Preface to Special Topic: Caloric materials

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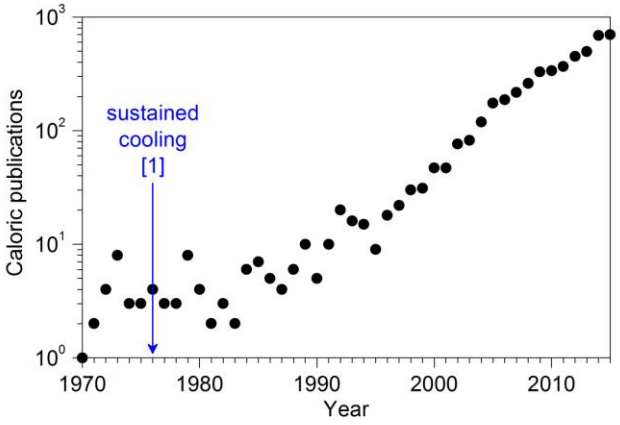
It has now been 40 years since the publication of the revolutionary work by Gerald Brown that demonstrated the first room-temperature magnetic cooler [1]. By doing so, he introduced the concept of regeneration, which is central for the development of heat-pumps based on magnetocaloric, electrocaloric and mechanocaloric materials. Since then, research into caloric materials has gone a long way, as illustrated in the figure below.

The Special Topic presented here has emerged from a meeting that we organised on 10-11 February 2016 at the Møller Centre in Churchill College, Cambridge, under the auspices of the Winton Programme, Adande Refrigeration and *APL Materials*. The Cambridge meeting followed on from a Discussion Meeting at the Royal Society in London on the same subject, but with different speakers. The London meeting was entitled "Taking the temperature of phase transitions in cool materials", and its proceedings will be published in *Phil. Trans. R. Soc. A.*

The content of the Special Topic is divided into magnetocaloric, electrocaloric and mechanocaloric materials, and ranges from fundamental aspects to applications of the materials in heat-pump systems. As well as containing a number of invited papers that cover the exciting advances presented at the time of the meeting, the Special Topic also includes a small number of stimulating contributed articles.

The Special Topic would not have happened if it were not for the extraordinary work of all the authors, reviewers, and the team at *APL Materials*. In future, one expects continued growth in the worldwide research activity on caloric materials for environmentally friendly cooling applications, with more meetings, and more researchers, focusing on this hot topic.



Caloric publications have seen a nominally exponential growth since the demonstration of sustained cooling near room temperature by Gerald Brown in 1976 [1]. The data shown here are taken from [2], and updated to include 2013-2015. We were privileged to count on the presence of Gerald Brown as a session chair in both meetings.

References

[1] G. V. Brown, *J. Appl. Phys.* **47**, 3673 (1976).

[2] X. Moya, S. Kar-Narayan and N. D. Mathur, *Nat. Mater.* **13**, 439 (2014).