Heartbeat-to-heartbeat cardiac tissue characterization

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Biography

Maaike van den Boomen was born on the 24th of March 1991 in Amsterdam, the Netherlands. As a child, Maaike went to the *Annie M.G. Schmidt* school, which was named after one of her favorite writers at that time. When her family moved to Bilthoven, she attended a much smaller community school before she went to the *Werkplaats Kindergemeenschap*. Being a close friend of Maria Montessori, Kees Boeke started this school to inspire children explore their own identity, while learning the skills and getting the experience they needed. This approach facilitated Maaike to get an independent and structured way of absorbing knowledge to subsequentially applying it in newly combined applications. During her participation in the *European Youth Parliament* she also learned to communicate and explain the sometimes quite controversial approaches for the currently still relevant European challenges.

After graduating from high school, the *University of Technology Eindhoven* was a great place to further develop these skills and to learn how to work with stretchable boundaries. During her bachelors in Biomedical Engineering, she fulfilled a role in the national board of a student consultancy named *UniPartners*, where she was able to collaborate with students from different disciplines throughout the Netherlands and Europe. In the last year of her bachelors she also led the first *iGEM* team that represented the *University of Technology Eindhoven* in which she managed to balance leadership and guidance of a team in a protein engineer lab environment and their communication towards society. The focus of the team was the incorporation of autofluorescence cardiac calcium pumps into yeast cells, which could help understanding their responsive mechanisms.

Furthermore, she also attended the *Eindhoven School of Education* and obtained her degree as high school teacher in physics and chemistry. As a result of this opportunity to develop her communication and education skills she decided to start her own

business named *BètaBoomen*. With this non-profit company she managed to develop new modules for several schools throughout the Netherlands that were thought by driven and enthusiastic engineering students. In the meantime she moved on with her masters in Biomedical Engineering at the *University of Technology Eindhoven* in combination with the newly establish program named Regenerative Medicine and Technology in collaboration with the *University of Utrecht*. Here she could again expand her horizon by participating in classes and projects with students from different backgrounds in the medical discipline.

In her last year of this masters program she joined the lab of Klaas Nicolay where she got supervised by Katrien Vandoorne. Katrien motivated Maaike to think of her own MRI based research study in mice, while making use of the recent developments in their lab. Eventually her graduation thesis was also supervised by Carlijn Bouten and Patricia Dankers, which later resulted in Maaike her first publication. As a last part of her masters program, Maaike decided to broaden her imaging knowledge and world by starting with PET imaging in the lab of Ciprian Catana at the *A.A. Martinos Center for Biomedical Imaging* in Boston, USA. For this internship she received two individual grants from the *Alzheimer Nederland* and *McKinsey & Company*.

Despite the positive experiences in academia, Maaike still decided to explore her opportunities in the imaging field from an industry perspective and joined *General Electric Healthcare* in the Benelux as an application specialist in cardiac PET/CT. While the thrill of new challenges and being able to help others on a day-to-day basis was very exciting, academia, and more specifically Boston, was still luring. When Ronald Borra contacted her for an opportunity to pursue a PhD degree at the *University of Groningen* in collaboration with the *A.A. Martinos Center for Biomedical Imaging* she made the decision to go back into academia.

Within her PhD, Maaike was supposed to focus on cardiac PET/MRI research, but at first, she got fully occupied with the development of new cardiac MRI techniques. While working on cardiac applicability of the brain-based GESE-EPI sequence in the lab of Kawin Setsompop, she attended several courses and talks that often covered the use of functional MRI in the brain. These talks made her realize that the MRI sequence she was working on could potentially be used for cardiac blood oxygenation level dependent (BOLD) imaging, which she explored further with the help of Christopher Nguyen. Furthermore, in another project with Chris, she worked on using several MRI techniques to determine the cardiac protectivity of exercise to heart failure in swine. In the meantime, Maaike realized that the *A.A. Martinos Center for Biomedical Imaging* could use some better internal networking events, so

she set up a weekly center-wide meeting in which colleagues could show of their work to each other. Towards the end of her PhD program she finally managed to accomplish the reason she started working with the GESE-EPI sequence in the first place by also showing its applicability for vessel architectural imaging (VAI). Eventually, to validate both of these newly developed cardiac MRI techniques Maaike went back to using PET/MRI again, while in parallel comparing the MRI results with immunofluorescent histological data.

In addition to the academic work she performed at the *A.A. Martinos Center for Biomedical Imaging* she also helped to elevate the collaboration with the *University of Groningen* to a new level. This first started with a few joined grant applications, but progressed into sharing other graduate students from the *University of Groningen* within joined projects. However, now this academic chapter is almost to an end, industry is luring again with new opportunities on the horizon.

List of Publications

- G.J. Leenders, M.B. Smeets, **M. van den Boomen**, M. Berben, M. Nabben, D. van Strijp, G.J. Strijkers, J.J. Prompers, F. Arslan, K. Nicolay, K. Vandoorne; *Statins promotes cardiac infarct healing by modulating endothelial barrier function revealed by contrast-enhanced magnetic resonance imaging,* Arterioscler Thromb Vasc Biol, 2018 Jan;38(1):186-194;

- **M. van den Boomen**, R.H.J.A. Slart, E.V. Hulleman, R.A.J.O. Dierckx, B.K. Velthuis, P. van der Harst, D.E. Sosnovik, R.J.H. Borra, N.H.J. Prakken; *Native T_1 reference values for non-ischemic cardiomyopathies and populations with increased cardiovascular risk: A systematic review and meta-analysis,* J Magn Reson Imaging, 2018 Apr;47(4):891-912;

- **M. van den Boomen**, H.B. Kause, H.C. van Assen, P.Y.W. Dankers, C.V.C. Bouten, K. Vandoorne; *Triple-marker cardiac MRI detects sequential tissue changes of healing myocardium after a hydrogel-based therapy,* Nature Scientific Reports, 2019 Dec;9(1):19366;

- **M. van den Boomen**, M.K. Manhard, G.J.H. Snel, S. Han, K.E. Emblem, R.H.J.A. Slart, D.E. Sosnovik, C. Catana, B.R. Rosen, N.H.J. Prakken, C.H. Nguyen, R.J.H. Borra, K. Setsompop; *BOLD-MRI of the myocardium with a Multi-Echo-Gradient-Echo-Spin-Echo Acquisition,* Radiology, 2020 Jan;293(3):538-545;

- G.J.H. Snel, **M. van den Boomen**, L.M. Hernandez, C.T. Nguyen, D.E. Sosnovik, B.K. Velthuis, R.H.J.A. Slart, N.H.J. Prakken; *Native T_2 and T_2^* quantitative reference values for cardiomyopathies and heart transplantations: A systematic review and meta-analysis,* J Cardiovasc Magn Reson., 2020 May;22(1):34;

- **M. van den Boomen**, M.K. Manhard, K.E. Emblem, R.H.J.A. Slart, D.E. Sosnovik, C. Catana, R.A.J.O. Dierckx, D. Izquierdo-Garcia, B.R. Rosen, C.T. Nguyen, N.H.J. Prakken, R.J.H. Borra* and K. Setsompop*; *Simultaneous Multi-Slice Cardiac BOLD-MRI with Multi-Echo Gradient-Echo-Spin-Echo EPI,* under revision;

- **M. van den Boomen**, K. Setsompop, M.K. Manhard, K.E. Emblem, M. Awadalla, R.H.J.A. Slart, R.A.J.O. Dierckx, T.G. Neilan, R. Wiener, A.L. Baggish, N.H.J. Prakken, C.T. Nguyen* and R.J.H. Borra*; *Cardiac Vessel Architectural Imaging using Heartbeat-to-Heartbeat GESE-EPI,* in preparation;

- K. Phipps, **M. van den Boomen**, R.A. Eder, S.A. Michelhaugh, A. Spahillari, J.H. Kim, S. Parajuli, T. Reese, C. Mekkaoui, D. Gee, R. Shah, D.E. Sosnovik, C.T. Nguyen; *Accelerated In Vivo Cardiac Diffusion Tensor MRI using Residual Deep Learning based Denoising in Lean and Obese study Participants,* in preparation;

- **M. van den Boomen**, K. Lee, W. Hucker, J. Coll-Font, M.S. Saleh Mahamdeh, J.H. Kim, R.A. Eder, K. Phipps, H. Deng, A. Mauskapf, S. Parajuli, T.G. Reese, C. Mekkaoui, S.Yuan, D.E. Sosnovik, P. Ellinor, A. Rosenzweig, C.T. Nguyen; *Exercise-Induced Cardiomyogenesis Protects Myocardial Microstructural Helicity and Function in a Porcine Model of Heart Failure,* in preparation;

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