Lefschetz fibrations on cotangent bundles and Lagrangian submanifolds

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Given a Morse function $f : N \to \mathbb{R}$ I will describe a Lefschetz fibration $\pi : E \to \mathbb{C}$ which models the complexification of $f$ on the disk cotangent bundle $D(T^*N)$. I will then describe a program in progress for studying closed exact Lagrangian submanifolds of $T^*N$ using $\pi$. The idea is to translate questions about Lagrangian submanifolds into questions about representations of certain quivers, following Seidel’s work on $T^*S^n$.

If time permits I will discuss the following offshoots of this program:

1. The program yields a conjectural bridge between the analysis of $Fuk(T^*N)$ by Nadler-Zaslow, using constructible sheaves, and that of Seidel, using Picard-Lefschetz theory.

2. In a more geometric vein the construction of $\pi : E \to \mathbb{C}$ suggests a way to generalize matching paths from spheres to more general manifolds.

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