

## From supernovae to galaxy clusters

Observing the chemical enrichment in the hot  
intra-cluster medium

1. A significant fraction of the intra-cluster medium (ICM) of Abell 4059 may have been enriched in metals via ram-pressure stripping of an infalling galaxy (**Chapter 2**).
2. Several sources of systematic uncertainties affect the abundance measurements in the ICM; all of them should be carefully treated and discussed before any attempt is made to interpret these measurements (**Chapters 3 and 5**).
3. Ca-rich gap transients, a recently discovered peculiar sub-class of supernovae, may significantly contribute to the chemical enrichment of the ICM (**Chapter 4**).
4. Type Ia and core-collapse supernovae have enriched galaxy clusters and groups in the same way, out to at least a third of their virial radius (**Chapter 6**).
5. In addition to higher spectral resolution instruments on board future X-ray missions, significant improvements of atomic data, nucleosynthesis models, and ICM simulations are absolutely necessary to understand the chemical enrichment of the Universe.
6. Finding a systematic bias in measurements is not necessarily bad news.
7. One of the main challenges in the synergy between observations and numerical simulations is to speak about the same quantities, and compare what is comparable.
8. X-ray fitting tools should never be used as black boxes.
9. The main challenge of doing a PhD in two separate institutes is to maximise the advantages while reducing the drawbacks.
10. In some cases, cultural differences are highly significant even below 100 km scales.
11. Astronomy can be, and should be used to combat populism and obscurantism.
12. Because science, culture, and education are the three main pillars of human civilisations, they should be entirely free and accessible to everyone, at any time.