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It is our great pleasure to present in this issue of the *Journal of Applied Physics* selected contributions to the 31st International Conference on the Physics of Semiconductors (ICPS-31), which took place in Zurich, Switzerland, from July 29 to August 3rd, 2012. The contributions comprise the plenary talk by Professor Hideo Ohno on “Bridging semiconductor and magnetism” and ten invited talks by different authors. The articles in this collection have undergone the same peer-review process as regular journal articles.

The International Conference on the Physics of Semiconductors has a long history and covers all the important subfields of this research area. The thirteen specific topics presented at the Zurich conference in 2012 were

1. Material Structure,
2. Wide Bandgap Semiconductors,
3. Narrow-gap Semiconductors,
4. Carbon: Nanotubes and Graphene,
5. Organic Semiconductors,
6. Topological Insulators,
7. Transport in Heterostructures,
8. Quantum Hall Effects,
9. Spintronics and Spin Phenomena,
10. Electron Devices and Applications,

11. Optical Properties of Heterostructures,
12. Quantum Optics and Nanophotonics,
13. Quantum Information.

Since the first conference took place in Reading, England, in 1950, the field of Semiconductor Physics has continued to present exciting new and important results for physicists and engineers. At ICPS-31, highlights also covered with plenary talks were the progress in quantum information processing with single spins and spintronics, the experimental and theoretical investigation of Majorana fermions, the physics of graphene, exciton-polariton condensates, and solid-state cavity QED with a quantum dot coupled to a photonic crystal.

The organizers of ICPS31 are particularly grateful for the continued partnership with the American Institute of Physics that allows us to publish plenary and invited papers in the *Journal of Applied Physics*, thus making the valuable contributions of the most committed invited and plenary speakers available to a broad audience in applied physics and related fields. We wish to thank the authors who took the extra effort to condense their excellent talks into the presented journal articles. We hope that the readers will find the results interesting and scientifically stimulating.