

## Evariste Sanchez-Palencia

### *Singular perturbations generating complexity*

We consider a kind of variational singular perturbation boundary value problems depending on a small parameter  $\varepsilon$  which are classical for  $\varepsilon > 0$  but highly ill - posed for  $\varepsilon = 0$ . This kind of problems arises from thin shell theory but, here we only deal with a model problem. For a special geometry (the domain is an infinite strip) the problem allows a complete Fourier transform treatment. The asymptotic process exhibits a complexification phenomenon: in some sense the solution becomes more and more complex as  $\varepsilon$  decreases. This phenomenon is associated with the emergence of a new characteristic parameter  $\log\left(\frac{1}{\varepsilon}\right)$ . We then give an approximate heuristic method for describing the behavior of the solutions for small  $\varepsilon$  in more general geometries not allowing Fourier transform treatment. This leads to a variational problem in a constrained space with energy described by pseudo-differential operators.