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Blow-up of solutions to non-linear elliptic Neumann problems

In this talk I shall discuss some recent results concerning blow-up of solutions to boundary value problems of the form

$$\triangle u = 0 \qquad \text{in } \Omega \ , \qquad \frac{\partial u}{\partial n} = \lambda f(u) \qquad \text{on } \partial\Omega \ .$$

A particular case, namely that of $f(t) = e^{\alpha t} - e^{-(1-\alpha)t}$, $\lambda \to 0$, frequently shows up in the context of corrosion modelling . This exponential f is associated with a phenomenon of blow-up at certain points. It is hoped that detailed information about the blow-up behaviour will facilitate the imaging (detection) of highly corroding, inaccessible parts of the boundary.