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Axion mass from magnetic monopole loops

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We show that axions interacting with abelian gauge fields obtain a potential from loops of magnetic monopoles. This is a consequence of the Witten effect: the axion field causes the monopoles to acquire an electric charge and alters their energy spectrum. The axion potential can also be understood as a type of instanton effect due to a Euclidean monopole worldline winding around its dyon collective coordinate. We also discuss how this potential affects phenomenology in the case of a minimal U(1) hidden sector.

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