase in the number of students since 2012 and the prevalence of audiologists.

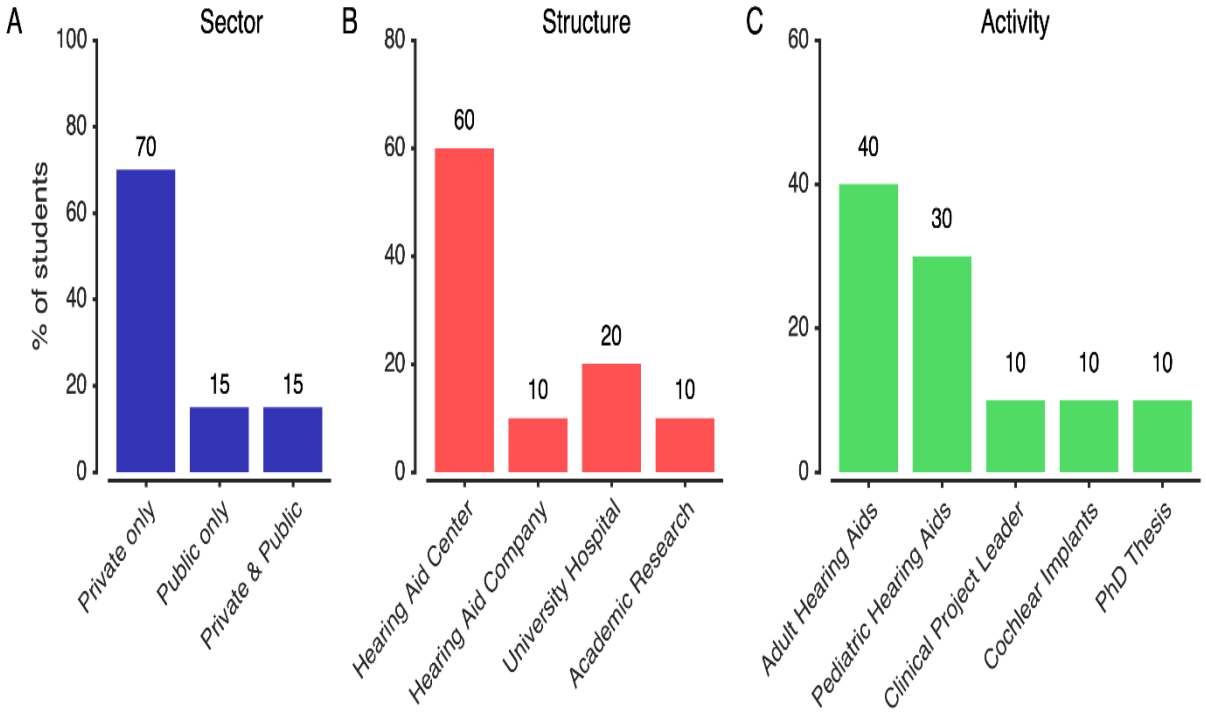

Figure 2: Graduates. The majority of students go into private practice in conventional hearing centers where they work with adults and children. Some of them work in hospitals fitting cochlear implants, whereas others turn to hearing aid or cochlear implant companies to manage clinical projects. Finally, 10% work in academic research to obtain a PhD. (Statistics taken18 months after the Master's degree).

Once enrolled in this two-year master's program, students engage in scientific practice and develop clinical skills that lead to a rewarding career in audiological centers dedicated to pediatric audiology, in clinical departments dedicated to cochlear implantations, and in companies working in the field of hearing aids and/or cochlear implants, as well as in pharmaceutical companies. Because the Master's degree program is an integrated part of the LMD curriculum (Bachelor's-Master's-PhD), the ECTS (European Credit Transfer Scale) credits are recognized by all European Universities, and give access to a doctorate (PhD). In addition to solid partnerships with clinicians, we interact with patient associations. These strong links between researchers, clinicians, manufacturers and patients are critical for the successful development of new devices to improve the quality of life of patients with implanted devices.

PROGRAM

The two-year master's program offers generalist courses in the first year (Master 1) to provide students with a foundation in signal processing and functional assessment in the field of sensory and motor deficits. This includes two months of experimental work in an academic lab, a clinical department or an audiological center, or with an industrial partner. The second year (Master 2) is more focused on pediatric audiology, with strong training in hearing and vestibular testing and speech analysis, and with a special focus on cochlear implant fitting. In addition to theoretical lectures, students will complete their scientific knowledge with a 6-month internship in France or in a foreign country (Canada, Australia, China...).

FIRST-YEAR MASTER'S

Semester 1 (Sept -January)

Educational Units (UE)	ECTS
Mathematics training E. Le Clézio (HMSN107)	0
Electronics Training P. Gall-Borrut (HMSN105)	0
Initiation to biological signal processing J Bourien & JC Céccato (HMBS113)	5
Applied Statistics F. Boutin (HMBS123)	5
Data Acquisition 1 G. Despaux (HMEE117M)	5
English 1 R. Pevsner (HMBS127L)	5
Choice of 2 UE in the Biology/Health mention	10

30 ECTS

Semester 2 (January-July)

Educational Units (UE)	ECTS
Sensorial perception JL Puel (HMBS212)	5
Neuro-prosthesis & medical robotics 1. F. Bonnetblanc (HMEE216M)	5
Supervised Work-based Learning. J Bourien & JC Céccato. (HMBS113)	5
Internship (2 months) + report	15

30 ECTS

SECOND-YEAR MASTER

Semester 3 (Sept - January)

Educational Units (UE)	ECTS
Deafness & Neuropsychology of developpement M. Mondain et D. Purper-Ouakil (HMBS335)	5
Cochlear Implants F. Venail (HMBS345)	5
Neuro-prosthesis & medical robotics 2 F. Bonnetblanc (HMEE346M)	5
Language disorders R. Garrel (HMBS318)	5
Data Acquisition 2 G. Despaux (HMSN318)	5
Balance and motor deficits F. Venail, R. Biboulet) (HMBS356)	5
	30 ECTS

Semester 4 (February-July)

Educational Units (UE)	ECTS
English 2 R. Pevsner (HMBS409L	5
Internship (6 months) + report	25
	30 ECTS