

**Graduate School of Excellence MAINZ**



**Report on the International Workshop and Winter School:  
Photoemission**

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Dijon, being located in 315 km from Paris in the Eastern France, is not a particularly large city but presented to be very charming one with many fascinating historical sights that gives an enormous pleasure to visit it. Dijon became the capital of the duchy of Burgundy around 1000 AD, but its golden age occurred during 14<sup>th</sup> and 15<sup>th</sup> centuries under the rule of the Dukes of Burgundy that made it to be one of the great cities of Europe of that time. Today this city is the capital of the Cote-d'Or department and of the Burgundy region with the population of 150,800.

The Graduate School MAterials Science IN MainZ organized the “Workshop and Winter School: Photoemission” in Dijon. Over 40 participants from all over the world (USA, Japan, France, Switzerland, Ireland, Italy, Belgium, and Germany) joined the workshop.

Prof. Charles S. Fadley (University of California Davis, Davis, USA) opened the scientific program with the 1<sup>st</sup> part of his overview lecture on Characterization of Surfaces, Interfaces, and Complex Materials with Core and Valence Photoemission. This lecture laid the main emphasis on introducing the basic concepts and experiments of core and valence photoelectron spectroscopy. Afterwards Dr. Zegenhagen (ESRF, Grenoble, France) gave a comprehensive insight into the physical principles of the x-ray standing wave technique and its applications. This method using x-ray standing wave as a source of excitation adds spatial resolution to many traditional x-ray spectroscopy techniques.

After lunch, the scientific program continued with another presentation of Charles S. Fadley. He discussed the aspects of valence-level photoemission as well as some current developments such as photoemission with standing wave excitation, hard x-ray excitations and ambient pressures in the multi-torr regime in this lecture in more detail. The lecture part of the first day was closed by Martin Aeschlimann (University of Kaiserslautern, Germany) with the talk “Linewidth versus real time measurements”. After dinner all participants took part in the flash-presentation (short presentation) of their posters. 26 students were given an opportunity to introduce themselves to the audience and briefly describe the information presented on their posters.

The next day session was started by Peter Krueger (University of Burgundy, Dijon, France) and his lecture on core-level line shapes and the resonant photoelectron diffraction method detailing the theory as well as recent experimental results obtained with this technique on transition metal oxides. Later, Dr. Gerhard H. Fecher (University of Mainz, Germany) gave an enlightening insight on the comprehension of the dichroism phenomena in angular resolved photoemission.

A rich scientific programme would have been hard to follow without being accompanied with a social activity programme. Therefore, the second part of the day was devoted to a guided excursion to the Abbey Fontenay. Located in the northern Burgundy, 80 km north of Dijon, surrounded by valley of forests and ponds the Abbey Fontenay is one of the oldest Cistercian monasteries in Europe. The guide introduced to us the historical aspects of founding and developing of the abbey as well as paying attention to the social life of the monks and its economical aspects. The significant fact was that most of the rooms have been perfectly conserved. Founded in 1118 by St. Bernard the abbey has not changed its magnificent Romanesque style. The Abbey Fontenay was declared a World Heritage site by the UNESCO in 1981.

After dinner a comprehensive poster session was held. Giving an opportunity to the young scientists to present their results it also helped to develop communication by exciting discussions that continued till late in the evening.



**Fig.1.** Poster session.

The 3<sup>rd</sup> day of the winter school started from the lecture of D. Sebilleau (University of Rennes, France) on the basic phenomena underlying the x-ray photoelectron diffraction technique accompanied by experimental results. The second part of the lecture explained the application of this method as well as usage of related techniques and was followed by the talk of Prof. J. Kirschner (Max Plank Institute of Microstructure Physics, Halle, Germany). He gave a broad introduction into electron pairs photoemission by one photon excitation. The overview of potentialities of resonant photoelectron and resonant Auger spectroscopies and their applications for the investigation of solids was presented in the lecture of P. LeFevre (Synchrotron SOLEIL, France). Prof H. Ebert from Ludwig Maximilian University of Munich (Germany) proceeded with electronic structure calculations laying the emphasis on the KKR method and then the theory of ARPES.

In the evening all the participants were kindly welcome to the Haus Rheinland-Pfalz in Dijon. As we know Dijon is a twin city of Mainz. The diplomatic mission of the Haus Rheinland-Pfalz in Burgundy is not only a representative role but it also serves as a social organization to pave the cultural and scientific collaboration and exchange between these administrative regions of Germany and France. Tens of young students from both countries are given a unique opportunity to travel, to study languages and to take part in exchange trainings in their specialties every year.

Thursday morning gave us a broad insight into basic principles, experimental setup and recent results in the method of extremely low energy photoelectron spectroscopy presented by Prof. Suga (Osaka University, Japan). This method is highly demanded all over the world due to its feasibility to provide both high energy resolution and bulk sensitivity. The scientific session of this day was concluded with an informative lecture of J. Osterwalder (University of Zürich, Switzerland) on spin-polarization photoemission technique, its experimental setup and results from applying it for investigation of surface states of solids.





**Fig.2.** Tour of Dijon.

The remaining part of the day was spent on social activities, starting with a guided tour of Dijon. The impressive stories told by the guide helped us to understand Dijon as a city of all ages illustrating its architectural diversity. A lot of interesting facts about the construction and history of such places as Palace of the Dukes and the States of Burgundy and the Church of Notre Dame owing its origins in the mediaeval times were revealed.

After an exciting tour through Dijon, the group continued to travel to the remarkable city of Beaune. Being one of the key wine centres in France, Beaune is famous by its annual primary wine auction in France that takes place in the Hospices de Beaune, the master element of the town's heritage. The short overview walk around the city centre was followed by the wine tasting. The pleasant conclusion of the day was visiting a fascinating restaurant in the best French traditions.

The next morning the lecture of Joerg Fink from Helmholtz-Zentrum Berlin (BESSY), Germany, proceeded the lecture programme. He explained the principles of applications of angle and time resolved photoemission spectroscopy for solids characterization and recent experimental results. Further on Prof. Suga presented the 2<sup>nd</sup> part of his lecture concerning applications of hard x-ray photoemission to the investigation of strongly correlated electron systems. The same problem was addressed by the talk of Giancarlo Panaccione (TASC-CNR, Trieste, Italy). After the lunch break he thoroughly discussed the novel electronic properties of such systems studied by photoemission, concluding the scientific programme of the winter school.



**Fig.3.** Wine testing.



**Fig.4.** City of Beaune.

This workshop and winter school in photoemission having the goal to provide thorough information in the basics of experimental and theoretical concepts of photoemission as well as its recent developments and applications to condensed matter physics was quite successful. It gave an opportunity to young specialists in this field not only to obtain knowledge but also to present their own results, meet other PhD students and professors from the worldwide community of photoemission, to improve scientific communication and find the directions and ideas for the future research.