China Scholarship Council – University Maastricht

PhD Programme Application form

Basic information

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1. Information on prospective UM supervisors and Promotor

1a. First Supervisor:

- Title(s), initial(s), first name, surname:	Dr. J.P.J.M Jill Hikspoors
- Research group:	NUTRIM
- Address for correspondence:	Universiteitssingel 50 6229ER Maastricht
- Telephone:	+31(0)43 388 1189
- E-mail:	jill.hikspoors@maastrichtuniversity.nl

1b. Second Supervisor:

- Title(s), initial(s), first name, surname:	Prof. Dr. W.H. Wouter Lamers
- Research group:	Emeritus
- Address for correspondence:	Universiteitssingel 50 6229ER Maastricht
- Telephone:	+31(0)43 388 1060
- E-mail:	wh.lamers@maastrichtuniversity.nl

1c. Promotor:

- Title(s), initial(s), first name, surname:	Prof. Dr. S. Eleonore Koehler
- Research group:	NUTRIM/SHE
- Address for correspondence:	Universiteitssingel 50 6229ER Maastricht
- Telephone:	+31(0)43 388 1191
- E-mail:	leo.koehler@maastrichtuniversity.nl

2. Information on UM Faculty/ Department/ Institute/ School contact person:

- Initial(s), first name, surname:	Dr. J.P.J.M Jill Hikspoors
- Research group:	NUTRIM
- Address for correspondence:	Universiteitssingel 50 6229ER Maastricht
- Telephone:	+31(0)43 388 1189
- E-mail:	jill.hikspoors@maastrichtuniversity.nl

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1. Information on the applicant

- Initial(s), first name, surname:
- Male/female:
- Current work address:

- Telephone:
- E-mail:
- WeChat:
- Private address:

2. Details of applicant's home university

Note! A separate letter of recommendation by the supervisor or faculty dean of the home university is required.

- Name of home university:
- Address:
- Telephone:
- E-mail:
- Website (if available):

3. Applicant's home university Master Thesis supervisor:

- Title(s), initial(s), first name, surname:
- Address for correspondence:

- Telephone:
- E-mail:
- WeChat:

4. Research field(s)

Basic research / Biological Foundations of Human Health and Diseases

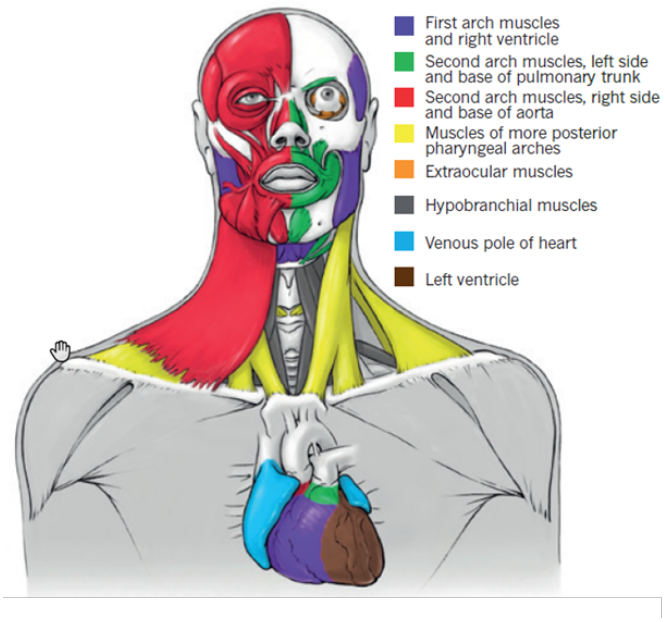
Keywords: Neck development, head-trunk interface, 3D-reconstruction

5. Title of research plan for CSC-UM PhD Programme

The forming of the neck at the interface between head and trunk

6. Short summary of research plan (max. 250 words) (A full plan has to be submitted later)

The head is a relatively late acquisition in vertebrate evolution, with the neck forming the interface between head and trunk. The developmental origins of some typical components of head and trunk (Table 1), and the regulatory mechanisms underlying their development show substantial differences. Accordingly, the morphological features that characterize structures with similar function in head and trunk also differ considerably. In addition, the boundaries in the neck between regions that qualify as head- or trunk-derived are irregular (Figure 1). Lineage studies have, for instance, shown that the heart muscles share their origin with the masticatory and mimical muscles in the first 2 pharyngeal arches, that the tongue muscles and the skull base originate from the first 4 somites, and that the remodeling of the pharyngeal arch arteries is necessary to accommodate the perfusion of both head and neck. This highly irregular junction between head- and trunk-derived structures can only be understood from a developmental perspective. A proper knowledge of the developmental anatomy of the neck and head- and trunk-derived structures is necessary to understand safe section planes during neck surgery. As far as we are aware, a detailed knowledge of the migratory pathways of the composing structures of the neck is not presently available for human anatomy.



origin of structures with similar function	
head	**trunk**
segmentation	
pharyngeal arches rhombomeres	somites
muscles	
lateral plate	
mesoderm	somites
non-segmented	segmented
muscle innervation	
branchiomeric nerve	spinal nerve
dorsal root	ventral root
bone	
neural crest mesoderm	mesoderm
connective tissue	
neural crest	mesoderm
coelom	
absent	present
limb-forming competence	
absent	present

Figure 1 and Table 1: The muscles of head and neck, and their origins (color codes).
Source: R Diogo et al, Nature 520 (2015) 466-473.

The aim and expectation of the research:

The project aims to map all relevant structures in the human neck between 5 and 15 weeks of development. These data will then be used to establish the migratory pathways qualitatively (trajectories) and quantitatively (growth and migration rates).

The techniques to acquire these data have been developed and fine-tuned during the last 5 years.

Three-dimensional reconstructions of sections of human embryos and fetuses will be used to identify and quantify growing structures, and to produce a time-resolved topographic atlas of neck-head anatomy that characterizes the growth dynamics in this junctional region.

In this project, we focus on the head-trunk junction. Our aim is to explain how the structures shown in the Figure attain their definitive position, and how the different structures with a similar function shown in the Table cohabit. We will address these questions by mapping the migratory pathways of these structures both qualitatively (route) and quantitatively (growth and migration rates of the respective structures).

Requirements:

Highly motivated and proactive student with great interest in embryology. Having affection for 3D-modeling is a plus.

Group's performance:

Jill P.J.M. Hikspoors: Thesis *cum laude*; publications 21; citations 251, H-index 10

Wouter H. Lamers: publications: 449, citations:17048; H-index 69

Selected publications:

JPJM Hikspoors, N Kruepunga, GMC Mommen, SE Köhler, RH Anderson, WH Lamers (2022) A pictorial account of the human embryonic heart between 3.5 and 8 weeks of development. Commun Biol 5(1): 226 *https://doi.org/10.1038/s42003-022-03153-x*

HK Mekonen, JPJM Hikspoors, GMC Mommen, N Kruepunga, SE Köhler, WH Lamers (2017) Closure of the vertebral canal in human embryos and fetuses. J Anat 231 (2) 260-274; https://doi.org/10.1111/joa.12638

7. Motivation for CSC-UM PhD application (max. 250 words)
Two letters are required, one from the student and one from the promotion team.

Our department has generated a large database with digitized sections of human embryos and fetuses, and has implemented state-of-the-art reconstruction techniques. We have further developed a unique expertise to identify regions of differential growth in development. This CSC-UM grant allows the PhD candidate to use this database to generate a thus far unavailable interactive topographic atlas of fetal neck anatomy.

With our earlier experience of four Chinese graduate students, we are confident that we can successfully generate migratory pathways qualitatively (trajectories) and quantitatively (growth and migration rates) of the head-trunk interface.

Applicant's Curriculum Vitae (if available)
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8. Personal details

Applicant
- Title(s), initial(s), first name, surname:

CSC-UM PhD programme start 1-9-2023

- Surname:
- Nationality: Chinese
- Date of Birth:
- Country and place of birth:

9. Master's degree (if applicable)
Note! Add a copy of your Master's degree to your application

University:
Faculty/discipline:
City and country:
Date:
Grade average:
Title Master's thesis (if applicable):
Thesis grade: