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Academic Hertzsprung-Russell Diagram as a Diagnostic Tool for Student Learning in Introductory Physics JACOB BUCHMAN, JON PERRY, JAMES OVERDUIN, THOMAS KRAUSE, Department of Physics, Astronomy and Geosciences, Towson University — We report on preliminary results of a statistical study of student performance in more than a decade of calculus-based introductory physics courses at Towson University. For this anonymized sample of over a thousand students, we calculate average termwork and test grades for each student, and treat these as proxies for "student effort" and "student achievement/understanding," respectively. We plot "achievement" vs. "effort" in exactly the same way that astronomers plot luminosity vs. temperature for stars on the Hertzsprung-Russell diagram. As in the astronomical case, we find that most students lie along what can be called a "main sequence," but also that there are small groups roughly corresponding to both "dwarf" and "giant" stars (i.e., students who achieve little despite apparently expending great effort, and vice versa). We then study the evolution of this diagram in time, showing that the academic main sequence has begun to break down in recent years, losing its structure as student achievement has become decoupled from "effort" (as measured by graded homework problems). We argue that this breakdown is likely related to the emergence of easily accessible online solutions to most textbook problems, and discuss possible responses and strategies for maintaining and enhancing student learning in the online era.

Jacob Buchman
Department of Physics, Astronomy and Geosciences, Towson University

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