MAPPING CLASS GROUPS AND THE JOHNSON HOMOMORPHISMS

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In the first lecture, we will review some basic facts on the mapping class group of a compact connected oriented surface, and how the group is related to degenerations of Riemann surfaces and characteristic classes of surface bundles. The classical Picard-Lefschetz theorem describes the behavior of the simplest degeneration corresponding to a Dehn twist in the homology level. Among the characteristic classes, the Mumford-Morita-Miller classes play important roles. In view of the Johnson-Morita theory, the classes can be obtained also from the extended first Johnson homomorphism. We will explain the original Johnson homomorphisms and their geometric re-construction in the second lecture. As an application of the re-construction, we will give a description of the action of a Dehn twist on the fundamental group of the surface.