Close Encounters with Bloch functions of the third kind

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Abstract: Landau in the 30’s estimated the univalent Bloch-Landau constant $U$, i.e., the biggest radius $R$ that such that $f(D(0,1))$ always contains a disk of radius $R$ for any univalent $f$ normalized with $|f'(0)| = 1$. The extremal functions that attain this maximum are known as Bloch functions of the third kind. Although the exact value of $U$ is not known many authors have provided upper and lower bounds. In a joint work with T. Carroll we have studied fine properties of the extremal functions and shown the connection with other well studied question, the Pólya-Cebotarev problem. This relationship has been exploited to improve (very slightly) the upper bound for the constant.