

# Science on the Cutting Edge

by T. Anderson/D. Meyer

The medical community is abuzz - there's been a breakthrough.

You flip on the TV. Sure, you've seen them before, but there's something about press conferences you find irresistible. The throng of eager reporters, the normally reclusive scientists clad in impeccably pressed, pure white lab coats, exhibiting an air of exuberance befitting their first public sighting in five years. You're not sure what's up, but you can tell it's going to be big.

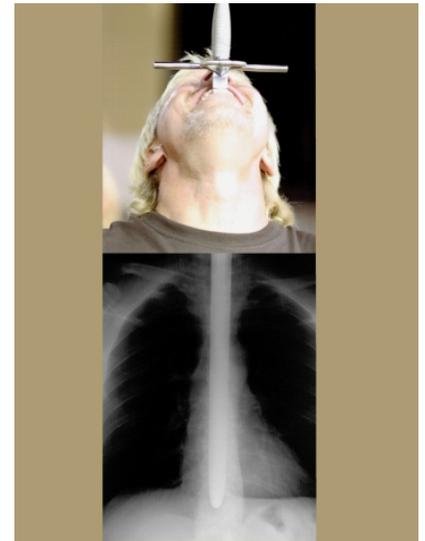
Pan left.

An intruder. A middle-aged man smiles mischievously. He steps into the light, his black jacket standing out in stark contrast to the scientific environment of sterile white labcoats. He draws a 3-foot sword from his scabbard, tilts back his head, and plunges the length of the blade down his throat.

The scientists erupt in wild applause.

Science and swords may seem an odd pair. But, without the contribution of sword swallowers, we may not have some of today's most critical diagnostic tools. Sword swallowers rigorously train themselves to ignore the body's natural gag reflex, making them the perfect test subjects.

With February as National Swallowing Awareness Month, it's only fitting that sword swallowers celebrate World Sword Swallower's Day on the last Saturday of the month. In their honor, and to gain insight into their medical contributions, let's take a closer look at the development of the endoscope.



Sword Swallower Dan Meyer – Inside and Out

Today's flexible endoscopes are widely used by physicians to visually inspect various internal aspects of the body, including the esophagus, the nasal passage, the colon, and respiratory tract. Man's interest in getting a look inside the human body dates back centuries, and a prototype of an endoscope was discovered in the ruins of Pompeii.

But it was not until 1868 that a physician first peered through an endoscope directly into a human stomach. Eureka!

Dr. Adolph Kussmaul, a renowned German physician, developed several innovative diagnostic procedures. But, when it came to fashioning a functioning endoscope, the challenge seemed beyond his reach.



Kussmaul had read of the development, by Antoine Jean Desormeaux in France, of a small tube to examine the urinary tract and bladder. He began work on a similar design for studying the stomach, but his progress soon faltered. Then, the hand of fate swept in. His assistant, while enjoying a pint of beer at a local pub after a hard day's work, was captivated by the evening's performer – a sword swallower.

He gulped down his pint and raced back to tell Dr. Kussmaul what he'd witnessed.

Kussmaul quickly set about designing a prototype based on the sword swallower's act. He meticulously sketched out the specifications - a rigid 18-inch stainless steel tube, one-half inch in diameter. He'd illuminate it with an external alcohol-turpentine lamp, like Desormeaux. He took the drawings to a skilled instrument maker, and the resulting endoscope was perfect.



Kussmaul's device was revolutionary. Interest in peering into the very core of the human body spread quickly, and he was asked to demonstrate the endoscope in Freiburg at a meeting of the Society of Naturalists. But, how could he possibly do it? Where would he find someone capable of serving as the test subject? Yes, of course – he would use the sword swallower!

This rudimentary beginning laid the foundation for the modern, flexible endoscope. Dr. Kussmaul and his sword-swallowing associate toured extensively, giving demonstrations at leading hospitals, and soon even Desormeaux was using an endoscope to examine esophageal disorders.

Men of steel. In 1894, sword swallower Chevalier Cliquot swallowed 14 swords at one time, stunning the physicians at New York's Metropolitan Throat Hospital so much, that one doctor impulsively rushed in and removed the swords at once, causing lacerations that left the performer incapacitated for months. In the 1930s, Delno Fritz made the ultimate sacrifice for science. He died of complications from testing a bronchialscope. During the testing a screw came loose and lodged in his lung, resulting in pneumonia and his untimely demise.

Today there are less than a few dozen surviving sword swallowers left actively performing around the world. Gone are the days of the traveling sideshows where they plied their dangerous craft. Gone are the acts of daring that tantalize all, traumatize the young, and terrify the fainthearted. Gone are the magical days of covering one's face, not daring to look, but being unable to turn away. Or, are they?

Each year, the last Saturday in February is celebrated as World Sword Swallower's Awareness Day. Dan Meyer, President of the Sword Swallower's Association International (SSAI), said the day is held in conjunction with February's National Swallowing Awareness Month.

"We sword swallowers have been risking our lives to perform the ancient art of sword swallowing for over 4000 years, but many people don't believe it's real, or they think that the art has died out," Meyer explained. "We've chosen this day to honor veteran sword swallowers, to raise awareness of the medical contributions that sword swallowers have made to the fields of medicine and science, and to correct misconceptions about the art by performing for medical facilities and the media around the world."

Meyer and his co-author Dr. Brian Witcombe are the recipients of the **2007 Ig Nobel Prize in Medicine**. The Ig Nobel Prizes are presented at Harvard each year for discoveries that "first make people laugh, and then make them think." They won the award for their article, "Sword Swallowing and its side effects," published in the British Medical Journal in December 2006. The team makes presentations at scientific and medical events around the world, bringing a bit of swashbuckler's magic to the otherwise scholarly gatherings.

If you listen carefully at your next scientific event, you might just hear the "schwing" of a sword being pulled from its scabbard. And if you look closely, you might just recognize a mischievous smile behind a protruding hilt among the white labcoats...

Science and swords... perhaps not such an odd pair after all.

### **Medical Facts and Trivia about Sword Swallowing - Did you know?**

- Sword Swallowing is a 4000 year old art that originated in India around 2000 BC.
- The average person swallows about 600 times per day – 350 while awake, 200 while eating, and about 50 times while asleep.
- The average swallow uses 50 pairs of muscles and can take from 3-23 seconds to complete.
- Sword swallowers use mind-over-matter techniques to repress the gag reflex in the back of the mouth, the peristalsis reflex in the throat, relax the lower esophageal sphincter, and repress the retch reflex in the stomach to "swallow" solid steel blades from 15-30 inches in length.
- Sword swallowing can take from 3 years to 7 years to learn, and even after years of practice, some never learn to master the art.
- SSAI reports there are on average between 4-8 serious sword swallowing related injuries reported around the world each year that require medical attention and hospitalization, with dozens more that go unreported.
- The cost for treatment of sword swallowing injuries can range from \$25,000 to \$75,000 per injury.

This might help explain why there are currently less than a few dozen full-time professional sword swallowers left performing around the world today!

## Medical History of Sword Swallowing over the past 150 years

**1868** - Dr. Adolph Kussmaul enlists a sword swallower to develop the first rigid endoscope at the University of Freiburg, Germany. Kussmaul was so pleased with his success that he took the sword swallower with him to perform demonstrations in clinics and universities, and later enlisted other sword swallows due to their ability to voluntarily relax the cricopharyngeal muscle and form a straight line from the pharynx to the stomach, allowing passage of the rigid endoscope.

**1894** – Doctors at the Metropolitan Throat Hospital in New York are amazed when sword swallower Chevalier Cliquot swallows 14 swords at one time. When the sword swallower appeared to be in pain, Dr. G.B. Hope rushed forward and yanked out the swords, causing lacerations in the esophagus and injuring the performer, leaving him incapacitated for months. After recovery, Cliquot performed lectures for doctors at the Rush Medical College in Chicago, and the University of Liverpool in England, among other places.

**1897** - Dr. Stevens, a Scottish physician, conducts experiments on digestion by enlisting a sword swallower to swallow metallic tubes pierced with holes filled with pieces of meat. After a length of time, the sword swallower disgorged the tubes and the doctor observed the degree of digestion that had taken place. This sword swallower also showed the doctors to what extent the pharynx could be stretched, resulting in the invention of the tube of Faucher, the esophageal sound, lavage, and illumination of the stomach by electric light.

**1906** – Dr. Cremer performs first esophageal electrocardiogram on a sword swallower in Wales.

**1908** – In an article in the American Journal of Medical Sciences, Dr. Hald reports his observations in esophagoscopy in a sword swallower. The esophagus had been largely distended due to the sword swallower's practice, and the cricoidean zone of the pharynx was patent and larger than normal, with an excoriation on the posterior wall of the cricoid cartilage. Surprisingly, the sword swallower could not support the examination any better than other subjects, his esophagus apparently more accustomed to flat foreign bodies than cylindrical ones.

**1930s** – While testing a bronchialscope for doctors in Pennsylvania, sword swallower Delno Fritz dies of pneumonia developed as a result of a screw that came loose and lodged in his lung.

**December 2006** - The [British Medical Journal](#) publishes the first internationally recognized medical research study on sword swallowing injuries entitled "[Sword swallowing and its side effects](#)". Results reveal that sword swallowing injuries are more likely to occur when multiple swords are swallowed, when unusual feats are performed beyond the scope of a "regular" sword swallow, or after a previous minor injury when tissue is tender and swollen.

**October 2007** – The [2007 Ig Nobel Prize in Medicine](#) is awarded to sword swallower Dan Meyer, SSAI Executive Director, and his co-author Dr. Brian Witcombe, SSAI Medical Advisor, at Harvard University for their paper "[Sword swallowing and its side effects](#)".

The [Sword Swallowers Association International](#), founded in 2001 to preserve the art of sword swallowing, is comprised of sword swallows from around the world and maintains a site with general information on sword swallowing for the general public at [www.swordswallow.com](http://www.swordswallow.com). Each year, SSAI celebrates **World Sword Swallower's Day** on the last Saturday of each February to raise awareness of the contributions sword swallows have made in the fields of science and medicine, to honor veteran sword swallows, to raise funding for the Injured Sword Swallower's Relief Fund, and to support esophageal cancer awareness and research.

To learn more about the art and science of sword swallowing or to book a demonstration for [World Sword Swallower's Day](#), visit SSAI at [www.swordswallow.org](http://www.swordswallow.org) or email [Halfdan@aol.com](mailto:Halfdan@aol.com)

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[www.swordswallow.org/wssd/](http://www.swordswallow.org/wssd/) (World Sword Swallower's Day)

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