K-EQUIVALENCE IN BIRATIONAL GEOMETRY

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ABSTRACT. Two birational $\mathbb{Q}$-Gorenstein varieties X and X' are called K-equivalent, denoted by $X =_K X'$, if for some (hence for any) common dominant smooth Y with birational morphisms $\phi : Y \to X$ and $\phi' : Y \to X'$ one has $\phi^* K_X =_{\mathbb{Q}} \phi'^* K_{X'}$.

For smooth varieties, using p-adic integrals and p-adic Hodge theory, it is shown that $X =_K X'$ implies $h^{p,q}(X) = h^{p,q}(X')$. Also by using a Grothendieck-Riemann-Roch type technique, it is shown that the most general Chern numbers invariant under the K-equivalence relation consist of the complex elliptic genera.

In this talk, I will survey differential-geometrical, algebro-geometrical and also topological aspects of this theory. A deformation/decomposition conjecture will be stated whose validity would reveal the *underlying geometry* of the K-equivalence relation.

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