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The interaction of cosmic rays with the background plasma during shock acceleration TONY BELL, Imperial College, London, UK — Acceleration of cosmic rays (CR) at shock fronts takes place through the interaction of CR, which must be modelled kinetically, with the background thermal plasma, which can be modelled as a magnetised fluid. The CR gain energy from the difference between the fluid velocities upstream and downstream of the shock. In order to match observations, the scattering of CR by fluctuations in the magnetic field must take place on the scale of a CR Larmor radius and the magnetic field must in many cases be greater than that far upstream of the shock. We show that CR naturally excite an instability which can non-linearly amplify the magnetic field by orders of magnitude. We explain how the instability works, why it can grow beyond $\delta B/B \sim 1$, and show that as well as producing very large fields it also produces voids in the background plasma of very low density and very low magnetic field. We discuss the relationship to observation and how CR might react on the background plasma to produce observable macroscopic structures including filaments and beams.

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