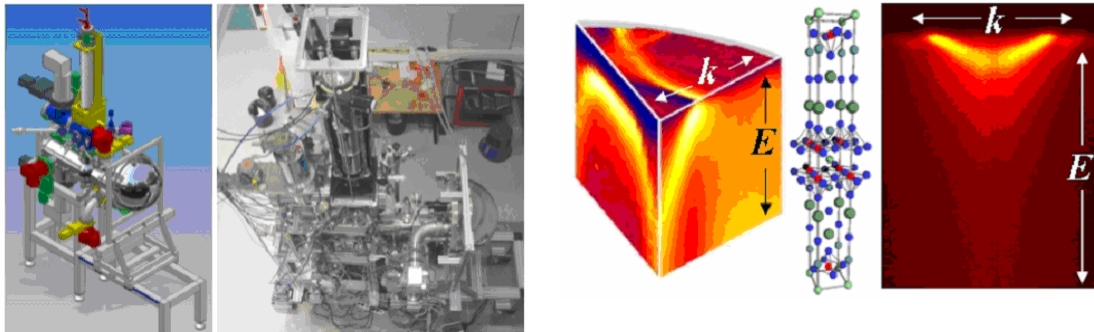


k-space microscopy of high temperature superconductors

In the States, Cadillac's ride round with bumper stickers saying "*High T_c's do it the hottest*" even if that one may not be true, it is undeniable fact that the high T_c superconducting cuprates *do it* at half of room temperature. The challenge is that despite the best efforts of the global solid state physics community (experiment + theory, spiced with expert input from materials science and solid state chemistry), we still don't know exactly how their Cooper pairs stand the heat. The clever and mature quantum field theoretical description of conventional superconductivity essentially calls a time-out for the game at about 40K, as above that temperature thermal fluctuations overwhelm the effective attractive interaction between the charge carriers within the Cooper pairs.

As this isn't the case with the cuprates, many researchers are convinced - and the rest are at least uneasily suspicious - that the high T_c superconductors represent a new form of quantum electron matter in which the old rules do not apply.



Left: the FAMoS microscope, in the computer and in reality (lab K03 in Valckenierstr. 65.) Right: k-space mapping of the electronic states of a Bi₂Sr₂CaCu₂O₈ crystal

In this project, you'll use k-space microscopy (a.k.a. angle-resolved photoemission spectroscopy) to study the energy and momentum dependence of the elementary excitations of Bi₂Sr₂CaCu₂O₈-based high temperature superconductors, with the aim of helping lift the veil on the high T_c mystery. Your activities will span from helping prepare, characterise and 'tune' the doping of crystals of Pb-doped Bi₂Sr₂CaCu₂O₈, to the FAMoS experiments themselves and the analysis of the resulting high-resolution datasets. If the timing's right (and you've shown yourself to be a motivated and skilled experimentalist), you can also join the group at a beamtime, carrying out photoemission experiments at a third-generation synchrotron radiation source such as BESSY in Berlin or SLS near Zürich. Back in Amsterdam, the ultra-high vacuum FAMoS microscope is on-line and has world-beating performance, so right now is an exciting time to join in....

Mark Golden - mgolden@science.....
 Yingkai Huang
 Iman Santoso, Sanne de Jong, Freek Masseur
 ?

Group Leader. Van der Waals-Zeeman Institute.
 Staff member. Crystal growth wizard.
 Ph.D. students (Freek from April 2007)
 M.Sc. students (2006/2007)