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A QUEER KETTLE

By Dr. Edwin E. Slosson

"If a kettle of water be placed on a fire there is a chance, though an exceedingly small one, that the water will freeze." This startling saying, quoted from Planck by Paul R. Heyl of the Bureau of Standards, is an admirable illustration of how much the scientific viewpoint of the twentieth century differs from that of the nineteenth.

We were taught in school that heat always flows from a hot to a cold body, and we verified this law for ourselves frequently and sometimes unpleasantly. If we touched a boiling tea-kettle, the heat flowed into our finger before we could snatch it away. If we touched a lump of ice the heat ran into the ice and the finger became cold.

Twentieth century physicists do not presume to contradict these facts, nor do they propose to abrogate the law, yet they point out that the law is not an absolute rule but a statistical average, based upon the calculation of probabilities. It holds in the long run and on the whole, yet there may be, in fact must be, local and temporal exceptions.

Just so a man might say of the Hudson River tunnel that in the morning the crowd flows from New Jersey to New York, and in the evening from New York to New Jersey. Quite true, yet if we look more closely we observe that a minor proportion of passengers are going in the opposite direction from the majority, both morning and evening.

Now from the point of view of the physicist the difference between a hot body and a cold body is that in the former the molecules are moving about more rapidly on the average. But the molecules of both are moving with various and varying velocities, and when the two bodies are in contact they influence one another, both ways, Heat is continuously flowing from the cooler to the warmer, running up hill, so to speak, but this minor effect is masked by the overwhelming current of heat running down to the cooler body.

Nevertheless, as Dr. Heyl points out, this involves the admission that perpetual motion, which was anathema to nineteenth century science, is theoretically possible on a very small scale, although it is practically impossible on a large scale. In other words, the heat might all run from the kettle of water to the fire -- only never does.
