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Modern Chemical Warfare: A History

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Resident

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This article won the first place award in the 2003 AHA Resident Essay Contest.

Recent events including the Sept. 11, 2001 attacks in New York, Washington, DC, and Pennsylvania have illustrated the vulnerability of the United States to terrorist activity. Many experts agree that a chemical or biological event is likely to occur within the continental United States during our lifetime. The anesthesiologist, as well as, emergency medicine provider and critical care specialist will represent an integral part of the initial recognition and medical response to such an attack. A modern chemical attack on the United States could involve many differing agents including: nerve agents, vesicants, cyanide compounds and pulmonary irritants. In this situation, the anesthesiologist will be in the unique position to respond and treat affected patients. Physicians trained in anesthesiology possess expertise and knowledge in a variety of areas including airway protection, ventilation, oxygenation, pharmacology, cardiovascular physiology and pulmonary physiology. It is this training which gives the anesthesiologist the flexibility to respond to a chemical threat more effectively than most other medical specialties. We present a history of chemical warfare as practiced in the modern era. Comprehensive coverage of all chemical agents would be beyond the scope of this paper, therefore we will focus on the development and history of the major chemical agents.

Classification of Chemical Warfare Agents

Chemical weaponry has been classified in many ways including year of development, historical use, mechanism of action, site of action or type of action. For the

purpose of this article we have chosen to classify by TYPE of action. Chemical weapon types include choking agents, nerve agents, vesicants, blood agents, lacrimators, emetogenics, and incapacitating agents.^{1,2,3,4,5} Choking agents work on the pulmonary system causing pulmonary edema or pulmonary hemorrhage. They can be thought of as pulmonary irritants. Examples include the gases chlorine and phosgene.^{2,3,5} Nerve agents alter nerve transmission and are commonly, but incorrectly, called "nerve gases". Specifically, these substances inhibit the enzyme acetylcholinesterase (ACHE) leading to respiratory failure and seizures. Examples of the nerve agents include: tabun, sarin, soman, cyclosarin, and VX.^{2,3,4,5}

Vesicants cause blistering of skin, mucous membranes, respiratory system and GI tract. These agents are not very lethal but cause significant morbidity. Examples include mustard gas and lewisite.^{2,3,4,5} Various cyanide compounds comprise the blood agent group. These compounds release CN ions into the bloodstream resulting in respiratory failure and CV collapse. HCN and Zyklon B are examples.^{3,5} Lacrimating agents, also known as tear gas, irritate the mucous membranes and are used widely for riot control. Pepper gas and CS are lacrimators.^{4,5,6} Adamsite is an emetogenic agent developed in WWI. Its emetogenic properties were designed to make soldiers remove gas masks causing exposure to more lethal agents.^{4,5} Incapacitating agents include pharmacologic drugs designed to inhibit of an individual's "will to fight". LSD and BZ are examples.^{4,5,6} Finally, chemical defoliants are also classified by some ex-

perts as chemical warfare agents.⁶

History of Chemical Warfare

During the Peloponnesian War of the 400's, irritant fumes derived via sulfur combustion were used in combat and represent the earliest form of chemical warfare.¹ The British may or may not have utilized sulfur fumes in combat against Russian forces during the Crimean War.^{1,7} The Boer War of the late 1800's was witness to British use of chemical laden artillery shells in combat.⁷ However, the foundations of modern chemical warfare would not be established until the defining conflicts of the 20th century.

Chemical agents were used on an unprecedented scale during World War I (WWI). It represented the beginning of modern chemical warfare as feared today. During this conflict that chemical agents were scientifically investigated for the purposes of maiming and killing, specifically, chlorine, phosgene and mustard. These chemical agents were widely used by several countries. In fact, such widespread use of chemical weaponry has not been seen since.

Germany

In general, the Germans made each significant innovation in chemical weaponry during WWI only to have Allied forces duplicate them. At the onset of the war, Germany was confident of a decisive, rapid victory. However, this conflict rapidly developed into a stalemate by 1915, and was characterized by combat involving large fixed troop emplacements known as trench warfare. In an attempt to break this stale-

Continued on Page 4

Bulletin in the News

Civil War saw drugs' benefits, costs*

by Dave Parks

Newhouse News Service

BIRMINGHAM, Ala. — The pain started for Confederate Gen. Thomas Jonathan "Stonewall" Jackson as darkness fell May 2, 1863, when he mistakenly was shot twice by his men during the Battle of Chancellorsville.

Jackson's horse bolted, and an overhanging branch knocked him in the head. Terribly wounded in the left arm and right hand, he was dragged to a litter. He was dropped three times, once when a litter-bearer was killed by artillery fire. Eight hours later, while being prepared for amputation, he described the pain's end as the chloroform anesthesia took hold.

"What an infinite blessing," he said, and continued uttering "... blessing, blessing, blessing ..." as he slipped from consciousness. He died later.

Details of the incident were published in the *Bulletin of Anesthesia History* in 2001 by Dr. Maurice Albin, an anesthesiologist, historian and professor at the University of Alabama, Birmingham (UAB), which has one of the best collections of Civil War medical records.

Research into Jackson's death is part of a growing body of work delving into drugs used during the Civil War. Historians have found many of the roots of anesthesiology, the U.S. pharmaceutical industry and even the nation's chronic problem with drug addiction.

The merciful, pain-killing properties of ether and chloroform were discovered about 15 years before the Civil War. Contrary to popular belief, they were used widely by doctors for both the North and South, Albin said.

His research indicates that up to 130,000 soldiers, about one in every four wounded, were likely to have received anesthesia.

About 30,000 amputations were performed by Union doctors, according to Albin's research. Only 20,000 patients survived, not surprising since sterile techniques had not been developed.

But few deaths were caused by anesthesia, usually administered by chloroform on a cloth placed over a patient's face, Albin said. Operations were speedy, with one surgeon claiming he could amputate a limb in

32 seconds.

Before the war, there was resistance to anesthesia. Some believed there was moral value in excruciating pain. In his research, Albin found a Civil War doctor who wrote, "There's nothing like hearing the lusty bawling of the wounded as the knife goes in."

By the end of the war, doctors' attitudes had changed, and anesthesia had become widely accepted, Albin said.

Michael Flannery, associate director for historical collections at UAB, said many other drugs were used. The Civil War sparked a huge demand for pharmaceuticals for battlefield injuries and to treat an epidemic of diseases that ravaged unsanitary military camps.

In fact, two of three casualties in the Civil War were caused by illnesses such as dysentery and malaria, said Flannery, who has written a 369-page book, "Civil War Pharmacy," scheduled for release this spring.

Flannery said the U.S. pharmaceutical industry was nearly nonexistent when the war began, but it boomed after the government began purchasing large quantities of medical supplies and drugs, often based on herbal remedies.

Perhaps the most effective and popular was quinine, mixed with whiskey to treat malaria.

"The Civil War in general, and quinine production in particular, would launch the American pharmaceutical industry into the world arena of major industry giants," Flannery said.

Dr. Edward Squibb, for one, found himself in a lucrative position after starting a small pharmacy operation in 1858, three years before the war. Since Squibb's business was well-established, the military awarded it big contracts.

Because of the Union blockade, the Confederacy had to rely upon more indigenous plants to produce medicine. Thus, the South later produced a multitude of patent medicines that were sold after the war, Flannery said.

Civil War doctors relied heavily on narcotics such as morphine made from opium poppies grown in several parts of the country. These powerful drugs were used not only for pain but also to treat diarrhea and other illnesses.

Little was known about addiction, and no laws restricted the sale of narcotics. After the war, horror stories abounded of wounded veterans who had become "opium drunkards," "morphinists" and "opium eaters," Albin said.

In 1868, it was estimated that up to 120,000 veterans were addicted to drugs, Albin said.

The problem wasn't confined to veterans, he noted. Narcotics were included in several medications.

"Opium essentially moved from the city to the country," Albin said. "Large increases in opium addiction were far above the proportional increases in population."

Dear Dr. Cope,

Just a brief note to add to the very justified article by Dr. Ken Sugioka (*Bull Anesth Hist* 2003; No. 4:10-11) in just recognition of Dr. Stuart Cullen who trained many future chairmen of anesthesia. I realize that after a certain age all of us forget some events; may I add to the list of distinguished University of Iowa trainees Robert Wallace Virtue who upon his return to Denver in 1953 became Head of the Division of Anesthesiology until 1970 when he retired from academics. He did pioneer work with gamma hydroxybutyrate, ketamine, enflurane, and conducted research in hypothermia for early cardiac surgery; as a matter of fact the tub that we used to cool patients in is displayed in the Smithsonian Museum.

Sincerely,

J. Antonio Aldrete, M.D., M.S.

*This article appeared in the April 4, 2004, issue of *The Seattle Times*. It is reprinted here with permission from Newhouse News Service.

Dear Colleagues:

"The John J. Bonica Memorial Symposium on Pain, Obstetrics and Regional Anesthesia" will be held in Capo Calava', Messina, Italy, from the 19th thru 23rd of September, 2004. This meeting is being co-organized by The Ohio State University and the Italian Society of Anesthesiology (SIAARTI).

Ten years after the death of John Bonica, the Symposium will pay tribute to the "Father of Pain Therapy". The topics of discussion will include assessment, therapy, education, and research of:

1. Pain
2. Obstetrical and
3. Regional Anesthesia and Analgesia

These were the fields of great interest of John Bonica and to which he dedicated his professional life with great passion. International speakers recognized for their scientific and clinical merits, many who were Dr. Bonica's friends or pupils will attend. The Italian Society of Anesthesiology will select several other speakers. The Symposium will cover both topics of basic science that have clinical application plus clinical issues. There will be simultaneous translation from English to Italian and vice versa.

By combining a tribute to John Bonica with topics of great interest not only to anesthesiologists but also to many other health care professionals, we have organized a Symposium that will be attractive from a scientific, clinical and historical perspective. Participants will be able to attend scientific discussions as well as partake in relaxed social interactions – an ideal forum for education and useful interchanges of ideas.

The meeting will start the 20th of September 2004 (registration) and will end on the 23rd. An optional visit to Filicudi is planned to unveil a memorial in his honor. Since we will travel by boat to the Island of Filicudi, the trip and date is dependent on the condition of the sea. The visit to Bonica's birthplace will represent the fulfillment of his dream to have as many of his friends and pain specialists visit his "beloved island".

Capo Cavala' is a sea resort on the coast of Sicily between Messina and Palermo. It faces the Island of Filicudi the birthplace of John Bonica. The Symposium and the lodging will be at Capo Calava'. The resort has seaside bungalows and single rooms. Recreational activities for spouses and children are planned as well as daily tours for sites around Sicily.

The registration for the Symposium is 250 Euros before July 31, 2004 and 300 Euros after July 31. The resort provides room and board for 550 Euros per person for the duration of the Symposium. Participants are welcome to remain at the resort until Saturday, September 25, 2004 at no increase in cost. Board includes continental breakfast, lunch, and dinner. The trip to Filicudi, all inclusive, is included in the cost of room and board.

I hope to see you there!

Costantino Benedetti, MD
and the Organizing Committee

For further information, contact Costantino Benedetti, MD.

Phone: 614-293-6040

Fax: 614-293-6587

Per Dr. Dennis Bastron, the Special Collections section, at the University of Georgia Libraries has a nice Crawford Long collection. They are raising money to improve that material and to provide a proper building to house the Special Collections. Contributions, payable to the University of Georgia Foundation, and directed to the Collection Endowment, can be sent to:

Chantel Durham
Director of Development
University of Georgia Libraries
Jackson Street
Athens, GA 30602

This is an excellent way for members of the Anesthesia History Association to promote the memory of Dr. Long and his contribution to our specialty.

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The *Bulletin*, formerly indexed in Histline, is now indexed in several databases maintained by the U.S. National Library of Medicine as follows:

1. Monographs: Old citations to historical monographs (including books, audiovisuals, serials, book chapters, and meeting papers) are now in LOCATORplus (<http://locatorplus.gov>), NLM's web-based online public access catalog, where they may be searched separately from now on, along with newly created citations.

2. Journal Articles: Old citations to journals have been moved to PubMed (<http://www.ncbi.nlm.nih.gov/PubMed>), NLM's web-based retrieval system, where they may be searched separately along with newly created citations.

3. Integrated History Searches: NLM has online citations to both types of historical literature -- journal articles as well as monographs -- again accessible through a single search location, The Gateway (<http://gateway.nlm.nih.gov>).

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Warfare. . . *Continued from Page 1*

mate, German forces introduced a novel form of combat now known as chemical warfare.

German scientists began investigating chemicals that had the potential to gain an advantage over the Allies during these bloody battles. Early experimentation involved sneezing and irritating agents used to force enemy troops out of trenches. Although this early battlefield experimentation with chemical agents was largely inept, subsequent development would prove lethal.

Fritz Haber (1868-1934) has been called the Father of Modern Chemical Warfare.⁸ He was responsible for the development of chemical gases for Germany during the war. Haber was born in Germany but was of Jewish descent.^{6,9,10} He was a brilliant chemist who was awarded the Nobel Prize in Chemistry (1918) for a process that allowed for fixation of nitrogen from the atmosphere.^{9,10} This was later known as the Haber-Bosch process. Eager to help his homeland, Haber approached the German Army about the possibility of using of chlorine gas against Allied trench positions. He was initially rebuffed. Later, out of desperation due to the possibility of losing the war, Germany hired Haber. Initially a sergeant, he was involved in the organization of a chemical corp.

During the spring of 1915, despite the Hague Conventions banning the use of poisons as military weapons, gas cylinder installation began in an area known as Ypres, Belgium. In April 1915, chlorine gas was released against Allied troops. The effect of the chlorine was staggering. The Allied retreat was so unanticipated and stunning, the Germans were caught unprepared to exploit the breach in battle lines. The Allies suffered horrendously as they were ill prepared to deal with the chemical assault. The world had just been witness to the first successful large-scale chemical gas attack.^{1,2,5,6,8,11} (The Germans had already tried an unsuccessful attack against Russian troops in Poland during the month of Jan in 1915.)^{1,7,12} Haber was promoted to captain. A Jewish officer serving in the German army was unprecedented.¹⁰ In addition, Haber also became director of the Kaiser Wilhelm Institute for Physical Chemistry.¹⁰ This institution actively investigated the chemistry of war gases, toxicity of such agents and the development of personal protective equipment (PPE).

Under Haber's direction, other events and historical firsts marked the German chemical warfare program: including at-

tacks on the Eastern Front, the introduction of phosgene gas and the use of mustard. In May of 1915, German chemical attacks took place along the Eastern Front against the Russians with Haber supervising.⁶ A new attack at Ypres, Belgium, occurred in December of 1915, using chlorine and a new agent phosgene.⁶ Phosgene is a subtle type of choking agent, causing only initial mild irritation followed by massive pulmonary edema days after exposure. In July of 1917, again at Ypres, German positions fired shells filled with a chemical liquid onto the British. This agent, caused a massive number of Allied casualties. The typical manifestation of which included blistering of the skin, respiratory and GI tracts. This agent became known as mustard gas.^{1,2,6} Actually a liquid, it was also more appropriately called mustard. It was used on an increasing basis late in WWI by German forces as Allied training and protective equipment rendered chlorine and phosgene attacks less effective.

Canada

The major Canadian contribution in the field of chemical war came in the form of protection and response to chemical assault. This very event occurred during that first chlorine attack at Ypres, Belgium, in April 1915. Defending against any German advance was an eight-mile Allied line manned by French colonial troops on the left, Canadian soldiers in the center and British forces to the right.¹³ A German artillery barrage was followed by a cloud of yellow-green gas which crept toward the allied positions. The allies had not seen such a cloud before. Soon the chlorine vapor reached the French positions causing symptoms of respiratory irritation, coughing, and dyspnea among the soldiers. Panic set in, and the French line broke leaving a large gap in the defenses. The stunned Canadians looked at their exposed left flank in horror.

Two critical events prevented a total rout of Allied positions. As mentioned previously, the Germans were stunned by the effectiveness of the chlorine gas attack and did not have the manpower mobilized to exploit the breach in the allied lines. Secondly, the Canadians had two medical corps officers present, Lieutenant Colonel (Dr.) George Nasmith and Captain (Dr.) FAC Scrmiger who would prove instrumental in responding to this chemical insult.^{13,14,15,16,17}

Dr. Nasmith, with a background in public health, and Scrmiger an experienced physician, recognized the gas as chlo-

rine.^{13,14,15,17} Dr. Scrmiger's immediate orders to his battalion included instructions to urinate on handkerchiefs, placing them over mouth and nose when encountering the gas cloud.^{13,16,17} The ammonia present in urine caused the chlorine gas to crystallize minimizing absorption into the pulmonary system.^{14,17} The Germans, determined to exploit this new weapon, launched several attacks over the next few days. By this time, Dr. Nasmith had constructed crude gas filters by soaking cotton pads in "hyposulfite of soda".^{14,15,17} As a result of these actions, many lives were saved and the Canadian military was able to hold the Allied positions almost single handedly for 17 days.^{13,14,17}

This incident illustrates the importance of innovative thinking and adaptability in the face of a novel threat to human health. Drs. Scrmiger and Nasmith's quick recognition of the threat and instructions to form very crude mask filters undoubtedly played a key role in saving the lives of many young soldiers. Dr. Francis Alexander Caron Scrimger was born in Montreal in 1880. He received his MD from McGill University and joined the military as a 35 year old surgeon from Quebec.^{17,18} He served as a medical officer in the Canadian Army Medical Corps and received the Victoria Cross for actions during the battle of Ypres. One might assume that Dr. Scrmiger had some experience with open-drop ether anesthesia as a young resident training in Canada. Perhaps this early experience, gave Dr. Scrimger the ideal for his crude handkerchief field mask.

Dr. Nasmith was from Toronto. He held multiple degrees (MA, PhD, DPM, DSc) and was involved with development of water purification systems that could be used near the front lines.^{16,19} One may also assume that Dr. Nasmith's background played a pivotal role with identification of the chlorine gas and in producing the early hyposulfite masks. The actions of these two health care providers saved many Canadian lives and allowed the Allies to hold their positions during the Second Battle of Ypres.

Great Britain

In response to the German use of chlorine, the British placed new emphasis on research and development both in offensive and defensive chemical warfare. In June 1915, the British introduce a defense in response to the German gas attacks in Belgium. These "Hypo Helmets" were essentially gas masks designed for the neutralization of chlorine gas vapors. September 1915 was witness to the first large scale

Allied chemical gas attack at Loos, Belgium. British forces attacked using 5,000 cylinders of chlorine gas. Unfortunately, some of the vapors were swept by unfavorable wind conditions back toward Allied positions causing massive "friendly fire" casualties.⁶

The British first used phosgene gas in the summer of 1916. Around the same time, a chemical weapons research and development facility was established in Britain. The Livens Projector, a new delivery system for chemical agents, was the first invention from this facility.^{6,8} Essentially, a cannon was used to propel a thirty-pound drum of chemical agent a half mile into enemy positions. This system was first used during the Battle of Arras in 1917, and proved to be very effective. Throughout the remainder of the war, Germany tried, but could never duplicate the Livens Projector.⁶ The British used mustard late in the war, but never to the extent of German use. In October of 1918, British forces fired mustard shells at a small village in Belgium injuring a young German officer by the name of Adolf Hitler, which would have consequences some twenty years later.⁶

United States

The United States participated in the research and development of chemical warfare techniques during WWI. Novel agents developed and produced included the vesicating agent lewisite, and the emetogenic adamsite.^{4,6} The post WWI era witnessed an attempt to prevent the future use of chemical warfare agents by the drafting of the 1925 Geneva Protocol entitled the "Protocol for the Prohibition of the Use in War of Asphyxiants, Poisons or Other Gasses and of Bacteriostatic Methods of Warfare".^{20,21} Numerous countries signed the protocol with notable exceptions of the United States and Empire of Japan.⁶ Despite the Geneva Protocol, continued experimentation with the choking agents and early development of the nerve agents continued to occur during the interwar period.

Germany

The armistice ending WWI was signed in 1918.⁶ Some have described the peace treaty terms (Treaty of Versailles, 1919) for Germany as humiliating and punitive. Specifically, because of the grotesque nature of gas warfare, the Treaty of Versailles contained a provision prohibiting Germany from engaging in chemical warfare. Fearing reprisals as a war criminal, Fritz Haber fled to Switzerland.⁶ Despite his involvement with war gasses and his posi-

tion as director of the Kaiser Wilhelm Institute, he was awarded the 1918 Noble Prize in chemistry for his work on nitrogen fixation.⁹

The 1920's and 30s witnessed the rise of the Nazi Empire in Germany and the subsequent build toward offensive military capabilities. Haber returned to Germany in the early 30s. Due to Nazi interest in gas warfare, Haber resumed secret work with chemical agents under the cover of "Pest Control".⁶ His clandestine activity, took place at the Kaiser Wilhelm Institute where Haber developed a solid delivery system for the release of CN fumes. This agent was tested within closed spaces and found to be very lethal and efficient. As anti-Semitism became increasingly rampant, the Nazis gave Haber an ultimatum: dismiss Jewish colleagues at the Kaiser Wilhelm Institute. Instead, Haber chose to resign in protest.^{6,9,10} The development of the CN compound continued and was later to become Zyklon B.^{6,10} In one of history's greatest ironies, Zyklon B developed by Haber, a German of Jewish ancestry, was later used in Nazi concentration camps as part of Hitler's Final Solution.^{6,10,21}

As Haber faded into obscurity, the German chemical warfare program kept on rolling forward. In 1936, the German chemist Gerhard Schrader, legitimately working on insecticides, developed an extremely effective organophosphate insecticide called tabun.^{1,6,8} Apparently, a laboratory accident occurred where a very small amount of tabun was spilled causing dyspnea to laboratory personnel in the area.^{6,8} The Nazis became aware of Schrader's work because of a law which mandated the report of any scientific discovery of potential military significance.^{6,8} In 1937, a sample of tabun was sent to the Ministry of War and further research determined that tabun exerted its effect by interfering with nerve transmission. Thus the G series nerve agents were born. Schrader was given a secret lab to continue research and development, resulting in the synthesis of sarin in 1938.^{1,6,8}

Other Nations

The inter war era witnessed several smaller instances of chemical warfare and development. The Russian Empire used chemical gas during the Russian civil war.⁶ The British used chemical means to solidify their empire in Afghanistan.⁶ Japan became involved in heavy research and development of chemical weapons. There are many unconfirmed reports of chemical use against the Chinese during Japanese expansion prior to WWII.⁶ The Italians

under the direction of Mussolini, employed mustard during fighting in Ethiopia. This use was characterized by a novel delivery system in which mustard was loaded into bombs and dropped from airplanes.⁶

World War II (1939-1945)

In addition to the nerve agents, WWII saw the production, development and proliferation of many new weapons including the first jet aircraft, ballistic missiles and the atomic bomb. Among these new weapons, nerve agents were unique. The German war machine mass-produced and weaponized these compounds but then showed uncharacteristic restraint in their utilization. At the outbreak of hostilities in 1939, Germany introduced Blitzkrieg warfare emphasizing rapid mobility. This new technique made the strategy of occupying land with large numbers of fixed troops obsolete. Mass stockpiles of chlorine gas, phosgene gas and mustard developed during WWI were rendered inconsequential, and chemical warfare as practiced in WWI impractical.

The Germans turned to their scientific and industrial communities for advances which could be applied on the battlefield. In 1940, secret construction began on multiple pilot plants for small-scale tabun production. Construction on a large-scale tabun production facility at Dyhernfurth, Germany, was also undertaken. In addition, a pilot plant for small-scale sarin synthesis was constructed. In 1942, the Dyhernfurth plant became operational and began producing tabun.^{1,6} In 1944, German scientist and Nobel Laureate (Chemistry 1938) Richard Kuhn discovered the nerve agent soman.^{1,8,22} Details and documentation detailing this discovery are hidden near Berlin.

By the mid 1940's, the war turned against the Axis powers. Eventual German defeat was becoming more and more evident. Nerve agents were considered in retaliation for Allied bombing of civil population centers within Germany. However, these plans were abandoned for unknown reasons. By war's end, 12,000 tons of tabun had been synthesized, of which 2,000 tons had been loaded into artillery shells and 10,000 tons had been loaded into bombs for delivery.⁸

Due to the advancement of the Red Army, the chemical plant at Dyhernfurth was rigged for demolition. However, the plant was captured by the Soviets before demolition could be undertaken. Subsequently, the Luftwaffe was instructed to

Continued on Page 6

Warfare. . . *Continued from Page 5*

destroy the facility but, this order was never carried out and the Soviets obtain the secrets of nerve agent synthesis along with a stockpile of the agent. The plant was demolished and moved back to the Soviet Union.^{1,6,8}

Why weren't these powerful weapons utilized in combat? Some scholars believe that Hitler despised chemical warfare because of his personal experience with mustard during WWI.⁶ Others scholars have written that the Germans were fearful of large-scale nerve gas reprisals by the Allies. Both Roosevelt and Churchill made no qualms about using chlorine gas and mustard on Axis forces should Allied troops be subjected to chemical agents. German intelligence believed the Allies possessed similar nerve toxins and would respond to any German attack. In fact, *only* Hitler's Germany possessed these nerve agents. Allied forces, shockingly learned of their existence from captured German scientists and munitions at the end of WWII. The Germans had in their possession a decided unilateral advantage in terms of chemical warfare.⁶

United States

WWII saw the United States (U.S.) shift from a relatively isolationist country, in terms of foreign policy, into a superpower. Involvement in chemical warfare paralleled this course. U.S. involvement prior to entering the war consisted of secretly shipping WWI era agents to Britain.⁶ In 1942, the U.S. Chemical Warfare Service was formed with testing and production facilities in Pine Bluff, AR; the Rocky Mountain Arsenal in Denver, CO; and the Dugway Proving Ground in Utah.⁶ Throughout the conflict, Roosevelt issued public warnings to the Axis powers threatening gas warfare in the event of a German chemical attack.⁶ In 1943, the SS John Harvey while waiting to unload a secret cargo of mustard filled munitions in Bari, Italy, was struck as the Luftwaffe raided the harbor. Numerous military as well as civilian injuries occurred as a result of mustard release.^{6,12} As the war focus shifted toward the Pacific theater, the U.S. became increasingly involved in the development of chemical defoliants, eventually synthesizing an agent called 245T.⁶ Serious consideration was given for the use of chemical weapons during a possible invasion of the Japanese mainland.^{5,21}

Yet, among the horrors of war, two young Yale scientists began to study chemical warfare agents. They were assigned to study

the effects of nitrogen mustard (a close relative of mustard) and to formulate an antidote. Their research led them to focus on the cellular targets of nitrogen mustard toxicity. Through an incredible chain of observational and clinical experimentation this work guided the first attempts at chemotherapy for the treatment of malignancies. For example, nitrogen mustard would later become the M in the MOPP regimen for Hodgkin's disease. These two scientists were Alfred Gilman and Louis Goodman, who wrote the textbook **Pharmacologic Basis of Therapeutics**.¹²

Other Nations

The Soviet chemical weapons program was jump started by two major events of WWII. The Dyhernforth production plant was captured intact by the Red Army. These facilities were dismantled and transferred to the USSR.^{1,6} Secondly, German scientist Richard Kuhn's documentation regarding soman development was discovered by the Soviets near Berlin.^{1,8} Swiss scientists in the late 1930s and early 40s discovered the compound LSD.⁶ In time, it would be investigated as an incapacitating agent.

Post WWII

The post WWII era was characterized by the emergence of the two superpowers and the subsequent cold war with its massive arms proliferation. Chemical weaponry, once again, paralleled this course. The United States and Soviets took the lead with further development and production of these weapons. Of particular importance during this time frame was further military evolution of nerve agents. Due to the secret nature of such programs, details concerning these compounds are scarce. Nerve agents, were first produced by German scientists during WWII (with the exception of VX) and are known by German code names: GA (Tabun), GB (Sarin), GD (Soman), GF (Cyclosarin), and VX.^{1,6} The principal difference between these agents is in volatility. All are volatile liquids at room temperature, thus the term "nerve gas" is incorrect. Sarin is the most volatile and VX the least volatile. All act by phosphorylation and inhibition of the enzyme acetylcholine-esterase (ACHE) producing respiratory failure, cardiovascular, and CNS effects.

Allies

The discovery of German munitions filled with nerve agents, was of great concern to the western Allies. Following the end of hostilities, the United States, Great Britain, Canada and Australia formed an

alliance to develop and experiment with the G series nerve agents.⁶ Early research in Great Britain focused mostly on sarin. In 1952, the compound VX was formulated.^{1,6} VX has a low volatility and has the consistency of oil. Dispersal allows it to persist in the environment for long periods of time. It is the least volatile and most lethal of all the nerve agents. Other areas of British research involved work with the defoliant 245T and the development of CS lacrimating agent.⁶ In the 1950's, the British renounced chemical warfare and subsequently delivered VX to the United States for further testing.⁶

The United States assumed the bulk of chemical agent research and production. Large-scale production of sarin took place at facilities in Alabama and at the Rocky Mountain Arsenal in Denver, Colorado. Chemical weapon testing was conducted at Dugway Proving Ground in Utah. VX was produced in Indiana, creating thousands of tons for use.⁶ North Korea and China make accusations of chemical agent use by the United States during the Korean conflict, but most modern scholars agree that these claims are unfounded.²¹

The 1950's also marked the beginning of U.S. research into incapacitating agents. In general, the United States was looking for a nonlethal means of chemical warfare, which would eliminate the "will to fight". LSD was the focus of early research involving animals, volunteers, and psychiatric patients. Eventually a compound called BZ was formulated. BZ acted at CNS receptors causing vomiting, memory lapses and hallucinations.⁶

Also in the 1950's, work began on development of binary weapons.^{1,6} Rather than a new type of weapon, binary agents could be more appropriately classified as a new chemical delivery system. This concept can be described as the separation of two relatively safe compounds which when mixed together, retain all the lethal properties of the original compound.^{1,5} Binary weaponry adds an extra level of safety for the transport and storage of chemical weapons.

As the 60s progressed, the United States became increasingly involved with combat operations in Vietnam. The nature of jungle warfare increased the amount of research into chemical defoliants with large scale use occurring in the late 60s and early 70s. The United States military used massive amounts of 245T in the jungles of Southeast Asia. These herbicides are designated by color codes (agents): pink, purple, green, white, blue and orange.⁶ The extensive defoliation effort is summed up by a famous

Warfare. . . Continued from Page 1

graffiti like statement with the words "Only We Can Prevent Forests" scrawled on a military helicopter. Agent orange was the most widely used defoliant in Vietnam. Dioxin, a compound found in agent orange, was subsequently identified as a carcinogen. Lacrimating agents were also used in large quantities during the war to flush enemy soldiers out of underground bunker complexes.

In 1969-1970, President Nixon ended the U.S. Offensive Chemical Weapons Program. However, defensive work with chemical agents was allowed to continue.⁶ In 1975, the United States ratified the 1925 Geneva Protocol governing the use of chemical weapons in war.^{6,7,20,21}

USSR

Thought to have been very large and advanced, not much is known about the Soviet chemical weapons program during the cold war. As mentioned, the Soviets obtained nerve agent secrets from German scientists and the captured Dyhernfurth chemical plant at the end of WWII. During the Cold War, the USSR was thought to be involved principally with tabun, soman, VX, and binary weaponry. During the 1960's and 1970's, the Soviet Union was suspected of supplying Yemen and Vietnam with chemical agents.⁶ Mustard and nerve agents (unsubstantiated reports) were used during the Yemeni Civil war in the 60s.⁷ There have also been allegations of chemical weapon use during Soviet-Afghan War in the 1980's.^{1,6}

Iraq

Iraq was involved in a fierce border war with Iran during the early 1980's. Later during the conflict, Iraq faced massive human wave attacks and was clearly in danger of losing. As a last resort, mustard and possibly tabun, were employed with devastating success against unprotected Iranian troops.^{1,5,21} Chemical weapons essentially rescued Iraq from the brink of defeat. These attacks were so successful that the Iraqi government lost all inhibitions in the use of chemical weapons. In 1988, mustard and possibly nerve agents were used by the Iraqi government against the Kurdish minority population in Halabja, Northern Iraq.^{2,5,6,7}

Terrorism and Accidents

Perhaps more concerning than chemical weapon dispersal in wartime, is the potential for accidental exposure or release from a terrorist incident. The first recorded

chemical weapon accidents came from the Dyhernfurth chemical plant in Germany during WWII. Several deaths occurred as nerve agents were inadvertently spilled onto manufacturing personnel.^{6,8} After WWI, almost 50,000 tons of mustard containing munitions were dumped into the Baltic Sea. Some chemical weapon stockpiles were also disposed of in this manner following WWII.^{4,6} From the 1950's-1970's, sporadic instances of fishermen dredging up these compounds and being exposed took place.^{4,6} A VX leak at the Dugway Proving Ground in Utah killed 6,000 sheep on a ranch in 1968.⁶ Scores were killed and hundreds injured from 1994-1995, after the Aum Shirikyo cult staged sarin gas attacks in Japan.^{4,5,21}

Most chemical weapon stockpiles are becoming increasingly dangerous to surrounding communities as old munitions start to deteriorate and leak. Proper disposal of stockpiled chemical warfare agents presents its own set of unique problems related to inadvertent release, environmental contamination and vulnerability to terrorist incidents. Early disposal consisted of loading chemical stockpiles onto ships, which were scuttled at sea.⁶ This practice resulted in the contamination of fishing beds and accidental exposure of fishermen to chemical agents from 1950's-1970's. Modern attempts at disposal involve the process of incineration. The United States maintains an incinerator at Jonston Atoll in the Pacific Ocean. Russia also possesses a chemical incinerator. Furthermore, Japan has made an investment to build an incinerator in Manchuria, China for disposal of chemical warfare agents left by the Empire of Japan following WWII.⁶

Status of Nations

Since 1992-1993, hundreds of nations have signed the Chemical Weapons Convention, which bans the production, possession, and development of chemical weaponry.^{5,20,23} Thus, chemical weapons programs are frowned upon by most of the world, and their existence is often clouded with secrecy and deception. Several countries are known to have chemical weapons programs either by: history of recent use, open declaration or as a result of strong intelligence information. Many countries possessed these weapons at one time but have since ended their programs. Finally, many countries are suspected of having these weapons without solid intelligence information to support these suspicions.

Conclusions

The history of chemical warfare is essentially a twentieth century phenomena. There has only been one large scale use, during the stalemate in the West during WWI, and the horrors of that conflict still permeate the thinking of generals about to use chemical warfare. Indeed, were it not for the quick thinking of several physicians, the initial German chemical attacks might have succeeded. These weapons have the ability to decimate the enemy, yet a small shift in wind direction can decimate the forces using the weapon. Although possessing the knowledge and capability to use these weapons, most nations have not, and the history of chemical warfare is a potential, what if, history. Yet, some good has come out of research into these weapons of mass destruction. Goodman and Gilman's work on antineoplastics demonstrates some good coming from evil. Today, the major threat these materials poses is with rogue nations and terrorists who do not have compulsions about whom they kill.

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Continued on Page 15

Gertie F. Marx Einstein Journal Personal Reminiscence

by Ronald Simon, M.D. and Jill Maura Rabin, M.D.

Gertie F. Marx, M.D., began her journey to the Albert Einstein College of Medicine while still a young medical student in Germany in the 1930's. While attending a rally where the featured speaker was a still relatively obscure Adolph Hitler, she quickly realized that the future of her and her family lay outside of Germany. Subsequently she completed her medical training at the University of Bern, Switzerland in 1937 and immigrated to the United States. After completing an internship and residency at the Beth Israel Hospital in anesthesiology, and serving as attending anesthesiologist at that institution for eleven years, by 1955, in Dr. Marx's own words, she was "ready for a change".

Dr. Marx's expectations for her career at Einstein were lofty but did not include the police escort she received on her first day. While making her way from her Manhattan apartment to Einstein, she apparently got lost in the South Bronx. In her haste to get to Einstein, she made an illegal u-turn directly in front of an unmarked police car. When confronted by the officer, she stated, "Give me the ticket fast because I am supposed to start an anesthetic in



forty-five minutes at the new hospital and I don't know where it is." The officer then proceeded to give her a high-speed escort to Einstein, sans ticket. She was able to arrive in time to give the first of her many spinal blocks at Einstein.

Over the course of her forty-five year career at Einstein, Dr. Marx, as described by her long-time friend and colleague, Dr. Paul Goldiner, "single-handedly pushed

the development of obstetric anesthesiology as a specialty". She founded both The Society For Obstetric Anesthesiology and Perinatology as well as the Obstetric Anesthesia Digest. There were two accomplishments in particular of which Dr. Marx was most proud. In 1989 she joined Virginia Apgar as the only woman ever to receive the Distinguished Service Award from the American Society Of Anesthesiologists. In 1993 Queen Elizabeth II presented her with the College Medal from the Royal College Of Anesthetists for her lifetime achievement.

In addition to her many academic accomplishments she was also one of those very rare individuals who could instantly cut through the superfluous straight through to the heart of the matter. She became a trusted advisor and confidante to many medical students, residents and colleagues. Her opinions were widely sought on issues as diverse as anesthetic management, global politics, immigration law, opera and personal and family relationships. She will be missed by her family, many friends and colleagues.

The Anesthesia History Association (AHA) sponsors an annual Resident Essay Contest with the prize presented at the ASA Annual Meeting.

Three typed copies of a 1000-3000 word essay written in English and related to the history of anesthesia, pain medicine or critical care should be submitted to:

William D. Hammonds, M.D., M.P.H.
Professor of Anesthesia
Director of Pain Outcomes Research
Department of Anesthesia
University of Iowa
200 Hawkins Drive, 6JCP
Iowa City, IA 53342-1079
U.S.A.
william-hammonds@uiowa.edu

The entrant must have written the essay either during his/her residency or within one year of completion of residency. Residents in any nation are eligible, but the essay MUST be submitted in English.

This award, which has a \$500.00 honorarium, will be presented at the AHA's annual dinner meeting to be held in October, 2004, in Las Vegas, NV. This dinner is always held during the annual meeting of the American Society of Anesthesiologists. The paper will be published in full in the *Bulletin of Anesthesia History*.

All entries must be received on or before August 23, 2004.

John Lundy's Influence on Mario Dogliotti's Anesthesia Career: The Rochester – Turin Connection*†

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Achille Mario Dogliotti's most notable contribution to regional anesthesia and pain medicine is his seminal work that opened the door to practical epidural anesthesia. But what started his interest in regional anesthesia? During his early career he visited the Mayo Clinic where he observed a very active practice of regional anesthesia directed by John Lundy. The present research explores the friendship between Dogliotti and Lundy to examine what influence it may have had in Dogliotti's subsequent contributions to anesthesia and pain medicine. Three main characters are involved in this story.

The Cast of Characters

The first character is Achille Mario Dogliotti (Figure 1), an Italian physician who was born in 1897. He became Professor of Clinical Surgery in 1925 and sometime thereafter began pursuing an interest in anesthesia. At that time regional anesthesia was an attractive alternative to deep ether anesthesia for abdominal operations. Dogliotti's place in the history of anesthesia was secured by popularizing the hanging drop technique for identifying the epidural space,¹ a method originally described by Gutierrez. Dogliotti promoted the technique and its application to pain and surgery.² He was also an advocate of anesthesiology as a medical specialty. "He advocated the training of physicians as specialists in anesthesiology, and suggested that full responsibility of anesthesia in the operating room be relegated to the anesthesiologist, and that [the anesthesiologist] be considered by the surgeon as a collaborator rather than as one who performs an ancillary service."³

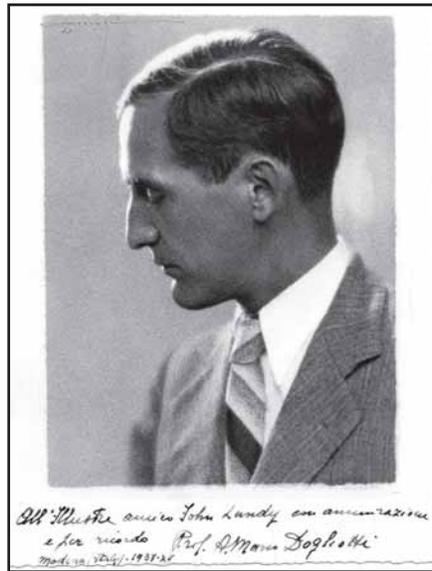


Fig. 1. Achille Mario Dogliotti, M.D. The inscription reads "To my esteemed friend John Lundy, with admiration and as a memento. Prof. A. Mario Dogliotti. Modina (Italy) 1937. (Photo courtesy of the Wood Library-Museum of Anesthesiology, with permission.)"

Dogliotti was very interested in pain management. He was one of the first to describe alcohol neurolysis of the Gasserian ganglion for trigeminal neuralgia.⁴ He was also interested in the ethical foundations of pain treatment and, toward the end of his career, joined others in lobbying the Vatican and Pope Pius XII regarding moral guidelines to allow physicians to provide aggressive pain relief in cases of palliative care.⁵

Dogliotti also earned a reputation as an accomplished surgeon. In 1946 he studied with Alfred Blalock in Baltimore and went on to perform the first Italian extracorporeal circulation heart surgery in Turin. In 1951 he founded the Blalock Heart Surgery Center there. His accom-

plishments include the development of an aortic valvular prosthesis.⁶ The techniques described in his report of the artificial aortic valve demonstrate that Dogliotti had considerable prowess in surgery as well as in his anesthesia abilities.

The second character in this story is John Silas Lundy (Figure 2). Lundy was born in 1894, the son of a frontier physician. Lundy graduated from medical school at the University of Chicago in 1920, the same year that Dogliotti graduated from medical school. In the early 1920s he practiced anesthesiology in Seattle. In 1924 he met Dr. William Mayo, who recruited him to the Mayo Clinic.⁷ He became the third head of the Section of Regional Anesthesia at Mayo, and over the course of his career he transformed it into the more comprehensive Section of Anesthesia.⁸ Lundy introduced sodium pentothal as an intravenous anesthetic agent. He opened the first post-anesthesia recovery room in the world, was President of the American Society of Anesthesiologists, and was a founding member of the American Board of Anesthesiology.⁸ As chair of the Section of Regional Anesthesia at Mayo Clinic, he led what was probably the world's largest practice of regional anesthesia for surgical procedures.⁹

The final person in this group is Frank M. Pugliese (Figure 3). He was a surgeon who maintained a lifelong friendship with Lundy. Pugliese was born in 1899 at Calimera, Italy. He graduated from medical school at the University of Pennsylvania in 1923. He was an intern and a fellow in surgery at the Robert Packer Hospital, Sayre, Pennsylvania, from 1923-1925. Pugliese pursued a fellowship in surgery at Mayo Clinic from 1925 to 1928. For three months in 1928, Pugliese rotated as fellow in the section of Regional Anesthesia at Mayo where he met Lundy.¹⁰

Upon completion of this training at

*Note: A portion of this work has appeared in: *The History of Anaesthesia Society Proceedings*, Vol 30, pp. 60-62, 2002.

†Abbreviated Title: Lundy's influence on Dogliotti

Lundy. . . *Continued from Page 9*



Fig. 2. John Silas Lundy, M.D. (Photo courtesy of the Wood Library-Museum of Anesthesiology, with permission.)

Mayo, Pugliese practiced general surgery in Scranton, Pennsylvania until 1930. From there he moved his practice of surgery to Wilkes-Barre, PA, and was an associate surgeon at the Mercy Hospital and consulting surgeon at Pittston Hospital.¹⁰ Pugliese was a friend of both Dogliotti and Lundy. Pugliese arranged for Dogliotti to visit Mayo Clinic for two months in 1929.

The Story

In a handwritten note to Lundy dated April 3, 1929, Pugliese described Dr. Dogliotti as “the man about whom I wrote you before. He probably is in Rochester now with the hope that he can pick up a good bit of information on anaesthesia. I am again asking you to do all you can for him while he is there and I am sure that some day you will be repaid for your kindness to him.”¹¹

Dogliotti visited Mayo Clinic in April and May of 1929. At that time the role of regional anesthesia was expanding at Mayo Clinic, including spinal, sacral, and field blocks. These regional techniques were used to augment abdominal and thoracic surgery because muscle relaxants were not yet available. In 1929 over a thousand sacral blocks and field blocks were done. With time, spinal anesthesia was being utilized more frequently than field blocks or sacral blocks. By the early 1930s, spinal anesthesia accounted for about 60% of all regional cases at Mayo. Approximately 20-30% of all anesthetics at that time were regional.¹²

After his meeting with Dogliotti, Lundy wrote back to Pugliese expressing his ini-

tial impression: “I met the Italian doctor the other day but haven’t the faintest idea what his name is, although Dr. Hirsch pronounced it perfectly. I presume that he is the man who is going around with me. I, of course, am unable to speak Italian and he speaks but little English, so I talk with my hands almost as fluently as any Frenchman now. I am glad to do what I can for him, but I obviously am a handicapped in explaining the details of the various procedures. However, he will be here a month or so and possibly by that time I will find some way of making him understand me.”¹³

Before he left the United States, Dogliotti wrote from Boston, saying to Lundy: “I wish to say you good-by and thank you warmly for your courtesy and kindness. I hope to see you shortly in Italy and show to you many interesting things in my country exchanging your nice hospitality. I would beg you remember to send me your latest paper about the postoperative lung complications.”¹⁴ At the very end of the letter he remarked, “I beg your pardon for my bad English. I hope to improve in the future!”¹⁴ The fact that he wrote fluently in English means that he probably



Fig. 3. Frank M. Pugliese, M.D., F.A.C.S. (Photo by permission of Mayo Historical Unit, Mayo Foundation, Rochester, Minnesota.)

absorbed a lot more than Lundy appreciated on their initial visit.

Lundy replied promptly on June 24, saying, “Thank you for your letter of June 22. I am glad that you enjoyed your trip and your visit here. I am looking forward to seeing you some day in Europe.”¹⁵ A correspondence subsequently ensued between Dogliotti and Lundy. During this time both Lundy’s experience in regional anesthesia and Dogliotti’s initial experiences

with it were growing in parallel.

The Initial Outcome

Dogliotti was exposed to a wide variety of regional techniques during his two-month visit, including the use of regional anesthesia for chronic pain. Lundy had a small pain practice at the time. At the time of Dogliotti’s visit, Lundy was expanding the use of ethylene at Mayo Clinic. Respectful of the explosive nature of the gas, Dogliotti published a short monograph with a chapter titled “Sul pericolo di scoppio e di incendio degli attuali anestetici e sui mezzi di prevenzione e di difesa”¹⁶ (Explosion and fire danger of current anesthetics, and means of preventing and defending against them). In this chapter, he refers to his visit to Mayo in May, 1929, and extensively discussed the safe use of ethylene, including mixtures, gas evacuation, and control of electrostatic discharge.

His interest in ethylene stemmed from a desire to minimize postoperative pulmonary complications. The matter was evidently a daily concern for him as he worked to introduce new techniques to the cardiothoracic program in Turin. Dogliotti turned to Lundy while preparing a presentation for the Italian Congress of Surgery in October, 1929. He asked three specific questions. “1) Is the general anesthesia more or less dangerous than the local one for the lungs? 2) What kind of general anesthesia is less dangerous for the respiratory tract – ether, gas, ethyl chloride, chloroform [sic]? Why? 3) What do you think is the most important factor in producing the postoperative pneumonia: cold, sepsis, breathing’s reduction, embolism, ...?”¹⁷ Lundy referred Dogliotti to their recent results with ether and ethylene anesthetics¹⁸. The ongoing correspondence between the two show that Dogliotti greatly valued and respected Lundy’s contributions to the field.

The Next Step

Lundy wrote to Dogliotti December 28, 1937, stating “I am planning a trip to Europe in April and May of 1938. I should like very much to see you, and I am wondering if you could meet me in Milan.”¹⁹ Dogliotti handwrote a long reply dated February 4, 1938, suggesting that Lundy stay a while longer and present a paper to the Italian anesthesia society, during which he wanted to bestow honorary membership to Lundy.²⁰ Lundy declined because of scheduling constraints, and concluded his letter with “Perhaps I can meet your friend also. We will be looking for-

ward to seeing you."²¹

Lundy recorded his meeting with Dogliotti in his personal journal on April 14, 1938. He wrote "We had lunch at the Granonino Café, it was very fine food and a well-known place. We had a long walk and then met Dr. Dogliotti, who had come all the way from Sicily to do a therapeutic alcohol injection for a lady in Milan who suffered from sciatica. He informed me that a young man from Italy will attend the meeting of the anesthetists in New York in October."²² It was likely out of politeness that Dogliotti came up with the excuse of the injection to travel such a distance to meet Lundy. The fact that Dogliotti travelled to meet Lundy speaks well of their friendship and supports the point that the two had remained close personal friends through the years.

The Rest of the Story

Dogliotti had written his textbook on anesthesia in 1935.²³ The preface of his text acknowledges his colleagues in America, and has two references to Lundy in the index. Dogliotti sent a complimentary copy of the book to Lundy, who donated it to the Mayo Library shortly thereafter.²⁴ Carlo Salvatore Scuderi translated the text into English, which was published in 1939.²⁵ Scuderi was born in 1904 and graduated from the University of Illinois College of Medicine in 1929. He was an orthopedic surgeon, a Fellow of the American College of Orthopedic Surgeons, and a member of the American College of Surgeons.²⁶ Although not an anesthesiologist, he taught some of the anesthesiology residents at Cook County Hospital, Chicago.²⁷

Dogliotti's text contains sections on pain, regional anesthesia, and the Lundy technique of balanced anesthesia where general and regional anesthesia are combined. We can imagine that at their meeting in Italy they talked about the book and its upcoming translation to English. Lundy had planned for years to write a textbook on anesthesiology. Lundy's text appeared a year after the English translation of Dogliotti's text. Dogliotti might have spurred Lundy to complete his book.

Pain Medicine

Dogliotti's interest in pain medicine grew throughout his career. As the infant practice of pain medicine developed new techniques to relieve suffering, there arose new and subtle moral questions. Medical science was advancing therapeutic options at great pace, but the ethical framework for applying these techniques was lagging.

In the aftermath of Nazi eugenics efforts

and the Holocaust, there was great sensitivity about euthanasia. Pope Pius XII was trying to rebuild the injured Church and had to take great care to distance himself from euthanasia. "... to Our profound grief we see at times the deformed, the insane, and those suffering from hereditary disease deprived of their lives, as though they were a useless burden to Society. ... this not only violates the natural and the divine law written in the heart of every man, but outrages the noblest instincts of humanity."²⁸

The church also struggled with the argument that spiritual benefit may come from suffering. Pain relief was seen by some as violating God's will – an especially contentious issue during the 19th century when pain relief for childbirth was becoming available. The concept of "redemptive suffering" posits that spiritual gain can come from voluntarily accepting pain, analogous to the sacrifice made by Jesus. Although a uniquely Christian argument, Dogliotti – working in Italy – may have been heavily influenced by this thinking.

"[Dogliotti] requested and received a special meeting with Pope Pius XII, so that the Highest of Human moral and Christian Chair could field some specific and delicate questions."²⁹ Malan reports that "Dogliotti tackled the relief of pain in a religious context and from Pope Pius XII he obtained doctrinal declarations which are still fundamental for the Christian doctor."³⁰

The Pope issued an encyclical in which he said "when bodies are racked with pain and souls are oppressed with grief, every individual must be aroused to this supernatural charity so that, by the combined efforts of all good men, striving to outdo each other in pity and mercy – We have in mind especially, those who are engaged in any kind of relief work – the immense needs of mankind, both spiritual and corporal, may be alleviated."²⁸ This was the permission to practice pain management that clinicians were looking for. The encyclical recognizes that it is appropriate to relieve pain and suffering, even if that act might accelerate death. Today, this concept is known as the principle of "second effect" or "double effect."

The principle of "double effect" plays a central role in the ethical practice of pain management at the end of life. As long as the clinician's motivation is to treat pain and suffering, then it is ethical to do so even if the treatment may, as a "double effect," bring about an earlier death. The clinician's motivation is the principal distinction between ethical care and euthana-

sia.

Dogliotti founded the first Italian society for anesthesia and critical care as the Italian Society of Anaesthesia in 1934. Pope Pius XII addressed the Italian Society of Anesthesia on February 24, 1957. He welcomed the advances in anesthesia and pain control while affirming the Christian attitude to suffering and the need to respect the spiritual rights and duties of patients.³¹ Asked whether it is morally permissible, using narcotic analgesics, to suppress pain and consciousness, even when it is clear their use will shorten life, Pius replied: "If no other means exist, and if, in the given circumstances, this does not prevent the carrying out of other religious and moral duties: Yes."³²

Despite World War II and the difficulties in a devastated Europe, Dogliotti maintained his contact with American anesthesiologists. In fact, in 1953 he presented two refresher courses at the American Society of Anesthesiologists annual meeting. Both lectures were about regional anesthesia, the first titled "The segmental peridural analgesia in the abdominal and thoracic surgery," and the second was "Our method for the differential block in pain relief."³³ He maintained his interest in regional anesthesia throughout his career.

Conclusions

Dogliotti practiced in an era when anesthesia was part of surgical training. He was one of the few physicians who was able to practice both anesthesia and surgery at a high level. At this time continental Europe lagged behind the United States in anesthesia as a specialty, so he had to look elsewhere for his early training in anesthesia. Dogliotti met Lundy at an early point in both of their careers. During this exposure to regional anesthesia he saw a high volume of cases at the Mayo Clinic in Rochester. Dogliotti and Lundy maintained a correspondence and friendship throughout their careers. Mario Dogliotti died in 1966 at the age of 69. His legacy in regional anesthesia and pain medicine lives on – a legacy perhaps sparked by John Lundy.

Acknowledgements

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Continued on Page 12

Lundy. . . Continued from Page 11

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33. American Society of Anesthesiologists annual meeting Program. October 5-9, Seattle, WA. 1953, p. 7.

Peter Safar Passed away, Master of the Anesthesiología and a Resuscitation

By Orestes Milicchio M.D.

In 1962, I began to work at the Children Hospital, La Plata, where I developed my career for forty years, from concurrent doctor to Head Doctor. I remember that I was looking for an article in a German medical magazine when I found an investigation about R.C.P. It was written by a Dr Peter Safar and collaborators. I found it extraordinary because it replaced the aggressive open-sky resuscitation by the massage to closed thorax and mouth breathing. Immediately the new technique of RCP caught my interest. It would be of crucial importance for the future.

The impact of the new technique, impelled to me to hand in copies of this article between doctors and residents. From that time onwards, I constantly followed the successive changes that this method had.

Later, by 1981, Peter Safar wrote the R.C.P. handbook at the request of the World Federation of Anesthesiology.

This eminent researcher and scientist was the headmaster of the RCP center at the University of Pittsburgh where he headed RCP studies for the hospital laboratory and community level.

I have always studied the life and trajectory of the pioneers of anesthesiology and reanimation. Thus, I have developed great interest for the history of this speciality. I agree with Dr. Osvaldo Loudet, an outstanding Argentinian doctor, who said: "It is not complete the intellectual Knowledge of a doctor while he is not able to give a historical reason to his Knowledge..." As any other anesthesiologist living in this border of South América, I have a personal ranking of the most relevant world figures of this speciality where Dr. Peter Safar occupied a preferential place.

In 1977, I attended the Symposium of History of Anesthesiology in Hamburg, Germany. There, with great excitement, I had the opportunity of meeting and talking to the admired Dr. Peter Safar. In spite of being an eminence, he showed great simplicity and humbleness. I gave him an Argentinian music CD which he received with great pleasure. Then he told me that he was going to give it to his son who was a musician.

Finally, I asked him for his signature on a copy of his 1962 work. It was for me an incomparable achievement to meet him

and start a lasting friendship through successive epistolary interchanges.

Some days ago, I received the sad item of news about the death of Dr. Peter Safar. It was hard to me to accept the fact that I would not meet him in the congresses of anesthesiology with his kind, relevant, pleasant presence. Yet I thought that he would always be present in each RCP that is performed. Undoubtedly, this will be the best way to honour him as well as he would be happy if everybody remembered him in this way.

Dear master, your lessons will have permanent force. "Teachers will not be." They were, are and will be the kind of people who leave a great scientific work. Those who believe in the intellect and the spirit, have wielded untouchable ethic, moral behaviour like yours.

The Smell of Sleep

by Fred J. Spielman, M.D.

Professor of Anesthesiology and Obstetrics and Gynecology

Director of Obstetric Anesthesia

Vice Chair, Dept. of Anesthesiology

The University of North Carolina at Chapel Hill

When Crawford Long administered ether to John Venable on March 30, 1842, we know that the anesthesiologist was thrilled and filled with wonder and excitement. We can also imagine the vapors of the anesthetic permeating the room, stimulating Dr. Crawford's olfactory nerve, making him aware of a pungent, concentrated, and overpowering smell. Most physicians have practiced without environmental hazards; however, while the field of anesthesiology has discovered and employed drugs that have benefited patients, there have been adverse effects on operating room personnel. Our profession has advanced through the stages of discovering the offending pollutant, investigating the extent of harm, inventing and constructing devices to eliminate or reduce the damaging agent, and monitoring.

A variety of complaints have been ascribed to operating room pollution including fatigue, confusion, congenital abnormalities, impaired hepatic function, atrial fibrillation, exacerbation of myasthenia gravis, laryngitis, and headaches. For the first hundred years after the introduction of inhalation anesthetics, concern about pollution in the operating room wasn't palpable; rarely was the subject discussed in the literature. Frederick W. Hewitt (1857-1916) published *Anaesthetics and their Administration* in 1893. The London anaesthetist, who invented the first practical gas and oxygen machine, wrote that chloroform administered in the presence of open gaslights decomposed into hydrochloric acid and phosgene. "...all occupants of the room, including the patient, will be liable to be affected by the irritant products of decomposition. Smarting of the eyes, burning sensations about the upper air-passages, dry spasmodic cough, and a feeling of oppression and tightness about the chest, may be experienced." Nephritis was a feared complication of open-drop ether by many who practiced anesthesia. In 1922, *Current Researches in Anesthesia and Analgesia* published an Editorial/Obituary, "Noted Anesthetist Dies a Martyr to His Skill." The article indicated that Dr. T. Edward Costain, had anesthetized (with ether) more than 30,000 people and "...he paid with his life for his humane work of giving anesthetics so that surgery would



Charles Bragg's print, "The Gas Man."

be relieved of its horror and patients of their pain." Anesthesiologist Dr. Gilbert Fitz-Patrick was quoted, "that while we have not been able to prove it definitely, still we have much evidence to show that the administration of anesthetics, over a long period of years produces a condition of nephritis that results fatally." Perhaps for the first time, the publication stressed the need to know what protective measures were required to keep the anesthesia care team safe from operating room pollution. James Tayloe Gwathmey, distinguished anesthesiologist and inventor of anesthesia delivery systems, died in 1944, and Dr. Richard Foregger memorialized him in *Anesthesiology*. The article stressed Dr. Gwathmey's zeal for a healthy life style, abstaining from tobacco or alcohol, and "sculptured his body to perfection by athletic exercise and outdoor life." The obituary stated "Gwathmey's disease—Asthma—might be considered as effect of the daily inhalation of ether vapors during his many years of his life." Gwathmey was 81 years old at the time of his death. While it is possible that operating room pollution aggravated his reactive airway disease, it is doubtful that ether shortened his life. Wertham, in 1949, reported that a surgeon, nurse, and anesthetist who were exposed to ether for many years complained of depression, fatigue, headache, anorexia, and loss of memory. Their symptoms disappeared after six weeks of vacation and didn't return after the installation of ven-

tilation equipment in the operating rooms. Included in the title of the article, published in a German surgical journal, was "chronic ether intoxication."

The start of an energetic and spirited interest in operating room pollution started in the 1960s. Vaisman conducted the first large-scale investigation, and in 1964, he published the results of a questionnaire sent to 354 Russian anesthetists who employed various combinations of nitrous oxide, ether, or halothane using semiopen or semiclosed techniques. The majority complained of headache, fatigue, and respiratory inflammation. The most dramatic and unexpected information obtained was that 18 of 31 pregnancies among the anesthetists resulted in spontaneous abortion, and only seven pregnancies were without complications. As a result of the investigation, Russian anesthetists received a 20 percent pay bonus as a compensation for their harmful employment conditions. Unfortunately, several methodologic problems existed with the investigation, most notably the absence of a control group and bias in the selection of test populations. No attempt was made to illuminate the affects of long hours, excessive workload, poor ventilation, or defective equipment. The uncertain results of this investigation underscored the difficulty in citing the direct cause-effect of operating room pollution and workers' health. Future investigators would come to understand that multiple environmental factors are unfavorable to safe and efficient anesthetic practice, and only one of those is anesthetic pollution. In 1968, research supported by the National Institutes of Health investigated the causes of death among anesthetists during the years 1947-1966. The scientists were

Continued on Page 14

Sleep. . . Continued from Page 13

concerned that anesthesiologists were at increased risk of dying from hematopoietic and lymphoid diseases compared with people who were not exposed to halothane and methoxyflurane. The results were inconclusive and only served to stimulate interest in additional studies.

In 1970, the Occupational Safety and Health Act became public law. Its goal was to assure citizens they would have safe and healthful working conditions. This act of Congress created the National Institute for Occupational Health and Safety (NIOSH). One year later NIOSH became concerned with the potential hazards linked to chronic exposure to inhalational anesthetics. The American Society of Anesthesiologists joined NIOSH in a national health survey of operating room personnel. A questionnaire was mailed to 49,585 operating room workers and to 23,911 unexposed individuals. The results revealed that females working in the operating room had an increased incidence of cancer and hepatic and renal disease, and of spontaneous abortion and congenital abnormalities in their children. Unexposed wives of males working in the operating room also had increased risk of congenital abnormalities. The report stated that while there was not, "...unequivocal evidence concerning the several occupational diseases studied, it seems likely that a number of serious environmental problems exist in the operating room." The authors of the study strongly recommended the venting of waste anesthetic gases in all anesthetizing sites, including dental offices; in addition, programs must be instituted that would be responsible for regular surveillance of operating room pollution. Many anesthesiologists advocated low-flow circuits and aggressive scavenging systems, others had a more conservative view, concerned that scavenging and low-flow systems would diminish patient safety and be inordinately expensive. Although researchers concluded that the rate of complications from waste gases were dose-related, no specific information was available on safe levels of exposure. Concern about the possibility of inhaled anesthetics causing cancer in operating room personnel prompted a 1976 editorial in *Anesthesiology*, in which Dr. Ellis N. Cohen stated, "It seems probable that anesthetic agents do pose a risk as carcinogenic environmental pollutants." Four goals were proposed: 1) gather facts and assess all information, 2) conduct appropriate research, 3) evaluate all currently employed anesthetics and under-

stand their carcinogenic potential, and 4) continue research into new anesthetics specifically designed to have low cancer-inducing properties.

In 1980, four national regulatory agencies (NIOSH, OSHA, FDA, and JCAH) had the power to formulate rules and guidelines relating to operating room pollution from anesthetic gases. In a "Special Article" in *Anesthesiology* (1980), Dr. Richard I. Mazze voiced his concern that these federal bureaucracies have too much power, and that anesthesiologists should not be complacent about the potential for continued interference in their profession. He noted that many of the governmental recommendations appear to be "cost-ineffective, impractical or unnecessary." Dr. Mazze appealed to his readers "...organized anesthesia must take the lead and advocate a reasonable alternative program of control in this possibly hazardous situation. If we do not advance a strong position of our own, then one or all of the regulatory agencies will step in and take over."

Charles Bragg's print, "The Gas Man," highlights the potential for functional impairment in the operating room from exposure to waste anesthetic gases. In the early and mid 1970s, tests involving cognition, perception, motor skills, memory, reaction time, and vigilance were performed on medical and dental students and anesthesiologists who breathed high ambient concentrations of nitrous oxide, halothane, and ethrane. Several of these investigations supported the notion that breathing waste anesthetic gases may interfere with optimum performance. However, the conditions of these studies were quite dissimilar to those that existed in the operating room, statistical differences in reaction times and motor incoordination may not be clinically significant, and some researchers observed no detrimental effect with similar concentrations of inhalation anesthetics.

Charles Bragg is an internationally celebrated American artist and illustrator, recognized for his etchings and caricatures. His paintings are displayed in venues ranging from the Pushkin Museum in Moscow to the art galleries of Scottsdale, AZ. His images of physicians seem to ask the question, "Is today's medical system making you ill?" The Gas Man, uncaring and asleep on the job, confirms our patients' worst suspicions about anesthesiology. Although Mr. Bragg's art is infused with humor, his messages are serious, stating, "In our specialized society we are so helpless in these people's hands. We depend on their expertise and feel so vulnerable."

Interest in operating room pollution appeared suddenly and profoundly in the 1960s, but the inquisitiveness evaporated within two decades. A MEDLINE search for *occupational diseases* and *anesthesiology* revealed that in the period 1971-76, publications about pollution occurred 33 times versus only three times for infection. By 1983-87 three times as many articles were published about infection as pollution. In the American Society of Anesthesiologists' publication *Waste Anesthetic Gases* (1999), 75 percent of the references are from the 1970s and 1980s; only 21 percent were published in the 1990s. Many researchers attempted to understand the relationship between waste anesthetic gases and a host of problems, complaints, and concerns from operating room personnel. A vast array of experiments, animal and human, retrospective and prospective, clinical and by survey, failed to define conclusively the effects of waste anesthetic gas pollution. Nevertheless, 20 years of ardent investigations, controversy, debate, rules and regulations resulted in attention to gas scavenging, low-flow techniques, closed systems, and motivation to discover inhalation anesthetics with minimal biotransformation. And it can be stated, without dispute, these efforts made anesthesia safer for both our patients and coworkers.

Suggested Reading

Occupational disease among operating room personnel: a national study. Report of an Ad Hoc Committee on the Effect of Trace Anesthetics on the Health of Operating Room Personnel, American Society of Anesthesiologists. *Anesthesiology* 41(4):321-40, 1974.

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Miller MG, Cullen BF. The cost of scavenging—is it worth it? *Anesthesia & Analgesia* 58(4):265-6, 1979.

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Continued on Page 20

Book Review

Stratmann, Linda. *Chloroform, the Quest for Oblivion*. Phoenix Mill, UK, Sutton Publishers, 2003

by Ray J. Defalque, M.D., M.S.

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This compact book is a spellbinding history of chloroform, from its discovery in the early 1830s to its present role in our industrial plants and our environment. The book is, to my knowledge, the first and only historical survey of that famous anesthetic. The author has researched a prodigious number of sources, many of them little known. The book is written for laymen but physicians, especially anesthesiologists, will enjoy reading it and learn much from it.

Mrs. Stratmann clearly presents the controversies which surrounded chloroform from the moment of its birth on who was its first discoverer; the debate between Boston and Edinburgh on its safety as compared to that of ether; the medical and religious opposition to its use in obstetrics (or even in surgery); the quarrel between the Scottish and English surgeons on its safest mode of administration; and the disputes over the mechanism of the instant death that it not infrequently caused. All sides of the debates are fairly presented and soundly judged on the basis of the facts gleaned in a vast literature.

The scientific and medical material is presented clearly and soberly, in a crisp, vivid and lucid style. The author offers a balanced judgment on a drug, which spared so many patients the horrors of surgical pain, but could also kill "with the speed of a thunderbolt".

The book also offers vivid biographic vignettes of the great pioneers of chloroform. Some of them, little known to the medical historian, such as Samuel Guthrie or Edward Lawrie, beautifully come alive in Mrs. Stratmann's work.

Over the years, chloroform was recommended to treat every imaginable physical and mental disease, and the book includes many amusing stories about those medical fads. From its birth to our present days, chloroform has been used for wrongdoing, and Mrs. Stratmann narrates at great length some famous criminal cases involving chloroform, which will delight every crime buff. No mystery writer could have presented with more verve and sense of suspense the stories of Adelaide Bartlett,

Winnifred Markand, Sir William Wilde, W.T. Stead, H.W. Mudget and "Old Man" W.M. Rice.

Chloroform raised much clinical and scientific interest on the Continent, especially in Germany, although less so than in Great Britain. I hope that the author will delve more extensively with the story of chloroform in Continental Europe in her book's second edition.

Chloroform, the Quest for Oblivion is a serious book on a difficult medical subject but its fluent, crisp and vivid style makes it a delight to read. I immensely enjoyed reading it and am sure that laymen and physicians who read it will share my pleasure. I highly recommend it to both.

Warfare. . . Continued from Page 7

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20. Fox News Weapons of Mass Destruction Handbook; website: www.foxnews.com/story/0,2933,76887,00.html.

21. Malloy CD. A history of biological and chemical warfare and terrorism. *Journal of Public Management Practice* 2000; 6(4):30-37.

22. Nobel e-Museum, Richard Kuhn-Biography; website: <http://www.nobel.se/chemistry/laureates/1938/kuhn-bio.html>.

23. Monterey Institute of International Studies, Chemical and Biological Weapons Resource Page, State Possession and Proliferation; website: <http://cns.miis.edu/research/cbw/>.

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Modest Proposal for an Anesthesia History Full Text Project

by A.J. Wright, M.L.S.

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This article is an edited version of comments I made at a panel discussion held at the annual meeting of the American Society of Anesthesiologists in October 2001 in San Francisco. The panel was entitled "Open Forum on the Writing of the History of Anesthesiology" and my contribution was to be called "What's in Cyberspace—Finding the History of Anesthesia on the Web." In the summer of 2001 when I began planning for the panel, I thought I would simply do some slides that were screen captures of various anesthesia history sites on the web and talk about those and a few others.

The more I thought about that approach, the less I liked it. I was afraid that I would give the wrong impression—that there is a significant amount of anesthesia history material on the World Wide Web. Unfortunately, that was not the case. So I scrapped the slides idea; that would be a distraction from what I wanted to say. I decided to try and keep the audience's attention with something as low-tech as a few ideas.

First, though, I briefly described some of the anesthesia history materials available on the Internet. I maintain a web page called "Anesthesia and Pain History on the Internet" which is just a listing of links to these materials. I update this page several times a year, and thus I attempt to find as much relevant web-based material as possible.

Several organizations have substantial anesthesia history web sites including the ASA's Wood Library-Museum, the Nuffield Department of Anesthetics at Oxford and the Pain Archives at the UCLA Library. There is an anesthesia history electronic discussion list known as "anes-hist" that was created in 1995. There are some organizational histories on the web, but most of these are very brief. There are also numerous brief biographies of important individuals in anesthesia history.

Some full-text primary resources items are available, almost all of them journal articles from the 19th century in medical journals such as *Boston Medical and Surgical Journal* and popular journals of the day such as *Harper's New Monthly Magazine* and *The Century*. Most of this full-text material is short articles that I have placed on the

web or that are on the web as the serendipitous result of large full-text projects that have nothing to do with anesthesia or even medical history.

Anesthesia history materials are of course a subset of the medical history resources on the web. Many medical history sites are those of libraries, which describe their collections and may have some full text material online from their collections. Otherwise, not much full text material in medical history is available on the Internet with the exception of projects devoted to such classical authors as Hippocrates or Galen. Medical and anesthesia history material on the web is a very small, indeed tiny subset of history material that's available.

Some areas of history that have massive amounts of primary and secondary material online include the U.S. Civil War, World War II, and genealogy. Some of these materials are available free as the result of incredible volunteer efforts, such as the gigantic RootsWeb genealogy site. Others are available only to subscribers of particular databases or to faculty and students at universities or public libraries which have subscribed.

Full-text projects—efforts to put complete books online—reflect this same kind of division. Project Gutenberg is the oldest such project. Begun in 1971 by Michael Hart, PG has more than 10,000 books online and several dozen are added to their database each month. Many are classic titles by Melville or Dickens, but others are obscure volumes of 19th century fiction and non-fiction. All of these texts are public domain. PG is operated entirely by volunteers around the world who scan or type the texts or research their copyright status. At any moment PG has hundreds of books in various stages of completion.

There are some commercial full text projects such as netLibrary that market subscriptions mostly to libraries. These contain current academic material in many fields.

Another non-commercial effort is the Making of American Project at the University of Michigan and Cornell University. This project has made over 10,000 nineteenth-century American books and thou-

sands of journal issues available for free. The database has over 3,000,000 pages, all of which can be searched. Other full-text projects include the Sacred Text Archive, Historic Mathematics Collection, Digital Quaker Collection, Historic Brazilian Books, Afghanistan Digital Library, Project Runeberg (Nordic literature), Saganet (Icelandic literature) and Project Perseus (classical Greek and Roman literature).

I'm currently mining the MOA journals for anesthesia history materials and I've found a number of articles. These items are from popular not medical journals. I am linking to these on another web page I maintain, "Anesthesia History Files."

The Online Books Page at the University of Pennsylvania currently indexes more than 20,000 full-text books available on the net. The Internet Public Library indexes a similar number. As far as I can determine, not a single one of these titles relates to anesthesia history.

Why should there be?

Where is the interest?

No individuals or organizations, or a combination have taken one initiative to do it.

The Wood Library-Museum over the years has made a heroic effort to reprint anesthesia history books and articles. But what they have reprinted is only the tiniest fraction of what is available.

Hundreds of books and thousands of articles related to anesthesia and published in the nineteenth century remain almost below the radar, waiting on the library shelves. Making a portion of this material available on the web would no doubt increase interest in anesthesia history since a significant group of primary resources would be easily available.

Digital information should be viewed as a means to increase access – not as a preservation tool since digital media are currently unstable, although efforts are underway by archives and libraries around the world to overcome that obvious problem.

But unless it's something we have to do or are passionate about, most of us are just lazy enough to look for the easiest, quickest route in most situations and that in-

cludes information seeking. Librarians at high schools and colleges have been noticing for several years that students doing research don't want to go beyond what is available on the web or as databases accessible from machines they are using that moment. They don't even want to go upstairs and seek out the paper journals on another floor of the very library they are using.

This attitude is not limited to lazy young people. We should note the situation a couple of years ago at John's Hopkins where a researcher missed important medical articles because he had only done a literature search on PubMed – the online database that only went back to 1960 at that time. The articles he missed that described serious side effects of the drug he was researching and had been published in the 1950s. One of his experimental subjects died.

This incident is a graphic reminder of how quickly people have become used to searching the web and not beyond.

How do we make anesthesia history more visible in cyberspace?

Let me propose something called, say, the Anesthesia History Full Text Project that could stimulate and loosely coordinate efforts to put anesthesia history materials on the web. Potential partners to begin this project could include the WLM, the Anesthesia History Association, the History of Anesthesia Society, the anesthesia history club in France, and volunteers like you and me.

Efforts by the genealogical community might serve as a model, or at least as inspiration. Over the past decade or more, a combination of commercial firms, non-profit organizations and thousands of volunteers have placed massive amounts of census, death and marriage records; cemetery inventories and other materials online. Some are available by subscription, but much of it is free. Greater interest in genealogical research has been stimulated by the fact that people can now do at least some of their research from home.

How to begin? I would suggest that representatives of those anesthesia history organizations named above attend a summit meeting—held in cyberspace, of course—and develop an initial plan. This plan could be widely circulated around the anesthesia history community and further refined. One thing that might be included in such a plan is an initial list of books and articles to be digitized, ranked in some loose fashion. Perhaps each organization could commit to finding volunteers to begin working on digitizing lists of titles

originally published in their country. The plan would also have to address format and storage issues.

This modest proposal remains my current thinking about anesthesia history in cyberspace. Unfortunately, in the two years since this talk was given, almost nothing has changed. Those of us with an interest in anesthesia history face similar challenges as many genealogists and others interested in historical research—not much

free time and not much easy access to primary resources without expensive travel. A large body of anesthesia books and articles from the nineteenth and early twentieth centuries available online might involve more people in “doing” anesthesia history. At the very least, faculty and residents in anesthesiology departments around the world would have easy access to a significant amount of the historical published record of their specialty.

Appendix 1: Anesthesia history sites mentioned

Anesthesia and Pain History on the Internet
www.anes.uab.edu/aneshist/anesnet.htm

Anesthesia History Association
www.anes.uab.edu/anesthesia_history_association.htm

Anesthesia History Files
www.anes.uab.edu/aneshist/aneshist.htm

Club de l'Histoire de l'Anesthesie Reanimation
www.char-fr.net/

History of Anaesthesia Society
www.histansoc.org.uk/

Nuffield Department of Anaesthetics Online Anaesthesia Museum
www.nda.ox.ac.uk/museum/index.htm

Wood Library-Museum of Anesthesiology
www.asahq.org/wlm/

UCLA Pain Archives
www.library.ucla.edu/libraries/biomed/his/pain.html

Appendix 2: Full-text projects mentioned

Afghanistan Digital Library
dlib.nyu.edu/divlib/bobst/adl/

Digital Quaker Collection
esr.earlham.edu/dqc/about_project.html

Internet Public Library
www.ipl.org/div/books/

Historic Brazilian Books
portal.prefeitura.sp.gov.br/secretarias/cultura/bibliotecas/marioandrade/0012

Historic Mathematics Collection
www.hti.umich.edu/m/mathall/

Making of America: Cornell University
cdl.library.cornell.edu/moa/

Making of America: University of Michigan
www.hti.umich.edu/m/moagrp/

Online Books Page [University of Pennsylvania]
onlinebooks.library.upenn.edu/

Project Gutenberg
ibiblio.org/gutenberg/
see also ibiblio.org/gutenberg/GUTINDEX.ALL

Project Perseus
www.perseus.tufts.edu/

Project Runeberg
www.lysator.liu.se/runeberg/

RootsWeb
www.rootsweb.com/

Sacred Text Archive
www.sacred-texts.com/index.htm

Saganet
saga.library.cornell.edu/

MedNuggets

by Fred J. Spielman, M.D.

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The University of North Carolina at Chapel Hill

Analgesia will continually improve, for it is here to stay. Intelligent women of character demand it; we must answer the demand not only in the name of humanity but in the interest of the race, for those are the women who should become multiparae and bring into the world a reasonable number of fine offspring to offset those of the lower stratum of intelligence and character.

—Eliot Bishop

American Journal of Surgery 35:252,
1937

The surgeon and the anesthetist are a team. The anesthetist runs the interference. He is the consultant, the helper. He is the man who makes hard surgery easy.

—Fred E. Woodson

Southern Medical Journal 38:224, 1945

The general administration of anesthetics as performed today is the shame of modern surgery, is a disgrace to a learned profession, and if the full, unvarnished truth concerning it were known to the laity at large it would be but a short while before it were interfered with by legislative means and properly so.

—J.M. Baldy

American Journal of Obstetrics and Diseases of Women and Children 58:1, 1908

On the other hand, there has always been a danger that the practicing anaesthetist, in the development of the technical skill upon which his living depends, would become more and more a mere technician. A gulf has thus tended to widen between the anaesthetist and the physician.

—Editorial

British Journal of Anaesthesia 32:513,
1960

Proper administration of the anaesthetic is an art in itself. No part of the art of surgery requires more painstaking care, judgment and craftsmanship than does the art of selecting and properly administering the anaesthetic.

—E. Starr

Surgery, Gynecology, and Obstetrics
51:479, 1930

The anesthetist, though he may be an

excellent technician, rarely considers the general condition of the patient, except to notice the pulse and temperature. Seldom does he take the precaution to ascertain the state of the cardiovascular system.

—Paul Kurt Sauer

American Journal of Surgery 48:532,
1940

Again let it be emphasized that recently introduced cardiac monitors are not to be condemned. They are a useful and important adjunct in the estimation of a patient's welfare. But to trust entirely these electronic gadgets may endanger the life of the patient. The finger on the pulse and the blood pressure cuff still remains our most useful tools— the age of electronics has not rendered the skilled and attentive anesthetist obsolete.

—David A. Davis

American Surgeon 24:647, 1958

It is increasingly clear that the anesthesiologist's role is that of the internist in the operating room. He deals with aspects of clinical physiology and pharmacology, while the surgeon devotes his time and energies to surgical problems and concentrates his skill in the restoration of anatomical continuity. Such a definition of activities on a mutual cooperation basis can lead to but one thing: better patient care.

—Vincent J. Collins

Bulletin of the New York Academy of Medicine 31:438, 1955

Anaesthesia is peculiar among the specialties in that comparatively minor degrees of lack of skill may result in the direst of consequences, even resulting in death.

—William W. Mushin

Anaesthesia 9:232, 1954

It is the practice of members of the anesthesia department to maintain all patients receiving spinal anesthesia in a light state of hypnosis and sedation throughout the anesthetic and surgical periods. We have used intravenous alcohol in 5 to 10 per cent concentrations for this purpose with excellent results.

—Mary Karp

Surgery Clinics of North America, p. 325,

1952

The question is asked frequently—“do you have any difficulty getting the consent of the patient for a spinal anaesthetic?” The answer is “No.” The reason is that the consent is not requested. Certainly we do not ask patients “what type of colour of antiseptic do you wish applied to the skin of your abdomen?” So why ask the patient to pass judgment on what type of anaesthetic is good for him? Simply do not ask foolish questions.

—E.H. Wood

Canadian Medical Association Journal
33:298, 1935

It will probably always be necessary for the general practitioner to give some anaesthetics; but it should be recognized that the fact that he has referred a patient to a surgeon is insufficient evidence that he is the most suitable anaesthetist for the case.

—Gilbert Brown

The Medical Journal of Australia 1:209,
1939

As for the post operative sequellae (spinal anesthesia)- severe headaches I have seen but twice and they recovered in a few days by placing them in a slight Trendelenberg position in bed and administering four ounces of a twenty-five per cent solution of Mag Sulph per rectum once or twice at five hour intervals.

—Leo F. Simpson

New York State Journal of Medicine
30:1275, 1930

Whatever the anesthesiologist does, including his work in intensive care areas, he must forever keep his mind, his heart, and his training in the surgical amphitheatre whence all his skills and strengths arise. If the anesthesiologist maintains this original and fundamental skill, then his extended and derived skills will always be fresh, constantly renewed, and prepared for advances. If, on the contrary, he becomes a specialist only in the work of acute medical care in the intensive care unit he will become a minor and de-

Continued on page 20

From the Literature

by A.J. Wright, M.L.S.

Associate Professor of Anesthesiology

Director, Section on the History of Anesthesia

University of Alabama at Birmingham

Note: In general, I have not examined articles that do not include a notation for the number of references, illustrations, etc. I do examine most books and book chapters. Books can be listed in this column more than once as new reviews appear. Older articles are included as I work through a large backlog of materials. Some listings are not directly related to anesthesia, pain or critical care but concern individuals important in the history of the specialty [i.e., Harvey Cushing or William Halsted]. I also include career profiles of living individuals. Non-English materials are so indicated. Columns for the past several years are available as "Recent Articles on Anesthesia History" in the "Anesthesia History Files" at www.anes.uab.edu/aneshist/aneshist.htm I urge readers to send me any citations, especially those not in English, that I may otherwise miss!

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Continued on page 20

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MedNuggets... *Continued from Page 18*

rived specialist of internal medicine.

–E.M. Papper
Anesthesiology 28:969, 1976

The dangers of general anesthesia depend more on the lack of experience and incompetency of the anaesthetist than on the drug itself, in most instances.

–Alice Magaw
Surgery, Obstetrics, and Gynecology
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From the Lit... *Continued from Page 19*

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The winner will receive a cheque for £1000 and an item of engraved glass, the runners up will receive £300 and £200 respectively. These awards have been kindly donated by Mrs Regina Bullough to commemorate her late husband, Dr. John Bullough. A Consultant Anaesthetist at the Dartford Group of Hospitals in 1963 he successfully resuscitated a young woman at the road side following a traffic accident, an event which gained national media coverage.



Dr. John Bullough

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