### NJIT professor's research suggests changes in underwater data communications

An NJIT professor who has discovered new communication channels in underwater environments and invented a technique to communicate data through these channels was honored later in October by the New Jersey Inventors Hall of Fame. His work will eventually allow multiple users and underwater vehicles and instruments to communicate information and data faster and more reliably in complex underwater environments. The National Science Foundation has supported this research.

Ali Abdi, Ph.D., associate professor in the department of electrical and computer engineering at NJIT received the 2008 New Jersey Inventors Hall of Fame Innovators Award, on Oct. 23, 2008. The organization will also honor NJIT President Emeritus Saul F. Fenster, Ph.D., professor of mechanical engineering, as a founder of the group.

Underwater communication systems use acoustic pressure channels. Abdi's invention differs from existing systems because his uses acoustic particle velocity channels for data communication. These channels would be able to provide new and extra canals for data communication.

There are obvious advantages to increasing the number of canals. Not only would they increase the speed and reliability of data reception, but more importantly, by going to Abdi's system manufacturers could shrink the size of the receiver receiving the data.

"Today, existing receivers rely upon separated pressure-only sensors that are spaced far apart," Abdi said. "Needless to say, array size can be a serious limitation in many situations, including the modern applications of small, autonomous and unmanned underwater vehicles. My new receiver would allow for a smaller, more nimble and easier-to-use product."

In the 15th century, the celebrated artist and scientist Leonardo da Vinci conducted the first underwater communication trial. By hearing the sound of distant ships, Da Vinci discovered the possibility of long-range underwater sound propagation. The first practical implementation of an underwater wireless system was delayed until 1945, when a single sideband underwater telephone was developed. It is well known that water is a better medium for sound propagation than the air. With a nominal speed of 1,500 meters per second, acoustic waves propagate faster in water, when compared to how they propagate 330 meters per second in air. In addition, acoustic waves can travel more than thousands of kilometers in oceans.

"This invention offers a new way to communicate data in underwater channels," said Abdi. "I see it making a major impact on the commercial and naval underwater acoustic communication systems." Potential users include meteorologists monitoring environmental changes in oceans, especially those linked to hurricanes; off-shore oil-drilling companies overseeing underwater work sites; fisheries who make their business from the water; underwater surveillance operators for homeland security and more.

### St Petersburg flood barrier opened by Putin

Monday, October 7, on his birthday, Russia's Prime Minister, Vladimir Putin, officially opened the most important section of the St. Petersburg flood barrier. This official opening marks a significant milestone in the progress of this enormous project, which can best be described as a combination of the Afsluitdijk, the Haringvlietsluizen, the Hartelkering, and the Maeslantkering in a single project. The completion of this project will make the huge city far more secure against flooding which is a regular occurrence.

Peter the Great founded the city of St. Petersburg in 1703 in Neva Bay at the mouth of the River Neva at the head of the Gulf of Finland. Over the centuries the city has been plagued by floods from the sea, caused by storms in the Baltic Sea. After extremely severe floods in 1955 and 1975, it was decided to construct a dam in Neva Bay to protect the city. Construction started in1979 but a combination of factors caused it to stall in the 1980s.

Royal Haskoning has been involved in studies with a focus on resuming this project and completing the flood barrier since the 1990s. The project involves building a dam (a kind of causeway) around 25 km long. Six sluice complexes for water discharge are being built in this dam (as in the Haringvlietsluizen) and there are two openings for shipping that can be shut (similar to the Hartelkering and the Maeslantkering near Rotterdam). Lastly, the dam will form part of a six-lane ring road around St. Petersburg.

Royal Haskoning is advising the Russian government, the client for this project, on a broad range of hydraulic, technical, and contractual aspects. Construction resumed in full in 2005 and involves the Dutch dredging company Boskalis. The most important section of the project was officially opened Oct. 7 by Prime Minister Putin. This is the vast opening for shipping that can be shut by a kind of Maeslantkering. The ceremony marks an important milestone and the achievement of far greater security against floods for the city and its monumental buildings, such as the Hermitage. Expectations are that this project will still take some years to complete.

Founded in 1881, Royal Haskoning is the oldest firm of engineering consultants in the Netherlands. The company employs 4,300 staff in 68 offices in 24 countries. Royal Haskoning is a multidisciplinary firm with international operations. Its consultants, architects and engineers advise on spatial development, infrastructure and transport, architecture and building, building services, industrial installations, project management, water and water management, environment, coasts and rivers, harbors, and maritime projects. Public and private sectors throughout the world value the organization for its focus on the sustainable interaction between people and the environment.

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