

# Theory of the leakage of seals with applications

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The leakage of seals involves the flow of fluids in open channels of complex geometrical shapes between regions of different fluid pressure. I will present an analytic theory for the leakage of seals, and discuss the role of surface roughness anisotropy, interfacial hydrophobicity, the ballistic flow of gases, and plasticity. The theory results will be illustrated by applications to rubber and metallic seals, suction cups, and syringes.

The leakage of seals involves the flow of fluids in open channels of complex geometrical shapes between regions of different fluid pressure. This is illustrated in Fig. 1 which shows the flow of a Newtonian liquid from a high pressure region (left side) towards a lower pressure region (right side) [1]. I will discuss how the fluid flow current can be accurately obtained using analytic theory and present a number of practical applications.

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- [1] W.B. Dapp, A. Lücke, B.N.J. Persson, and M.H. Müser *Self-Affine Elastic Contacts: Percolation and Leakage*, Phys. Rev. Lett. **108**, 244301 (2012)

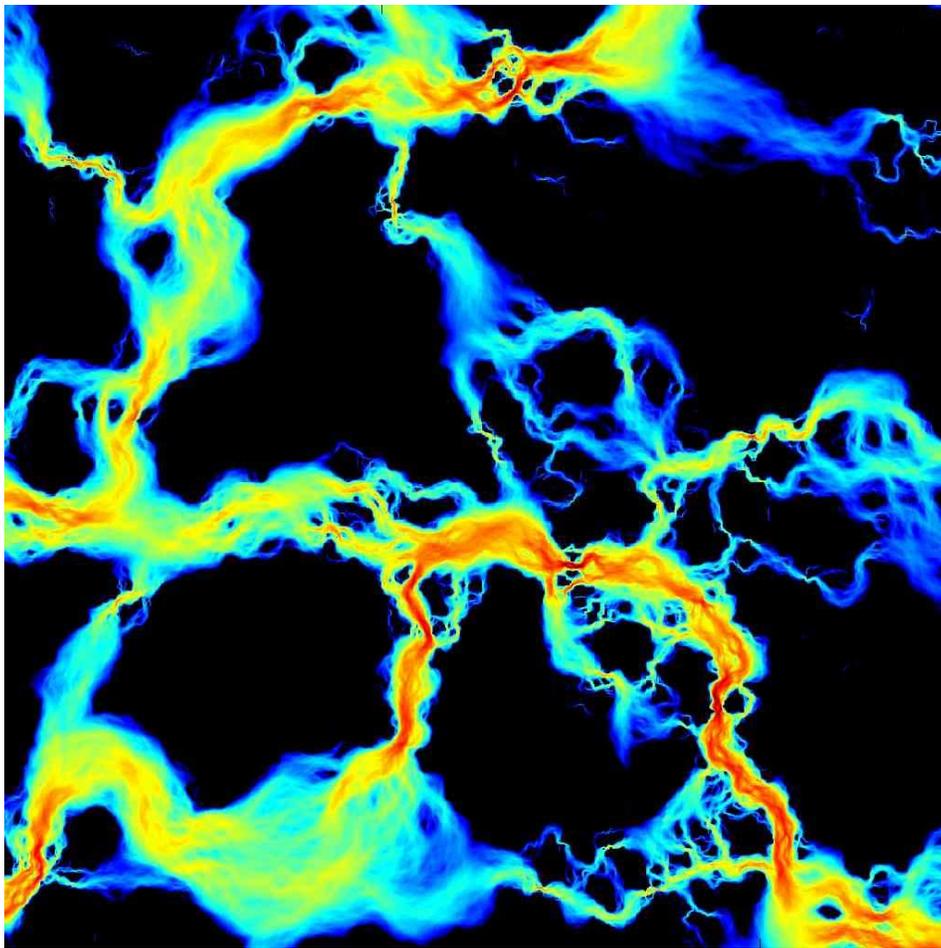


FIG. 1. Fluid flow at the interface between two elastic solids with random surface roughness. From Ref. [1].