Action–reaction forces

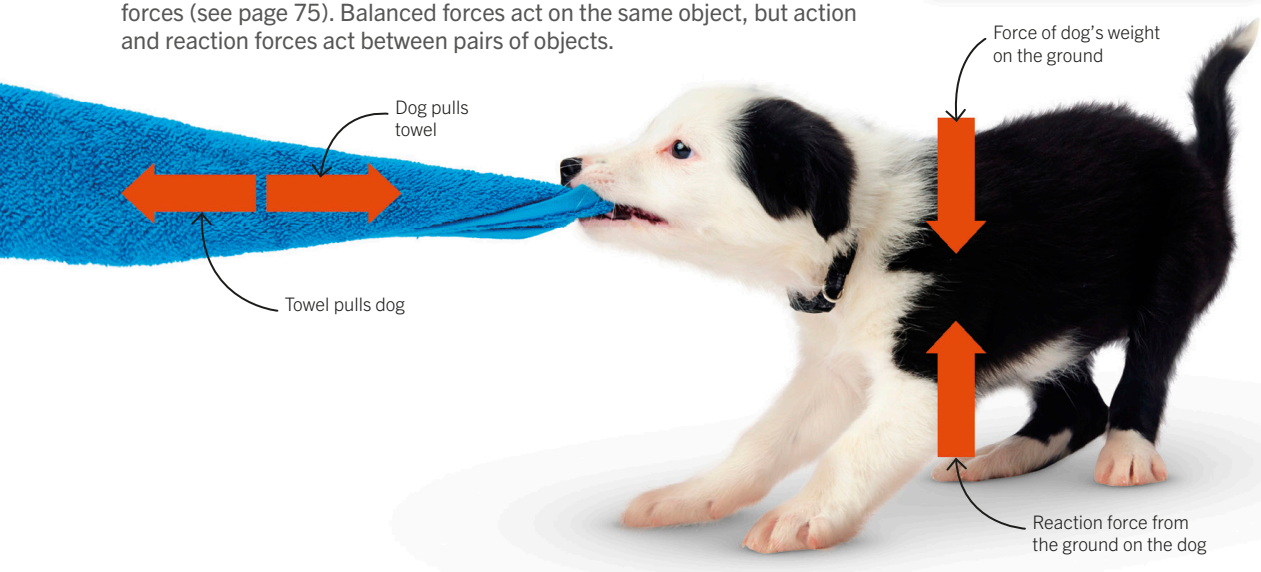
The English scientist Isaac Newton realized that forces always come in pairs. He said that every "action" (meaning force) has an equal and opposite "reaction" (opposing force). We call this Newton's third law of motion.

Key facts

- ✓ **Newton's third law states that every force is accompanied by an equal force acting in the opposite direction.**
- ✓ **Pairs of action and reaction forces are always the same type of force and act between pairs of objects.**
- ✓ **Action and reaction forces shouldn't be confused with balanced forces.**

Action and reaction

This dog is pulling a towel, but the towel is also exerting a pulling force on the dog. These two forces are called action–reaction forces and exist whether the dog is moving or stationary. The dog also exerts a force on the ground because of its weight. This has a reaction force, too: the ground is pushing up on the dog. Action–reaction forces are not the same as balanced forces (see page 75). Balanced forces act on the same object, but action and reaction forces act between pairs of objects.



Effects of action–reaction pairs

Both forces in an action–reaction pair are real and can cause changes in motion or shape for the objects involved. For example, when a skateboarder pushes against a wall, she exerts a force on the wall and the wall exerts an equal and opposite force on her. The wall stays still, but the skateboarder gets a push in the opposite direction. If she pushes against another skateboarder, both move in opposite directions.