Glow with the flow: Quantifying blood flow and photoluminescence signal in biological tissue

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Glow With The Flow.
A thesis that contributes to the development of optical techniques to assess microcirculation functionality for the diagnosis, monitoring, therapy guidance and understanding of many diseases ranging from the onset of septic shock to the delivery of drugs to tumours. The first part of this thesis aims to develop a non-invasive technique to quantify microcirculatory blood flow velocity based on laser speckle flowmetry. The second part is devoted to the quantification of optical signals arising from photoluminescent upconversion nanoparticles for sensitive detection in biomedical tissues. The combination of these techniques is particularly useful in the context of tumour therapy by providing information on tumour angiogenesis, enabling molecular contrast and delivering nanoparticle-based drugs.
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# Table of Contents

Chapter 1  Introduction .................................................. 7

Chapter 2  Laser speckle contrast imaging .......................... 25

Chapter 3  Quantitative laser speckle flowmetry of the *in vivo* microcirculation using sidestream dark field microscopy ................. 37

Chapter 4  Quantitative blood flow velocity imaging using laser speckle flowmetry ................................................. 57

Chapter 5  Upconversion nanoparticles ................................ 91

Chapter 6  Quantitative imaging of single upconversion nanoparticles in biological tissue .................................................... 103

Chapter 7  Feasibility study of the optical imaging of a breast cancer lesion labeled with upconversion nanoparticle biocomplexes .... 133

Chapter 8  Discussion and conclusion .................................. 155

Chapter 9  Outlook ............................................................ 173

Appendices  List of abbreviations ..................................... 181
List of symbols ............................................................ 182
Samenvatting van het proefschrift ................................... 185
Thesis summary ........................................................... 191
List of publications ........................................................ 197
Portfolio ................................................................. 200
Curriculum vitae .......................................................... 203
Acknowledgments ......................................................... 205