

Scientific Report on CORPES07: Strong Correlations and Angle Resolved Photo Emission Spectroscopy

4 weeks of seminar and one week of workshop at the MPI-PKS, Dresden, Germany
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Main focus of the conference: The overall objective of the CORPES workshops and seminars is to investigate the electronic structure of highly correlated materials by studying their low-energy (one-electron) excitations. Participants are situated at the crossing between many-body theory for correlated electrons and angle-resolved photoemission spectroscopy (ARPES). A detailed modelling, realistic calculations, and the understanding of the effects of electronic correlations on photoemission spectra is particularly important when the standard quasi-particle picture no longer applies. The main focus is the complex electronic self-energy $\Sigma(k, E)$, but various intrinsic and extrinsic influences stand in the way of quantitatively extracting its momentum and energy dependence from the experimental data. These influences can obstruct the desired focus and also lead to erroneous interpretations. The program of CORPES07 was to concentrate decidedly on such refinements of the theory that either eliminate the perturbing influences or else turn them into assets of additional information.

Participants: A total of 101 participants was evenly divided between theory and experiment. Among these, 52 assisted only in the workshop, 45 in both workshop and seminar, 4 only in the seminar. The geographical distribution was as follows: Western Europe - 61, North America - 15, Asia - 11, Eastern Europe - 10, Central and South America - 3, Nigeria - 1. We strove to have a wide spectrum, reaching from the most **established leaders in the field** (among them: Franz Himpsel, winner of the 2007 Davisson-Germer Prize, James Allen, winner of the 2002 Isakson prize, Gabriel Kotliar and Dieter Vollhardt, winners of the 2006 Agilent Europhysics Prize) to scientific newcomers (defined as grad students and postdocs, 22 participants). All participants presented either a talk during the workshop or seminar, or gave a poster during the workshop (many did two of the above). Our policy was to not have any invited speakers for the workshop who had given a talk during the CORPES05 workshop. The majority of the talks is again available online: <http://www.mpi-pks-dresden.mpg.de/corpes07/>.

Additional funding: In addition to the generous support from the MPI-PKS, we succeeded in raising extra support for the conference. We received over 12000 \$ from various synchrotron facilities around the world, and travel support for 10 junior participants from IICAM (International Institute for Complex Adaptive Matter).

Scientific results of the conference in the broader sense: Different material classes have been in the focus of the discussions: transition-metal oxides, heavy fermions, graphene, Luttinger liquids, nanostructures, etc. Substantial advances have been reported in the understanding of the spectrum of one-electron excitations, both for low-dimensional lattice models of correlated electrons and for realistic multi-orbital systems, also including phonon degrees of freedom, more complex electron spectroscopies, ab initio approaches to the electronic structure of correlated materials, final-state effects and effects of transition-matrix elements. High-temperature superconductors continue to attract the main attention, but also fertilise the interpretations in other systems. A major goal of the organisers, which we feel has been successfully promoted during CORPE07, is to encourage interactions between theory and experiment in a more sustained way and thus improve the understanding of ARPES data on correlated systems.

Future of CORPES: During this workshop, new generations of synchrotron beamlines were presented, dedicated to ARPES with unprecedented resolutions. In view of the important investments in these facilities and the expected explosion of experimental data, it was generally agreed that a sustained and long term effort for improved understanding of ARPES is required. A great and clear enthusiasm for continuing this series of conferences in future years prevailed among the participants. Representatives of leading synchrotrons expressed their support and offered venues for future workshops.