Newton's Third Law at a Traffic Intersection

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Many physics students seem to have the impression that physics is something found only in textbooks; therefore it is particularly nice to show them physics phenomena in the "real" world. I recently noticed an interesting example of Newton's third law at a traffic intersection on campus, and students are quite intrigued by it.

Fig. 1. What happened to these lines painted on a road?

Figure 1 shows part of a road at the intersection, from the curb and gutter in the foreground (bottom of photograph) to the center of the road (top). The white lines painted on the road show a rather unusual pattern—indeed, it looks as if the road-painters went berserk! However, the lines were straight when originally painted, eventually assuming the shape in the photograph.

Fig. 2. A car accelerating to the right across the lines.

What happened to the lines? There are traffic lights at this intersection, and each day hundreds of cars stop just to the left of the lines. When the light turns green, the cars accelerate to the right (Fig. 2). To achieve this acceleration, the car tires exert a backward force on the road (to the left in the photograph), and by Newton's third law, the road exerts a forward force on the tires, i.e., on the car. At this particular intersection, the top layer of pavement is poorly bonded to the underlying layers, and the backward force on the road under the tires has actually caused the top layer to slide to the left, as seen from the photo, leading to the unusual bends in the painted lines. ♦

Newton's Fourth Law

We would like to draw attention to Newton's fourth law, a matter of common observation though sadly neglected in theoretical physics: *The weight of an object, particularly if it is very heavy, is proportional to the time you carry it.*

The Editor