Editorial

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This volume contains selected papers from the 8th Workshop on Parallel-in-time Integration which took place from 20 May to 24 May 2019. The workshop was hosted and funded by the Center for Interdisciplinary Research (ZIF) at the University Bielefeld in Germany. Additional support came from Jülich Supercomputing Centre and from the Darmstadt Graduate School Computational Engineering.

After the first workshop in 2011 at the University of Lugano in Switzerland, the parallel-in-time workshop series has now established itself as the central annual event for all researchers in the growing community studying parallel-in-time integration.

The rapid development towards extreme parallelism in high-performance computing poses many challenges. One particular problem is the requirement to find new numerical algorithm algorithms (or to “recast” old ones) to deliver the necessary degree of concurrency that is required to extract performance from massively parallel hardware. For models based on time-dependent differential equations, serial numerical time-stepping algorithms like Runge–Kutta or multi-step methods have typically been used. This bottleneck increasingly limits scalability of time-dependent models on state-of-the-art high-performance computing systems. Parallel-in-time methods attempt to replace time stepping by procedures that offer at least some degree of concurrency.

The workshop brought together mathematicians, computer scientists and domain scientists and engineers who are interested in novel numerical techniques. The 2019 workshop also saw the first plenary talk given by a representative from industry, addressing computational challenges in simulating electric machines. Other plenary talks addressed the use-

fulness of parallel-in-time integration methods for specific applications like weather prediction or large-scale computational fluid dynamics, presented mathematical advances around waveform relaxation for fractional equations, or explored the potential to transfer ideas from parallel-in-time integration to the quickly growing field of computational social sciences. The full programme is available on the ZIF website under [https://www.unibielefeld.de/\(de\)/ZiF/AG/2019/05-20-Ruprecht.html](https://www.unibielefeld.de/(de)/ZiF/AG/2019/05-20-Ruprecht.html).

Here is a list of all eight parallel-in-time workshops so far:

1. Lugano, Switzerland, 3 June 2011
2. Manchester, UK, 17–19 June 2013
3. Jülich, Germany, 26–28 May 2014
4. Dresden, Germany, 27–29 May 2015
5. Banff, Canada, 27 Nov -2 Dec 2016
6. Ascona, Switzerland, 23–27 Oct 2017
7. Roscoff, France, 2–5 May 2018
8. Bielefeld, Germany, 20–24 May 2019

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