The article *What is Force?* demonstrates how an applied force is related to energy change using Newton's Laws. More specifically, the movement of photons could be the source of the energy change for applied forces. These ideas may be further developed by evaluating the movement of energy using the Law of Conservation of Momentum.

The Light Experiment

Figure 25 shows a platform floating in free space with an observer at each end.

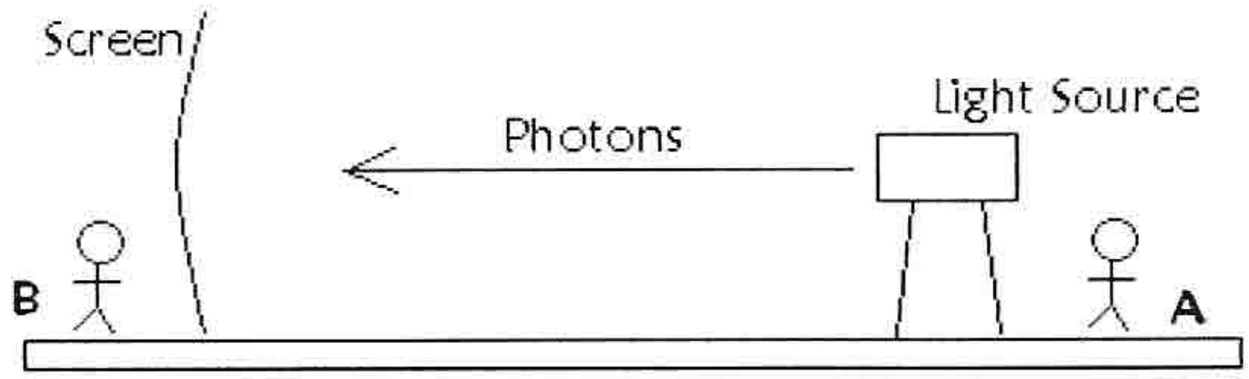

Figure 25. Light shines from the source to the screen.

The platform is stationary relative to our observing reference frame. The observer at A has a powerful light source (with battery). The light source is initially off, then is turned on for a period of time, then is turned off again. The observer at B has a screen that absorbs light energy at 100% efficiency. Real experiments have shown that during the time the light is on, the light source will experience a force that is a reaction to the momentum of the emitted photons (radiation pressure effect). A similar force will occur at the screen when these photons impact it.

If the total energy emitted by the light source is E, then one result of the experiment is a movement of energy from the light source to the screen. Therefore, mass E/c^2 has moved from position A to position B. The platform begins the experiment stationary relative to our observing reference frame. The Law of Conservation of Momentum requires that the platform move during the experiment so that the center of mass of the system stays in the same place as the light energy changes location. This is possible because the photons produce a force on a material when they are emitted, reflected or absorbed. The movement of the platform can be separated into three steps.

1. When the light source is turned on, the photons begin moving to the left and this change in momentum imparts a force on the light source to the right. This force accelerates the platform to the right.
2. When the photons impact the screen, the force on the screen equals the force on the light source and is opposite in direction. These forces

cancel each other and the platform moves with a constant velocity.

3. When the light source is turned off, the force on it stops. The force on the screen continues as long as there are photons traveling to it. This force decelerates the platform until all the photons have impacted the screen and the velocity of the platform returns to zero.

The Motor-Generator Experiment

An experiment similar to the one of Figure 25 is shown in Figure 26.

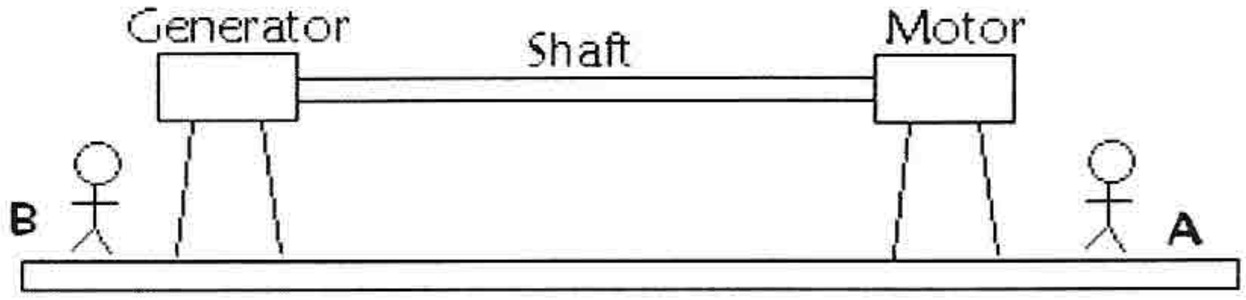

Figure 26. The motor turns the generator using a shaft.

Again, a platform is stationary in our observing reference frame. A motor (with battery) is next to observer A and a generator (with battery) is next to observer B. The motor and generator are connected by a shaft. The motor is initially off, then is turned on for a period of time, then is turned off again. After the experiment is over, the motor battery has lost energy E and the generator battery has gained this energy. There has been a transfer of mass E/c^2 from the position A to position B. The Law of Conservation of Momentum requires the platform to move to the right to keep the system center of mass in the same location.

The movement of this energy requires the identification of a new type of force that is not recognized in Newtonian Physics. This is the Moving Energy Force (MEF). As the energy E moves left through the rotating shaft, forces must be generated, simulating the three steps outlined for Figure 25.

1. When the motor is first turned on, the signal of this event will not reach the generator instantaneously, it must travel down the shaft. The maximum possible velocity for this energy movement is the speed of light. During this time, there must be a force on the motor that pushes it to the right. This force is an MEF and accelerates the platform.
2. When the signal of energy transfer (shaft rotation) reaches the generator, the generator rotates and transfers the energy to its battery. This process produces and MEF on the generator to the left. The platform now has

MEF's balancing each other and moves with a constant velocity.

3. As the motor is turned off, the MEF at position A stops. The signal of the motor being turned off also travels down the shaft at a maximum speed of the speed of light. The MEF at the generator continues until this signal arrives and the energy transfer is complete. The platform has been decelerated by the generator MEF until its velocity is zero.

The Linear Motion Experiments

Figure 27 shows an experiment with linear forces. A motor (with battery) at position A operates a wheel that drives a shaft linearly as shown. A collar at position B exerts a frictional force on the shaft. When the shaft moves through the collar, heat is produced.

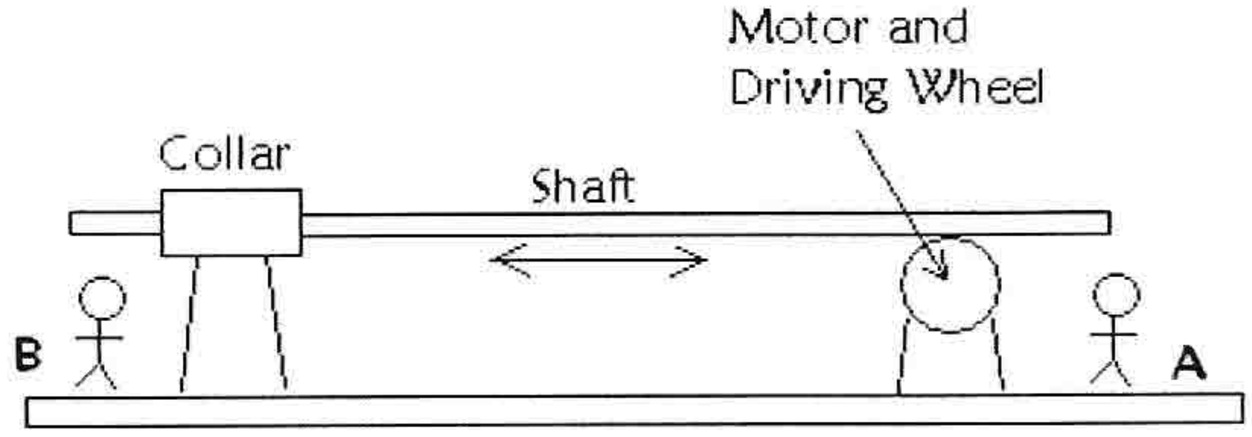

Figure 27. A motor moves a shaft linearly through a collar.

The shaft has mass, but the effects on the platform due to the movement of this mass can be figured separately. Whether the shaft moves to the right (producing tension in the shaft) or to the left (producing compression), there is an energy transfer from position A to position B. Note that the energy must travel "up" from the motor to the shaft, then "left" from position A to position B, then turn at a right angle again to go into the friction collar. Each turn of the energy flow must produce an MEF to react to the movement of the mass of the energy. At the completion of the experiment, the MEF net effect is to produce the same three steps as outlined previously, regardless of the motion of the shaft.

Conclusions

The article *What is Force?* reveals a key relationship between energy flow and applied force. This principle is further defined when the mass of energy is put into dynamic situations. The fact that energy has mass requires the concept of MEF if the Law of Conservation of Momentum is to be observed for the experiments cited. This is true even if relativistic velocities are not involved. Energy flows through objects and devices like water flows through a system of pipes. Each turn or end point in the flow is the source of an MEF. Now consider that in the experiment of Figure 25, the flow of light (photons) also produces forces. Could these two situations be related? See the article *Static Force*.