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Preface

Between the eye and the matter falls the surface. For decades, though, physicists tried to treat the solid as if its surface were absent — see the famous Cyclic Boundary Conditions — they wanted to see the bulk and get rid of the surface. Engineers were of a reverse attitude — to make good devices they always used to hammer, polish, etch and heat the surface, imp roving in this way the properties of products. Although things have fundamentally changed in the Solid State Physics of the last years, both communities went on practically independently. Clearly, the environmental consciousness of mankind should push them towards a close convolution of ideas and works.

To produce tools and machines of good performance and high reliability one has to improve the quality of the surface layers of the parts interacting with others — their hardness should be enhanced, roughness — diminished, friction — lowered, corrosion resistance — raised, their lifetime — prolonged. The usual way the Materials Science used to achieve such goals had so far been mainly the phenomenologic, trial and error method — to exert various physical forces on the surface, to check the effects and to choose the most promising combination of the forces for the next trial. The depth of the relevant surface layer is here about 10 μm and more.

For physicists the surface means just a few atomic planes close to the geometric surface of a crystal, down to about 10 Å. They focus their interest on the microscopic structure of these surfaces, their relaxation, restructurization and dynamics, and related optical, scattering, chemical, elastic, magnetic, electronic and other properties of them. Modern techniques permit setting new materials composed of very thin layers. Nowadays our understanding of the microscopic structure and dynamics of some crystal surfaces seems already to be quite satisfactory. Related quasi two-dimensional forms, like grain-boundaries, interfaces, or made-for-purpose multilayer atomic structures have been parallelly mastered.

This School and Symposium was intended to gather both physicists and engineers, to give them a good ground for a fruitful exchange of ideas and concepts concerning the surface of objects we deal with in life. One has to bridge the gap between them, symbolised perhaps by the ratio 10 μm/10 Å.

It is perhaps the intercrystalline interface that has turned out to be the convergence area of both societies present at ISSPMS'95. Its properties are essential for the working properties of industrial surface layers, while they are sufficiently well distinguished spatially and structurally to set a well-defined problem for physicists. But the properties of open surfaces — their structures, restructurization, roughness, dynamics, etc. — also attracted vivid attention.

Among the practical methods of modifying the surface layers by disposing on them the energy, other materials or both — grinding, hammering, explosive pressing, implantation, electric discharges, MBE, etc. — the laser methods dominated. Continuum aspects rather than atomic ones turned out to be more en vogue for the consideration of the phenomena of surface plasticity. Engineering of special properties of surfaces, including magnetic ones, was shown to be one of the major achievements of the MBE technique. The participants could see that modern diagnostic methods, ranging from sophisticated X-ray methods, via neutron scattering, perturbed angular correlations and Mössbauer techniques, Auger spectroscopy, electron scattering, atomic force microscopy, to Raman spectroscopy, enter more and more effectively the domain of designing new surface properties of materials. And the lecture on the theory of music helped us to avoid a too technocratic attitude to the scope of the ISSPMS'95, and enrich it with a humanistic flavor.

The bridge between both societies is now open to go both ways. Let us do it for the benefits of physics and technics.

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