



## Contents

### Special Issue

#### Superconducting Materials: Conventional, Unconventional and Undetermined

Dedicated to Theodore H. Geballe on the year of his 95th birthday

Edited by J.E. Hirsch, M.B. Maple and F. Marsiglio

Superconducting materials classes: Introduction and overview

*J.E. Hirsch, M.B. Maple and F. Marsiglio* ..... 1–8

What  $T_c$  tells

*Theodore H. Geballe, Robert H. Hammond and Phillip M. Wu* ..... 9–16

### I. Conventional Superconductors

- C1. Superconductivity in the elements, alloys and simple compounds  
*G.W. Webb, F. Marsiglio and J.E. Hirsch* ..... 17–27
- C2. Superconductivity in the A15 structure  
*G.R. Stewart* ..... 28–35
- C3. Superconductivity in doped semiconductors  
*E. Bustarret* ..... 36–45
- C4. Superconductivity from insulating elements under high pressure  
*Katsuya Shimizu* ..... 46–49
- C5. Superconductivity in graphite intercalation compounds  
*Robert P. Smith, Thomas E. Weller, Christopher A. Howard, Mark P.M. Dean, Kaveh C. Rahnejat, Siddharth S. Saxena and Mark Ellerby* ..... 50–58
- C6. Superconductivity in the metallic elements at high pressures  
*J.J. Hamlin* ..... 59–76
- C7. Superconductivity in compressed hydrogen-rich materials: Pressing on hydrogen  
*Viktor V. Struzhkin* ..... 77–85
- C8. Pristine and intercalated transition metal dichalcogenide superconductors  
*Richard A. Klemm* ..... 86–94
- C9. Chevrel phases: Past, present and future  
*Octavio Peña* ..... 95–112
- C10. Conventional magnetic superconductors  
*C.T. Wolowiec, B.D. White and M.B. Maple* ..... 113–129
- C11. Superconductivity of very thin films: The superconductor–insulator transition  
*Yen-Hsiang Lin, J. Nelson and A.M. Goldman* ..... 130–141
- C12. Superconductivity of magnesium diboride  
*Sergey L. Bud'ko and Paul C. Canfield* ..... 142–151

### II. Possibly Unconventional Superconductors

- P1. Bismuthates:  $\text{BaBiO}_3$  and related superconducting phases  
*Arthur W. Sleight* ..... 152–165
- P2. Superconductivity in alkali-doped  $\text{C}_{60}$   
*Arthur P. Ramirez* ..... 166–172

P3. Quaternary borocarbides: Relatively high $T_c$ intermetallic superconductors and magnetic superconductors <i>Chandan Mazumdar and R. Nagarajan</i> . . . . .	173–183
P4. Superconductivity in plutonium compounds <i>J.L. Sarrao, E.D. Bauer, J.N. Mitchell, P.H. Tobash and J.D. Thompson</i> . . . . .	184–188
P5. Interface superconductivity <i>S. Gariglio, M. Gabay, J. Mannhart and J.-M. Triscone</i> . . . . .	189–198
P6. Superconductivity in aromatic hydrocarbons <i>Yoshihiro Kubozono, Hidenori Goto, Taihei Jabuchi, Takayoshi Yokoya, Takashi Kambe, Yusuke Sakai, Masanari Izumi, Lu Zheng, Shino Hamao, Huyen L.T. Nguyen, Masafumi Sakata, Tomoko Kagayama and Katsuya Shimizu</i> . . . . .	199–205
P7. Superconducting doped topological materials <i>Satoshi Sasaki and Takeshi Mizushima</i> . . . . .	206–217
P8. Superconductivity in layered $\text{BiS}_2$ -based compounds <i>D. Yazici, I. Jeon, B.D. White and M.B. Maple</i> . . . . .	218–236
P9. Unstable and elusive superconductors <i>Yakov Kopelevich, Robson R. da Silva and Bruno C. Camargo</i> . . . . .	237–245

### **III. Unconventional Superconductors**

U1. Unconventional superconductivity in heavy-fermion compounds <i>B.D. White, J.D. Thompson and M.B. Maple</i> . . . . .	246–278
U2. Organic superconductors: The Bechgaard salts and relatives <i>S.E. Brown</i> . . . . .	279–289
U3. Hole-doped cuprate high temperature superconductors <i>C.W. Chu, L.Z. Deng and B. Lv</i> . . . . .	290–313
U4. $T'$ and infinite-layer electron-doped cuprates <i>P. Fournier</i> . . . . .	314–338
U5. Unconventional superconductivity in $\text{Sr}_2\text{RuO}_4$ <i>Ying Liu and Zhi-Qiang Mao</i> . . . . .	339–353
U6. Unconventional superconductivity in electron-doped layered metal nitride halides $\text{MNX}$ ( $M = \text{Ti, Zr, Hf}$ ; $X = \text{Cl, Br, I}$ ) <i>Yuichi Kasahara, Kazuhiko Kuroki, Shoji Yamanaka and Yasujiro Taguchi</i> . . . . .	354–367
U7. Ferromagnetic superconductors <i>Andrew D. Huxley</i> . . . . .	368–377
U8. Superconductivity of cobalt oxide hydrate, $\text{Na}_x(\text{H}_3\text{O})_2\text{CoO}_2 \cdot y\text{H}_2\text{O}$ <i>Hiroya Sakurai, Yoshihiko Ihara and Kazunori Takada</i> . . . . .	378–387
U9. Superconductivity in non-centrosymmetric materials <i>F. Kneidinger, E. Bauer, I. Zeiringer, P. Rogl, C. Blaas-Schenner, D. Reith and R. Podloucky</i> . . . . .	388–398
U10. Iron-based superconductors: Current status of materials and pairing mechanism <i>Hideo Hosono and Kazuhiko Kuroki</i> . . . . .	399–422
U11. Superconductivity in Fe-chalcogenides <i>C.C. Chang, T.K. Chen, W.C. Lee, P.H. Lin, M.J. Wang, Y.C. Wen, P.M. Wu and M.K. Wu</i> . . . . .	423–434

### **In Closing**

Ted Geballe: A lifetime of contributions to superconductivity <i>G.R. Stewart</i> . . . . .	435–436
Epilogue: Superconducting materials past, present and future <i>C.W. Chu, P.C. Canfield, R.C. Dynes, Z. Fisk, B. Batlogg, G. Deutscher, T.H. Geballe, Z.X. Zhao, R.L. Greene, H. Hosono and M.B. Maple</i> . . . . .	437–443