Émilie Du Châtelet, *Foundations of Physics*, 1740.
Translated by Katherine Brading *et al.* [1] at the University of Notre Dame and Duke University.
Footnotes are ours except where otherwise indicated.
Du Châtelet's marginal notes are placed in **{bold}** in the closest appropriate place in the text. Please see the French original for the position of each note in the margin alongside the paragraph. Figures are available in the original text, and online via the BNF.

Chapter 11. Of Motion, and of Rest in general, and of Simple Motion

[See Bour and Zinsser for the beginning of this chapter, §§211-46. An alternative translation of §§211-17 is included below.]

211. {Definition of Motion.} Motion is the passage of a Body from the place that it occupies into another place.

212. {Three kinds of motion.} We distinguish three kinds of motion: absolute motion, common relative motion, and proper relative motion.

213. {Of absolute motion.} Absolute motion is the successive relation of a Body to different Bodies considered as immobile, and this is real motion, and properly so called.

214. {Of common relative motion.} Common relative motion is that which a Body experiences when, being at rest with respect to the Bodies that surround it, it nevertheless acquires along with them successive relations, with respect to other Bodies, considered as immobile, and this is the case in which the absolute place of Bodies changes, though their relative place remains the same; and it is what happens to a Pilot, who sleeps at the tiller while his Ship moves, or to a dead fish carried along by the current of water.[2]

215. {Of proper relative motion.} Proper relative motion is that which one experiences when, being transported with other Bodies in a common relative motion, one nevertheless changes one's relations with them, as when I walk on a Ship that is sailing; for I change at every moment my relation with the parts of this Ship, which is transported with me.

[1] Monica Solomon and Penelope Brading.
[2] This is the type of motion that Du Châtelet needs in order to try to address the nut example in the scholium to the definitions of Newton's *Principia*.

216. {Examples of different kinds of motion.} The parts of every moving body are in common relative motion; but if they came to be separated, and if they were to continue to move as before, they would acquire a proper relative motion.

217. If a Ship went towards the East, and if a man were to walk on the Ship from the stern to the prow,[3] that is to say, from the East toward the West with the same speed as the Boat, this man would have, while he traverses the length of this Ship, a proper relative motion, but his absolute motion would be only apparent, since in changing at every moment his situation in relation to the parts of this Ship, he would nevertheless remain always in the same relation to the points outside the Ship.

If, on the contrary, this man walked on this Ship from the stern to the prow, that is to say, in the same direction as the Ship carrying him, he would have at the same time a relative common motion with the Ship, and a relative proper motion; for he would change at every moment his situation with the parts of this Ship, and with the Bodies outside the Ship: it is this kind of motion that all the Bodies moving on the earth experience, for the earth moves unceasingly.

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247. {Of accelerated motion.} A Body has an accelerated motion when some new force acts upon it and increases its speed.

248. The motion of a Body can nevertheless be accelerated only when the new force that acts upon it acts entirely or partially in the direction in which the Body is already moving.

249. {Of decelerated motion.} The motion of a Body is decelerated when some force opposed to its own removes from it a part of its speed.

250. The motion of a Body is either equally or unequally accelerated, depending on whether the new force that acts on it acts equally or unequally in equal times; and the motion is equally or unequally decelerated, depending on whether the losses that happen are equal or unequal in equal times.

251. When the motion of a Body is equally accelerated in equal times, the speeds of this Body increase as the times of its motion.

[See Bour and Zinsser for §§252-3.]

254. The greater the speed of a Body, the more Space it traverses in a given time, and vice versa.

[3] This is the wrong way round in the 1740 first edition, but corrected in the second edition.

In accelerated motion, the Space traversed is all the greater in a given time as the speed is all the more increased; and in decelerated motion, the Space traversed is all the lesser in a given time as the speed is all the more diminished; for by the Second Law, the changes that happen in motion are always proportional to the force that produces them.

255. {Of the comparison of the motion of Bodies.} If we compare several Bodies that are in uniform motion, and that have equal speeds, the Spaces traversed will be as the times of their motion.

If the speeds are unequal and the times equal, the Spaces traversed will be as the speeds. If the speeds and the times are unequal, the spaces will be in the composite ratio of the ratios of the speeds and of the times, or as the products of the time of each of these Bodies multiplied by its speed. And finally, if the speeds and the Spaces are unequal, the times will be in direct ratio to the Spaces and in inverse ratio to the speeds; for a Body needs more time to traverse a given Space as this Body has less speed.

[See Bour and Zinsser for §§256-8.]

259. [See Bour and Zinsser for the opening paragraphs.] When the mass of this Body is a certain proportion of the mass of the Body that pushed it, this Body advances perceptibly, and when at a certain point its mass surpasses that of the Body that acts upon it, this Body advances infinitesimally; but in either case the reaction is always equal to the action, that is to say, the decrease of the force in the Body that acts is always equal to the force that it has communicated, and thus a Body loses as much of its motion as it communicates. Since the motion of a Body cannot be removed from it except by an equal and opposite force (and in these two very different things, the cessation of motion and its communication), the reaction is always equal to the action. [See Bour and Zinsser for the closing paragraph.]

[See Bour and Zinsser for §§260-61.]

262. [See Bour and Zinsser for the opening paragraph.] For suppose that a Body A that has four units of mass, and a Body B that has two, move with the same speed: this body A can be cut into two equal parts without its motion being stopped; and so each of its halves will be equal to Body B and will continue to move with the same speed that the whole of Body A had before it was cut into two. This double Body must therefore have double the motion.

[See Bour and Zinsser for §§263-70.]