

2nd July 2017

To whom it may concern:

Reference for Dr Martin S. Alnæs

It is a pleasure to be able to write this reference letter for Martin Alnæs. I have known Martin since 2006 when he was a graduate student completing a PhD degree, and have worked with him closely ever since.

I have worked with Martin on the development of open-source scientific/mathematical software over many years, and specifically within the context of the international FEniCS Project¹. Martin's contributions to the FEniCS Project cannot be understated; he has made major software contributions that have shaped research in the area of mathematical software worldwide, and his work has had significant impact on the way many engineers, scientists and researchers now compute. Martin's software design and software engineering skills, coupled with his advanced mathematical and algorithmic understanding the problems at hand, placed him uniquely to make major advances through new scientific software libraries.

Noteworthy amongst Martin's achievements are the domain-specific Unified Form Language² (UFL) and the code generation and optimisation backend to the FEniCS Form Compiler, known as UFLACS. With UFL, Martin developed an embedded domain-specific language for mathematical equations that mirrors conventional mathematical syntax. UFL allows engineers and scientists solving differential equations to input their problems in a more compact and expressive format than was previously possible, and with the advantage of mathematical error checking. UFL is now used at research centres, and increasingly at leading companies, around the world. Martin's work on UFLACS takes the abstract problem description provided by UFL and transforms the problem into a concrete

¹ <https://fenicsproject.org/>

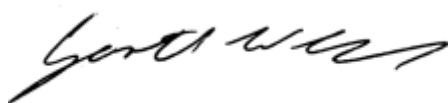
² <http://dx.doi.org/10.1145/2566630/>

implementation in a conventional high-performance computing language, e.g. C++. By applying domain-specific optimisations, the generated code runs faster than code that could reasonably be produced by hand. With his work on UFL and UFLACS, Martin has made a major contribution to demonstrating that simplicity and performance in scientific computing and software are not mutually exclusive. On the contrary, he has demonstrated that with an in-depth understanding of the underlying technical problem, appropriate levels of abstraction and high-quality software engineering, simplicity can lead to reduced development time and higher performance.

Alongside Martin's development of tools targeting specific application domains, he has excellent general software engineering skills and expertise in a number of computing languages. He has provided leadership in promoting the adoption of software engineering and testing best-practices; leadership by applying leading engineering and testing approaches in his own contributions, and leadership by guiding others in the community in the adoption of best practices. Examples of Martin's development work can be found in the public domain at <https://bitbucket.org/fenics-project/ffc> and <https://bitbucket.org/fenics-project/ufl>. Martin has worked on a number of other projects that I have not been involved with, so there are more public demonstrations of his excellent software design and engineering skills.

Martin comes with my strongest possible recommendation. Please do not hesitate to contact me if you would like to know more about his past work.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Garth N. Wells', written in a cursive style.

Garth N. Wells