



Universiteit  
Leiden

The Netherlands

## Genomics applications of nanopore long-read sequencing for small to large sized genomes

Liem, M.

### Citation

Liem, M. (2024, April 17). *Genomics applications of nanopore long-read sequencing for small to large sized genomes*. Retrieved from <https://hdl.handle.net/1887/3736436>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/3736436>

**Note:** To cite this publication please use the final published version (if applicable).

**Genomics applications  
of nanopore long-read sequencing  
for small to large sized genomes**

Cover art: Elephant by Michael Liem.

Referring to the largest sequencing reads among sequencing technologies.  
The plethora of animal illustrations decorating the elephant represents the Oxford Nanopore Technologies slogan "*To enable the analysis of anything, by anyone, anywhere.*"

Lay-out:            Ontwerpstudio Carlijn Hoogenboom  
Printed by:        Gildeprint - Enschede  
ISBN:               978-94-6496-089-1

Genomics applications of nanopore long-read  
sequencing for small to large sized genomes

## Proefschrift

ter verkrijging van  
de graad van doctor aan de Universiteit Leiden,  
op gezag van rector magnificus prof.dr.ir. H. Bijl,  
volgens besluit van het college voor promoties  
te verdedigen op woensdag 17 april 2024  
klokke 11:15

door

Michael Liem  
Geboren te Alphen aan den Rijn, Nederland  
in 1987

|                    |  |   |
|--------------------|--|---|
| Promotors:         | Prof. dr. H.P. Spaink<br>Prof. dr. ir. F.J. Verbeek  | Leiden University<br>Leiden University  |
| Co-promotor:       | Dr. C.V. Henkel  | Norwegian University of Life Sciences   |
| Promotiecommissie: | Prof. dr. A.H. Meijer<br>Prof. dr. V. van Noord<br>Dr. K.J. Wolstencroft<br>Dr. J. Masschelein<br>Prof. dr. ir. D. de Ridder | Leiden University<br>Leiden University<br>Leiden University<br>Katholieke Universiteit Leuven<br>Wageningen University & Research |

“You must be shapeless, formless, like water.  
When you pour water in a cup, it becomes the cup.  
When you pour water in a bottle, it becomes the bottle.  
When you pour water in a teapot, it becomes the teapot.  
Water can drip and it can crash.  
Become like water my friend.”

– Bruce Lee



## — Contents

|   |            |
|---|------------|
| <b>Chapter 1</b>  | <b>11</b>  |
| Introduction and thesis outline   |            |
| <b>Chapter 2</b>  | <b>35</b>  |
| <i>De novo</i> whole-genome assembly of a wild type yeast isolate using nanopore sequencing                               |            |
| <b>Chapter 3</b>  | <b>59</b>  |
| Genome assembly of the transposon-enriched <i>Allorhizobium</i> strain LBA9072  |            |
| <b>Chapter 4</b>  | <b>83</b>  |
| Rapid <i>de novo</i> assembly of the European eel genome from nanopore sequencing reads                                   |            |
| <b>Chapter 5</b>  | <b>115</b> |
| Microbial diversity characterization of seawater in a pilot study using Oxford Nanopore Technologies long-read sequencing |            |
| <b>Chapter 6</b>  | <b>147</b> |
| Summary and discussion  |            |
| <b>Addendum</b>   | <b>159</b> |
| Nederlandse samenvatting  |            |
| Curriculum Vitae  |            |
| List of publications  |            |