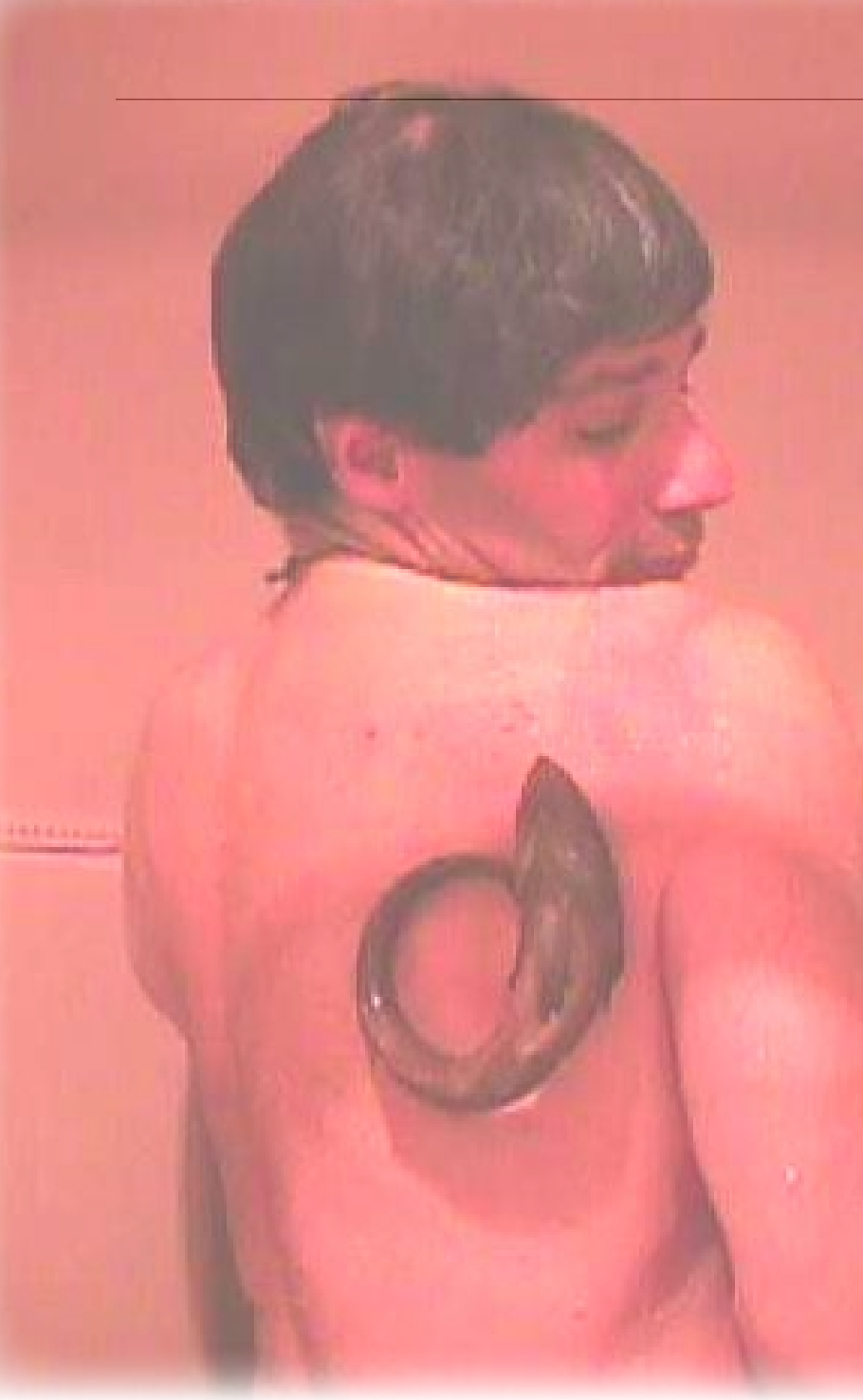


Fish, Fish, Fish

compiled by Alice Shirrell Kaswell, Improbable Research staff

Frank Fish is a Professor of Biology at West Chester University in West Chester, Pennsylvania. He studies energetics and hydrodynamics of vertebrate swimming, with particular regard to propulsive modes and the evolution of aquatic mammals. He also likes fish.

We previously presented some of Professor Fish's work (see "What Do Fishes Know About Fishes?" *AIR* 9:4) and some photographs of him in the company of several kinds of fish and other animals (see the *AIR* Vents column for the past several years).

Here is a further selection of Fish's citations and cetaceans and fish and much else. The citations are partial -- just the titles and publication years of some of Professor Fish's studies on swimming, fish, or related subjects. For fuller details, see any good database or see Professor Fish's web site http://darwin.wcupa.edu/~biology/fish/fishcv.html.

1982 - Muskrats

Aerobic energetics of surface swimming in the muskrat (Ondatra zibethicus).

Function of the compressed tail of surface swimming muskrats (Ondatra zibethicus).

1983 - Muskrats

Metabolic effects of swimming velocity and water temperature in the muskrat (Ondatra zibethicus).

1984 - Muskrats, alligators

Mechanics, power output, and efficiency of the swimming muskrat (Ondatra zibethicus).

Kinematics of undulatory swimming in the American alligator.

1987 - Alligators, frogfish

Behavioral thermoregulation of small American alligators in water: Postural changes in relation to the thermal environment.

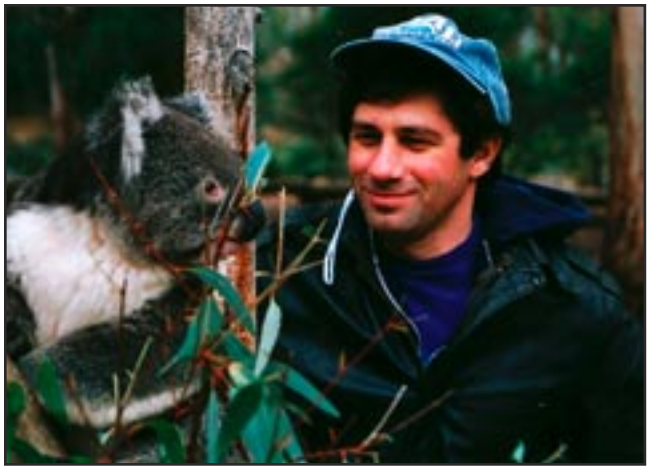
Kinematics and power output of jet propulsion by the frogfish genus Antennarius (Lophiiformes: Antennariidae).

1988 - Seals

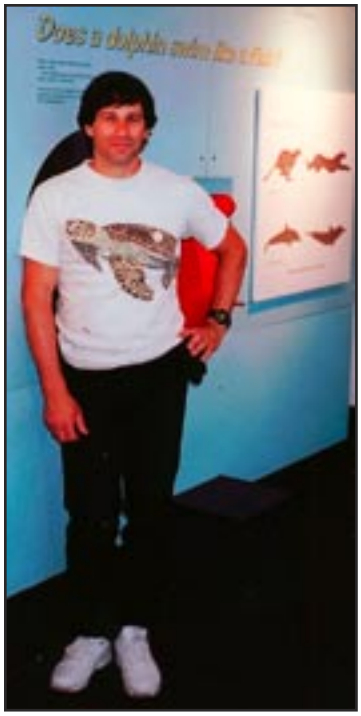
Kinematics and estimated thrust production of swimming harp and ringed seals.

1990 - Flying fish

Wing design and scaling of flying fish with regard to flight performance.



1991 - Bats, fish, dolphins



Hydrodynamics of the feet of fish-catching bats: Influence of the water surface on drag and hydrodynamic design.

Burst-and-coast swimming in schooling fish (Notemigonus crysoleucas) with implications for energy economy.

Dolphin swimming: A review.

1992 - Fins, locomotion

On a fin and a prayer.

Aquatic locomotion.

1993 - Opossums, dolphins, swimming

Comparison of swimming kinematics between terrestrial and semiaquatic opossums.

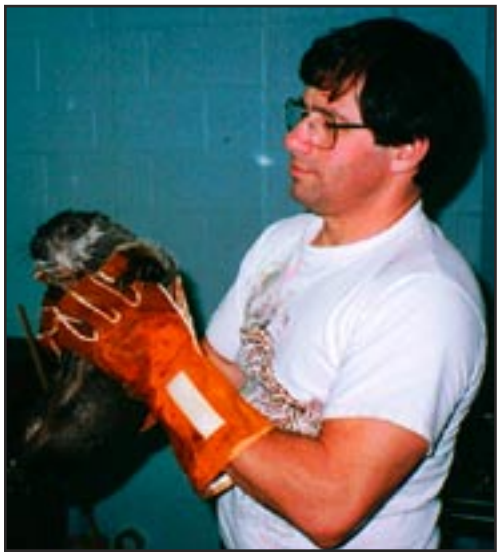
Power output and propulsive efficiency of swimming bottlenose dolphins (Tursiops truncatus).

Influence of hydrodynamic design and propulsive mode on mammalian swimming energetics.

1994 - Ducklings, ducklings, otters

Energy conservation by formation movement: Metabolic evidence from ducklings.

Scaling of the locomotory apparatus and paddling rhythm in swimming mallard ducklings (Anas platyrhynchos): Test of a resonance model.



Association of propulsive mode with behavior by swimming river otters (Lutra canadensis).

1995 - Ducklings, flippers, ducklings

Hydroplaning by ducklings: Overcoming limitations to swimming at the water surface.

Hydrodynamic design of the humpback whale flipper.

Kinematics of ducklings swimming in formation: Energetic consequences of position.

1996 - Swimming, mammals

Measurement of swimming kinematics in small terrestrial mammals.

Transitions from drag-based to lift-based propulsion in mammalian aquatic swimming.

1997 - Flatfish, platypuses, cetaceans

Opercular jetting during fast starts by flatfishes: Adhesion attenuation or jet propulsion?

Energetics of swimming by the platypus (Ornithorhynchus anatinus): Metabolic effort associated with rowing.

Locomotor evolution in the earliest cetaceans: Functional model, modern analogues, and paleontological evidence.

1998 - Dolphins, drag, cetaceans, flukes

Observations of dolphin swimming speed and Strouhal number.

Imaginative solutions by marine organisms for drag reduction.

Comparative kinematics and hydrodynamics of odontocete cetaceans: Morphological and ecological correlates with swimming performance.

Biomechanical perspective on the origin of cetacean flukes.

1999 - Rats, flying, dolphins

Energetics of locomotion by the Australian water rat (Hydromys chrysogaster): Comparison of swimming and running in a semiaquatic mammal.

Energetics of swimming and flying in formation.

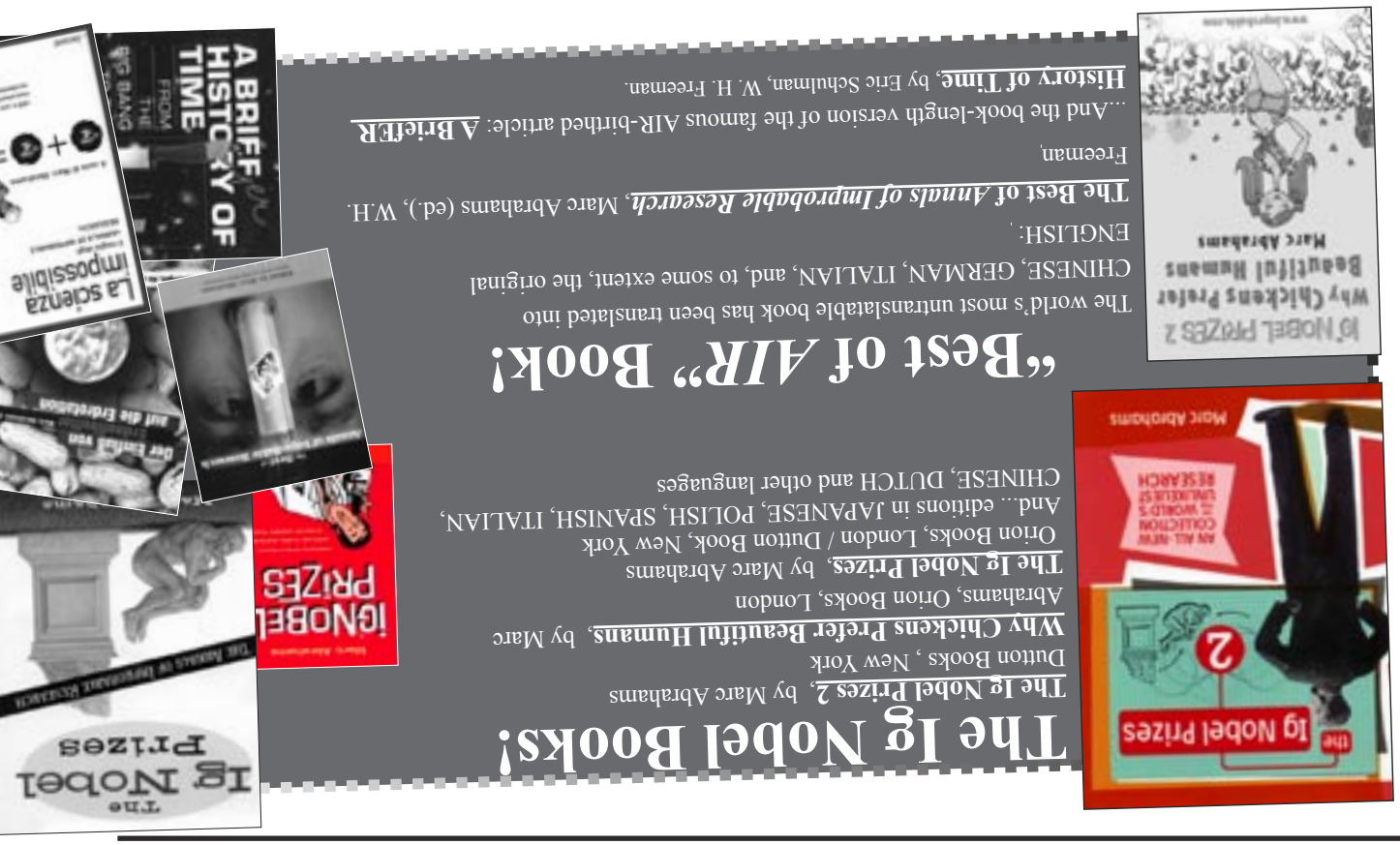
Review of dolphin hydrodynamics and swimming performance.

2000 - Sharks, propulsion, biomimetics, cetaceans, fish, mammals

The role of the pectoral fins in body trim of sharks.

Review of natural underwater modes of propulsion.

Limits of nature and advances of technology: What does biomimetics have to offer?



Phase relationships between body components of odontocete cetaceans in relation to stability and propulsive mechanisms.

Swimming in fish.

Biomechanics and energetics in aquatic and semiaquatic mammals: platypus to whale. Water, land and air: unifying principles in locomotion.

2001 - Platypuses, mammals

Energetics of terrestrial locomotion of the platypus Ornithorhynchus anatinus.

Mechanism for evolutionary transition in swimming mode by mammals.

2002 - Speed, streamlining, speed, balancing, fur

Speed.

Streamlining (Morphology).

Maximum swim speeds of captive and free ranging delphinids: critical analysis of extraordinary performance.

Balancing requirements for stability and maneuverability in cetaceans.

Fur doesn't fly, it floats: buoyancy of hair in semi-aquatic mammals.

2003 - Sea lions, sharks, beetles, cetaceans

Maneuverability by the sea lion, Zalophus californianus: Turning performance of an unstable body design.

The shark has sharp turns.

Aquatic turning performance by the whirligig beetle: Constraints on maneuverability by a rigid biological system.

Stabilization mechanism in swimming odontocete cetaceans by phased movements.

2004 - Flippers, cetaceans, dolphins, humpbacks, porpoises

Leading edge tubercles delay stall on humpback whale (Megaptera novaeangliae) flippers.

Strouhal numbers and optimization of swimming by odontocete cetaceans.

High performance turning capabilities during foraging by bottlenose dolphins.

A bumpy ride for humpbacks.

A porpoise for power.

2005 - Flippers

Stall delay by leading edge tubercles on humpback whale flipper at various sweep angles.

2006 - Control, dolphins

Passive and active flow control by swimming fishes and mammals.

Dynamics of the aerial maneuvers of spinner dolphins.