1164-37-118 **Jean-Philippe Lessard*** (jp.lessard@mcgill.ca), , Canada, and **Jacek Cyranka** (cyranka@mimuw.edu.pl), , Poland. *A fully spectral validated forward integration scheme for parabolic PDEs via Fourier/Chebyshev series.*

In this talk we introduce an approach to solve rigorously IVPs for a class of semi-linear parabolic partial differential equations. Expanding solutions with Chebyshev series in time and Fourier series in space, we introduce a zero finding problem $F(a) = 0$ on a Banach algebra X of Fourier-Chebyshev sequences, whose solution solves the IVP. The challenge lies in the fact that the linear part $L = DF(0)$ has an infinite block diagonal structure with blocks becoming less and less diagonal dominant at infinity. We introduce analytic estimates to show that L is boundedly invertible, and obtain explicit, rigorous and computable bounds for the operator norm $||L^{-1}||_{B(X)}$. These bounds are then used to verify the hypotheses of a Newton-Kantorovich type argument which shows that the operator $T(a) = a - L^{-1}F(a)$ is a contraction on a small ball centered at a numerical approximation of the IVP. The contraction mapping theorem yields a fixed point which corresponds to a classical (strong) solution of the IVP. We apply our approach to Fisher's equation, the Kuramoto-Sivashinsky equation, the Swift-Hohenberg equation and the phase-field crystal (PFC) equation. (Received January 15, 2021)