Dr. Wilkinson's Desired features:

For simplicity, a portable device that models the left ventricle and left circulation only. For clarity, the device should consist of discrete structures functioning as:

- A ventricle (pump) with inlet (AV) and outlet (aortic) one-way valves. Might be powered by squeezing.
- Arteries, comprising a single large elastic tube with compliance; connected to outlet of pump.
- Veins, comprising a single large elastic tube with compliance, connected to inlet of pump. Compliance of this tube should be about 24 times the compliance of the arterial tube (e.g. about 5 times the dispensability and 5 times the volume at low/zero pressure).
- Resistance vessels, comprising small diameter tube/tubes connecting the arteries to the veins. Resistance should be variable over about the same range as human total peripheral resistance (e.g. sitting versus exercising).
- Pressure in the arteries and veins should be evident by expansion of the tubes, like balloons.

The device should be able to illustrate the following:

- With a pressure that models 8 mm Hg in the circulation, heart stopped, venous side should blow up to hold about 24 times the volume of arterial side.
- Pumping the heart should transfer fluid (air or liquid) from the venous side to the arterial side, and stay there (resistance of resistance vessels made infinite with a shut-off valve).
- With a "leak" via resistance vessels, a student pumping the heart should observe that only one pumping rate will maintain the venous pressure (or volume) constant (should be about 4 mm Hg). If he pumps too hard, the venous side will empty out; too soft and the venous side will fill completely. Arterial pressure should be about 120 mm Hg. Put another way, the student is asked to "obey" Starling's Law, and observe the consequences.
- With a change in resistance, a student should observe that the pumping rate to maintain constant venous pressure changes such that more cardiac work is required with lower resistance. It should be evident that the arterial pressure remains constant as well, but that cardiac output increases (appropriate range: from about 5 l/min to about 25). Pressures and flow rates can be arbitrary, but in approximate proportion to the physiological numbers given above.
- With a change in filling volume (e.g. diuresis or blood loss) a student should observe the effect on venous and, consequently, arterial pressure.

Possible additional features:

- Pressure transducers to quantitate pressures and visualize waveforms
- Red and blue colors representing arterial and venous blood
- Long-lasting materials (e.g. no latex rubber)
- Low price (~$500 or less; need six)