Orlando P. Simonetti, Ph.D., is a Professor of Internal Medicine and Radiology at The Ohio State University in Columbus, Ohio. He joined the OSU faculty in 2005 as the Research Director of Cardiovascular MR and CT.

His current research interests include fast imaging, flow quantification, parameter mapping, and exercise stress CMR.

Dr. Simonetti has dedicated his entire career to the advancement of cardiovascular magnetic resonance technology, and is widely recognized for his contributions to the field.

Dear MAGNETOM Flash reader,

One could easily argue that cardiovascular magnetic resonance (CMR) is in the midst of another technical revolution. Those of us who have worked in the field for the last two decades have seen similar periods in the past, when major advances in hardware technology like array coils and fast gradients, in software technology like parallel acquisition techniques, and pulse sequences like balanced steady-state free precession have spawned dramatic improvements in the efficiency and effectiveness of CMR. Three of the most exciting recent advances: myocardial parameter mapping, MR-PET, and compressed sensing are highlighted in the six articles of this issue of MAGNETOM Flash. Relaxation parameter mapping has initiated an exciting new direction of research into the clinical implications of diffuse changes in myocardial tissue (e.g., fibrosis or edema) that can accompany a variety of diseases. The novel combination of CMR and PET is enabling the powerful diagnostic combination of the exquisite assessment of myocardial tissue structure and function provided by CMR, together with the evaluation of metabolism by PET. New approaches to sampling and reconstruction using compressed sensing are dramatically reducing the data acquisition requirements, and thereby significantly enhancing the efficiency of CMR. Together, these advances are indicative of the ever-changing nature of CMR; a technology that continues to improve thanks to the passion, creativity, and tireless effort of the researchers around the world who have made this their life's work.

The article by Moon et al., from University College London Hospitals, London, UK, discusses recent trends in the development and investigation of techniques for quantitative mapping of myocardial T1 and T2 relaxation parameters. Quantitative mapping addresses many of the technical limitations of conventional T1-weighted and T2-weighted sequences, most importantly offering the capability to assess diffuse changes in myocardial tissue that can accompany many disease states. The article by Fernandes et al., from University of Campinas, Brazil, nicely summarizes the techniques that are employed for myocardial T1 mapping, and reviews recent investigations of this technology in patients with a variety of diseases including amyloid, aortic stenosis, and various cardiomyopathies. As noted in both articles, the early evidence suggests that myocardial relaxation parameter mapping has fantastic potential as a diagnostic tool that may be sensitive to early pathological changes in myocardial tissue potentially missed by other imaging methods. Challenges remain in standardization of these methods to ensure consistent quantitative results across patients and imaging platforms.

The article by Schwitter et al., from the Cardiac Magnetic Resonance Center of the University Hospital of Lausanne in Switzerland nicely demonstrates an important advantage of highly accelerated cine imaging using compressed sensing data acquisition and reconstruction strategies. The ability to acquire sufficient cine slices to cover the entire heart in multiple orientations in a single breath-hold (2 beats per slice) not only reduces exam times, but also facilitates more accurate LV volume calculations using a three dimensional modeling approach rather than the traditional Simpson's Method. Reducing the potential for mis-registration of slices avoids one of the primary limitations of the 3D approach to LV volume calculations. Thus, the efficiency gains achieved via compressed sensing data acquisition and recon-

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struction strategies can positively impact the clinical value of CMR from several different perspectives.

The article by Carr et al., from the group at Northwestern University in Chicago highlights the tremendous potential of iterative reconstruction techniques to dramatically accelerate cardiac cine imaging. The results shown indicate that efficiency gains of at least a factor of two are possible over conventional parallel acquisition techniques. The time-consuming nature of most CMR techniques, and the requirements of repeated patient breath-holds and regular cardiac rhythm are factors that have constrained the widespread acceptance of CMR into the clinical routine. While there is still work remaining to optimize data sampling and reduce image reconstruction times, the gains in scanning efficiency demonstrated in this study could have far-reaching implications in moving CMR further into the mainstream as a cost-effective diagnostic imaging modality.

The potential advantages of simultaneous CMR and PET acquisitions are explored in two articles of this issue of MAGNETOM Flash. Drs. Cho and Kong from Yeungnam University Hospital, Daegu, South Korea, demonstrate in a patient with hypertrophic cardiomyopathy the ability to characterize myocardial fibrosis using both Late Gadolinium Enhancement and ^{18}F-FDG PET.

The article by Dr. James A. White from The Lawson Health Research Institute, London, Ontario, Canada, nicely describes the potential for advanced myocardial tissue characterization using the synergistic capabilities of CMR and PET. Dr. White points out how the complementary and unique information provided by CMR and PET may better characterize pathological changes in myocardial tissue in diseases such as sarcoidosis. The evaluation of cellular metabolic activity using PET may fill the role that MR spectroscopy has promised but as yet been unable to deliver in the clinical setting. The field of metabolic imaging is rapidly evolving, however, and the continued development of hyperpolarized ^{13}C offers exciting possibilities as well.

In summary, the three new technologies of myocardial parameter mapping, CMR-PET, and compressed sensing discussed in this issue represent some of the most exciting recent advances in CMR. They offer the potential to significantly improve the efficiency and effectiveness of CMR, and to expand the information CMR can provide to physicians to better diagnose and treat cardiovascular disease.

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