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across China.

While in China the AUA delegation was given a tour of the Urology Department at Xijing Hospital, Fourth Military Medical University, by Drs. Yuan Jianlin and Xiaojian Yang. They also toured the Peking University Wujieping Urology Medical Center, which opened on August 29, 2010 in Beijing (fig. 2). The facility is named after the founder of Chinese urology, Dr. Jieping Wu, who worked as a visiting scholar from 1947 to 1948 at the University of Chicago under Dr. Charles B. Huggins.

The clinical demand for urology is continually increasing as the average life span of the population in China increases, and the construction of this facility responds to this developing medical need. The state-of-the-art facility comprises 10 floors, 209 beds and 5 operating suites. It features an outpatient clinic, endoscopic simulator training rooms, and urodynamic simulation and multimedia training rooms as well as sexual education and family planning exhibits for the public.

Fig. 2. AUA delegation tours endoscopic simulation training area at Wujieping Urology Medical Center.

The AUA congratulates the CUA on achieving this significant milestone in its history. To commemorate the opening of the Wujieping Urology Medical Center, Dr. Lacy presented the CUA with an original William P. Didusch urological drawing. Additional updates regarding AUA/CUA collaborations will be provided in future issues of *AUANews*. ◆

HISTORY *Corner*

Electricity in 19th Century Medicine and Mary Shelley's *Frankenstein*

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After Luigi Galvani published his research on animal electricity in 1791 and Alessandro Volta developed the first battery in 1799, electricity became a field of study in physics and medicine. I will discuss the promises that electricity held for medicine in the early 19th century as well as the fear that it caused. This fear is exemplified in Mary Shelley's *Frankenstein*, first published anonymously in 1818.

Fig. 1. Boris Karloff as "the monster" (1931)

Victor Frankenstein, the novel's protagonist, is a student of natural philosophy, chemistry and anatomy at the University of Ingolstadt in Bavaria. He puts together a human form from bones and body parts that he collects from charnel houses and dissecting rooms, hoping that he "might infuse a spark of being into the lifeless thing that lay at my feet. It was already one in the morning; the rain pattered dismally against the panes, and my candle was nearly burnt out, when, by the glimmer of the half-extinguished light, I saw the dull yellow eye of the creature open; it breathed hard, and a convulsive motion agitated its limbs."[1] In many cinematic adoptions this is the central scene. Often the "spark of being" is delivered by a strike of lightning, as in the iconic 1931 adaption, staring Boris Karloff as "the monster" (fig. 1).

Shelley's novel was successful in the decades following its publication in 1818, and today the story of Victor Frankenstein and his creature has become a modern myth. While most people know Frankenstein as a work of gothic horror, I argue that it can also be read as Victorian science fiction that imagines the possibilities of the medical applications of electricity.

Electricity, Galvanism and Vitalism

Electricity became a focus of natural philosophy in the early modern period. By the 17th century electrostatic generators could produce electricity at high voltage and low current. By the mid 18th century the Leiden jar was developed. It could store the "electric fluid" and deliver it in a shock. Around the same time an experiment devised by Benjamin Franklin established that lightning is a discharge of electricity.

In 1786 Luigi Galvani, Professor of Medicine and Anatomy at the University of Bologna, discovered that severed frog's legs twitched when he conducted an electric charge to them (fig. 2). Galvani started a research program into animal electricity, which he regarded as a vital force and which was soon called "galvanism."

Alessandro Volta, Professor of Experimental Physics at theUniversity of Pavia, disagreed with his colleague's interpretation. Volta understood electricity primarily as a physical and not a biological phenomenon. He produced electric current between zinc and silver electrodes, and in 1799 he constructed a pile of zinc and silver plates separated by pieces of brine-soaked cloth. This "voltaic pile" would emit a steady current and function as a battery.

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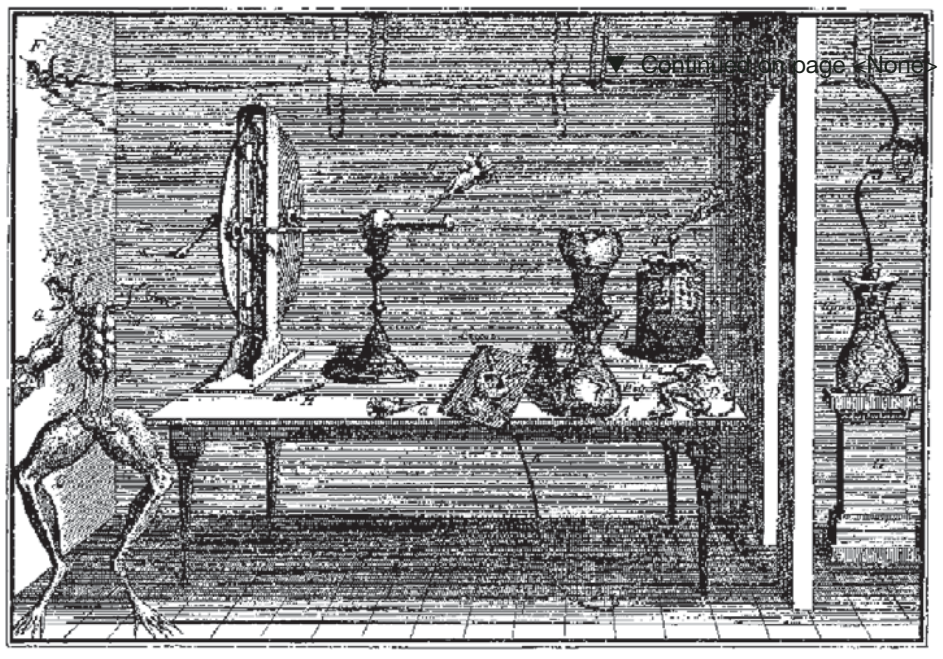

Fig. 2. Illustration from Luigi Galvani, De viribus electricitatis in motu musculari commentarius (1791)

History Corner

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Galvanism and Control Over Dead and Living Bodies

After Galvani's death in 1798, his nephew, Giovanni Aldini, Professor of Physics at the University of Bologna, defended his uncle's interpretation of animal electricity. Between 1800 and 1805 Aldini traveled through Europe and performed electrical experiments on corpses (fig. 3). At the Royal College of Surgeons in London he galvanized the body of John Forster, who had been executed for murder. Aldini connected electrodes to the body so that "the jaw began to quiver, the adjoining muscles were horribly contorted, and the left eye actually opened."[2] An application of electrodes to the ear and rectum "excited in the muscle[s] contractions much stronger than in the preceding experiments, [so as] almost to give an appearance of re-animation."[2] Shelley's description of the animation of Frankenstein's creature, which was published 15 years after Aldini's account, is markedly similar.

Galvanic experiments on corpses remained in fashion throughout the first half of the 19th century. In 1818 Andrew Ure, Professor of Natural Philosophy at Anderson's Institution in Glasgow, connected a voltaic pile to the phrenic nerve and diaphragm of the body of Mathew Clydesdale, who had been hanged for murder just an hour earlier (fig. 4). This had the effect that "full, nay, laborious breathing, instantly commenced. The chest heaved, and fell; the belly was protruded, and again collapsed, with the relaxing and retiring diaphragm."[3]

Electric current could just as well be used to control living bodies. From 1800 onward electric therapy became established as a treatment for nervous disorders ranging from hysteria to paralysis. Most patients treated with electric therapy were female, treated for hysteria and often both.[4] Electricity was used as a means for the physician to exercise control over the patient's body.

Golding Bird was a physician at Guy's Hospital in London and Fellow of the Royal College of Physicians who lectured and published on "electricity and galvanism in their physiological and therapeutical relations" as well as the "pathological characters of urinary deposits."[5] In 1849 he reported the application of electrotherapy to treat urological problems. "In more than one case of want of power in emptying the bladder in hysterical girls, I have succeeded in curing this annoying symptom by passing a pretty strong current from the sacrum to the pubes. My own impression has been, however, that the pain of the current and the dread of its repetition have constituted the real elements of success in these cases."[6]

These examples illustrate that in the first half of the 19th century galvanism could be seen as a force to control dead and living bodies. In an era in which the experimental method was established in the biomedical sciences, the ethical question of what the experimenter should do to dead bodies and living research subjects is raised in Shelley's novel.

What can physicians learn from this today? Like electricity in the early 19th century, many new technologies and therapies can instill apprehension or fear in the public or individual patients. Medical practitioners must take these reactions seriously and address them as well as use the tools of their trade responsibly in order not to turn loose another Frankensteinian monster. ◆

1. Shelley M: Frankenstein. London: Colburn and Bentley 1831; p 43.
2. Aldini G: An Account of the Late Improvements in Galvanism. London: Cuthell and Martin 1803; pp 191-194.
3. Ure A: An account of some experiments made on the body of a criminal immediately after execution, with physiological and practical observations. Quart J Sci 1819; **6**: 283.
4. Morus IR: Frankenstein's Children. Electricity, Exhibition and Experiment in Early Nineteenth-Century London. Princeton: Princeton University Press 1998; p 146.
5. Hirsch A: Biographisches Lexikon der hervorragenden Ärzte aller Zeiten und Völker. München: Verlag von Urban|&|Schwarzenberg 1962; vol 1, p 548.
6. Bird G: Lectures on Electricity and Galvanism in Their Physiological and Therapeutical Relations. London: Kessinger 1849; p 148.

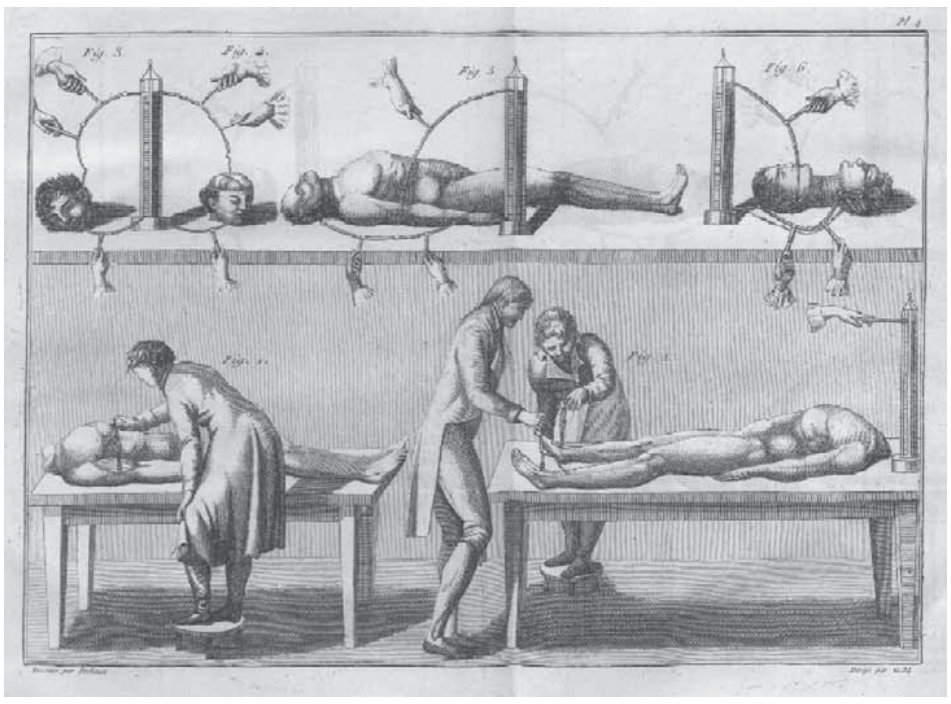

Fig. 3. Illustration from Giovanni Aldini, Essai Théorique et Expérimental sur le Galvanisme (1804)

Fig. 4. Dorctor Ure galvanizing body of murderer Clydsdale. Illustration from Louis Figuier, Les merveilles de la Science (1867).