On the Modular Isomorphism Problem

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Abstract: The Isomorphism Problem for group rings asks for which groups G and H the group rings these groups over a given commutative ring R are isomorphic as rings. Less formally speaking, it asks how much the linear representations of G over R know about the structure of the group G. Several concrete formulations of the problem were studied. For instance the question, if the integral group ring of a finite group G determines G up to isomorphism, found a lot of attention after being first studied by G. Higman. The only classical formulation which remains open today and was explicitly formulated by R. Brauer is the *Modular Isomorphism Problem:* Does the group ring of a finite p-group G over a field of characteristic p determine G up to isomorphism?

Contrary to the general problem the modular version in its strongest form studies a finite object and allows algorithmic approaches, but even for rather small examples a lot of computational resources are required. I will review some history of the general Isomorphism Problem, present techniques used in the study of the Modular Isomorphism Problem and give some recent results.

This is joint work with Tobias Moede and Mima Stanojkovski.