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THE NEXT ISSUE

MEDICAL IMAGING

SUBMISSION DEADLINES
ARTICLES........ April 9, 1996
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COVER ART:
Pen and Ink: Ancient physicians believed that health prevailed if the four "humours" (blood, phlegm, black bile and yellow bile) were in balance. The observation of urine or uroscopy, was used as a reflection of humoral balance. A basic diagnostic tool for centuries, uroscopy was refined to the point that the Breslau Codex of Salernitan Medicine devoted forty pages to the practice, and eighteen different colours of urine were described.

Sudeep Gill, Meds '97

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PROBLEM SOLVING

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A look at the past will show that the philosophies of one age become the absurdities of the next, and the foolishness of yesterday becomes the wisdom of tomorrow.¹

In his extensive writings, Sir William Osler emphasized the necessity for medical students and physicians to have a sound appreciation for the history of their profession and for the humanities. He encouraged his students to be well rounded individuals, to expand their intellectual horizons beyond the medical textbooks, and epitomized the idea of the physician as scholar.

Unfortunately, the information-age mindset prevalent in contemporary undergraduate science programmes and schools of medicine discourages such enlightenment, requiring early dedication to the scientific aspects of medicine to the exclusion of everything else. To receive grades which are suitable for acceptance to medical school, most students enrol in primarily science-based courses (where grades in the 90's are commonplace) rather than risk mediocrity (i.e., anything less than an “A”) marks in the courses centring on the humanities. The trend continues when the student enters medical school; science predominates over the humanities once again. As a result, modern medical practitioners have concentrated their sphere of knowledge to a pinprick. Physicians know only how to treat diseases, have focused competence and general ignorance.²

Medical humanities, such as the history of medicine and medical ethics, have all but disappeared from today's medical school curricula. Considered extraneous in the pursuit of a medical career by administrators who stress utility over enrichment, humanities-based instruction has been supplanted by science and technology dominated courses, on the fallacious principle that only what is 'factually relevant' is of importance. As the medical knowledge base expands relentlessly, representatives from the various medical departments vie for the precious and continuously diminishing course hours, upholding their instruction as indispensable. Unfortunately, the medical humanities are little match for anatomy, pathology, histology, and the like and are invariably the first to be sacrificed to make room for the 'necessary' basic facts of a medical education. I am, by no means, negating the importance of the above courses in the training of a physician; rather I am proposing that the value of the humanities has been significantly underestimated to the detriment of the medical profession.

An education in the medical humanities is indispensable on two levels. On a basic level (one that will appeal to medical school administrators) it directly strengthens the physician's ability to care for patients. To effectively appreciate medical history, we must first accept the paradox that “the beliefs and knowledge of antiquity have been superseded only by the more rational ignorance of today.”³ Then, through knowledge of the influencing forces, general trends, flaws, and controversies within modern medicine and that of antiquity can we control the destiny of our profession.⁴ An appreciation of the history of our profession, of the achievements and of the shortcomings, permits us to discern the forces at work, and what is to come.

Of course, there is a higher, less tangible reason for appreciation of the medical humanities, indeed the humanities in general: learning the humanities for personal enrichment rather than for vocational purposes. It may not be the responsibility of a school of medicine to instill a love of the humanities in their students. However, in curricula where the humanities are given the recognition and respect they deserve, these qualities may develop on their own. It will then become self-evident to all involved that the pursuit of human enlightenment through the study of philosophy and history will not only create better physicians, it will create better human beings.

It seems fitting, then, to close with the words of Sir William Osler:

Every day do some reading...apart from your profession. I fully realize, no one more so, how absorbing is the profession of medicine...but you will be a better man and not a worse practitioner for an avocation. I care not what it may be: literature or history or...any of which will bring you into contact with books.¹

Jay Nathanson, Meds '96  "Editor

REFERENCES

To the editor,

Paolo Campisi's article (Rapid Sequence Induction: Airway Establishment and Management in the Emergency Department, UWO Medical J 1995: 64; 83-86) is an excellent review of the topic. However, I have serious reservations about the use of rapid sequence induction (RSI) in the emergency room by non-anesthesiologists.

Although Mr. Campisi discussed the anatomical problems that may be associated with difficult intubation, he failed to mention other contraindications to RSI which include:

1. inexperience with endotracheal intubation
2. inexperience with anaesthetic induction agents and muscle relaxants
3. inexperience with rapidly obtaining a surgical airway
4. immediate availability of equipment for cricothyrotomy
5. facial trauma
6. C-spine injury
7. retropharyngeal abscess
8. epiglottitis
9. laryngeal trauma or tumour, tracheal trauma
10. Zenker's diverticulum
11. potential difficulty to ventilate (e.g., chest wall trauma, tension pneumothorax, or bronchopleural fistula)
12. active vomiting
13. lack of suctioning equipment immediately available
14. cardiovascular disease
15. hypovolemia
16. anaesthetic drug contraindications

These contraindications exclude all but the most experienced persons in airway management from performing RSI in the ER setting. Furthermore, the use of lidocaine spray topically to the vocal cords is controversial. It elicits a strong cough reflex initially which may be detrimental with an unstable C-spine or raise intracranial pressure and also lidocaine spray obtunds the protective airway reflexes which may prevent aspiration. Atracurium and vecuronium (table 2) are not sufficiently rapid acting to be used for RSI and should not be used. The atropine dose suggested for adults is incorrect and is rarely used for RSI in adults. The dose of thiopental suggested (table 2) may be too high for the elderly and is relatively contraindicated in hypovolemic patients.

In the case of a failed intubation, if the patient cannot be ventilated, immediate cricothyrotomy must be performed. Waiting for the help of a surgical team will likely prove disastrous. Every person capable of inducing anaesthesia must be able to perform cricothyrotomy.

The use of RSI in the ER is extremely dangerous in the hands of persons not expert in airway management, pharmacology or anaesthetic agents, muscle relaxants and pathophysiology. The use of muscle relaxants in the ER causes more problems than it may solve. RSI of anaesthesia rarely has a place in the ER.

Steven Dain, MD, FRCPC
Assistant Professor, University of Western Ontario Department of Anaesthesia
The passing of Murray Barr on May 4, 1995 concludes an epoch in the development of medical science in Canada and in the evolution of the Department of Anatomy at Western, which he joined nearly 60 years ago. In addition to carrying out his personal scientific work and his duties as a teacher and administrator of a department, Dr. Barr occupied a vital position in the advancement of anatomical sciences and genetics in Canada through his involvement in the national granting agencies and scientific societies. As a teacher of neuroanatomy, an advisor, and a friend, he will be remembered by generations of grateful medical students. The students of the Vet’s classes were particularly attached to him, since he was also one of them, a Veteran from the Air Force, and not much older than they were.

Murray Barr was born in 1908 on a farm not far from London, in Belmont, where he went to elementary school. In London he completed his secondary schooling. In 1926 he enrolled in the B.A., M.D. course at Western, graduating with an M.D. in 1933. Along the way he took a leading role in student activities, especially in student administration, and was made President of the University Student’s Council, in medical history (with Dr. Crane in the Osler Society), and in athletics.

Dr. Barr did his internship at Erie, Pennsylvania, decided to become a neurologist, and returned to Western, joining the anatomy department in 1936 for the purpose of enhancing his knowledge of the anatomy of the nervous system. During the summers he studied in Minnesota under A. T. Rasmussen, a renowned American neuroanatomist. However, he did not complete his studies in the States because at the outbreak of the war he joined the R.C.A.F. as a medical officer, serving in Canada and in England. He had great aptitude for administration, and was made President of the R.C.A.F. medical Board in London, England for a period of two years. When he left active service in 1945 he held the rank of Wing Commander.

ABOUT THE AUTHOR:

Dr. Robert Buck is Professor Emeritus of Anatomy at the University of Western Ontario and was a friend and colleague of Dr. Murray Barr for nearly 40 years. Dr. Buck was Editor of the UWO Medical Journal in 1946.

Dr. Barr then returned to Western as a member of the Department of Anatomy where he began research on cytological changes in nerve cell bodies following nerve injury. He soon became totally engrossed in neurocytological research and decided to pursue an academic career. He was promoted and became a department head in 1953.

The most renowned discovery resulting from Dr. Barr’s research was that the ordinary cells (somatic cells) of males and females exhibit a distinct difference in the pattern of the distribution of DNA in their nuclei. This discovery was the result of research carried out in collaboration with his graduate student, E. G. Bertram. A small mass of DNA was present in cells of females, but not in cells of males. This they called the “sex chromatin”. Further research by Dr. Barr and his colleagues showed that the sex chromatin represented the stainable chromatin of one of the two X chromosomes of the female, absent in the male where only one X chromosome is present. Its discovery was almost immediately applied to clinical medicine, particularly in the study of abnormal sex development and of mental retardation. It significantly advanced the study of the new field of human cytogenetics, especially the study of human chromosome abnormalities.

This discovery, and the continued work by Dr. Barr in cytogenetics, earned him a well deserved international reputation, and he received many honours, including many honourary degrees, fellowships in prestigious societies, and awards. He was perhaps most pleased to be awarded the Joseph P. Kennedy Jr. Foundation Award, presented to him by President John F. Kennedy and also to be made a Fellow of the Royal Society of London, the first recipient of this honour among Western graduates.

In addition to his research papers Dr. Barr was the author of a highly respected textbook of neuroanatomy which is used world-wide. Dr. Barr’s long standing interest in historical matters led the Faculty of Medicine to invite him to compile a history of the medical school for the 1978 celebration of the Centenary of the University. His book, “A Century of Medicine at Western”, which was written largely after his retirement, provides a vivid portrait of the evolution of a prestigious medical school from humble beginnings.
Active Compression-Decompression CPR

by Sara Gray and Terry Skoretz

Standard cardiopulmonary resuscitation (SCPR) is an interim technique designed to artificially maintain ventilation and systemic perfusion until spontaneous cardiopulmonary function can be re-initiated. SCPR in its current form was developed in the 1960's, and has changed very little since that time. SCPR maintains systemic circulation by compressing the heart between the sternum and the vertebrae and by rhythmically increasing intrathoracic pressure. These techniques replicate the systolic phase of the cardiac cycle, while the diastolic phase occurs passively. Despite the prevalence of this technique, SCPR has a success rate of only ten to 15 percent, even when performed on patients who arrested while in-hospital. Furthermore, SCPR only produces one third of the normal cardiac output. Therefore it is a poor substitute for a heart in normal sinus rhythm.

Due to the lack of overwhelming success, improvements upon the current method are continually sought. As reported in JAMA (1990), a patient was successfully revived after chest compressions were performed with a toilet plunger applied to the anterior thoracic wall. In theory, a plunger may provide sufficient suction to ameliorate chest wall expansions, transforming diastole into an active event. It was hypothesized that this may improve the extent of circulatory perfusion, thereby facilitating resuscitation. Active compression-decompression CPR (ACD CPR) may be able to produce greater negative intrathoracic pressure due to the active decompressions. This creates lower right atrial pressure which may lead to improved venous return and right atrial filling, producing increased cardiac output and systolic arterial pressure. Considerable scientific study has been stimulated by this anecdotal report of ACD CPR, including the current Ontario ACD CPR trial. This two year study involves cardiac arrest patients at both the University of Ottawa and the University of Western Ontario. The majority of the recent ACD studies use a scaled-down plunger to perform compressions. It is a small suction device with a handle (Ambu CardioPump, Ambu International, Copenhagen, Denmark) which weighs approximately one kilogram, and has a radius of seven centimetres and a height of 12 centimetres. The device includes a gauge which ensures that compressions are performed in compliance with the guidelines for force and depth provided by the American Heart Association. Therefore, the compressions are calibrated to the size of the patient: a woman, a man, or a large man.

The original anecdote was published in October 1990, and produced a spate of empirical investigations. Cohen, Tucker, Lurie et al. (1992) demonstrated that ACD CPR improved hemodynamics in ten human subjects, in addition to increasing a measure of cardiac output and end tidal carbon dioxide (ETCO). Both of these measures are reliable indicators of coronary perfusion pressure (CPP); increasing CPP is an important factor in improving rates of resuscitation. To support their hypothesis that ACD CPR could increase perfusion pressure, Cohen, Tucker, Redberg et al. measured haemodynamic properties in eight non-ventilated dogs with induced ventricular fibrillation. They replicated their haemodynamic results from the human study, by directly assessing coronary perfusion pressure using ascending aortic and right atrial pressures. The dog's minute ventilation was approximately doubled during ACD CPR, presumably due to the increased intrathoracic pressure produced by the active decompression phase of ACD CPR.

Cohen, Goldner and Maccaro et al. then performed an outcome study of 62 patients experiencing in-hospital cardiac arrests. The patients, all of whom were over the age of 18, were randomly assigned to either ACD or SCPR trials. They found that ACD CPR improved the likelihood of initial resuscitation (p<0.03), 24 hour survival (p<0.004), and neurological outcome as measured by the Glasgow Coma Scale (p<0.02).

Schultz et al. performed a haemodynamic study involving human subjects undergoing cardiac surgery. The benefit of this methodology is that it allows the researchers to examine variables that can not be measured in patients who undergo spontaneous cardiac arrests. The surgical patients required an intracardial defibrillator; this procedure involves multiple inductions of ventricular fibrillation in order to calibrate the cardioverter. During periods of fibrillation, if intracardiac defibrillation failed, the patients randomly underwent either SCPR or ACD until the defibrillator could recharge. They were defibrillated again, and if the procedure was unsuccessful, the alternate method of CPR was performed until transthoracic defibrillation was possible. In this way, the patients could act as their own controls, and the haemodynamic properties of both methods could be compared within a brief time period. Schultz found that

ABOUT THE AUTHORS:
Sara Gray and Terry Skoretz are medical students at UWO who are both considering residencies in Emergency Medicine.
ACD provided increased arterial blood pressure during compressions (p<0.03), coronary perfusion pressure (p<0.02), minute ventilation (p<0.001) and negative inspiratory pressure (p<0.04). By directly measuring right atrial pressure in human patients, this study proved that ACD CPR improves coronary perfusion pressure.\(^5\)

Lurie, Schultz et al. investigated 77 out-of-hospital cardiac arrest patients. Although they did not find that ACD provided a statistically significant benefit to spontaneous recovery of circulation or survival to hospital discharge, their results indicated trends in that direction. They conclude that larger studies are required to provide more definitive results.\(^6\) Most recently, Tucker, Galli, Savitt et al. performed an outcome study which compared ACD CPR to SCPR in 53 in-hospital patients. They found that ACD improved the prevalence of circulatory return and 24 hour survival rates. ACD also showed a trend for improving survival to hospital discharge, although as yet no study has found a clinically significant result on this outcome measure.\(^7\)

Further alternatives to SCPR include interposed abdominal counterpulsation, and an inflated vest device. However, both methods require further clinical testing before their use becomes widespread. Interposed abdominal thrusts have been studied in a small human population; the initial results were promising however they need to be clinically validated in a large sample.\(^8\) The inflated vest technique has been extensively tested in animals. While it provided a haemodynamic benefit, no results from studies using human subjects have been performed. In contrast, ACD is simple to learn and inexpensive as compared to other CPR methods such as the vest device. Therefore, if it is found to be effective in improving survival rates it may be the best alternative.\(^9\)

The current Ontario ACD CPR trial is expected to be completed in September 1993, and the results will be available in the spring of 1996 at the earliest. The study began in May 1993 and is unique due to its large sample size (expected N=1500). The experiment is designed to determine whether long and short term survival rates can be improved by the use of ACD CPR compared to SCPR. For patients who suffer cardiac arrest, the method of resuscitation is determined by a sealed study container, which has a 50 percent chance of containing an ACD CPR apparatus. If the box is empty SCPR is performed; therefore the patient has a randomly assigned equal chance of entering either the ACD group or the SCPR group. Both methods of resuscitation follow the AHA guidelines for compressions and ventilation. All personnel who perform chest compressions have been trained in ACD CPR so that they can perform either method effectively. The same randomization procedure is also followed for out-of-hospital cardiac arrest patients; Thames Valley Ambulances begin CPR by opening one of study containers, which determines their method of resuscitation. As in previous ACD CPR studies, patients who are under age 16 are excluded from the experiment. In addition, the Ontario ACD CPR trial does not include acute trauma patients.\(^10\) The results of this study are expected to affect the treatment of cardiac arrest patients worldwide.

ACKNOWLEDGEMENTS

The authors would like to thank Dr. J. Dreyer and Sharon Baker R.N., of Victoria Hospital, for their information and constructive suggestions.

REFERENCES

Airway Management in the Trauma Patient with a Cervical Spine Injury

by Qasim Raza Alikhan, B.Sc, Meds ’97

INTRODUCTION

Trauma patients usually present a complex clinical scenario in terms of airway management. Unlike the patient undergoing elective or planned surgery, the trauma patient is unprepared for surgical intervention.

It is imperative that airway control be the central issue in the stabilization of the patient. Suspecting and recognizing a spinal injury is important to prevent secondary injury that may occur if the diagnosis of CSI is delayed.

In the United States, spine injuries occur at an incidence of about 280 per million people accounting for two to three percent of all trauma patients. CSI is responsible for about 6000 deaths and 500 cases of paraplegia annually. Considering that the cervical spine is the most mobile and least supported portion of the vertebral column, it is not surprising that this part of the body is susceptible to an excessive amount of movement and injury during impact. In addition, up to 90 percent of all traumatic cervical spine injuries are unstable.

Therefore, normal movement and load have the potential to disrupt anatomical relationships resulting in neurologic deficits.

Etiologies of CSI include hyperextension, hyperflexion, compression, rotation, and penetrating trauma. In general, motor vehicle accidents are responsible for most cases of CSI followed closely by falls, sports injuries and non-penetrating injuries. Knowing the mechanism of injury is important as it allows for a more focused treatment plan to be established. It has been estimated that up to 25 percent of patients with CSI suffer exacerbations of their injuries because of a delay in diagnosis or unwarranted manipulation. Thus, proper evaluation of the patient must occur before any treatment is initiated, including a history, physical, and a radiologic examination.

GENERAL CONSIDERATIONS

The trauma patient presents with a complex scenario for the proper management of the airway. This is because (i) the patient usually undergoes numerous therapeutic and diagnostic testing concurrently with the assessment and management of the airway, (ii) traumatic injuries themselves may interfere with routine management techniques, (iii) there may be increased oxygen demand or an interference with gas exchange because of injuries and hemorrhages, (iv) there must be efficient and speedy control of the airway, and (v) the patient must be considered to have a full stomach and thus at risk for aspiration.

The trauma patient must be immobilized as soon as possible until cervical spine pathology is ruled out. The use of a soft collar is unsatisfactory and a hard collar is marginally better. The best method for immobilization is to secure the patient to a hard board from head to toe with sandbags on either side of the head and a rigid collar around the neck.

AIRWAY SUPPORT

Airway obstruction may be relieved in a relatively non-invasive manner by one of three potential methods: chin-lift, jaw-thrust, and nasal/oral pharyngeal airway insertion. Even though oxygenation is the highest priority, CSI is still a major concern, and both chin-lift and jaw-thrust may move the neck and cause irreparable damage. However, both are generally accepted for use in the trauma patient.

Chin-lift is performed by grasping the anterior base of the mandible and gently lifting upward to move the chin forward while displacing the lower lip to open the mouth. While performing this technique, an assistant is recommended in order to prevent any neck movement. The alternative to the chin-lift is the jaw-thrust which involves using both hands to push forward the angles of the mandible. As in the chin-lift, the patient’s lower lip can be simultaneously displaced downward to avoid closure of the mouth.

Adjuncts to both techniques, such as an oropharyngeal or nasopharyngeal airway insertion can be used to aid ventilation. It has been noted that the nasopharyngeal airway may be inferior to the oropharyngeal airway; however, the responsive patient usually tolerates the former better. Unfortunately, long term ventilation cannot be maintained with bag and mask and more secure methods of airway control will ultimately be required. Complications of the above techniques include an increase in agitation, retching, coughing, vomiting and bleeding.

ENDOTRACHEAL INTUBATION

Indications for endotracheal intubation in the trauma patient include head injury with a Glasgow Coma Scale less than or equal to nine, shock, airway obstruction, combative patient requiring sedation, general anesthesia employed, chest trauma with hypoventilation, post-resuscitation hypoxia, and cardiac arrest. Endotracheal

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intubation can be performed in the awake patient either by (i) oral or nasal route via direct laryngoscopy or (ii) by blind nasal intubation. In addition, intubation may be performed under general anesthesia.

The method of awake tracheal intubation reliably secures the airway, and is appropriate if an urgent airway is required. The awake tracheal intubation was found to be a safe method of airway management in patients with CSIs.14

Blind nasotracheal intubation is a technique which is successful in more than 50 percent of patients.1 It is useful for urgent intubations when mouth opening or neck movement is limited or prohibited.19 Topical anesthesia of the nose and oropharynx and appropriate sedation is important in this procedure. Transtracheal local anesthesia is especially useful.

Blind nasotracheal intubation is a relatively slow technique which usually requires a breathing patient, multiple attempts, and has a higher complication rate than oral intubation. Specific complications include trauma to the nose or pharynx,20 nosebleeds, and nares necrosis and sinusitis with prolonged intubation.1 This blind nasotracheal intubation is contraindicated in the patient with mid-face or basilar skull fracture because of the risk of entry into the cranial cavity.2,4 Thus, it is not usually attempted in the multiply injured trauma patient unless neuromuscular blockade is unavailable.20 This technique, however, is appropriate in a subset of trauma patients who are cooperative, and have sufficient ventilation to allow time for a nasotracheal attempt.4

In many trauma centres, orotracheal intubation is the technique of choice for endotracheal intubation.4 Preparation for an awake oral intubation involves the use of substances such as drying agents, sedation, topical anesthesia and/or nerve blocks.17 Direct laryngoscopy is the fastest and surest non-surgical manner of intubating the trachea.2 Oral intubation under general anesthesia is well conducted and may be performed without spinal cord damage provided that (i) the direct laryngoscopy and intubation is performed in a gentle and non-traumatic manner, (ii) precise cervical immobilization is maintained throughout the procedure, and (iii) a rapid sequence intubation technique with the use of neuromuscular blockade is employed.20

Cervical stabilization during intubation can be adequately performed with manual immobilization of the head and neck on a long spine board by a process named manual in-line axial traction (MIAT).2315 In MIAT, one person applies cricoid pressure and holds the endotracheal tube while the intubator opens the patient's mouth with the right hand and holds the laryngoscope in the left. Concurrently, a third person, on the other side of the intubator, is responsible for stabilizing the victim's head while the intubation is proceeding.415 Pharmacologic agents are frequently used during this technique.15 Preoxygenation of the patient increases the safety margin when intubating a potentially difficult airway.15

Complications of orotracheal intubation include: trauma from laryngoscopy, the potential for cervical spine motion, oesophageal intubation, broken teeth and vomiting, and extubation.1

SURGICAL AIRWAY INTERVENTION

The only indication for creating a surgical airway is the inability to intubate the trachea in an apnoeic or severely distressed patient.122 Surgical cricothyrotomy is a rapid but invasive technique to control the airway.2 If long-term tracheal intubation is required,7 the cricothyrotomy may be replaced with a tracheostomy at a later date.8

This procedure is performed by making a skin incision extending through the cricothyroid membrane and then inserting a small endotracheal or tracheostomy tube through the opening.2 With the use of one of the available cricothyrotomy kits, an inexperienced physician should be able to successfully perform this procedure.

Cricothyrotomy should be avoided in patients younger than 12 years of age.8 Complications include asphyxia, aspiration, cellulitis, subglottic stenosis or edema, laryngeal stenosis, haemorrhage or haematoma formation, laceration of the oesophagus or trachea, mediastinal emphysema, and vocal cord paralysis.5

OTHER TECHNIQUES

The fibre-optic bronchoscope assisted intubation allows relatively easy intubation in patients who are cooperative, have a secretion and blood-free airway, an unrestricted pharyngeal space, and adequate topical supra- and infra-glottic anesthesia.2 However, this

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technique may be more difficult in patients confined to a supine position. In this position, the tongue and pharyngeal tissue may obstruct the posterior pharynx and thus make endoscopy difficult to perform in patients with suspected CSIs.

Transthreshold jet insufflation of the airway (or percutaneous needle cricothyotomy) is a relatively safe, and extremely effective procedure which can temporarily bypass the need for surgical cricothyrotomy. It is an emergency method of ventilating the patient and not a method of securing an airway. The use of jet insufflation can provide 30 to 45 minutes of extra time so that intubation may proceed at an urgent, rather than emergent, pace. This technique is performed by placing a 14 or 16 gauge cannula through the cricothyroid membrane and then attaching it to a high pressure oxygen source. This technique is likely, at least on a temporary basis, to provide more expedient oxygenation and ventilation in comparison to the more invasive surgical airways. Complications of this technique include asphyxia, aspiration, cellulitis, oesophageal perforation, exanguinating haematoma, posterior tracheal wall perforation, emphysema (subcutaneous and/or mediastinal), thyroid perforation, and the possibility of inadequate ventilations leading to hypoxia and death. A more definitive airway must soon be established. This can be accomplished by tracheostomy, endotracheal intubation or waking-up the patient (with resumption of the normal airway).

CONCLUSION

Fifteen percent of patients who are admitted to a Canadian hospital with major or multiple trauma have a critical CSI. Therefore, a CSI should be assumed in any patient suffering from a multi-system trauma, in particular victims with a blunt injury above the clavicle.

Patients with CSI may be treated adequately by many types of management plans. As such, airway management should not be dictated by strict algorithms. There is now good evidence that suggests careful clinical assessment and management will result in consistently good outcomes and low incidence of secondary injuries. The clinician in charge should evaluate the cervical spine and estimate the chances of pathology in that area. Roentgenograms should be utilized in the appropriate situation. However, overreliance on the radiographs should not take precedence over clinical judgement. In addition, if intubation is indicated, it should be determined by the clinician's experience and skill level. Thus, optimal care is not based upon a "cookbook" paradigm, but many different paradigms where the essential elements are preserved.

ACKNOWLEDGMENTS

Many thanks to Dr. G.R. Sellery, department of Anaesthesia, for his helpful suggestions in preparation of this article.

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The Organization for Medical Gender Awareness (OMEGA) met for the first time on September 28, 1995. Approximately 25 to 30 people attended. They included medical students from all years, a few residents, and some faculty members: Dr. Garcia, Dr. Lent, Dr. McMurtry, Belle Potts, and Dr. Silcox.

The evening began with a brief introduction to OMEGA. Furthermore, the organization’s mission statement was illustrated: “to discuss gender-related issues while keeping an open-mind, and to allow all to express their thoughts and ideas freely.” As most people realize, many such issues exist which require discussion and delicate handling. OMEGA allows everyone to express their opinions regarding these issues without impediment.

It was uncertain as to whether a group discussion on everyday medical issues would work; however, the friendly and informal approach used by Drs. Silcox and Lent kept everyone interested and involved. The meeting lasted for two very relaxing and stimulating hours. Most importantly, everyone had something to say, and a few shared some interesting stories that directly related to OMEGA’s mission statement. To conclude, three video clips were viewed and discussed; they depicted scenarios that are all too familiar in medical school.

The first video showed a group of eight students and a clinician in a clinical methods teaching session. The doctor asked for a volunteer to take off his or her shirt so the respiratory exam could be demonstrated. No one would volunteer, so the physician chose a particularly shy, male student who was blushing and making all kinds of excuses. The class felt bad for their helpless fellow student, yet grateful that it was not them on the examination table. This student, obviously, was very uncomfortable and embarrassed. As he was removing his shirt quite reluctantly, one female in the group commented loudly “whoa, nice bod, we should get him to volunteer everytime.”

The second clip showed a female physician yelling at a lab technician for not having completed a C&S that she had ordered for a patient. When she left the room, 3 medical students who overheard the conversation were quick to comment on the doctor’s unnecessary rudeness. One male student said, “What a bitch.” And a female student added, “Yah, those testosterone levels must really be surging.” The second male student replied, “Nah, it’s just PMS.”

The third clip depicted a group of three medical students (one female and two males). One of the males wanted to tell a joke, but he warned the female that she would probably be offended. But, before she had the chance to comment, he began, “There’s this hot blonde babe...” The female student cut her colleague off, expressing her desire not to be exposed to that sort of humour. The second male student exclaimed that it was only a joke and ridiculed her for “always taking everything so seriously.”

One can only imagine the interesting opinions that were sparked by these scenarios. The room turned into a mini-talk show, with Dr. Silcox reminding one of Donahue, and Dr. Lent being more like Oprah! If you have opinions that you would like to share with others, please do come out to the next meeting. EVERYONE is welcome! Watch your mailboxes and the “All Years” Noticeboard for details.
Animals, Autonomy, and Rights -- A Moral Justification for Animal Experimentation

by Jay A. Nathanson, Meds '96

"Plants exist to give subsistence to animals, and animals to give it to men. Animals, when they are domesticated, serve for use as well as for food; wild animals, too, in most cases if not in all, serve to furnish man not only with food, but also with other comforts, such as the provision of clothing and similar aids to life. Accordingly, as nature makes nothing purposeless or in vain, all animals must have been made by nature for the sake of men."

In the Politics, Aristotle presents his view of man's position in the natural order; animals do not share equal moral status with man and, consequently, may be used as a means to man's ends. Today, animals not only provide man with food and clothing, but are often used as biological models in scientific experiments. There has been much discussion in recent years with respect to animal rights, and the public and media are taking a growing interest in the debate.

How is one granted rights? What rights, if any, do animals possess? What are the consequences of granting or denying animals rights? If animal experimentation is morally acceptable, what should be the limits of the research? In this essay, I will attempt to answer these complex questions and formulate a justification for the use of animals in research through an exploration of the principles of autonomy and beneficence. I will also discuss methods of ensuring that, if research involving animals is performed, it is carried out as responsibly as possible.

BACKGROUND

The United States Department of Agriculture estimates that there are 20 million animals used in laboratories each year. Of these, 90 percent are rodents, two percent dogs and cats, and less than one percent non-human primates. The remainder include pigs, frogs, sheep, chickens, pigeons, and reptiles. It is estimated that 40 percent of the animals are used in basic and applied research, 30 percent in drug development and testing, 20 percent in the production of biological products and toxicity testing, five percent in the diagnosis of disease, and five percent are used for teaching purposes.

There are many reasons why animals are used in scientific research. Animals, especially primates and other mammals, have remarkably close neurological, immunological, reproductive, physiological, and behavioral similarities to humans. In many cases, animals are simpler models than humans, allowing researchers to study biological functions with greater ease. Since animals have much shorter lifespans than humans, developmental and genetic effects of treatments can be studied more efficiently on animals. As well, a laboratory setting allows the experimenter to gain complete control over the conditions the animal is exposed to. Researchers can observe animal subjects of similar age and background in sufficient numbers to ensure that scientific findings are consistent.

THE INADEQUACY OF ALTERNATIVES

If appropriate replacements to animals could be found for use in research, there would be no need for their use in any further experiments. Isolated cells or tissues have been proposed as an alternate source of information. Unfortunately, organs and organ systems have properties which could not possibly be discovered through the analysis of their constituent tissues and cells. As well, the organs of the body are intricately linked and such interactive functioning can only be studied in a whole organism. Computer simulation has also been investigated as a replacement for animals in research. However, the use of computers raises a serious paradox; in order to have a computer accurately simulate a living organism, an immense amount of data about the organism would have to be established experimentally (through extensive animal research) prior to programming the computer. Unless this is done, any computer model would be immeasurably unreliable. Finally, it has been suggested that organ systems be studied by way of post-mortem. Although this may be useful for studying the basic anatomy of an organism, a deceased animal could never replace a living one when trying to ascertain the animal's response to a given treatment.

Unfortunately, a scientifically acceptable alternative has yet to be found which will allow for the successful replacement of animals in many areas of medical research. Therefore, the use of live animals currently remains the only effective method of studying disease or testing drugs, procedures, or vaccines. Our options are limited; if animal experimentation is morally unacceptable, a very large portion of our medical research will have to stop. It is this lack of alternatives that makes the debate over animal rights so acute.

ABOUT THE AUTHOR:

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ARGUMENTS FROM AUTONOMY

Autonomy is central to most moral theories and it is from autonomy that rights are derived. Immanuel Kant's theory of autonomy, as found in his work, Fundamental Principles of the Metaphysic of Morals, is perhaps the most influential of all philosophies regarding rights. Humans are unique in the possession of the ability to deliberate what their moral duty is and to lay down moral laws for themselves and for others. Man, therefore, is self-legislative, morally autonomous.

Once a being possesses autonomy, he or she also becomes a moral agent, that is, one entitled to moral rights. The reasons for this are twofold. Firstly, autonomous beings have the capacity for independent, deliberative, responsible actions and have the required awareness to appreciate that these acts are an integral part of their existence. Secondly, autonomous beings have the capacity to recognize autonomy in others and to participate fully in the moral community. Consequently, "without a moral capacity, actually or potentially, there can be no moral entitlement, no moral authority, no moral exercise or waiving of a moral right, and hence no moral rights possessed by mammals that lack moral autonomy, actually and potentially".

If one adheres strictly to Kant's definition of autonomy, it is clear that some humans would also not be considered autonomous, and, consequently, would be excluded as full members of the moral community. These "marginal cases" include infants, as well as those who are senile, comatose, severely mentally challenged, brain-damaged, or mentally ill. Proponents of animal rights contend that some animals may be more self-reflexive or have a greater ability to reason than the marginal human cases. Therefore, they argue, if it is morally unacceptable to use marginal humans in research, it should also be wrong to use higher animals. This argument fails in that significant differences between the humans and the animals are overlooked. Infants, if properly cared for, will eventually develop into fully autonomous adult humans. Those who are brain damaged, comatose, senile, or mentally ill have previously achieved autonomy, but have lost it due to uncontrollable circumstances.

There is a dilemma, however, in establishing the status of those who have never achieved and never will achieve autonomy, such as the mentally handicapped. I propose that merely being human (i.e., a member of an autonomous species) is sufficient for granting special rights. The ability to act morally is not a test to be given to each and every human individually. If, for whatever reason, a human lacks the ability to moralize, he or she is not excluded from the moral community.

ARGUMENTS FROM BENEFICENCE

Man has a moral obligation to his fellow man to improve his health and livelihood and to rid his life of disease and unnecessary pain and suffering. Sometimes, this goal only be achieved through the use of animals. In order to advance our scientific knowledge, diseases must be investigated and treatments must be studied. Indeed, the principle of beneficence, would suggest that, in many cases, it is immoral not to use animals in scientific experimentation.

Man has gained an abundance of medical and scientific knowledge from research on animals. Most of the great medical advances have been brought to fruition through animal research, including treatments for rabies, cholera, diphtheria, tetanus, pneumonia, polio, measles, and viral hepatitis. In pharmacology, animal experimentation has been central to the development and testing of drugs such as antibiotics, antiparasitics, antiallergenics, antiinflammatories, analgesics, and drugs for heart and renal diseases. Animals have been used in the advancement of surgical techniques such as organ transplantation and cardiac surgery, the control and management of haemorrhagic shock, and the development of artificial organs and nuclear medicine.

If man ceases to experiment on animals, incredibly grievous consequences to medical research will result. Medical advancement will cease completely, leaving us to fall susceptible to the scourge of disease. All hope of ever finding cures for AIDS, cancer, Alzheimer's disease, and the multitude of illnesses that afflict mankind will be lost.
SPECIESISM: CAN DISCRIMINATION BE JUST?

The belief that humans (or other autonomous beings, should they ever be encountered) are morally superior to animals is known as speciesism. Speciesism can exist on several hierarchical levels: Absolute speciesism is the belief that any human interest outweighs (the sum of) any non-human interests. Resolute speciesism, a weakened version of absolute speciesism, holds that any significant human interest outweighs any non-human interest (no matter how large). Weak speciesism holds that when human and animal interests are equivalent, the human interests prevail.

Critics of speciesism, such as Animal Liberation author, Peter Singer, call it a form of discrimination that is akin to racism or sexism:

"Racists violate the principle of equality by giving greater weight to the interests of members of their own race when there is a clash between their interests and the interests of those of another race. Sexists violate the principle of equality by favouring the interests of their own sex. Similarly, speciesists allow the interests of their own species to override the greater interests of members of other species. The pattern is identical in each case."

This analogy between speciesism and racism and sexism is a faulty one. Racist and sexist beliefs have absolutely no rational basis; differences in race, religion, or sex are not tenable ground for which to claim superiority of any kind. Although speciesism is indeed a form of discrimination, it is one based on differences that are of extreme relevance -- the animals' lack of autonomy and moral agency. Failure to distinguish between unjust forms of discrimination and speciesism trivializes the legitimate cases of those who are truly oppressed.

THE LIMITS OF ANIMAL EXPERIMENTATION

Since animals are our only viable source of medical information, it is our moral duty to ensure that when they are used in research, they are cared for to the fullest extent possible. Establishing committees for animal experimentation, similar to those that govern research on human subjects, will ensure that explicit guidelines exist and facilitate the creation of an environment that is as hospitable as possible. Research guidelines should be based on the "three Rs" of animal welfare as forwarded by Russell and Burch in 1959: (i) replacement of animals where feasible alternatives exist, (ii) reduction in numbers where possible, and (iii) refinement of techniques to minimize pain by seeking the least traumatic techniques feasible.

Researchers planning to use animals in an experiment should consult a veterinarian and administer the necessary anaesthetics and pre- and post-operative care. It also is essential to ensure that as few animals as possible are used in scientific research. Unnecessary repetition of experiments should be curtailed to the

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greatest extent possible. As well, the animals should be kept in comfortable, enriched environments in order to ensure mental well-being². Finally, scientists performing studies of tumour growth, toxicity, or infectious processes should euthanize the animals rather than letting them die slow deaths. It must be realized, however, that there comes a time when our efforts to ensure the animals’ well-being interferes with the experiment, causing inaccuracies in the results. It is important that an experiment be compassionately performed, but it is also essential that it be scientifically sound.

CONCLUSION

We have derived a moral justification of animal experimentation from the principles of autonomy and beneficence. Only humans are capable of applying or reciprocating moral claims. Moreover, only humans are capable of free and self-restricting moral judgements. Therefore, only humans are autonomous and possessive of rights. In addition, the principle of beneficence supports animal experimentation, through its requirement that man minimize the effects of disease on and relieve the suffering of his fellow man.

Where, then, do animals stand in the moral hierarchy? Some animals (e.g., shellfish, spiders, insects, etc.) should perhaps be placed outside the moral community altogether. Higher animals, because they have the capacity to suffer, should be given a form of limited moral status -- that of moral patient. Man, therefore, as a moral agent, is not free to do with animals as he pleases; whenever possible, we must treat other species with respect and minimize the pain and suffering inflicted. In other words, because they are sentient beings, we have an obligation to treat animals humanely - - although not as humans.

Ingrid Newkirk, director of People for the Ethical Treatment of Animals, states “Animal liberationists do not separate out the human animal, so there is no rational basis for saying that a human being has special rights. A rat is a pig is a dog is a boy.”. Yet, the metaphysical belief that there is no moral difference between a person and a rat amounts to the ethical and moral debasement of man. The belief that the value of animal life is the same as that of human life can lead to ludicrous conclusions. It is clearly inappropriate to ask: ‘Does a lion have a right to eat a baby zebra? Does a baby zebra have a right not to be eaten?’ This reductio ad absurdum of the case for animal rights highlights the necessity of a distinction between animals and humans based on morality. An unwillingness to acknowledge the moral chasm that separates animals and humans would set a dangerous moral precedent that could only lead to catastrophe.

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Militaryism, Its Interface with Health, and the Role of the Physician

The ultimate goal of the medical profession viewed in its broadest sense, and in an idealistic light, could perhaps best be understood as that of ensuring the preservation and promotion of health and well-being of the global community. The daily efforts of physicians in their local communities represent the impetus towards this ideal. However, the greater ideal is often "the forest" that is lost among the trees. Practical concerns of everyday practice further distance physicians from any such "idealistic" ponderings. This is however at the peril of not achieving an understanding of the complex network of social, political, and economic factors that impact upon society's health, particularly that of the "have-nots" of the world. For instance, although the ill effects of war, particularly on children, have been vaguely realized for decades, they have been poorly understood and often understated. In the past few years this has begun to be remedied with active research into the area as well as active participation of an extremely small group of physicians towards the prevention of war. If indeed militarism, leading to armed conflict, is a rapidly growing factor adversely affecting human health, then it falls well within the realm of the mandate of the medical profession. As such, this interface of politics (of which conflict is an outpouring) and health must be appreciated and the relevance of the physician's active role in preventing armed conflict better understood. This essay attempts to illustrate the preceding premise by attempting to achieve an understanding of the impacts of armed conflict, and the mechanism of their exertion on civilian populations, particularly children. In doing so, I hope to imply a role for the physician in the prevention of armed conflict in the world. At this point it must be noted that all the research currently being conducted is by independent researchers and that there is no international organization specifically studying the impact of war on human populations.

Conversation between Canadian father and six-year-old son during war against Iraq:
Father: What happens in wars?
Brennan: People get injured and dead.
Father: Do children get hurt?
Brennan: Daddy, adults wouldn't be so stupid!
(Santa Barbara, 1995)

INTERNATIONALLY "AGREED UPON" STANDARDS OF CONDUCT:

In 1959, governments of the world unanimously adopted the Declaration on the Rights of the Child at the U.N. General Assembly. It stated that children had "the right to be brought up in the spirit of universal peace and brotherhood". This declaration was then shaped into a Convention on the Rights of the Child, adopted by the General Assembly in 1989. Most countries of the world signed this Convention. The United States of America until 1995 had not! The convention states that "No child under 15 years may be recruited into an army" and "States will do all they can to protect and care for children affected by war." In 1990 at the Summit for Children, world leaders made similar pledges to protect children from the scourge of war and to take measures to prevent further armed conflicts. Finally, UNICEF has been promoting the idea of "children as zones of peace" to emphasize their right to protection from war (UNICEF, 1985).

REALITY:

What actually happens however to large numbers of children all over the world is in complete contrast to the standards that we set for ourselves and to the profound truth that the six year old's statement represents.

Conversation with an eleven-year-old Mozambican boy, 1990:
"The bandits (Renamo fighters) came to our house and told mother to give them food. My mother told them we didn't have any. They beat her until she died. They took my father and killed him.

I was alone with my younger sister and four brothers. I couldn't get other people to help get us food because nobody had any. I began to go farther and farther into the bush and search for roots that I brought back to feed my sister and brothers. While I was away, my sister died. Then my brothers began to die one by one. Then my last brother died. I left that night..." (Boothby et al, 1992)
EPIDEMIOLOGICAL INFORMATION:

Truth may be the first casualty of war, but children are undoubtedly the second. Little comparative epidemiological research is available on the subject of the effect of war on child health however, with most research and analysis of past wars being carried out by the military for purposes of planning (Garfield et al, 1991). This is ironic as the proportion of civilian casualties have risen considerably, from 5%-19% in World War I to 48%-50% in World War II. In the more than 150 declared and undeclared wars since World War II, it is estimated that 80% of the 20 million killed and 60 million wounded have been civilians, most of them children (Schaller, J.G et al). As reported by the Global Child Health News and Review, 1.5 million children have been killed in war zones in the past decade alone. In addition, more than 4 million children have been disabled by war in the last decade and 17 million have lost their homes (UNICEF, 1992). Millions of land mines throughout present and former war zones, some purposefully designed to be attractive to children, are responsible for a large number of injuries to children.

INDIRECT IMPACTS:

The Gulf war amply demonstrates that in addition to the above presented, “direct” impacts of war, there are devastating indirect effects. Lee and Haines (1991) estimate that despite the high number of Iraqi military casualties in the Gulf war, more deaths occurred there after hostilities ceased, through lack of food, clean water, medical care and adequate help of refugees. Indeed it is estimated that 80-90% of the civilian casualties, a large proportion of which were children, occurred after the war ended. Before the Gulf crisis, Iraq was an industrializing nation that had experienced major changes in its social structure and health care system, with a network of 131 hospitals and 851 community health centers, providing comprehensive health services to over 90% of the population (Lee et al, 1991). Child mortality had been reduced to 42 per 1000. As an urbanized (75%) and mechanized society, Iraq depended on electrical power for water purification and distribution, sewage treatment, and the functioning of hospitals and health care centers. Iraq also depended on imported foodstuffs for 70% of its food. (Ahitsaari, 1991). In the first days of the war, 13 of Iraq’s 20 power-generating plants were incapacitated and only two plants remained operational, producing less than 4% of the prewar output (The Harvard Study Team). As a result, water purification and distribution came to a virtual standstill. Most Iraqis now lacked clean drinking water, and murky pools of water and drainage ditches became the only source of water for much of the population. Sanitation was extremely poor throughout the country, with city streets blocked by pools of foul-smelling water and piles of uncollected garbage. Many hospitals and community health centers were severely damaged and lacked adequate running water for standard sanitary procedures such as cleaning, flushing toilets, or bathing patients (Harvard Study Team). There was also a shortage of medicines, intravenous fluids, infant formulas, needles, syringes, and bandages. Stores of heat sensitive vaccines had been depleted because of the lack of electricity. Despite the coalition’s claims that medical supplies have always been exempt from sanctions, between August 1990 and August 1991, less than one thirtieth of Iraq’s medicinal import requirements was met (Doyle, 1991). Whatever the nature of the bottleneck - political, legal, logistic, or economic, it is effectively inhibiting access to necessary goods.

As a consequence, there was an alarming increase in the incidence of water borne diseases, including cholera, typhoid, and severe gastroenteritis, particularly in children. The mortality rate for children with gastroenteritis was twice that of before the war (Hoskins et al, 1991). The incidence of these diseases reached epidemic proportions, and neither the hospitals nor health centres had the capability to treat them appropriately (Lee et al, 1991). Lack of food supplies combined with the 1000% inflation, resulted in severe malnutrition in children being a common occurrence. There was also an increase in the incidence of polio, meningitis, and hepatitis. The Harvard team estimated conservatively that child mortality had doubled, with a further 80,000 - 200,000 under 5 year olds expected to die in the year following the war, as a result of the war. Ironically, on closer examination of the costs of the war including millions of refugees, hundreds of thousands dead and injured, and the serious environmental damage one discovers that there were many more people killed or
At the idea that the world cannot afford to meet the need of all the world's children for adequate nutrition, basic health care, primary education, and clean water. Indeed the total annual cost of this obviously desirable (yet perhaps politically inconsequential) goal is estimated to be $34 billion dollars, a mere 3.4% of the annual world military budget! Furthermore, it has been estimated by the IPPNW that the combined annual cost for funding global programs aimed at solving the major human needs and environmental problems including population stabilization would be approximately 25% of the world's total annual military budget (World Game Institute, 1991). While the developed countries spend an average 5.4% of their GNP's on military, only 0.3% is allocated in aid to developing countries. This, despite 800 million starving people in the world (a large proportion of them, children), 3 out of 5 in the third world with no access to safe water, and 3 out of 4 with no sanitation. At the rate of present military spending, 35 seconds could build classrooms for 30,000 children or feed 20,000 people for a year (Barnaby, 1988). One would hope our willingness to spend $200 billion on the Gulf war contrasted with our unwillingness to spend $34 billion towards ensuring the health and well being of the world’s children, is not representative of the moral and ethical standards, or the ability for critical and logical thought that pervades contemporary consciousness!

PSYCHOLOGICAL IMPACTS:

The psychological trauma and subsequent psychopathology caused in children, by war related stress is potentially devastating and ensures the self-perpetuation of violence. The following accounts might help gain a passing appreciation of the extent of psychological trauma that children might be subjected to: “Some Cambodian children have been so successful at extinguishing all former ties that they were able to kill their own parents” (Elbedour et al, 1993).

“My father fought in World War II shortly after I was born. When he went to Korea, I was nine.... I was traumatized by his leaving, couldn’t retain any food and was hospitalized .... I was fed by intravenous for nearly a year.... I decided the only way to get to see my parents was to die. So I tried. And they brought my father home from the front. When I saw both my parents, my recovery was so miraculous I was discharged two days later, only to end up deathly ill after he went back.” (Quinn S., 1991).

“Come on, come on, plunge on. Those who step on mines will go to Paradise” Marching chant of a column of 15,000 Iranian children on their way to the front with Iraq, ahead of “more valuable” trained soldiers (Children and war, 1986).

As is evidenced throughout the essay, most war zones lie in poor, third world countries who even under conditions of peace are unable to provide adequate health care for children. The situation is of course further exacerbated by the breakout of conflict. For this reason, any modern war must be considered a war on children. As citizens of the western world who, willingly or unwillingly, support the war system of our nations, and in particular as health professionals, we must carefully consider the consequences of waging war on children and perhaps reconsider our role, implicit or explicit, in such outrageous endeavors. To further elucidate this point, it must be noted that the major (and in most cases, the only!) source of weapons for these warring parties in the
third world are the western countries (particularly, the US, England, France, and other “western allies”, who generally consider themselves to be not only technologically but also morally of higher standing than the rest of the world) (Kiefer, 1992). Not only are we in the West, suppliers of the military hardware responsible for the kind of heinous crimes against children documented above, but we also provide the third world with examples and ideologies that tout military power (or in case of some western countries, close alliances with such powers) as perhaps the single most important determinant of national or societal success. (Despite shallow rhetoric to the contrary, all concrete examples since World War II have implicitly yet clearly demonstrated this principle.)

Further, as Kiefer (1992) notes, this trend towards militarization of the developing countries, at the cost of constructive social programs is likely to accelerate as the liberalization and decentralization of the former Warsaw Pact countries, leads the arms manufacturers in the West to look toward the developing world as a major market. Also, the growing dependence of the industrial economies on the Third World labor, commodities, and markets has created an incentive for militarily advanced nations to establish hegemony, by arms transfer and/or war, in less developed nations. The Gulf war presents a graphic illustration, as Rochlin and Demchak (1991) note, due to the apparent success of the coalition being attributed to sophisticated electronic technology, lesser developed nations, will seek to acquire, at enormous cost, both the American-style “brilliant” weaponry, and the technology with which to defeat it. The increasingly sophisticated and costly militarization of the Third World will divert large sums that might have been used for health promotion. A recent World Bank study reports that Third World health expenditures have been shrinking, as a percentage of national budgets. Under such circumstances, the health professional, working within the military or foreign relations policies of his government would see much of his work undone by the effect of those policies.

Finally, a few useful conclusions relating to the role of the health care professional emerge. Firstly, a true realization that the military and foreign policies of our governments directly impact upon health not only within but also beyond the physical boundaries of our country. These policies thus become as much a part of the larger health environment as local health policy, or the presence of disease agents. Secondly, considering the devastating affect of war on health and well being of the global society, particularly the vulnerable, it becomes the work of health professionals, assuming a proactive role, to document in a reliable fashion, the specific effects of this factor on health, to disseminate this information, and perhaps most importantly, to promote prophylactic measures to reduce the presence of militarism.

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The Waiting Room: Mrs Forgiveness-from-heaven (Angela Wong, Meds 96), Wanda (Allyson Koffman, Meds 97) and Victoria (April Price, Meds 98) get acquainted in a doctor's Waiting Room (play by Lisa Loomer, songs by Allyson Koffman and Jeff Nisker M.D.) for the Yellow Brick Road Bioethics Series.

The hushed silence of over 150 medical students and faculty sitting in the dark was broken by waves of applause as the lights came on to the Waiting Room, a medical student and faculty production, created to surface bioethical issues. This was the first of a series of Student Affairs Committee sponsored Monday Night Narratives: Yellow Brick Road Bioethics forums. Based on characters from Lisa Loomer's play, The Waiting Room depicts the lives stories of three extraordinary women from three different historical eras with three different society-imposed medical problems. Through these three endearing and engaging women, who bravely accepted their lot in life without protest, the societal pressures that women and doctors of every century experience are explored in a medical context. This play demonstrates how doctors can act as pawns inflicting society's expectations on women. As the three women waited patiently for the doctor (who never actually arrives), an extraordinary thing happens. What began as the idle chatter of strangers in a waiting room becomes a sharing of profoundly personal details of their lives. By confiding in each other, they gain insight into how society-imposed medical problems have affected their lives.

Mrs. Forgiveness-from-heaven, a timid 18th century Chinese woman, whose foot binding at age six so crippled her that she could hardly walk, presents to the Waiting Room with severe necrosis of the foot, holding one toe to sew back on. Mrs. Victoria Smoot, an intelligent 19th century, truly Victorian woman was diagnosed with hysteria, “a disease of the ovaries” because she, a lady ahead of her time, was far too interested in science, literature, theatre and sex to suit her husband. Lastly, Wanda, a brash and honest woman of the 90's, whose forthrightness imparted to us her decisions regarding breast augmentation, was now seeing the doctor in fear of breast cancer. Each woman accepted their fates until they began to understand that Mrs. Forgiveness's necrotic feet, Victoria's psychiatric problems and Wanda's breast lesions, were not just their personal medical problems, but were, in fact, the symptoms of a larger societal disease. Mrs. Forgiveness lived in a world where women were expected to be humble, where having small feet was desirable and where the day was governed by her duty to please her husband. In Victoria's oppressive world, women were not allowed to liberate their minds by learning or their bodies by enjoying sex or intimacy. In contrast, in Wanda's world, women, have been liberated in one sense, yet are still burdened because they must compete in a world where people are judged by appearance, where physical beauty is appreciated and valued, and where big breasts are considered attractive.

The evening's excitement was followed by a conversation mediated by Dr. Jeff Nisker, Professor of Obstetrics and Gynaecology and Kate McBurnie, Assistant Director of the Westminster Institute of Ethics. Students articulated their opinions on the role of physicians in society, the responsibilities that have been entrusted to them, and the society-imposed expectations with which they have been burdened. We recognized that the pressures coming from society that affect physicians and patients may not necessarily be in the best health interest of the patient. Did Wanda's breast augmentation really augment her self-esteem and allay her insecurities? Was Wanda's need of plastic surgery really a cry for help because she lives in a society in which the laws are survival of the fittest, in which she must struggle to compete for her every success in an unfair world that can't help but to judge a person by her appearance before giving her merit for her accomplishments? Although physicians can't change the rules of society, a recognition of the pressures experienced by our patients may help us to make recommendations that guide them ultimately in their best interest.

The Yellow Brick Road Bioethics Series will be held on Monday evenings and will continue for all of trimester I. Each narrative presentation, prepared by medical students and faculty, will serve as a focus from which exploration of ethical issues will be generated. Yellow Brick Road Bioethics will use a variety of formats such as story-telling (either by the audience or by actors), watching movies, performing short plays or reading poems. Best of all, after each presentation, there will be an opportunity to discuss our feelings and thoughts about the issues. Other medical bioethical issues that will be presented in this trimester are euthanasia (Oct. 16), domestic violence (Oct. 30), death and dying (Nov. 6), when doctors make mistakes (Nov. 20) and ethical issues in psychiatry (Dec 11). All students and faculty are invited to have fun by exploring bioethical issues in interesting and creative ways.

If you would like to contribute to this program this year or next year (promotions, props/costumes/sets, acting/singing, drawing, writing/directing), contact Dr. Jeff Nisker at 663-3735, University Hospital.
A look at the past will show that the philosophies of one age become the absurdities of the next and the foolishness of yesterday becomes the wisdom of tomorrow.

Sir William Orser
Albucasis
(936-1013)

Even though only a very small number of books from antiquity are known to have survived the centuries, Arabic medical literature is relatively extensive. It is estimated that over the 500 years (850-1350 A.D.) of Muslim rule, more than 4000 medical titles were written by physicians utilizing the Arabic language. Any notion that Arabic medicine contributed little to the “treasure it inherited from antiquity” is incorrect.

The contribution of physicians from the Eastern (Baghdad) Caliphate, 749-1258 A.D., is well known. Examples of eminent physicians from that era include Rhazes (860-932), Haly ben Abbas (d. 994), and the “prince of physicians,” Avincenna (980-1037). The Western Caliphate ran from 655 to 1236 A.D., was based in Cordoba, Spain, which was once called the “most civilized city in Europe.” The total number of great physicians produced by the Cordovan Caliphate was much smaller than the Eastern Caliphate; nevertheless, their influence on the Latin world was far-reaching.

Deemed to be the greatest surgeon of Islam, Abul-Qasim Khalaf Ibn Abbas Al-Zahrawi, known in the West as Albucasis or Abulcasis, was one of the physicians of the Western Caliphate. He was born in the Andalusian town of Alzahra, just outside Cordoba. Very little is known about the life of Albucasis. The most widely accepted dates of his lifespan are 936-1013. What is known about him is that he studied at the famous seat of learning of Cordoba, attaining the position of a classicist, physician and surgeon and that he was the personal physician of the great Omayyad Caliph Abd-ar-Rahman II (912-961). Although his biographical details are sketchy, the legacy of his work is not. His chief work was his Kitab al-tasrif li-man 'ajiza 'an al-ta'rif, meaning ‘The Book of enabling him to manage who cannot cope with the compilation.’ Written in Arabic, it was an encyclopedia of medicine and surgery, but the Al-Tasrif’s Latin translation exerted its greatest influence in Europe. Section I of the encyclopedia dealt with medicine, section II with pharmacology, and section III with surgery. Of the 30 discourses in total, numbers 1, 2, 28 and 30 were the most important.

Discourses 1 and 2 were translated into Latin as Liber Theoricae. In it, Albucasis classified 325 diseases and discussed their symptomology and treatment. It contains, among other things, the first medical description of hemophilia, noting it is passed from unaffected women to their male children.

Discourse 28 is called Liber Servitoris in Latin and was the fourth medical book ever printed [Venice, 1471].

This book described the medical preparations obtained from minerals, plants and animals. It represents a very early example of practical pharmacology and pharmacognosy. In 1140, Nicolaus Salernitanus incorporated much of this discourse into his own Antidotarium without ever giving credit to Albucasis.

Of all the discourses in Al-Tasrif, number 30 on surgery had the widest influence. Some modern historians imply that Albucasis took his surgery from the classic writers (in particular Paulus Aegina) but others are not in agreement. Haddad even states “...I do not think those who hold this opinion have compared the works of the two men.” Spink, the English translator of Albucasis’ surgery, stated that it (discourse 30) “…contains a surprising amount of genuine original material.” Since Albucasis always stated his bibliography at the beginning of every paragraph, and there is no mention of Paulus Aegina in his discourses, this author tends to concur with the school which stresses the originality of Albucasis’ work.

Discourse 30 covers all branches of surgery, including dentistry. This discourse is comprised of three books; Book I on cauterization, Book II on surgery and Book III on orthopaedics. This text became the standard surgery textbook throughout Europe from the Middle Ages to Saliceto. In fact, it aided in raising the state of surgery in Christian Europe and almost all authors of surgical texts from the 12th to 16th century referred to Albucasis. The popularity of Al-Tasrif was so extensive that, in Medieval times, Albucasis became more frequently quoted than Galen himself. One of the reasons for its immense popularity was the practical manner in which it was written.

The surgical discourse was the first individual illustrated work on surgery and many of the approximately 200 surgical instruments depicted in the surgery were devised by Albucasis himself. It was the first authentic description on the surgery of the abdomen and the first on the treatment of deformities of the mouth and dental arches. He was the first to recommend the reimplantation of teeth using a prosthesis. In addition, Albucasis was the first to use fine suture extracted from animal gut for intestinal anastomosis and he introduced the modern surgical technique of varicose vein excision through small spaced incisions. He also introduced some of the many surgical uses of cotton such as in surgical dressings, the control of haemorrhage, as padding in the splinting of fractures, as vaginal packing in pelvic bone fractures, and in dentistry. Other surgical contributions by Albucasis include descriptions of Pott’s disease, Kocker’s method of dislocation reduction, Trendelenburg position, Walcher’s position for obstetrics, vaginal ureterolithotomy, and extraction of a dead fetus with the aid of obstetrical forceps. He also described the classical operation for breast cancer, warned against the dangers of

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metastasis, advised the ligation or cauterization of bleeding vessels. At a time when a physician was considered to be a universal scholar, Albuscas advocated specialization (and tended to adhere to the practice alone). Al-Tasrif was a comprehensive medico-surgical encyclopedia and the above are examples of only some of the numerous contributions Albuscas made to the field of surgery. His influence on the field of medicine is so fundamental that he helped surgery become a separate specialty. Thus, there is little doubt as to why Albuscas is considered to be the greatest surgeon of his time and even the greatest Arab surgeon of all time.

ACKNOWLEDGEMENTS:

Many thanks to Dr. Farid Haddad, Department of Urology, Phoenix, Arizona, for stylistic advise and for research material pertaining to this article. Also, I would like to thank Dr. David Colby, Department of Microbiology, University Hospital, for reviewing this work.

REFERENCES:


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The Ontario Cancer Treatment and Research Foundation
Changes in the treatment of the mentally ill, more than in any other branch of medicine, are profoundly affected by social and political developments. With the current controversies over deinstitutionalization and the continuing closure of psychiatric facilities, it is useful to look at the history of asylums for the mentally ill in Ontario to see where we have come from and where we are going.

In this article, I will briefly outline 1) asylum reform in Europe; 2) the establishment of insane asylums in Ontario; 3) physical features and treatment philosophies of these institutions; and 4) the fate of these asylums.

CARE OF THE INSANE PRIOR TO THE 1800'S

In ancient civilizations and through to the Renaissance, people with mental illness were left to the care of family and friends. There were no special institutions for their treatment. In the sixteenth and seventeenth centuries in Europe, partly as a result of a rise in unemployment and population growth, the mentally ill and other “vagrants” were kept in custodial institutions such as the Hôpital Général in Paris and the workhouses of England. Conditions in these institutions were dismal and there was no separation between the poor, the insane, and criminals. The insane were often mingled together in cold, damp cells and sanitation was at a minimum. Furthermore, the public exhibition of “lunatics” was commonplace and in England trips to see them perform were popular weekend diversions.

In response to the inhumane treatment of the mentally ill, reforms were made in the eighteenth century almost simultaneously by William Tuke and the Society of Friends in England and by Phillipe Pinel in Paris. These first modern asylums were based on the principles of ‘social psychiatry’ or ‘moral treatment’ that asserted a link between mental illness and the social environment. The notion was that individuals were susceptible to the corruptions of society (such as war, poverty and disease) “hence if mental illness was induced by conditions of society, then mental health could be encouraged by removal of the sufferer from the source of irritation.” This involved a more humanitarian approach, avoiding the use of mechanical restraints and improving living conditions with good food and comfortable bedding. This was the model (and ideal) upon which the nineteenth century asylums in North America were based.

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Caroline King is a fourth-year UWO medical student with an interest in the history of psychiatry. She has a Bachelor of Arts and Science degree from McMaster University and her interest in psychiatry dates back to her work as a summer student at the Hamilton Psychiatric Hospital in 1991.

ASYLUMS IN ONTARIO

The early care of the insane in Upper Canada was provided by families or custodial institutions. With the increasing population, however, there was an increase in the numbers of the mentally ill requiring care. The movement towards the building of insane asylums in Canada in the middle of the nineteenth century is thought to have been provoked by three main sociopolitical and economic factors: 1) during the 1830s and 1840s, an elitist group of reform-minded physicians, judges, clergymen and politicians encouraged the idea of providing therapeutic care for the mentally ill in planned, non-custodial institutions; 2) the fiscal status of the government at this time was very strong; and 3) restructuring of the welfare state, especially after confederation, gave control and funding responsibility of prisons and asylums to the provinces, such that the mentally ill became wards of the state.

By the late 1800's there were 11 separate mental institutions in Canada, including ones in Toronto (1843), London (1870), Hamilton (1875) and Kingston (1867).

TREATMENT PHILOSOPHIES AND PHYSICAL FEATURES

The concept of occupational therapy was not unknown to the Victorian era psychiatric caretakers. In fact, part of moral treatment included occupying the patients time and energy with work, as well as the avoidance of mechanical restraints. In the 1880's, Daniel Hack Tuke (a great-grandson of asylum-reformer William Tuke) visited many asylums in North America and wrote an account of his findings in an 1885 work entitled, “The Insane of the United States and Canada.” Of the Ontario asylums, Londons seems to have had the best reputation, due to the influence of its
superintendent Richard Maurice Bucke, who discouraged all forms of mechanical restraint. Likewise, sedatives were rarely given. Tuke remarks, "When Dr. Bucke is asked how he employs a man in a state of acute mania, he replies, 'Oh, I make him break stones.'" That is to say, the main form of treatment was work—in fields, farms, gardens, carpentry, masonry, sewing and knitting. Recreation therapy was in vogue as well, with regular poetry readings, concerts and plays being available to residents as a past-time as well as an effective form of treatment. Tuke found the London facilities, with its low patient to attendant ratio, to be clean and the patients well-fed with daily servings of meat or fish.

Likewise, Tuke reported little mechanical restraints used in the Toronto asylum and most of the patients were employed in some meaningful work. However, several years earlier, Tuke's brother had visited the asylum, which was then under a different superintendent, and found conditions to be horrible, with starvation and treatments such as bleeding and cupping commonplace. Thus, the conditions of an asylum probably very much depended on who was running it.

The architectural features and treatment philosophies of these institutions cannot be separated, as form was meant to follow function. In his review of American asylums in 1836, Dr. Duncombe comments: "The site of the asylum should be elevated, commanding an extensive prospect of surrounding scenery from which the patients may look down on the surrounding countryside without being too near, so as to be incommoded from the too frequent approach of the imprudent and thoughtless stranger or visitor. It should contain land sufficient to employ the whole number of insane in some interesting and profitable occupation as well as afford each class a large yard entirely separated from the yards of other classes..."

Tom Brown, the author of "Architecture as Therapy" states, "The asylum, then, was to be situated in the country, and yet be near an urban centre, command a pleasant prospect to divert the lunatic mind, and have ample grounds for both patient recreation and occupation."

Many Ontario asylums employed this design principle. For example, the asylum in Hamilton was located on the Niagara escarpment overlooking Lake Ontario. It was separated topographically, being 2 miles away and 200 feet above the city centre. It also had ample grounds for farming. Tuke notes that it was originally designed as an inebriate asylum, "but the needs of the insane were justly deemed more pressing and practical than those of dipsomaniacs."

The Toronto asylum, located at 999 Queen St. West and completed in 1850 was originally thought to be one of the most technically advanced buildings of its
kind in North America. However, within a decade, problems with the new heating and ventilation system became evident and quite soon the expanding urban limits of Toronto encroached on the buildings grounds. This led superintendent Dr. C.K. Clarke in 1906 to remark:

"Instead of the desirable two or three hundred acres, 26 acres are enclosed within gaol-like walls ... Queen Street, one of the busiest thoroughfares in the city, is directly to the north. The smoke from the many trains and factories in the neighbourhood, pollutes the air. A more undesirable site for a hospital could not be selected."

THE FATE OF ONTARIO ASYLUMS

One can see that there are many similarities between the type of therapeutic environment that early asylums in Ontario were trying to create and the current concepts of occupational and recreational therapy. If one is to believe Daniel Tuke's account, Victorian era asylums enjoyed a time of success in the care of the mentally ill. It was optimistically believed that moral treatment would increase the cure rate to over 90 percent and eliminate mental illness as a major societal problem. The optimism was short-lived however, as Canadian cities became larger and the population in need of mental health care increased. The asylums which were built to house only a few hundred patients contained thousands by the 1940's. The more familiar conditions of overcrowding and impersonality associated with large institutions became apparent. The declining conditions in provincial psychiatric hospitals, along with new advances in psychopharmacology sparked yet another reform in mental health care in the 1950's and 1960's — deinstitutionalization. However this has brought new problems including the "revolving door" syndrome, whereby mentally ill people experience many repeated admissions and discharges from general hospital psychiatry wards and longer-term psychiatric facilities. The increase in the numbers of ex-psychiatric patients among the homeless and in the criminal justice system also suggest that instead of being institutionalized in asylums, these people are now marginalized in the community. Perhaps by looking to the past and understanding how the political, social and economic forces of the time affected changes in mental health care, we can learn from mistakes that were made, and try not to repeat them.

ACKNOWLEDGEMENTS:

This article came out of a presentation originally given at the first Hannah Symposium for the History of Medicine in 1993. Many thanks to Dr. Potter for his ongoing support and encouragement, and to Brian Misiaszek for his useful comments.

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An Alarming History of Breast Cancer Treatment in Times of Old

This paper was presented by Ms. McKnight, in a similar form at the 'Hannah History of Medicine Day', on April 1, 1995, in Halifax, NS.

It is frightening to think of having malignant breast disease in the twentieth century. What we take for granted nowadays, such as surgery, radiation, chemotherapy, sterile technique, antibiotics, and analgesia are techniques that were not heard of in ages past. So, what could be done in antiquity, the middle ages and renaissance about a growing, worrisome intrusion in the breast? This brief survey takes a look at some of the "serious" and folk medicines used in the treatment of breast disease.

We begin with a familiar name, our endear Hippocrates. He lived and worked in and about 480 BC. He was well aware of breast 'karkinoma', and this was explained by his well known humoural theory. Hippocrates believed that the imbalance of the four humours, in particular, sludging within the breast, accounted for the mass, and was the result of amenorrhoea. He states that occult cancers should be left untreated, for treatments such as surgery would hasten death.

Galen, of about 150 AD, used Hippocrates' theories and expanded on them. These ideas lasted well into the 1800's. Galen also maintained that a thickening or sludging of humour would produce a 'scirrhus', a hard, heavy tumour, fixed and painless. This was thought to be different from a malignancy, which was caused by congestion of black bile. Treatment was either purging or bleeding, to prevent over-accumulation of the bile, or restarting menstruation in young women, if it had stopped, with hot baths, walks, and other external therapy. Galen also recommended local application of strychnos (nightshade) juice, or pompholyx, which contained zinc oxide, especially for ulcerated lesions. If the cancer was hidden or unulcerated, chalices, which contained copper, were used. If the mass was large, then surgery was the only option left. Surgery began by purging the tumour. Then, one would cut away the diseased part, let the blood flow, and cauterize.

Few women with breast disease in these times had Galen's methods of treatment available to them. Thus, there existed magic, divine intervention and animal sacrifice for the betterment of health. For instance, from ancient times right up into the renaissance, one could try to cure cancer with a crabfish or crab. One recipe was to burn the crab to ashes, or cook it in milk. The belief was that a cancer, with swollen veins like the legs of a shellfish, could be cured by using a natural object which resembled it. This is known as the doctrine of signatures. So developed the crab symbol for cancer.

If the above treatments failed, as they often did, one could pray. And conveniently, the Catholic Church has no less than thirteen saints of breast disease alone. The most famous of these is St. Agatha. Her fame stems not from divine cure of her own breast ailment, but from martyrdom. She was a beautiful, but chaste woman who devoted her life to God. Refusing the advances of a Roman official landed her in a brothel as punishment. However, she remained a virgin while there. This infuriated the Roman, and he showed his displeasure by having Agatha's breasts sheared off and having her thrown in prison. St. Agatha's day is still celebrated in Catania, Sicily, where Agatha is said to have lived. The occasion is marked by a procession through the town to her shrine with two large breast effigies leading the way.

Other treatments used for their magical value included laying raw meat on an ulcerated breast cancer. The idea was that the disease would be transferred to the warm, freshly slaughtered kitten or puppy, and when the meat cooled, a fresh slab was to be applied. This suggestion from DaVigo, a Renaissance doctor to the Pope, may have stemmed from the notion that heat attracted coagulation and inflammation, and hence would purge the disease out. This theme of cure by forcing disease out of the body, such as in phlebotomy, rather than having the body deal with it, was used throughout Western medicine until the age of microscopic biology allowed us to know of and aid in the body's own defenses.

Meat consumption was the treatment of choice for St. Comas and St. Damian, physicians who instructed a Jewish woman with breast cancer to eat pork. As her religious convictions would not allow this, she instead laid the pork on her breast and was thus cured. As well, other dietary considerations were in vogue for the ailments of the breast. It was thought that avoiding hot food and drink would decrease internal heat, which predisposed to inflammation and thickening of humor in the breast. It was also important for the unfortunate soul to keep up her spirits, for it was believed that a depressed mood lead to melancholic humor and coagulation within the breast.

This overview of beliefs and practices with regard to breast cancer in remote times is by no means complete. It is alarming to think of how far medical knowledge has come, and yet so many women still die each year from the same cancer that plagued women of antiquity.

REFERENCES:
feature section

Alexis Carrel: Innovator of Surgical Vascular Anastomosis

"... Doctor Alexis Carrel was one of the most extraordinary and controversial figures of his generation. Bearing a fame that spread around the planet, he was decorated and damned, often by the same people."

Charles A. Lindbergh

On June 24 1894, the President of the French Republic, M. F. Sadi Carnot, was viciously stabbed by a political anarchist. The wounded President was rushed to Lyon’s Hôpital Antiguaille where his injuries, a lacerated liver and severed portal vein, were attended to by the senior surgeons. In an attempt to control the massive internal hemorrhage, the portal vein was ligated. The efforts of the surgeons were futile; President Carnot died the next day. A young intern, Alexis Carrel (Figure 1), was greatly moved by the tragic death of the French President and was inspired to develop surgical techniques that would lead to the birth of modern vascular surgery.

Alexis Carrel’s first endeavour was to solve the mystery of vascular anastomosis, a surgical technique that had eluded his predecessors. Carrel was successful in identifying and addressing the technical shortcomings of previously described methods: a) the surgical instruments used at the turn of the century were too crude for the suturing of delicate arterial and venous walls; b) early methods of anastomosis did not ensure that the free edges of a joined blood vessel were uniformly sutured about their circumference; and c) the suturing process itself inevitably damaged the intima of vessels and precipitated thrombus formation. Carrel’s theories regarding vascular anastomosis, published in 1902, became widely recognized by the international medical community. His rapid rise to fame, however, was not well received by senior physicians immovably entrenched in their conservative ways.

In 1903, Carrel participated in a religious pilgrimage to Lourdes during which he witnessed an unexplainable healing of a young girl afflicted with tuberculous peritonitis. As a scientist, he found it exceedingly difficult to accept this event as a miracle. On the other hand, he was unable to offer a scientific explanation for the child’s apparent cure. Perplexed by the occurrence, Carrel innocently described this experience to his colleagues in Lyon. Unwittingly, Carrel had exposed himself to the merciless criticism of envious colleagues. Virtually overnight, Carrel’s reputation became embroiled in controversy. He was ostracized by the Lyon medical community and was advised to abandon his surgical studies for he would never be permitted to complete his surgical residency.

Disheartened by his predicament, Carrel contemplated abandoning his career in medicine altogether. Upon reflection, he decided to dedicate his life purely to research. However, it was painfully evident to Carrel that these plans for his future could only be realized outside of France. In May of 1904, at the age of 31, Carrel sailed from Bordeaux to Montreal, Canada to present a paper on vascular anastomosis at the Second Medical Conference of the French Language in North America. After a brief stay in Montreal, Carrel was offered a permanent research position at the University of Chicago.

ABOUT THE AUTHOR:
Paolo Campisi is a third year medical student at the University of Western Ontario. He has recently submitted for publication the results of a retrospective study on the outpatient management of spontaneous pneumothorax with the Heimlich flutter valve.
Selected by the Karolinska Institute of Stockholm and awarded the Nobel Prize in Physiology or Medicine in 1912. Carrel went on to make many further significant contributions to the advancement of surgical medicine. His theories of organ transplantation, coronary artery bypass, wound debridement and organ culture have been described as being fifty to a hundred years ahead of their time. In spite of his brilliant research career, the unexplainable event at Lourdes and his controversial beliefs in extrasensory perception and supernatural powers of the human mind have made Alexis Carrel one of the most celebrated and criticized scientists in medical history. The life of this extraordinary man cannot be adequately chronicled in this brief introduction. Interested readers are encouraged to review the biographies noted at the end of this article.

SUGGESTED READING


Ω
Canada, despite being a relatively youthful nation, has made substantial contributions in the sphere of medical and scientific research. Some of these achievements are historically reflected in medical terms being derived from the name of their Canadian discoverer or originator in an eponymic fashion. It may be surprising and gratifying for many to learn that some of the terms that make up the medical lexicon were in fact coined by individuals residing in our own country. Ironically, such accomplishments and their originators are often better known to the workers in a country. Unlike accomplishments and their discoverer or originator in an eponymic fashion. Achievements are historically reflected in medical terms given specialty in countries far from Canada than they are at home. This article is an attempt to, at least in part, rectify this situation.

The word eponym is a compound word made up of two Greek words; -onym or name, and -ep or upon; therefore eponyms are those words which are stuck on top of another name; in other words, a nickname. Medical vocabulary is crowded with eponyms — terms derived from the proper names of persons, families and places, be they real or imaginary. Rather than being designations made to honour their discoverer, eponyms were adopted to provide a convenient identifying label to describe a particular phenomenon associated with that person. Some examples of commonly used eponymic medical terms include Bell's Palsy, Cushing's Disease, Tinel's Sign, the Heimlich Maneuuvre and Munchausen's Syndrome, among others.

One of the ironies of Canadian medical research is that the decline in the use of eponymic terms to identify new and important discoveries coincided with the growing influence and contributions Canadians have made in these areas. Hence, there are no eponyms in the medical literature reflecting the achievements made by such giants as Banting, Best, Collip and Penfield. Despite this, many Canadians have left their stamp on the medical vocabulary. Below is a brief (and by no means exhaustive) listing of medical terms associated with Canadian physicians and medical investigators. Following each is a brief biographical vignette. Part of the charm of medical eponyms is that they not only identify the item their originator first described, but they also provide a fascinating glimpse into the life and history of the person attached to the term itself.

### ABOUT THE AUTHORS:
Brian Misiaszek is a third year medical student at the University of Western Ontario, with an avid interest in medical history and literature. He is a member of the newly revived Osler Society at that institution.

### Murray L. Barr (1908-1995).
Dr. Barr is best known for his discovery of the condensed sex chromatin of the female cell nucleus that bears his name, "Barr Body", but he made many other fundamental contributions in the field of cytogenetics and neuroanatomy. Born in Belmont, Ontario, Dr. Barr graduated from the University of Western Ontario in 1933. After interning for a year in Pennsylvania, he returned to London, Ontario, where he spent two years in general practice until he joined the Department of Anatomy at Western in 1936. With the outbreak of the Second World War, he joined the Royal Canadian Medical Corps, and served with them until the end of the war in 1945. After the war, he returned to London where, working in his lab at Victoria Hospital on a shoestring budget, Dr. Barr and his graduate student E.G. Bertram made the discovery of sex chromatin, which was first published in 1949. He became a professor of Anatomy in 1951, was chairman of the Department of Microscopic Anatomy from 1953-1964, and chairman of the Department of Anatomy from 1964 until his resignation in 1967 to devote more time to research and teaching duties. His areas of interest included neurocytology and anomalies of human sex chromosomes; he also helped to identify the genetic condition 48 (XXXY);XXY, also known as Barr-Shaver-Carr Syndrome. Beyond his many scientific accomplishments and various scientific awards, Dr. Barr was also very interested in medical history, penning an account of the history of the UWO Medical School, "A Century of Medicine at Western", in 1978.

### Norman Bethune (1889-1939).
An intense, complex and passionate man, Norman Bethune's medical humanitarian efforts have only recently become known to Canadians (in contrast to China, where he is considered a national hero). Born in Gravenhurst, Ontario, he graduated with the medical class of 1917 from the University of Toronto (one of his classmates was Sir Frederick Banting, the co-discoverer of insulin). After discovering he had TB in 1926, and being treated successfully by an artificial pneumothorax, Dr. Bethune devoted himself to work in the field of tubercular research and surgery. After joining the staff at Montreal's Royal Victoria Hospital in 1928, he invented a number of surgical instruments to enhance thoracic surgery, which became widely used throughout North America. Although, time has rendered many of his devices obsolete, his curved Bethune Rib Shears are still used today.

While in Montreal, the flamboyant Dr. Bethune became one of the first socialist physicians, and then left-wing causes in general. In 1936, he became involved with the Loyalist forces in the Spanish Civil War, where he created the world's first organized blood transfusion
service. By 1938, after declaring himself a member of the Communist Party, he was in China, providing medical aid for the Communist forces of Mao Tse-Tung, who were then fighting off the invading Japanese army. In China, he developed the mobile army medical team, forerunner to MASH units used in subsequent armed conflicts. He died in a tiny peasant hut in China on November 12, 1939, as a result of a surgically derived infection. After his death, Mao Tse-Tung wrote about Dr. Bethune in a memorial essay, which included this line: “We must all learn the spirit of absolute selflessness from him.”

Maud Menton (1879–1960). One of the first Canadian women to receive a medical degree, Maud Lenora Menton was born in Port Lambton, Ontario. She received her medical degree from the University of Toronto in 1907. She went abroad to further her studies and, while in Germany, her collaborative efforts with Leonor Michaelis on the mathematical description of enzymatic action and kinetics, led to the derivation and publication in 1913 of what is now known as the Michaelis-Menton Equation, a fundamental theory of biochemistry. After receiving her Ph.D. degree in biochemistry from the University of Chicago in 1916, she accepted the position of pathologist at the University of Pittsburgh in 1918. Besides teaching pathology to untold numbers of students and residents, she made important contributions to the understanding of scarlet fever, and performed kidney and haemoglobin research. Dr. Menton became professor emeritus at the University of Pittsburgh in 1950, and afterwards returned to Canada where she worked in the field of cancer research until her death.

Sir William Osler (1849-1919). Arguably the greatest physician since Hippocrates, William Osler gained his fame not as much for his scientific accomplishments as for his invention of the system of modern medical education used today. Born in Bond Head, Ontario, the prankish and mischievous young William was diverted from a life of religious study towards a life of science by two influential persons; the Reverend W. A. Johnson who introduced him to a microscope and a drop of dirty pond water, and Dr. James Bovell who convinced him to switch from the religious training program at Trinity College in Toronto, to the Toronto School of Medicine. He spent the first two years towards his medical degree there, but then transferred to McGill, completing his degree in 1872. The next several years he spent abroad, studying medicine in London, Berlin, Leipzig and Vienna, until 1874 when he was appointed professor of medicine at McGill University at the age of 26. He spent ten years at McGill, where he began to make a name for himself as a stellar clinician and a superb teacher, his youthful enthusiasm and charisma energizing the students and faculty alike. From 1884 to 1889 he was professor of clinical medicine at the University of Pennsylvania, following which he was the first professor of medicine at the new Johns Hopkins University and Hospital, a post he held until 1904. It was while he was at Hopkins that Osler established his international reputation as the most influential medical educator of all time, aided by the publication of the first edition of his famous textbook, The Principles and Practice of Medicine, in 1892. In 1905 he was appointed Regius Professor of Medicine at Oxford, and he was
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created a baronet in 1911. Sir William Osler died of pneumonia in 1919, and his ashes lie in the library created from the priceless collection of books he donated to McGill University. After his death, his widow, Lady Osler, asked his friend Harvey Cushing (known today as the father of neurosurgery) to pen his biography; five years in the writing, The Life of Sir William Osler won Cushing the Pulitzer Prize in 1926.

For a person unschooled in medical matters, it may be difficult to understand the reason for Osler's enduring influence. While he did make a number of scientific medical discoveries, mostly in the area of cardiovascular disease: making the first observations of platelets, describing polycythemia vera (Osler-Vaquez Disease), hereditary haemorrhagic telangiectasia (Osler-Weber-Rendu Disease) and identifying some of the clinical signs of infective endocarditis (Osler Nodes). Such discoveries alone are not enough to explain why Osler left such a vast impression on his medical peers and contemporaries. What the facts cannot show is the engaging personality of the man himself which made him both the most famous and most beloved physician of his day.

Words alone cannot show the infectious enthusiasm towards the study of medicine that William Osler radiated from all his being and infected all whom he came in contact with. He was an odd chimera of medical sobriety and audacious prankster, and he delighted and entertained small children, students and medical colleagues alike with his wit and compassion. Osler's students adored him for the compassion, encouragement and inspirational advice freely shared, and he attracted many converts to his novel methods of teaching. Osler's philosophy of medical education stressed the bedside teaching technique, as stated in his oft-quoted clinical aphorism, "Medicine is learned by the bedside, not in the classroom." He introduced the concept of the clinical clerkship, and created the system of ever increasing acquired responsibilities — from clerk to resident to house officer — that is the hallmark of the transition of student to doctor still in use today. His highly readable textbook, an instant classic, and was the mete by which all other textbooks would be measured for the next 40 years and is still worth reading even today. It was so popular that it was translated widely into languages as diverse as German and Chinese. He emphasized the concept of continuing medical education, had a life long interest in literature, the humanities and medical history, and was a prolific writer in his own right. He was a role model for an entire generation of physicians throughout the world, and the "Oslerian Tradition" — a virtuous and idealistic approach to both medicine and life — exerts a strong influence on many even today.

This is by no means an entire listing of Canadian medical eponyms. Space forbids providing biographical information on the following Canadians who have lent their names to medical science: William Mustard [Mustard Operation], Robert Salter [Salter Operation, Salter-Harris Fracture Grading], John C. Steele & J. Clifford Richardson [Steele-Richardson-Olszewski Syndrome], Arthur Vineberg [Vineberg Operation], as well as many others who might very likely have been inadvertently omitted in this account.
ACKNOWLEDGMENTS:

I would like to thank Dr. Paul Potter for his contagious enthusiasm for this subject and for the many helpful suggestions that proved invaluable during the creation of this article. I would also like to thank Dr. David Colby, Dr. Bertha Garcia, Dr. Martin Inwood, Caroline King and David Martell for their suggestions and input as well.

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Throughout the history of humankind, few questions have been as omnipresent and as intriguing as that of what is life? Vastly different interpretations of this query have inspired thousands of investigators to employ diverse strategies in order to discover the secret which is the essence of life as we know it. Predictably, the many distinct pursuits, ranging the gamut from religious demagoguery, to philosophical rationalization, to scientific examination, have yielded various dogmata. Of the available paths of inquiry, perhaps the most empirical was that of deducing the physical and chemical basis for biological life. Specifically, by identifying the structure and the function of the macromolecule which is a quintessential component not only to the creation of life, but to its perpetuation over generations, and its evolution, an adequate and awe-inspiring solution was indeed revealed. Deoxyribonucleic acid (DNA) was the scientific community’s answer, which simultaneously rendered the age-old question suddenly less esoteric, yet demanded a newfound veneration for the artistry and the ingenuity of the ultimate Forces of Creation, whoever they may be. The magnitude of the endeavor to make this discovery should imply that numerous researchers, from several nations, over a period of decades, participated in the process. Yet, popularization of the history of this fantastic event has served only to glorify James Watson and Francis Crick, who eventually fitted the pieces of the puzzle together. While the enormous accomplishments of Watson and Crick are by no means negligible, neither should they be understood in isolation.

Early on, chemistry had a vital role to play, yet progress was limited by the state of chemical knowledge (biochemistry was, in the nineteenth century, a new discipline, and molecular biology was still unborn), and the lack of technological analytical apparatus. The first principle, which would enable later workers to imagine macromolecules, was postulated by Friedrich Kekulé (1829-96), who, following his discovery of the quadrivalency of carbon atoms, conceived the carbon-carbon link. His realization that all atoms in a particular molecule were not in contact with one another, that in fact each (carbon) atom was joined only to a few others, made possible the idea of long polymers.

Friedrich Miescher was born in Basel, Switzerland, on August 3, 1844. By 1868, Miescher had earned a degree in the available paths of inquiry, perhaps the most empirical was that of deducing the physical and chemical basis for biological life. Specifically, by identifying the structure and the function of the macromolecule which is a quintessential component not only to the creation of life, but to its perpetuation over generations, and its evolution, an adequate and awe-inspiring solution was indeed revealed. Deoxyribonucleic acid (DNA) was the scientific community’s answer, which simultaneously rendered the age-old question suddenly less esoteric, yet demanded a newfound veneration for the artistry and the ingenuity of the ultimate Forces of Creation, whoever they may be. The magnitude of the endeavor to make this discovery should imply that numerous researchers, from several nations, over a period of decades, participated in the process. Yet, popularization of the history of this fantastic event has served only to glorify James Watson and Francis Crick, who eventually fitted the pieces of the puzzle together. While the enormous accomplishments of Watson and Crick are by no means negligible, neither should they be understood in isolation.

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Friedrich Miescher was born in Basel, Switzerland, on August 3, 1844. By 1868, Miescher had earned a degree in histochemistry, and went to work in the laboratories of Felix Hoppe-Seyler. Luckily, Hoppe-Seyler himself was a reductionist, who advocated that a deeper understanding of the molecular forces which regulated cell life could be attained by studying the physical and chemical properties of individual cellular components. Miescher chose to study white blood cells, which could be readily obtained from the pus found on the discarded bandages of surgical patients. Cells were easily sedimented and preserved by washing the bandages with a dilute sodium sulfate solution, whereas if they were washed with a concentrated salt solution (as was done by Hoppe-Seyler), the cells swelled to form a gelatinous mass, which to many workers resembled myosin, the known protein of muscle cells. This uncritical, purely qualitative observation was the first instance in establishing the long-held stigma that protein was the genetic material. As was often the case, researchers tended to find what they expected, and proteins, which had been found thirty years earlier, by Gerardus Johannes Mulder, were considered to be the most significant material in cells; thus, Miescher was seeking to identify and describe the proteins which formed tissue in pus cells. Miescher concluded that the substance he had isolated did not exhibit properties which conformed to any known group, and hence he called it nuclein because he believed it to be derived from the nucleus. Miescher analyzed nuclein for its elemental composition, finding that it contained 2.5% phosphorus. Previously in Hoppe-Seyler’s laboratories, lecithin had been discovered, and was deemed to be unique because it contained phosphorus as well as the other elements usually found in organic molecules; Miescher not been fortunate enough to have made his finding amidst this excitement, his work might never have received the attention that it did. Although Miescher had isolated nuclein in 1869, his work was not published until 1871, after Felix Hoppe-Seyler had, himself, reluctantly confirmed Miescher’s novel observations.

Walther Flemming, who had observed and understood the process of mitosis in detail, introduced the term chromatin, in 1879, to denote the darkly stained nuclear material which he had observed during mitotic division. Furthermore, Flemming speculated that chromatin was identical to nuclein, much to the chagrin of Miescher, who denied this possibility as late as 1890. As early as 1884, Hertwig, a zoologist, is quoted as having declared “I believe [that it is] highly probable that nuclein is the substance that is responsible not only for fertilization but also for the transmission of hereditary characteristics”. Miescher was almost a visionary, but his keen speculation was spoiled by his bias and...
In 1892, Miescher had proposed that heredity was derived from the "stereo-architecture of only a few very large, complicated molecules", but was clearly referring to proteins, whose biological specificity was moderately well-known to the scientific community at this time. In 1895, American cytologist E.B. Wilson wrote that chromatin was similar to, if not identical to, nuclein, and that heredity may be effected by the physical transmission of a particular chemical compound from parent to offspring. Biochemist Richard Altman, with Miescher's approval, renamed the substance in question nucleic acid, to distinguish it from the protein-contaminated samples that Miescher had obtained. Eduard Strasburger, a botanist, and a contemporary authority to Wilson on mitosis, in 1909, repudiated the notion that nucleic acid could play any role in heredity. Despite the debate which had clearly arisen as to the identity of the hereditary substance, workers continued to examine nucleic acids, which finally led to the establishment of the structure of the nucleotide.

Albrecht Kossel, born in September, 1853, in Rostock, Germany, worked in the new Hoppe-Seyler laboratory in Strasbourg, where his objective was to determine whether or not nucleins extracted from different cells actually possessed the same chemical composition. While the existence of guanine was apparently known, Kossel, in 1885, described the preparation of a new base, termed adenine, from animal organs and yeast. Along with his co-worker Neumann, in 1893, Kossel reported another previously unidentified cleavage product of nuclein, which they called thymine, since calf thymus tissue was the source of their nuclein. Soon after, they identified cytosine. Finally, in 1900 Kossel and Neumann isolated the fifth base which occurred in large quantities, uracil. Emil Fischer, by 1898, had synthesized adenine and guanine, in classic retrosyntheses, from reagents of known chemical structure, and called this class of compounds purines. Pyrimidine was a term used by Adolf Pinner to designate the single-ringed bases thymine, cytosine, and uracil as a class; Fischer and Roeder synthesized uracil in 1901, and Wheeler and Johnson synthesized cytosine in 1903. All that remained, so far as nucleotides were concerned, was to assemble the components into a plausible configuration which would yield a monomer that could be elongated. There are several ways in which the three components (sugar, phosphate, base) could be connected, and this led to several incorrect structures, including the ether linkage between sugar groups proposed by Jacobs and Levene (1912). His wrong guess notwithstanding, it was Phoebus Aaron Levene who succeeded in providing the structure of the nucleotide. In 1909, Jacobs and Levene were able to crystallize the sugar constituent of the nucleotide, and called it deoxy-ribose. In 1909, Jacobs and Levene found the order of the phosphate-carbohydrate-nitrogenous base linkages.

During the following decades, popular belief, based on crude results, became that the four bases were present in equal proportions in nucleic acids, and this led to the erroneous tetranucleotide hypothesis. Levene gave the basic form of the tetranucleotide structure in 1921, using hexoses as the sugar components. An incorrect supposition which persisted until 1929 was given voice, in 1914, by Walter Jones, who stated that plant nucleic acids contained a pentose sugar, while animal nucleic acids contained a hexose sugar. By 1935, Levene's colleagues had concluded that the sugar was a pentose in animal cells as well as in plant cells, and Tipson and Levene modified the pre-existing tetranucleotide structure appropriately. Ultimately, Levene did ascribe the DNA polymer the phosphodiester bond. As for the structure of DNA as an entirety, several novel guesses were made, but none were supported by experimental evidence. The matter of structure would not be resolved for decades, but the chemical foundations had been laid.

Simultaneous to the elucidation of the composition of nucleic acids, scientists debated the meaning of heredity, and pondered the mechanism of genetic transmission. Dr. Archibald Garrod, a pediatrician in London, had observed a condition in infants which he called alkaptonuria. Alkaptonuria is an essentially harmless condition, in which the afflicted patient excretes copious amounts of homogentisic acid in their urine, which reacts with air to turn dark red. Garrod rebutted the arguments of his peers who insisted that the condition was caused by intestinal bacteria which produced homogentisic acid. Garrod countered that bacterial intestinal populations had insufficient time to become established in newborn infants who had alkaptonuria. He compiled pedigrees of several of his patients' families, and saw a pattern in which other relatives had the disease, while parents of the proband were frequently normal. The year was 1902, and...
Mendelian genetics had been confirmed. Garrod characterized the pattern which emerged as that of an autosomal recessive allele; moreover, he asserted that the affection was caused by an alteration in the patient's biochemistry which caused a metabolic block, due to an inherited deficiency of some specific enzyme activity. That the amorphous hereditary factors which were the basis of Mendel's theories of heredity could be equated with heritable diseases that were wrought by biochemical differences in the metabolic pathways of afflicted individuals was an idea of such incredible magnitude, that it is of tantamount importance to the structural work done by the researchers of the 1960’s, for Garrod, by virtue of his innovative thinking and his meticulous assembling of pedigrees, was able to hypothesize that inheritance of traits was necessarily fused to processes at the molecular level.

Garrod’s ideas were confirmed, and the impressive work of George Beadle and E. L. Tatum verified that the production of every enzyme is regulated by one gene. In order to demonstrate their one gene-one enzyme hypothesis, Beadle and Tatum, in the 1940’s set up a system in which they would cultivate Neurospora in various media, which systematically lacked certain amino acids or certain vitamins. They revealed two mutant forms.

The effort to prove that DNA was the material responsible for heredity was started, inadvertently, by Frederick Griffith, in 1923. Griffith was a conservative British civil servant who worked in the pathology laboratory in the Ministry of Health. He was examining different strains of the bacteria Streptococcus pneumoniae to try to account for the increased incidence of one type of pneumonia in the Smethwick area in England, when he discovered two distinct strains. He deemed the first the S strain, since the bacteria were shiny and smooth with a polysaccharide coat that caused it to be virulent; the second strain, the R strain, was rough, lacking a polysaccharide coat, and avirulent. He concluded that there must be some sort of transforming factor in the killed S strain which reverts live R strain to live S strain. Griffith never committed to any particular substance as being the transforming factor, and certainly never suggested nucleic acid as a possibility, although nucleoproteins had been discussed in his laboratory in relation to the phenomenon. Griffith was scrupulously honest, and genuinely unsure, which prevented him from arriving at the correct explanation; he had little idea of how the transformation came about, or its significance, and his discovery was an instance of pure serendipity.

Confirmation and continuation of Griffith’s work was done by Oswald Avery, a Canadian born in Nova Scotia, who was working in New York. Avery performed a series of experiments, which were extremely elegant in their simplicity and design. By 1944 he had shown that DNA was the transforming factor. Despite this rigorous proof that DNA was capable of being the material of heredity, with the capacity to regulate chemical production within the cell, many skeptics doubted Avery’s conclusion. Allegedly, the scrutiny was the direct result of nothing more than the prevalent belief in the genetic primacy of proteins. At first, Avery, a conservative, would not trust in his own results. Along with his co-workers, he was unsure of the nature of his discovery; he did not know which contemporary theory of DNA activity was most applicable —whether DNA was behaving as a gene, as a mutagen which caused mutation of the genetic material in the recipient cell, or as a virus. Another reason which exacerbated the reluctance of others to accept Avery’s results was that it was sufficiently understood that bacterial chromosomes were different than those of plants and humans, so Avery’s conclusions might be limited to the bacterium.

Eight years later, Al Hershey and Martha Chase sought to lay to rest the debate over the identity of the genetic material. In 1952, in California, they took advantage of the T2 bacteriophage as an experimental subject. James Watson, in a 1952 paper, said of the experiment that it was “a powerful new proof that DNA is the primary genetic material.”

Meanwhile, in New York, at Columbia University, from 1948-9, Erwin Chargaff was conducting a chemical investigation. His objective was to determine the basis of the specificity that was present in nucleic acids. One of the possibilities was the sequence of nucleotides in the molecule. Chargaff noted some quantitative relationships between base pair ratios, which he dismissed as being relatively trivial.

Chargaff had indeed found that total percent purines equaled total percent pyrimidines, and that adenine equaled thymine, while cytosine equaled guanine. It is noteworthy at this juncture to stress the good luck which
Chargaff had in not selecting E. coli for his initial bacterial analysis, as would have been typical. In bacteria and viruses, the cytosine/guanine content ranges from 20% to 75%, but in E. coli happens to be 50% to 52%. If Chargaff had chosen to work first on E. coli, the lack of variation in his results could have caused him to disregard his whole investigation as meaningless, and the information he uncovered would have remained undisclosed.

Workers in both the United States and Britain were in pursuit of the structure of DNA which could satisfy the criteria of accounting for the reproduction and transmission of genetic information. Rosalind Franklin and Maurice Wilkins worked meticulously, at King’s College in England, on the structure of DNA, utilizing a method known as X-ray crystallography. Wilkins was ambitious, and was willing to always share his work with the “scientific brotherhood”, while Franklin is remembered as being more introspective and an ardent observer. Rosalind Franklin made crucial contributions to the solution of the structure of DNA, but died of cancer in 1951. She was to undertake a systematic investigation of DNA fibers, and was an accredited specialist at X-ray crystallography. Franklin took her pictures at different humidities, and found two different structures, which she called A and B. She worked tirelessly on A, and eventually Wilkins, her supervisor at the Cavendish, was given permission to work on B, much to Franklin’s dismay. The structural changes between the two forms led Franklin to believe that the fundamental structural unit of DNA was an assemblage of polynucleotide chains, arranged so as to have the phosphate groups on the outside, accessible to water. The X-ray pictures made by Wilkins and Franklin show that DNA is a helix of two or three chains, held together by hydrogen bonding between identical base pairs. Franklin found that the B form helix had an axial repeat of 34Å, and an axial spacing between nucleotides of 3.4Å.

Linus Pauling, the American chemist-physicist, had discovered the a-helical structure of proteins, which was stabilized by hydrogen bonds, and was awarded a Nobel Prize for his work in 1953. He had communicated to some English colleagues that he was becoming interested in working out the structure of DNA using similar model-making methods to those which had aided him in discovering the a-helix. The Cavendish team was at war with Pauling who had beaten them to the a-helix, and thus, they were at war with the United states as well. Amidst this climate of urgency and anticipation, two young workers who shared an office at the Cavendish, and who coincidentally shared an interest in the riddle of DNA, began their quest for its structure. The degree of coincidence which abetted them, and the fact that good luck was their constant ally, was as important to their eventual success as was their perseverance and creativity.

James Watson, born in Chicago in 1928, moved to England, where he worked in Cambridge, at the Cavendish, where he met Francis Crick. While Crick possessed the expertise in crystallography, and Watson the expertise in phage genetics, their collaboration was not simply the sum of their abilities; rather, the nature of their partnership was molded by the nature of their problem—they had to guess what the structure of DNA
was, and show that it conformed to existing evidence. Having been introduced to John Griffith by a mutual friend, Crick found himself in line for tea with him in the spring of 1951, where, in the course of their banter, Griffith told Crick that he had calculated the preferential attraction of adenine to thymine, and of cytosine to guanine. Watson and Crick met Erwin Chargaff when he visited Cambridge in July of 1951, and they became acutely aware of his one-to-one ratios. After consideration of the problem, Crick ruled out the base-pairing of like to like, as was suggested by Franklin, because it was inconsistent with the crystallographic evidence, and because it provided no explanation of Chargaff's rule. Nonetheless, Watson and Crick were unable to ameliorate the situation, and were still unsure of how the structure could be held together. By this time, they had grown friendly with Peter Pauling, the son of Linus, who had arrived at the Cavendish to work. Incredibly, Peter Pauling shared the details of his father's progress with his English colleagues, yet did not report any of the goings on at the Cavendish to his father. Linus Pauling had written to Wilkins, asking for X-ray photographs. Although Wilkins was a proponent of sharing, he didn't dare send Franklin's photographs, aware that she was extremely possessive. Some time later, Pauling was to visit Cambridge personally. News of Linus Pauling's impending visit frightened Watson and Crick, and they were understandably relieved when the U.S. State Department revoked his passport, preventing him from making the journey. The next fantastic bit of fortune was made possible by Max Perutz, who was both a colleague of Francis Crick, and a member of a committee that had been appointed by the Medical Research Council to monitor the activities of Sir John Randall's labs at King's College. Randall had instructed his researchers to provide summaries of their works, which he mimeographed and circulated to all committee members to demonstrate their lab's productivity. As soon as Perutz saw the sections by Wilkins and Franklin, unbeknownst to them, he brought them to Watson and Crick for examination. Watson and Crick decided to build a model, as Linus Pauling had done when working on his a-helix. They built two helices, with the phosphate groups oriented to the outside, and they were in the keto, and not the enol, form. Watson redrew the diagrams he had been playing with, and in a moment of epiphany realization, found that thymine and adenine were bound by two hydrogen bonds, and that cytosine and guanine were capable of joining together by three hydrogen bonds. Moreover, he knew that this would account for the constant diameter of 2nm which Franklin had written of. Remarkably, Watson and Crick had succeeded, in the winter of 1952, in deducing the structure of DNA. It is obvious that Watson and Crick never performed a single original experiment, nor did they even refine the work of any of their predecessors, and for this they were criticized. Despite their lack of new research, their tremendous feat cannot be understated, for they were able to synthesize the work of many others into a plausible, functional, and verifiable structure, when their contemporaries lacked the creativity and open-mindedness to do so themselves. In 1962, Watson, Crick, and Wilkins were awarded the Nobel Prize. Ironically, Franklin, whose work Watson and Crick had exploited, was not named since the award cannot be given posthumously.

Watson and Crick immediately saw that their model could account for the two functions requisite to DNA: that it could encode the genetic information needed for polypeptide synthesis, and that it could replicate itself. Watson and Crick also suggested that the autocatalytic function of DNA would be a likely mechanism for mutation in accordance with the Darwinian school of evolution and variation.

The first function of DNA was demonstrated first by Marshall Nirenberg, and then independently by Har Gobind Khorana throughout the 1950's and 1960's. Nirenberg devised a cell-free system in which proteins could be synthesized in vitro. By making artificial mRNA, he was able to observe the products that were obtained from different redundant messages, and began to decipher the genetic code. Khorana developed a system which could utilize slightly more complicated messages. This system was not able to distinguish between reading frames (i.e. GUG or UGU), but it permitted further examination and refinement of the genetic code. By 1969, most of the details of the genetic code had been solved. Nirenberg and Khorana were awarded the 1968 Nobel Prize for their pioneering efforts.

Evidence for the semi-conservative nature of DNA replication, as proposed by Watson and Crick, was provided in 1958 by Meselson and Stahl, who illustrated that one strand of parent DNA is used as a template, while the complimentary daughter strand is synthesized anew.

Clearly, many resourceful and clever workers, from various scientific fields, participated in the discovery of DNA as the material of heredity. Watson and Crick, lauded for their crowning achievement, were great problem-solvers who employed knowledge and tempered it with imagination. Watson and Crick were also the fortunate beneficiaries of fate, which more than once seemed to intervene and protect them from being denied their ultimate glory. The discovery of the structure and the function of DNA which endow it with the ability to direct the growth of, and perpetuate life, continues to challenge both the intellectual and spiritual capacity of humankind.

REFERENCES
We are now closing in on the 100th anniversary of the discovery of radium. Purified between 1899 and 1903 by Marie and Pierre Curie (for which they shared a Nobel Prize), radium was a very important element in the early history of radiation technology, particularly in the field of medicine. The story that follows focuses primarily on the events surrounding the discovery of major health problems in a group of women related to industrial exposure to radium in large American watch factories in the 1920s. It took diligence on the part of an astute medical examiner and concern on the part of a few key public officials to bring this occupational hazard to light. In retrospect, it is difficult to ascertain whether the plight of radium-dial painters in the United States represents a triumph or defeat for the field of medicine. What affected the health of these people could not be undone and offered little hope. Important lessons were learned however in identification of the effects of radioactive compounds have on the human body. These lessons came with a price as many lives were lost before anything was even suspected.

In modern times when someone utters the word radioactivity one conjures up images of mushroom clouds, bizarre anatomic mutations and objects that glow in the dark. From the enormous publicity given the dropping of atomic bombs on Hiroshima and Nagasaki at the end of World War II and the carnage they caused, it is understandable that these first two images have been ingrained in our minds over the past fifty years and for many years to come. Historically however, the idea that radioactive substances glow in the dark dates back to well before the outbreak of World War II.

Luminescence, the natural phenomenon that causes a compound to glow in the dark, had been observed for centuries by the time Henri Becquerel decided to investigate its source toward the latter half of the 19th century. His efforts led to the discovery and, perhaps more importantly, a published description of the phenomenon of radioactivity. Soon after, in 1898, Marie Curie began to separate Radium from Uranium using the radioactivity as a measure of purity. By 1903 she and her husband, Pierre, succeeded in purifying and describing the new element Radium and shared the Nobel Prize for their efforts. Very early on radium came to be used in much the same way as therapeutic x-rays - its powerful radioactivity was used to destroy diseased tissue. The new phenomenon showed great promise in medicine and many were quick to exploit its "therapeutic effects" (real or imagined). It soon became apparent that this new material had enormous business potential. Patent medicines containing radium soon became quite popular. People began drinking it (in alarming quantities!), bathing in it, and some doctors were even injecting it into their patients. The rationale for the use of radioactivity internally was based on the belief that it activated enzymes, relieved pain, and reduced blood pressure. The drinking of radioactive spa waters was advised as a therapy for, among other diseases, liver disease and rheumatic sicknesses.

A key discovery in the early years of the "Radium Craze" was that when radium was mixed with a fluorescent compound and formed into a paint it glowed in the dark - like Roentgen's Screen. This became a quite a novelty and the paint was used in many commercial ventures. The most notable of these, the practice of painting figurines and clock and watch faces, began around 1913 in the U.S. The principle figure in this particular venture was a physicist named Sabin A. von Sochocky. Later he was to become one of the early victims of the poisoning effects of his invention. Radium paint soon came into great demand during the World War I. The armed forces would benefit greatly from aircraft and submarine dials and gauges that glowed in the dark, not to mention watches and compasses. When the war ended the industry developed quickly. Before long there was a market for glowing door knobs, light switches, and novelty items. Many people got quite rich in this industry. In the decade preceding the great depression working in a watch factory seemed like fairly decent work for the time and it all seemed fairly harmless. This was all to change by the late 1920s.

The women who worked in these factories painting things with radium paint did so fully blind to the dangers they faced. Few complained about the work - it was quite light. They worked by commission according to how many objects they could paint in a day, and the pay was reasonable. The women were told by their employers that the substance would "put roses in their cheeks, curls in their hair and generally improve health." The only annoyance the dial-painters really had to deal with were the fine brushes they used, which would not keep a point. It became necessary to learn how to point the tips of their fine, camel’s hair paintbrushes at the corner of their mouth. It was later estimated that this practice led to the ingestion over a five year period of about one thousand grams of radium - ten thousand times the modern standard for radium ingestion. There were other sources

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of radium exposure at these factories. Women would often get paint on their hands, wipe it on their clothing and, thinking it was harmless, intentionally wear the paint as make-up to social events. One Halloween workers were rumoured to have painted their teeth. Radioactive waste material was so poorly disposed of at this factory that long after the factory was torn down the earth around it (which was by this time was a residential area) was found upon inspection to be astoundingly radioactive - enough so to warrant proper disposal of many tons of soil.

The first medical case of radium poisoning was described in 1922 by a New Jersey physician. The young woman was a worker at a Radium Dial Company factory in Orange County, New Jersey. It was a case of jaw necrosis attributed to phosphorous ingestion. The patient had worked as a radium-dial painter for two and a half years. The case was investigated by local and state health departments as the worker sought compensation. Their findings were that the jaw necrosis must have been due to the radium component of the paint because it did not contain phosphorous. The case was closed and the worker was denied compensation (radium poisoning had not yet been defined and as such violated no existing state laws). Within the following two years seven more radium-dial painters died. These deaths were attributed to various diseases and since there was no suspicion of foul play autopsies were not performed. Often it was the community dentist that reported the illnesses to the authorities - many involved the teeth and jaws. At one point dentists began to refuse to see patients who worked at the factory for fear they would cause some of these horrendous conditions by tampering with their teeth.

When approached by a National Consumers League spokesperson, the company responded that the problems were due largely to poor dental hygiene. That same year, the company requested that someone from the Harvard School of Public Health visit the plant to sort out the problem. On inspecting the premises, the official found (and later reported) paint all over the work areas, arms and clothes (even underwear) of the dial painters. He also learned that the company had issued a warning to the painters to stop the practice of pointing the brushes on their lips - a request that was largely ignored. A report published the following year implicated radium as the cause of the illnesses. The official pleaded with the company to institute a safety program. The president of the company responded steadfastly that radium could not be the cause of the problem, he told the official that "Radium in small doses is a stimulant". The company president promptly sought a second opinion from Dr. F.B. Flinn at Columbia University. This time he got the response he initially sought. Dr. Flinn stated in an ensuing publication: "I believe we are justified in arriving at the conclusion that an industrial hazard does not exist in the painting of luminous dials." Two years later he reversed his position after two other young women died who worked in a plant in Connecticut. This opened the door for lawsuits against the company for damages related to radium exposure in the workplace. In 1927, five ailing young women brought the case before the courts. The case dragged on to the point that the lawyer representing the young women worried that one of them might not live to hear the court’s decision. The case got widespread publicity. Madame Curie even extended her sympathy to the young women and offered them advice on how to counteract anemia. Ultimately, the women settled out of court. But word had now spread about the evils of radium. To avoid further lawsuits the company closed its doors in 1934. Soon after, another company - run by the same president - started up using the same staff and facilities and making the same products. The company, called Luminous, is still thriving today as a multinational conglomerate with offices around the world.

These first few medical problems were due to the direct effects of radiation exposure to tissues. Cancer would claim many more lives in the years and decades that followed. A key figure in the definitive study of the ailing radium dial painters was the local Medical Examiner, Dr. Harrison S. Martland, who performed autopsies on some of the earliest cases and published his findings in 1929. In this publication he definitively described the health hazards of radiation ingestion and their likely pathophysiology. Radium is peculiar in that, even in minute quantities, is that it deposits in bone and can reside there literally for years. This fact quickly became evident when one group attempted to study a group of dial painters who had passed away as many as five years previously. Bodies were exhumed (with the permission of the family of course) and exposed to

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radiographic plates. The residual radium in their bones were quite evident on these artificial x-rays.

No longer was this a phenomenon that “put roses in their cheeks, curls in their hair and generally improve health”. It was ever after labelled a fearful concoction that caused cancer and painful medical conditions. The glow dramatically from this point on, but most of the historical century. How people viewed nuclear technology changed longer represented a passing fad, it represented death of many of the patients. Coincidentally, November 8, 1995 is the 100th anniversary of the discovery of x-rays by Wilhelm Roentgen.


6. It is difficult to establish exact dates for many of the discoveries involving radium that have been used in industry largely because they were deemed “trade secrets” and were never actually disclosed.


8. Von Sochocky was a physicist who studied under a Canadian, Lord Rutherford, at the Cavendish Laboratory. He came to the U.S. from Vienna where radioactive watch painting had already been practiced for a few years (these Swiss watches were very expensive and considered quite a status symbol). His new radium paint could be produced much more cheaply and he made a lot of money in the years that were to follow as a part owner of a watch factory in New Jersey.


10. Early colleagues of Roentgen and the Curies tried to warn people of the dangers of the materials they were working with to no avail. Both Marie and Pierre Curie ultimately died from illnesses arising from their exposure to radioactive substances during their scientific work.

11. At that time work was beginning to become fairly scarce for unskilled labor - a person took whatever work was offered.


16. Ulcerative stomatitis, syphilis, gingivitis, primary anemia, sepsis, Vincent’s angina, and phosphorous necrosis of the jaw to name a few.


27. This idea had first been conceived by a Canadian, Alexander Graham Bell, while teaching at Harvard Medical School.
The New Eugenics

In the 1900's, Sir Frances Galton founded the Eugenics Movement, which sought to improve the human condition through social reforms. These social reforms were based on scientific principles and the laws of natural selection. Eugenic ideals were met with tremendous excitement and gained acceptance much like the excitement being generated by today's scientific advances. However, as in Galton's day, we have a similar naive faith in science which often allows science to evolve without moral constraint.

Galton based his ideas for the Eugenics Movement from the study of pedigrees, from Darwin's Origin of the Species, and from Mendel's discovery of simple genetics. This movement was defined by three major principles: that character was based on inheritable traits, that successful people had innate abilities that unsuccessful people lacked, and that inferior members were breeding faster than superior members. Eugenists also felt that like the upper class, the superior white race should replace the inferior coloured races. Thus, racist ideals were introduced into the movement.

Eugenists argued that traits such as mental retardation, criminality, poverty, and various social defects were exclusively hereditary and therefore should be eliminated. Thus, the human race could be improved by breeding in good traits and by breeding out bad traits. Like Galton, Darwin believed that if the various checks do not prevent the otherwise inferior members of society from increasing at a quicker rate than the better class of men, the nation will retrograde. Thus Darwin suggests a eugenic solution, though much less vigorously than his contemporaries. Through these remarks, Darwin did much to aid the cause of eugenics in England, United States, Canada, and Germany.

In Germany, the eugenic ideals were carried to extremes with programs of planned reproduction, sterilization, and extermination. The Nazis defined the Aryan race as desirable and the Jewish race as undesirable. From the program of planned reproduction came a maternity cult called Lebensborn. Lebensborn, meaning "fountain of life", was an institution aimed at breeding an Aryan super race. Meanwhile, concentration camps were established to carry out the planned extermination of six million Jews.

The discovery of the Nazis' horrific experiments caused a sharp reaction against eugenics in the post-war period. But before the war, the eugenics movement enjoyed a favourable and uncritical reception in the US and Canada. Drawing support from the progressive era, the Eugenics Movement began as a scientific reform in an age of reform. In 1911, the American Breeders' Association successfully lobbied the government for sterilization legislation. The legislation was passed out of the fear that mentally retarded persons would transmit their defects to offspring and be incompetent parents. By 1937, 31 states had adopted eugenic laws.

In Canada, the Alberta Sterilization Act was created in 1928 and was repealed only as recently as in 1971. In that time, 2822 cases were recommended for sterilization; 55 received the operation. Consent was not required and decisions from the board could not be appealed. Besides sterilization, the Eugenics Movement influenced Canadian policy regarding immigration, education, intelligence testing, public health, and integration of the disabled. Thus, eugenic ideals pervaded many aspects of Canadian society.

In the 1940's and 1950's eugenics fell out of favour in Canada, as society reacted against the Nazi experience, as we adopted welfare policies, and promoted reproduction through the influence of the Catholic church. The Eugenics Movement eventually failed for both scientific and social reasons. The scientific community rejected eugenics because it was based on false assumptions regarding how traits are determined and failed to recognize the impact of the environment on character. Scientists realized that selective breeding would eliminate hybrid vigour and that genes required for human survival could be lost. Socially, eugenic philosophy was flawed because it was based on racist ideology. It blatantly violated human rights and there was a questionable societal benefit from discouraging reproduction in certain populations.

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Presently, the word Eugenics has fallen out of favour because of the negative connotations associated with it. But ironically, eugenic speculation remains with us today. We share Galton’s goal to influence the inborn qualities of a population to use them to an advantage. Carrier Screening, pre-natal diagnosis, sex selection, in vitro fertilization (IVF), and sperm donation are just a few of the medical options we now offer to the public. Each of these has potential benefits as well as significant eugenic implications.

For example, carrier screening programs have been met with both success and failure. In the 1970’s, the Ashkenazi Jewish community in the U.S. was screened for the Tay-Sachs gene. This program was successful because the initiative came from within the community, and proper pre and post test counselling was offered. A similar carrier screening program was established for the African American population to detect carriers of the sickle cell gene. In sharp contrast to the Tay-Sachs experience, this program failed because testing was involuntary and perceived to be racist. The results were not confidential, and there was inadequate counselling about what the tests meant. Positive carriers were left stigmatized and misinformed.

Pre-natal diagnosis has now made it possible to test fetuses for conditions ranging from Duchenne Muscular Dystrophy to cystic fibrosis to cleft palate. On the one hand, this information may be invaluable as it gives parents the choice whether to terminate or continue the pregnancy. On the other hand, pre-natal diagnosis is not 100 per cent accurate. Consequently, parents could be making crucial decisions based on a false positive result. Also, parents may make hasty decisions about terminating a pregnancy because of their own inexperience and pre-conceptions of having an unhealthy child. The fear is that as tests like these become more sensitive and readily available, parents, like eugenicists, will be tempted to terminate pregnancies that are associated with any undesirable trait. Extreme acts, such as aborting fetuses simply because they are female have already occurred within Canada.

Sperm donation has given parents unprecedented power in choosing the kind of children they want. Presently, a woman can go to a sperm bank and choose a donor based on race, hair colour, height, build, occupation and even athletic ability. There is a serious risk that parents will try to create the ideal child through unregulated access to this technology. Market forces could also open the door to abuse as higher quality sperm would fetch a higher price.

In Canada, physicians are forced to act as the gatekeepers. The potential for abuse is great because there is a lack of formal legislation regulating genetic technology. Currently we wait until a line is crossed before a public outcry calls for action. In other countries where health care is governed by market forces, the potential for abuse is even greater. We must carefully scrutinize the ethical implications of the scientific advances we enjoy today in order to avoid an era of the new eugenics.
During Medical School, I considered many different career paths and choices, some of which challenge the reader to find any threads of commonality. General Practice, General Surgery, General Internal Medicine and General Pathology were all generally unsatisfactory. I considered becoming a scholar of the History of Medicine, an Ophthalmologist, Radiation Oncologist, Diagnostic Radiologist, in fact several kinds of ‘ologists. For a long time, I considered Psychiatry. There is one medical specialty that I never considered for an instant: Paediatrics. The reader should not get the wrong idea here—I love children. That is why Paediatrics is so repugnant to me. It has always been my Achilles’ heel in Medicine. I would have graduated on the Honour Roll if it were not for Paediatrics. Three instances in Medical School were responsible for a disproportionate amount of anxiety, cower and abject loathing. In order of increasing unpleasantness, these were a) getting stuck between stations in the subway and being late for my first biochemistry exam (this cost me all my fingernails, right to the cuticles plus three packs of Rolaids); b) discovering that I had mistaken a rabid Alsatian dog for my examiner half way through my third year Clinical Medicine oral; and c) my Paediatrics rotation during Clinical Clerkship.

I tried to maintain my composure as I walked through the doors of the Renowned Paediatric Hospital on the first day of my eight week rotation. One of my best buddies was in second year residency and he told me, "Relax, Colby, you'll cruise this as long as you don't let your mouth get you into trouble and as long as you don't end up on 4-C." As I gathered in the room with my colleagues, my sense of dread increased. My worst fears came true when the roster list was distributed. Colby "Ward 4-C"

I immediately felt C-sick. I remember nothing of Orientation but afterwards I was greeted by the smiling faces and glassy eyes of the housestaff from Ward 4-C. I was later to realize that this type of countenance is common among cult members.

I was assigned seven patients, four of which were in irreversible vegetative coma. The other three had extremely rare genetic syndromes. Just the right type of patients for an undergraduate student to learn General Paediatrics. The residents explained that because of a recent (and famous) medical/legal problem with the hospital, all medications were kept in the Central Pharmacy. If a child had an asthma attack, you rang for the porter while filling out a medication requisition form (press hard because you are making seven copies). After the porter finished his coffee, cigarette and the round of cards that he was currently playing, he would make his way up to the Ward, pick up the medication requisition and saunter down to the Pharmacy. The Pharmacist would fill the order and the porter would reverse the procedure and deliver the drug to the Ward. Under the most extreme circumstances of urgent rush, the whole procedure took about 30 minutes - an eternity when a child is undergoing an asthma attack.

That night I had an admission or, more correctly, the admission had me. The procedure went something like this: Parents would get the idea that their child was sick and would take them to the Emergency Room of the Renowned Paediatric Hospital. There, they would be seen by the intern assigned to Emergency, who would do a complete history and physical examination. If the intern thought that this case was serious enough to warrant admission, he or she would discuss the case with the Casualty Officer. If the Casualty Officer, after repeating the complete history and physical examination, concurred with the opinion of the Emergency intern, the Junior Admitting Resident...
was summoned. The Junior Admitting Resident would perform a complete history and physical examination and phone the Senior Admitting Resident who would also come and do a complete history and physical examination before admitting the patient. After the Senior Admitting Resident conferred with the Staff Physician On-Call (who would sometimes come in to do a complete history and physical), the Clinical Clerk was then told to report to the hapless family and do a complete history and physical examination to learn. By this time, a few hours had elapsed. Needless to say, the parents and the child were hardly in the mood for this and were openly hostile. I don’t think violence was out of the question. Nevertheless, this was the atmosphere to which we were subjected, hour after hour, day after day, week after week, for two months.

Then there were the educational seminars. We were supposed to have one hour for lunch. One time the last lecturer before lunch finished late at 12:30 and the next lecturer was scheduled to begin at 1:00 pm. We had planned to visit a nearby restaurant and it was impossible to make the round trip in less than an hour. So we wrote on the blackboard, “The 1:00pm lecture will be delayed until 1:30”, and left. When we returned, the air was so thick you could cut it with a knife, which is exactly what the irate surgeon wanted to do to us. We were grilled about the origin of the words on the blackboard and, of course, we admitted nothing. Being honest, we simply said that the notice was already on the blackboard before we left. This was the truth. During the subsequent retelling, these exploits were enhanced and elevated to the status of urban legends in that hospital, right up there with the legendary story of the resident who could obtain blood samples from any child, regardless of the availability of peripheral blood vessels. His only condition was that he had to be left alone with the child. According to the legend, someone arranged to have him perform his magic in a Psychiatric Observation Room equipped with a one-way mirror. To their horror, he was performing an aortic puncture. Despite the fact that he had never lost a patient, his medical career came to an abrupt end (as it well should have).

I can only recall one enjoyable day in the entire two month Paediatric rotation. We had an outpatient clinic which was run by the only jovial paediatrician in the entire hospital. He was good for a few laughs and treated us like human beings. This was such an incredible contrast to the degrading, dehumanizing drudgery and intellectual starvation to which we were subjected to on our day-to-day rotation that it made the agony of returning to Ward 4-C ever the more acute. I shall always remember that bright Spring day when I left the Renowned Paediatric Hospital for what I hoped would be the last time. I remember the ecstasy as the morning sun hit my face and I bent down to kiss the sidewalk, free at last of the most hated specialty of them all.

Years later, when one of my own children required a highly specialized paediatric diagnosis, I had to enter the portals of that dreaded institution once again. My legs tingled, my heart pounded, and my pupils narrowed as we approached the building. It took a great deal of strength to go in there, but it’s amazing what one will do for one’s children. To this day, I will go blocks out of my way to avoid driving by the place where I sustained the most abject misery of my generally unenjoyable undergraduate medical education.

The Paediatrics rotation of my internship year, far away in the Hospital for Six Children, was not in the least unpleasant, except for the continuous attacks of upper respiratory infection and gastroenteritis courtesy of our little patients. This was the most astounding contrast of my entire medical career, but that is another story.
HISTORICAL MEDICAL VOCABULARY

Dr. Paul Potter

1. Horror Vacui
   a. Fear of open spaces.
   b. Boyle's law.
   c. Principle of attraction.
   d. Fear of housework.

2. Magic bullets
   a. Cobalt bomb.
   b. Antibiotics.
   c. Laser therapy.
   d. Chemotherapeutic agents.

3. Empirical tripod
   a. Surgical instrument.
   b. British camping utensil.
   c. Book by Francis Bacon.
   d. Medical epistemology.

4. Animal Magnetism
   a. Theory of muscle function.
   b. Mesmerism.
   c. Early form of NMR.
   d. Excessive physical attractiveness.

5. Non-naturals
   a. External factors influencing the body.
   b. Mutant microorganisms.
   c. Category of genetic abnormalities.
   d. Rock group.

6. Vis medicatrix nature
   a. Unnatural vice.
   b. Tendon of the lower arm.
   c. Instrument to measure physical strength.
   d. Healing power of nature.

7. Vegetable soul
   a. Factor isolated from tomatoes.
   b. In utero CNS pathway.
   c. Centre in rhinencephalon.
   d. Factor controlling nutritive functions.

8. Innate heat
   a. Physical principle of entropy.
   b. Black's theory.
   c. Life principle.
   d. Aphrodisiac drink.

9. Phlogiston
   a. Principle of respiration.
   b. Hypothetical component of fire.
   c. Russian instrument of torture.
   d. Flagellum.

10. Humour
    a. Fluid element of the body.
    b. Hormonal agent.
    c. Personality type.
    d. Synovial fluid.

11. Homunculus
    a. Achondroplastic dwarf.
    b. Cerebral centre of movement.
    c. Familial pederast.
    d. Spermatozoon.

12. Phoenician disease
    a. Purpura.
    b. Elephantiasis.
    c. Cunnilingus.
    d. All of the above.

13. Hydropobia
    a. Fear of drowning.
    b. Osmotic principle.
    c. Fear of electricity.
    d. Rabies.

14. Dysmorphophobia
    a. Fear of morphine overdose.
    b. Fear of personal deformity.
    c. Fear of freak-shows.
    d. Aberrant WBC reaction.

15. Nervous ether
    a. Cause of muscle action.
    b. Hysterical flatulence.
    c. Factor produced by Golgi cells.
    d. Rooky anaesthetist.

16. St. Vitus' dance
    a. Sydenham's chorea.
    b. Huntington's chorea
    c. Convulsion caused by tarantula bite.
    d. Sicilian folk custom.

17. St. Anthony's Fire
    a. Measles.
    b. Byzantine alcoholic drink.
    c. Gonorrheal urethritis.
    d. Ergot poisoning.

18. English sweat
    a. Febrile epidemic disease.
    b. Intertrigo.
    c. Miliaria.
    d. Tuberculosis.

19. Vapours
    a. Borborygmus.
    b. Volatile esters used as anaesthetic.
    c. Condition of feeblemindedness.
    d. Hypochondriasis.

20. Archeus
    a. Genus of medicinal plants.
    b. Principle of organized life.
    c. Bone of the foot.
    d. Hypothetical element of the body.
ANSWERS TO MEDICAL VOCABULARY

1. Horror Vacui
   a. The movement of material into an empty space was explained in antiquity and the middle ages by the principle that Nature abhors a vacuum: horror vacui.

2. Magic bullets
   b. Paul Ehrlich (1854-1915) called the class of drugs he was seeking magic bullets because they were to spare the host but hit the micro-organisms.

3. Empirical tripod
   d. The Empirical School of Medicine (I B.C.) proposed three sources of medical knowledge: personal experience; the experience of others recorded in medical literature; reasoning by analogy from experience.

4. Animal Magnetism
   b. Franz Mesmer (1733-1815) "discovered" his ability to heal by drawing disease out of patients with a personal physical force he called animal magnetism.

5. Non-naturals
   a. Health and disease were attributed by Hunayn ibn Ishaq (809-877) to three types of factors: the natural (i.e. the components of the body); the counter-natural (i.e. abnormalities in the body); the non-natural (i.e. external influences such as food, weather, exercise, sleep, evacuation, and passions of the mind).

6. Vis medicatrix naturae
   d. The most popular principle of therapy from the time of Hippocrates (V B.C.) down to the 18th century was the healing power of Nature.

7. Vegetable soul
   d. Galen of Pergamon (129-199) divided physiological functions into three categories, each of which he attributed to a specific soul: vegetable [gastro-intestinal and nutritive]; vital [pulmonary and cardiovascular]; animal [conscious and voluntary].

8. Innate heat
   c. In the Hippocratic writings life is often explained as the result of an inborn heat acting on nutritive elements.

9. Phlogiston
   b. Georg Stahl (1660-1734) explained combustion as the escape of phlogiston, a hypothetical substance present in all materials that burn.

10. Humour
    a. The Hippocratic treatise Nature of Man reduces the body to four fluid elements, or humours: phlegm, blood, yellow bile, black bile, whose imbalances explain diseases. This theory was very popular down to the 18th century, and has left us with the personality types: phlegmatic, sanguine, choleric and melancholic.

11. Homunculus
    d. Antony van Leeuwenhoek (1632-1723) examined the human spermatozoon under his 300x single-lens microscope, and believed he saw a "tiny man", a homunculus.

12. Phoenician disease
    d. The Phoenician disease is mentioned in the Hippocratic treatise Protrhetic II, but interpreters from Galen on have argued indecisively about its meaning, the three most likely possibilities being those mentioned.

13. Hydrophobia
    d. The disease rabies was known to the ancients as hydrophobia [fear of water] because patients fear to drink anything, since this is likely to bring on convulsions.

14. Dysmorphophobia
    b. The Italian neurologist and psychiatrist Enrico Morselli (1852-1929) first described this neurotic fear of one's own deformity in 1891.

15. Nervous ether
    a. Friedrich Hoffmann (1660-1742) explained life as a response of the muscles to nervous ether which was secreted by the brain and moved through the nerves in a slow systolic/anastolic flow. Medications to increase the secretion of this ether got the name "tonics", since they increase the body's tone.

16. St. Vitus' dance
    a. The involuntary dance-like movements of victims of rheumatic fever were first described medically by Thomas Sydenham (1624-1689); before that the condition was called St. Vitus' dance.

17. St. Anthony's Fire
    d. St. Anthony's Fire is a skin eruption caused by eating rye infected with the fungus ergot. St. Anthony of Padua was thought to protect against this condition.

18. English sweat
    a. Between 1485 and 1551 England was visited by several waves of an acute epidemic disease characterized by fever and sweating. The disease, which had considerable mortality, may have been a variety of influenza.

19. Vapours
    d. In 18th century France and England "the vapours" was a frequent complaint of upper class females. It was supposed to be caused by vapours rising from the spleen to the brain, which produced morbid anxiety and melancholy.

20. Archeus
    b. Paracelsus (1493-1541) and J.B. Van Helmont (1577-1644) considered the archeus, an immaterial principle located at the upper end of the stomach, to be the "intelligent" force that regulates all bodily functions.
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