What is claimed is:

1. A blood pump system switchable between a first flow direction and a second flow direction, the blood pump system comprising:

a filter trap; and

a blood pump comprising:

a pump housing comprising:

a first connector configured as a fluid inlet into the pump housing in the first flow direction and as a fluid outlet from the pump housing in the second flow direction; and

a second connector in fluid communication with the filter trap, the second connector configured as a fluid inlet into the pump housing in the second flow direction and as a fluid outlet from the pump housing in the first flow direction; and

an impeller disposed within the pump housing, the impeller configured to rotate at a predetermined pump speed in a first rotary direction to generate fluid flow in the first flow direction at a first pressure and a first flowrate, the impeller configured to rotate in second rotatory direction, opposite the first rotary direction, at the predetermined pump speed to generate fluid flow in the second flow direction at a second pressure and a second flowrate, the first flowrate greater than the second flowrate and the first pressure greater than the and the second pressure.

2. The blood pump system according to claim 1, wherein the impeller comprises:

a body having a first segment and a second segment; and

a vane extending radially outward from the body and helically wrapped about the second segment of the body.

3. The blood pump system according to claim 2, wherein the vane has a rake such that radially outer parts of the vane are farther from the first segment than radially inner parts of the vane.

4. The blood pump system according to claim 2, wherein the vane helically wraps about the second segment of the body with a variable pitch such that parts of the vane closer to the first segment have a lesser pitch than parts of the vane farther from the first segment.

5. The blood pump system according to claim 2, wherein the first segment is substantially egg-shaped and the second segment is frustoconically shaped.

6. The blood pump system according to claim 1, wherein the filter trap includes a one-way valve configured to remain closed when fluid flows through the pump housing in the first flow direction and to open when fluid flows through the pump housing in the second flow direction.

7. The blood pump system according to claim 6, further comprising a vacuum fluidly coupled to the filter trap.

8. The blood pump system according to claim 6, wherein the filter trap comprises:

a housing;

a first trap connector;

a second trap connector;

a perforated wall disposed within the housing, the perforated wall defining an interior chamber and an exterior chamber within the housing; and

the one-way valve segregating the interior chamber into an inlet section and a trap house.

9. The blood pump system according to claim 8, wherein the perforated wall defines a plurality of perforations, each perforation having a diameter in the range of 50 μm to 100 μm.

10. The blood pump system according to claim 8, wherein the one-way valve comprises two flexible members attached to the perforated wall, the two flexible members configured to engage each other in a closed position and to separate from each other in an open position.

11. The blood pump system according to claim 10, wherein the two flexible members are self-biased towards to the closed position.

12. The blood pump system according to claim 10, wherein the perforated wall includes a first perforated portion and a second perforated portion, the first perforated portion separated from the second perforated portion by an unperforated portion.

13. The blood pump system according to claim 12, wherein the two flexible members each include a wall engagement portion configured to engage the unperforated portion when the two flexible members are in the open position.

14. The blood pump system according to claim 13, wherein when each flexible member is in the open position and engaged with the unperforated portion of the perforated wall, each flexible member defines a trap room with the perforated wall.

15. The blood pump system according to claim 14, wherein the second perforated portion is segregated from the trap house within a respective trap room by the flexible members.

16. The blood pump system according to claim 15, wherein fluid flow through the filter trap in the second flow direction is impeded from flowing through the second perforated portion by the flexible members engaged with the unperforated portion.

17. The blood pump system according to claim 1, further comprising a gas exchanger fluidly coupled with the pump housing.

18. The blood pump system according to claim 1, further comprising heat exchanger fluidly coupled to the pump housing configured to maintain a desired temperature of a fluid.

19. The blood pump system according to claim 1, wherein the first pressure is greater than the second pressure, and the first flowrate is greater than the second flowrate.

20. A method of pumping blood in a first direction and a second direction, the method comprising:

inserting a first tube into a first blood vessel of a patient, the first tube fluidly coupled to a blood pump;

inserting a second tube into a second blood vessel of the patient, the second tube fluidly coupled to the blood pump;

operating the blood pump at a first operational pump speed such that blood flows through the blood pump in a first flow direction into the first blood vessel of the patient at a first pressure and a first flowrate; and

operating the blood pump at the first operational pump speed such that blood flows through the blood pump in a second flow direction into the second blood vessel at a second pressure and a second flowrate, the first flowrate greater than the second flowrate and the first pressure greater than the second pressure.