Determining the direction of a turbulent cascade[1] WALTER GOLD-
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Technology — In two-dimensional (2D) turbulence, one expects a cascade of energy
to larger spatial scales, while the enstrophy cascade is to smaller ones. Here we
present a new tool to study cascades using simple ideas borrowed from informa-
tion theory. It is entirely unrelated to the Navier-Stoke's equations or any scaling
arguments. We use the conditional entropy (conditioned uncertainty) of velocity
fluctuations on one scale conditioned on another larger or smaller scale. If the en-
tropy is larger after conditioning on larger scales rather than smaller ones, then the
cascade is to smaller scales. By varying the scale of the velocity fluctuations used
in the conditioning, we can test both direction and locality. We use these tools on
experimental data taken from a flowing soap film, an approximately 2D turbulent
flow. The Reynolds number is varied over a wide range to determine the entropy's
scaling with Reynolds number

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