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## THE GEOMETRY OF $N \times N$ KdV

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**Abstract:** This is joint work with Chuu-Lian Terng.

Many, if not all, integrable systems can be formulated via constraints imposed on the classical AKNS matrix systems. Each AKNS system has a natural (half)Virasoro action and a tau function constructed by Wilson. This tau function can be used in a rather complicated construction to describe the flows. In many cases these constructions pass to the constrained integrable systems, but their meaning and importance is unclear.

We give a somewhat unusual constraint on the AKNS flows which produces a system which is gauge equivalent to the Gelfand-Dickey KdV-N. Surprisingly, the simple geometrically defined Virasoro action and tau function are equivalent to the classically defined versions. The idea is very simple although the proof is quite complicated as is necessary to pass to the pseudodifferential operator description of KdV-N.