Mapping the structure of animal behavior GORDON BERMAN,
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— Most animals possess the ability to actuate a vast diversity of movements, osten-
sibly constrained only by morphology and physics. In practice, however, a frequent
assumption in behavioral science is that most of an animal's activities can be de-
scribed in terms of a small set of stereotyped motifs. Here we introduce a method
for mapping the behavioral space of organisms, relying only upon the underlying
structure of postural movement data to organize and classify behaviors. Applying
our method to movies of size closely-related species of freely-behaving fruit flies, we
find a wide variety of non-stereotyped and stereo-typed behaviors, spanning a wide
range of time scales. We observe subtle behavioral differences between these species,
identifying the some of the effects of phylogenic history on behavior. Moreover, we
find that the transitions between the observed behaviors display a hierarchical syn-
tax, with similar behaviors likely to transition between each other, but with a long
time scale of memory. These results suggest potential mechanisms for the evolution
of behavior and for the neural control of movements.

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