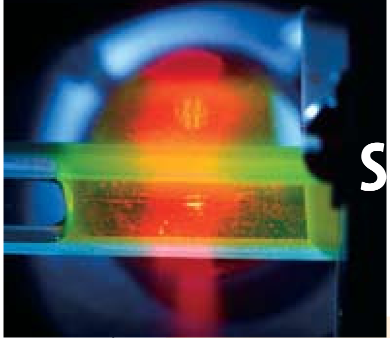

The Wonderful Net

Freak chance or deliberate design?

Swimsuit-clad men, determined to qualify as U.S. Navy Seals, sit in the cool ocean water off Coronado Island near San Diego, California. Their body temperature gets lower and lower until they become hypothermic and incoherent after just a few hours in the water. Nearby, shorebirds such as the heron, stand motionless in the same water yet their body temperature does not fall. How can this be so? The answer is that herons, but not human beings, employ a principle called "counter-current exchange" to conserve heat that would otherwise be lost to the ocean water. P. F. Scholander has called the counter-current exchanger "the wonderful net" and characterizes it as "a truly remarkable piece of biological engineering." [1]

Heat flows from warmer to cooler areas. Moving the areas in opposite, or counter, directions makes heat flow between the two areas much more efficient. In the heron, warm blood flows down out of the bird's trunk and into its legs through arteries that are closely interwoven with a network of veins coming up from the legs, carrying cool blood in the opposite direction. Heat from the arterial blood quickly moves into the cold, venous blood. This warms the blood coming into the bird's main body and cools the blood going out. Along with an insulating layer of feathers, this wonderful net of blood vessels keeps the heron from becoming hypothermic. People have a similar counter-current exchanger in the kidneys to regulate salt and water balance, but do not use counter-current nets of blood vessels to reduce heat loss to the environment. Instead, the human body restricts blood flow to the skin, reduces blood flow into arms and legs, and generates heat by shivering.

Counter-current exchangers are also found in some land animals like the armadillo, the sloth, and the anteater, which are very sensitive to low temperatures, but not in other animals like the fox or the Husky sled dog. Some shorebirds, like herons and cranes, have counter-current nets while other waterfowl, like ducks, geese, and gulls, do not. It seems that ducks and geese have a need, not to conserve, but to lose body heat because of their very efficient body insulation.

Scholander concedes that counter-current exchangers appear to be designed, or engineered, solutions to the specific physiological challenges faced by some animals but not others. They are found in animals as diverse as the tuna, the seal, the squirrel, and the heron but not in other types of birds or land animals. In other words, they are used selectively and intelligently on an "as needed" basis. Evolution proponents call this "convergent" evolution—where unrelated animal groups independently evolve the same solution to a common problem. This is interesting speculation, but naming something does not explain, nor prove, how it came to be. By contrast, we could reasonably infer that this "truly remarkable piece of biological engineering" came from the hand of the truly remarkable Creator who used the appropriate design elements, where needed, for each type of animal and for people.

—MICHAEL G. WINDHEUSER, PH.D.

1 P.F. Scholander, "The Wonderful Net," in *Vertebrate Structures and Functions: Readings from Scientific American* (San Francisco, CA: W.H. Freeman and Company, 1969), pp.125-131.