

LOUIS R. ORKIN LECTURE

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**THE EVOLUTION OF THE PRACTICE OF ANESTHESIOLOGY**

IT IS AN EXTRAORDINARY PLEASURE FOR ME TO HAVE THE PRIVILEGE OF GIVING THIS **SECOND ANNUAL LOUIS R. ORKIN LECTURE** IN HONOR OF A DEAR AND CLOSE FRIEND AND ONE OF THE COUNTRY'S MOST DISTINGUISHED ANESTHESIOLOGISTS.

I CANNOT REMEMBER A TIME IN MY ADULT LIFE WHEN I DID NOT KNOW **LOU ORKIN**, AND THE MANY YEARS THAT I HAVE HAD THIS PLEASURE HAVE SEEN OUR RELATIONSHIP **ALWAYS HAPPY**, AND I GET A CHANGING ONE DEPENDING ON THE DIRECTION THAT HIS LIFE AND MINE TOOK.

**LOU** RECEIVED HIS MEDICAL EDUCATION AT NEW YORK UNIVERSITY, AS I DID. I AM TOLD THAT MANY OF YOU IN THIS ROOM ARE ALSO ALUMNI OF THIS GREAT MEDICAL SCHOOL. HE HAD HIS RESIDENCY IN ANESTHESIOLOGY AFTER WORLD WAR II, WITH THE LATE E.A. ROVENSTINE - ONE OF THE TRUE GIANTS OF OUR SPECIALITY. WORLD WAR II WAS A BUSY AND HAZARDOUS ONE FOR ORKIN. HE WAS DECORATED FOR VALOR WITH THE BRONZE STAR IN THE EUROPEAN THEATER OF OPERATIONS. **LOU** SPENT SOME TIME IN PRIVATE PRACTICE IN CONNECTICUT WHICH HE ALWAYS FELT DID HIM A GREAT DEAL OF GOOD BEFORE RETURNING TO NEW YORK UNIVERSITY IN 1950, AS DR. ROVENSTINE'S CHIEF

ASSISTANT.

**LOU ORKIN** BECAME THE FIRST PROFESSOR AND CHAIRMAN OF THE THEN NEW AND NOW DISTINGUISHED **ALBERT EINSTEIN SCHOOL OF MEDICINE**. HE LED THAT OUTSTANDING DEPARTMENT FOR SOME TWENTY-SEVEN PRODUCTIVE AND BUSY YEARS. HE HAS JUST RECENTLY RETIRED FROM ACTIVE WORK THERE AND PLANNED, SO HE TOLD ME, TO INDULGE IN HIS FAVORITE RECREATIONS OF BOATING AND FISHING. I SUSPECT THAT THAT WILL NOT BE SUFFICIENT TO OCCUPY ALL OF HIS TALENTS AND INTERESTS AND FOR OUR SAKE AS WELL AS HIS OWN, I HOPE THAT HE WILL HEED SOME OF THE MANY CALLS HE WILL RECEIVE TO CONTINUE PARTICIPATION IN ANESTHETIC AFFAIRS IN THIS COUNTRY AND ABROAD. HE HAS RECEIVED MANY HIGHLY DESERVED HONORS AND HAS BEEN ELECTED TO HIGH OFFICE IN OUR SPECIALITY IN VARIOUS ORGANIZATIONS.

HIS FIRST PUBLISHED PAPER WAS ONE THAT I HAVE LOOKED UPON AS AN OUTSTANDING PIECE OF CLINICAL RESEARCH. OUR MUTUAL AND GREATLY BELOVED CHIEF E.A. ROVENSTINE WAS ONE OF THE CO-AUTHORS. I HAD THE PRIVILEGE OF BEING THE MIDDLE NAME ON THAT PAPER TO ORKIN'S SENIOR POSITION IN THE AUTHORSHIP OF HIS FIRST PAPER. SINCE THAT AUSPICIOUS BEGINNING, HE HAS PUBLISHED WIDELY AND WELL. HE ALWAYS DID THE RIGHT THING "RIGHT".

IN THE INVITATION THAT I RECEIVED FROM SOL HERSHEY TO DELIVER THIS LECTURE IN **LOU ORKIN'S** HONOR WE DISCUSSED THE POSSIBILITIES OF THE SUBJECT MATTER TO BE

PRESENTED. WHAT WOULD PLEASE OUR **DISTINGUISHED** FRIEND AND COLLEAGUE THAT WOULD ALSO BE OF INTEREST AND APPROPRIATE FOR THIS AUDIENCE WAS CONSIDERED. ACCORDINGLY, I RESPONDED TO HIS PLEASANT INQUIRY PICKING A TITLE THAT GAVE ME A GOOD DEAL OF ELBOW ROOM, SHOULD I NEED IT, FOR THE KINDS OF THINGS I MIGHT BRING TO YOUR ATTENTION.

THERE IS THE TEMPTATION TO BE HISTORICAL IN TALKING ABOUT THE **EVOLUTION OF THE PRACTICE OF ANESTHESIOLOGY**, BUT I DO NOT HAVE ANY PRETENSIONS, SERIOUS OR OTHERWISE, TO HISTORICAL SCHOLARSHIP. I ALSO DID NOT FEEL THAT IT WAS APPROPRIATE TO MAKE EVALUATIONS AS TO WHETHER OR NOT IT WAS BETTER "IN THE GOOD OLD DAYS". ARE THINGS SO MUCH CHANGED AND IMPROVED NOW THAT THE PRACTICES OF **LOU ORKIN'S** YOUTH AND MINE, MIGHT BE VIEWED AS ARCHAIC IN THE LIGHT OF MORE RECENT KNOWLEDGE, TECHNOLOGY AND UNDERSTANDING? OR IS THIS QUESTION NOT THE CORRECT ONE?

THE DICTIONARY DEFINES THE WORD "**EVOLUTION**" AS BEING DERIVED FROM THE LATIN WORD **EVOLUTUS**, WHICH IN TURN IS A PAST PARTICIPLE OF THE VERB "**EVOLVERE**", WHICH MEANS TO "ROLL OUT" OR "TO OPEN".

EVEN THOUGH THIS WORD HAS INSTANT IDENTIFICATION RECOGNITION BECAUSE OF ITS USE IN CONNECTION WITH DARWIN'S FAMOUS THEORY, THE DEFINITION HAS SOME ADDITIONAL MEANING TO THE PLAN I PROPOSE TO PURSUE. THE DICTIONARY ALSO CALLS **EVOLUTION** A "**GRADUAL PROCESS**". SOMETHING OR SOME PROCESS CHANGES INTO A SIGNIFICANTLY

DIFFERENT, ESPECIALLY A MORE COMPLEX OR MORE SOPHISTICATED FORM WITHOUT HASTE. IT SEEMS USEFUL THEREFORE FOR US TO DESCRIBE SOME OF THE GRADUAL PROCESSES OF CHANGE FROM EARLIER, APPARENTLY SIMPLER TO COMPLEX AND SOPHISTICATED FORMS OF ANESTHETIC PRACTICE. NO ATTEMPT WILL BE MADE TO BE COMPLETE. A BOOK OR MONOGRAPH IS NEEDED FOR THIS PURPOSE. IN FOLLOWING THE DEFINITION OF **EVOLUTION** "ROLL-OUT OR OPEN-UP", WITH ITS SENSE OF GRADUALISM, I HAVE ELECTED FOR OUR PURPOSES THIS EVENING TO EXAMINE A FEW TYPICAL VIGNETTES. I WILL PICK SUBJECTS THAT DEAL WITH THE DEVELOPMENT OF CONCEPTS AND THEIR SUBSEQUENT IMPACT ON SATISFYING BOTH THE NEEDS AND WANTS OF THE ANESTHESIOLOGIST. THE THRUST TOWARD TECHNOLOGY, NEW APPARATUS, AND NEW ENGINEERING APPLICATIONS OF BASIC PRINCIPLES AND A FEW INSTANCES OF THE SOCIOLOGICAL EFFECTS OF ALL OF THESE FACTORS ARE PART OF THE CONTINUALLY EVOLVING PHENOMENON OF ANESTHETIC PRACTICE AND WILL BE TOUCHED UPON HERE AND THERE.

I WOULD LIKE TO CONSIDER WITH YOU A PROBLEM OF CLINICAL MANAGEMENT WHICH HAS INTERESTING RELATIONSHIPS TO ALL OF THESE IDEAS, CONCEPTS AND DEVELOPMENTS.

AS THE RESULT OF THE FERMENT OF NEW IDEAS BY THE ANESTHESIOLOGICAL GIANTS IMMEDIATELY PRECEDING WORLD WAR II, AND THE EXPERIENCES IN THAT TRAGIC

CONFLICT, THERE WERE MANY NEW DRUGS AND PRACTICES DEVELOPED AFTER A DORMANT PERIOD OF ABOUT EIGHTY YEARS SINCE THE FIRST USE OF ANESTHESIA.

ONE OF THE MOST FASCINATING AND, TO ME, EXCITING STORIES OF CLINICAL MANAGEMENT IS WHAT WAS DONE IN APPLYING THE IMPORTANT KNOWLEDGE OF THE AIRWAY, PRESERVED BEST BY AN ENDOTRACHIAL TUBE IN THE CARE OF INFANTS AND CHILDREN, FOR MAJOR SURGICAL PROCEDURES, ESPECIALLY IN THE CHEST. I RECALL VERY WELL, AND SOMETIMES QUITE UNCOMFORTABLY, RATHER HEATED CONFLICTS BETWEEN PEDIATRIC AND THORACIC SURGEONS ON THE ONE HAND AND ANESTHESIOLOGISTS ON THE OTHER. WE, IN ANESTHESIOLOGY, KNEW THAT THE SAFE CARE OF PATIENTS REQUIRING THORACIC CAGE ENTRY MANDATED THE USE OF AN ENDOTRACHIAL TUBE. HOWEVER, THE CONTROVERSARY RAGED UNBELIEVABLY OVER A CONCEPT IN AN AREA THAT IS NOW TAKEN FOR GRANTED TODAY. IF IT WAS OBVIOUS THAT AN ENDOTRACHIAL TUBE WAS ESSENTIAL FOR THE CARE OF THESE INFANTS AND CHILDREN AND ALSO FOR OTHER KINDS OF PATIENTS REQUIRING A SECURE AIRWAY, WHY WAS THERE SO MUCH CONFLICT WITH PHYSICIANS AND SURGEONS, EQUALLY EDUCATED, AND WHOSE GOALS AND PURPOSES WERE SIMILAR TO OURS TO THE USE OF THE TUBE?

I MUST DIGRESS FOR A MOMENT TO DESCRIBE THE BACKGROUND FOR THE DISCUSSION OF THE CONFLICT. IT IS THE WAY MOST OF US IN ANESTHESIOLOGY IN THE POST-WAR PERIOD USED ENDOTRACHIAL TUBES. IT WAS NOT UNUSUAL FOR ANESTHESIOLOGISTS TO WORK IN

SEVERAL INSTITUTIONS AND PROBABLY IT IS NOT UNUSUAL TODAY, BUT WHETHER AT HOME, IN TRANSIT OR ELSEWHERE, THE ANESTHESIOLOGIST CARRIED A LARYNGOSCOPE AND SEVERAL RUBBER ENDOTRACHIAL TUBES, MORE OR LESS CLEAN, BUT NOT STERILE, WRAPPED IN A TOWEL THAT WAS SURELY NOT STERILE AND OFTEN WAS NOT EVEN REALLY CLEAN. THE ANESTHESIOLOGIST'S VIEW WAS FOCUSED ON AIRWAY MAINTENANCE WITH THIS KIND OF TUBE. THE SURGEON, WHEN PRESSED, ADMITTED FREELY THE GREATER COMFORT AND FREEDOM IT GAVE HIM TO OPERATE. HOWEVER, IN THE POSTOPERATIVE PERIOD THE COMPLICATIONS OF LARYNGITIS, LARYNGEAL GRANULOMA AND IN THE CASE OF VERY SMALL CHILDREN AND INFANTS, AN OBSTRUCTED AIRWAY DUE TO EDEMA OCCURRED OFTEN AND WAS FOLLOWED BY EMERGENCY TRACHEOSTOMY. THIS WAS CLEARLY AN UNDESIRABLE SITUATION FOR SUPERB OR EVEN GOOD PATIENT CARE. THE ANESTHESIA AND SURGICAL TEAMS **LOOKED** AT ALL OF THESE FACTORS TOGETHER, BUT ACTUALLY DID NOT **SEE** WHAT WAS CRUCIAL IN ACHIEVING THEIR COMMON GOAL. I REMEMBER VERY WELL HAVING THESE DISCUSSIONS AND ARGUMENTS WITH SURGEONS ABOUT THE IMPORTANCE OF THE ENDOTRACHIAL AIRWAY AS THOUGH IT HAD SOME KIND OF INTRINSIC MAGIC OF ITS OWN RATHER THAN TO ACHIEVE THE IMPORTANT OBJECTIVE OF THE CARE OF THE SICK PATIENTS WITH THE ILLNESSES I HAVE MENTIONED. IT TOOK YEARS OF **LOOKING** WITHOUT **SEEING** TO REALIZE THAT THE UNDESIRABLE AND SEVERLY UNPLEASANT POST-OPERATIVE COMPLICATIONS, ESPECIALLY IN INFANTS AND CHILDREN WITH OBSTRUCTED AIRWAYS,

WERE NOT DUE TO THE FACT THAT AN ENDOTRACHIAL TUBE HAD BEEN USED, BUT THAT THE TUBE WAS ALWAYS CONTAMINATED AND PERHAPS EVEN DIRTY. THE SIMPLE CHANGE IN PRACTICE OF STERILIZING ENDOTRACHIAL AIRWAYS AND FITTINGS SHARPLY REDUCED THE INCIDENCE OF POST-OPERATIVE RESPIRATORY OBSTRUCTION DUE TO EDEMA AND INFECTION AND PERSUADED SURGEONS AND PHYSICIANS THAT THIS METHOD OF AIRWAY MANAGEMENT WAS TRULY A MAJOR ADVANCE. A QUESTION THAT HAS NEVER BEEN RESOLVED TO MY SATISFACTION IS WHY IT TOOK SO LONG TO REALIZE ON THE PART OF ALL OF US THAT THE SIMPLE PROCESS OF STERILIZATION OF A FOREIGN BODY IN CONTACT WITH A NARROW AIRWAY WAS WHAT WAS NECESSARY TO SOLVE THE PROBLEM. THE IMPACT, FROM THE STANDPOINT OF CLINICAL ANESTHESIA, WAS AS CRUCIAL AS WERE THE DISCOVERIES OF SEMMELWEIS ABOUT POST-PARTUM SEPSIS AND ITS COMPLICATIONS. FOR REASONS THAT ARE IN ACCORD WITH THE NATURE OF HUMAN EXPERIENCES, THIS TREMENDOUS ADVANCE IN PRACTICE AND IN COMPREHENSION IS NOW TAKEN FOR GRANTED AND ITS CRUCIAL ROLE IN EFFECTIVE SAFE CARE OF PATIENTS IS NOT CONSCIOUSLY APPRECIATED FOR THE MAJOR IMPROVEMENT THAT IT REALLY REPRESENTED. IT IS AS THOUGH IT WAS ALWAYS THE WAY IT IS NOW - AND THAT STATE OF AFFAIRS IF GOOD AND HUMAN.

THIS PROBLEM AND OTHER RELATED ONES ALSO HAD A MAJOR IMPACT ON THE TECHNOLOGICAL ASPECTS OF THE EVOLUTION OF ANESTHETIC PRACTICE ON THE MEDICAL

AND HEALTH CARE INDUSTRIES. THEY WERE STIMULATED TO PRODUCE NEW PRODUCTS TO SATISFY THE NEEDS AND WANTS OF ANESTHESIOLOGISTS. FOR EXAMPLE, THE DEVELOPMENT OF PLASTIC AIRWAYS, PLASTIC TUBES, AND THE VARIOUS SOPHISTICATED FORMS OF INTRA-VASCULAR CATHETERS WAS CERTAINLY STIMULATED BY THIS NEW DEMAND. THE USE OF MODERN INTRAVENOUS NEEDLES OR CATHETERS IS AN INTERESTING EXAMPLE OF THE MAJOR IMPACT ON INDUSTRY REQUIRED BY THE EVOLUTION OF ANESTHETIC PRACTICE. IT WASN'T ALWAYS THUS.

IN THE LANDMARK PAPER OF JOHN LUNDY, AND HIS ASSOCIATES FROM THE MAYO CLINIC IN 1935 DESCRIBING THE FIRST USE OF THIOPENTAL THERE IS THE RECOMMENDATION THAT A SYRINGE CONTAINING THIOPENTAL SOLUTION SHOULD BE ATTACHED TO A NEEDLE WHICH IS THEN IN TURN INSERTED INTO A PERIPHERAL VEIN FOR INJECTION. A WISP OF COTTON OR SOME SIMILIAR DEVICE WAS PLACED ON THE NOSE OR MOUTH OF THE PATIENT SO THAT ONE COULD TELL WHETHER THE PATIENT WAS BREATHING! IN THAT PAPER OF 51 YEARS AGO, IT IS NOT CLEAR WHO WAS IN THE MORE RESPONSIBLE POSITION- THE PERSON HOLDING THE SYRINGE IN THE VEIN OR THE PERSON RESPONSIBLE FOR THE CARE OF RESPIRATORY FUNCTION. IT SLOWLY BECAME APPARENT THAT THE RESPONSIBILITY FOR THE PRODUCTION OF ANESTHESIA AND FOR THE CARE OF THE AIRWAY WAS THE SAME AND BELONGED TO THE PERSON WHO WAS GIVING THE ANESTHESIA. THIS EXPERIENCE WAS ANOTHER IMPORTANT STIMULUS TO THE DEVELOPMENT OF BETTER INTRAVENOUS TUBING, CONNECTIONS, AND



NEEDLES, THEN CATHETERS, AND I.V. SOLUTIONS TO ENABLE THE ANESTHESIOLOGIST TO DEAL WITH THE THEN NEW METHOD OF INTRAVENOUSLY ADMINISTERED ANESTHESIA MORE CONVENIENTLY AND MORE EFFECTIVELY.

AFTER TOO MANY YEARS, THE PERCEPTION BECAME OBVIOUS THAT IT DIDN'T MAKE ANY DIFFERENCE WHICH PORTAL OF ENTRY INTO THE BODY WAS USED TO PRODUCE ANESTHESIA. THE CARE OF VENTILATION AND THE PROTECTION OF THE AIRWAY WAS NECESSARY.

A THIRD ASPECT OF THE EVOLUTION OF ANESTHETIC PRACTICE IS CONCERNED WITH SOLVING THE THEN UNMET NEED FOR QUANTITATIVE ADMINISTRATION OF ANESTHETIC AGENTS. THE SAFETY OF ANESTHETIC CARE WAS IMPROVED BY THE INTRODUCTION OF QUANTITATION AND ITS APPRECIATION. TOO SLOWLY, BUT NONETHELESS INEXORABLY, THIS EVOLUTION IN PRACTICE LED TO THE DEVELOPMENT OF APPROPRIATE NEW ANESTHETIC DRUGS AND MADE POSSIBLE THREE IMPORTANT CONCEPTS AND THEIR APPLICATION TO THE GIVING OF ANESTHETIC AGENTS AND DRUGS TO APPROPRIATE EFFECT AS DESIRED AND NEEDED FOR THE SURGICAL PURPOSES AT HAND - AND NOT MORE THAN THAT. OVERDOSE AND ANESTHETIC COMPLICATIONS BECAME LESS FREQUENT AS A RESULT.

IN MY MIND, THE FIRST OF THESE IS THE CONCEPT OF MINIMAL ANESTHETIC ALVEOLAR CONCENTRATION DEVELOPED BY **EGER, SAIDMAN AND THEIR ASSOCIATES** AT THE UNIVERSITY OF CALIFORNIA IN SAN FRANCISCO OVER TWENTY YEARS AGO. THERE ARE

TROUBLES WITH THE PRECISION OF MAC FOR QUANTITATION BUT THE CONCEPT HAS BEEN A MOST IMPORTANT FACTOR IN THE EVOLUTION OF PRACTICE AND RESEARCH. IT BECAME POSSIBLE TO DETERMINE THE DOSE OF A POTENT DRUG, USUALLY POSSESSING RELATIVELY NARROW MARGINS BETWEEN EFFECT AND SEVERE INTOXICATION OR COMPLICATIONS. IT IS FORTUNATELY COMMON PLACE THESE DAYS TO HEAR ANESTHESIOLOGISTS TALKING ABOUT USING TWO MAC OR 1.5 MAC OR SOME SUCH NUMBER IN GIVING AN ANESTHETIC AGENT TO A PATIENT. THE EVERYDAY ACCEPTANCE OF THE CONCEPT OF KNOWING HOW MUCH ONE IS GIVING TO A PATIENT AND REALIZING ITS IMPORTANCE IS A MAJOR EVOLUTIONARY CHANGE IN ANESTHETIC PRACTICE. IT IS SO IMPORTANT THAT MOST JUNIOR ANESTHESIOLOGISTS TODAY DO NOT ACTUALLY REALIZE THAT IT WAS VASTLY DIFFERENT NOT TOO LONG AGO. THIS IS WHAT IS MEANT BY SOME WHEN THEY OVER USE THE CLICHE OF **"CHANGING ART TO A SCIENCE"**. IT IS REALLY ONLY GRADUAL CHANGE TOWARD DESIRED GOALS.

THE SECOND ASPECT OF THE IMPORTANCE OF BEING ABLE TO MEASURE AND CONTROL WHAT THE ANESTHESIOLOGIST IS GIVING TO A PATIENT IS SEEN IN THE RELATIVELY NEW AND CRUCIALLY IMPORTANT DEVELOPMENT OF OUR UNDERSTANDING OF PHARMACOKINETICS. SOME TWENTY-FIVE OR MORE YEARS AGO, DIM REALIZATIONS OF THE FACT THAT INTELLIGENT PROVISIONS FOR PROPER DOSAGE AND CONTROL OF ANESTHETIC DRUGS BEGAN WITH THE SEMINAL WORK OF **SEVERINGHAUS** AND HIS

COLLEAGUES THEN AT IOWA, IN A FIELD THAT AT THAT TIME WAS KNOWN AS THE UPTAKE AND DISTRIBUTION OF ANESTHETIC AGENTS. THE IMPROVED KNOWLEDGE IN THIS FIELD HAS RECENTLY INCLUDED THE APPLICATION OF SOPHISTICATED MATHEMATICS, COMPUTER TECHNOLOGY AND A BETTER UNDERSTANDING OF WHAT THE BODY DOES IN TRANSPORTING ANESTHETIC AGENTS TO THE SITE OF ACTION THAN HAD EVER BEEN POSSIBLE BEFORE. THE IMPLICATIONS OF MODERN PHARMACOKINETIC KNOWLEDGE AND HOW APPLICABLE IT IS TO THE PRACTICAL DAY TO DAY PRACTICE ARE DIFFICULT FOR MANY OF US TO COMPREHEND ENTIRELY. THERE IS NO QUESTION THAT A MUCH IMPROVED UNDERSTANDING OF THIS ASPECT OF CLINICAL PHARMACOLOGY HAS MADE A VAST DIFFERENCE IN THE EVOLUTION OF ANESTHETIC PRACTICE TO ONE THAT IS LESS EMPIRICAL, TO ONE THAT, HAS QUANTITATIVE BOUNDARIES AND INFLUENCES THAT ARE SIGNIFICANT AND USEFUL.

A THIRD MOST IMPORTANT DEVELOPMENT IN CONNECTION WITH THE ADMINISTRATION OF KNOWN AND DESIRABLE DOSES OF ANESTHETIC SUBSTANCES TO PATIENTS AROSE FROM THE DEVELOPMENT OF VAPORIZORS FOR INHALATION ANESTHETIC AGENTS THAT MAKE IT POSSIBLE FOR ANESTHESIOLOGISTS TO MEASURE THE CONCENTRATION OF THE EFFLUENT VAPORS FROM THEIR GAS MACHINES WITH RELIABILITY.

THE EVOLUTION OF QUANTITATIVE VAPORIZORS BEGAN FROM A FEW ATTEMPTS IN THE EARLY PART OF THE 20TH CENTURY TO MEASURE THE DELIVERY OF ETHER VAPOR TO PATIENTS BY THE APPLICATION OF HEAT TO LIQUID ETHER IN A CONTAINER. THE DESIRE FOR

QUANTITATION IS NOT NEW BUT ITS ACHIEVEMENT IN THIS RESPECT IS. A MAJOR CHANGE THAT TOOK PLACE TO MAKE THIS CONCEPT A QUANTITATIVE ONE WAS THE RATIONAL USE OF VAPORIZORS BEGINNING WITH THAT DEVELOPED BY LUCIEN MORRIS, THEN AT WISCONSIN, USING AMBIENT HEAT THROUGH A COPPER JACKET THAT WAS A GOOD CONDUCTOR OF HEAT. THE POSSIBILITY OF ACCURATE MEASUREMENT OF THE VAPOR CONCENTRATION OF ANESTHETIC AGENTS BECAME A REALITY. THESE EARLY DEVICES HAVE EVOLVED BY THE APPLICATION OF THE SAME PRINCIPLES, TO CAREFULLY CALIBRATED SYSTEMS THAT PERMIT THE ANESTHESIOLOGIST TO KNOW EXACTLY WHAT CONCENTRATION OF ALL THE VOLATILE ANESTHETIC AGENTS HE IS GIVING TO HIS PATIENT.

THE MAIN POINT OF THE COMBINED APPRECIATION OF THE CONCEPTS OF UPTAKE AND DISTRIBUTION, OF MAC, OF PHARMACOKINETIC INVESTIGATIONS AND OF THE TECHNICAL ABILITY TO IMPLEMENT THESE IDEAS IN THE FORM OF WELL ENGINEERED VAPORIZERS AND COLLATORAL APPARATUS HAVE GREATLY STRENGTHENED THE ABILITY OF THE ANESTHESIOLOGIST TO GIVE KNOWN AND, THEREFORE CONTROLLED, DOSES OF ANESTHETIC AGENTS TO PATIENTS.

THIS PART OF THE EVOLUTION OF ANESTHETIC PRACTICE IS A MAJOR ONE, INDEED, AND HAS MADE MORE RATIONAL THE USE OF VOLATILE ANESTHETIC AGENTS. IN MY VIEW, IT ALSO ACCOUNTS FOR THE FACT THAT VOLATILE INHALATION ANESTHETIC AGENTS WILL, FOR THE FORESEEABLE FUTURE, NOT BE ABANDONED OR REPLACED BY NON-VOLATILE

SUBSTANCES ADMINISTERED INTRAVENOUSLY OR BY OTHER ROUTES, EVEN THOUGH THESE ARE DESIRABLE GOALS. WE DON'T HAVE AS YET THE TECHNOLOGY FOR I.V. ANESTHETICS THAT WE HAVE FOR VOLATILE DRUGS TO TAKE PRACTICAL CLINICAL ADVANTAGE OF THE CONCEPTS THAT HAVE BEEN SO FAR DEVELOPED. THERE IS, FOR EXAMPLE, NO REAL EQUIVALENT TO THE CONCEPT OF MAC FOR INTRAVENOUS ANESTHETIC AGENTS THAT IS WIDELY ACCEPTED ENOUGH TO ENTER CLINICAL PRACTICE. MY BELIEF IS THAT ENOUGH KNOWLEDGE WILL BE ACCUMULATED GRADUALLY, PERHAPS PAINFULLY, TO MAKE AS PRACTICAL THE QUANTITATIVE USE OF INTRAVENOUS SUBSTANCES AS THOSE GIVEN BY INHALATION, BUT THAT TIME IS NOT YET HERE.

THE NEXT SUBJECT TO CONSIDER UNDER THE EVOLUTION OF ANESTHETIC PRACTICE IS THE ISSUE OF MONITORING. THIS SUBJECT OCCUPIES A GREAT DEAL OF OUR ATTENTION. IT HAS OBVIOUSLY BECOME AN OMNIPRESENT ASPECT OF ANESTHETIC PRACTICE, BUT SOME OF ITS MANIFESTATIONS ARE, TO ME AT LEAST, CURIOUSLY EXHIBITED.

THE CONCEPT OF MONITORING IS SIMPLY STATED, THE MEASUREMENT OF A BIOLOGICAL FUNCTION EXHIBITED BY AN ANESTHETIZED PATIENT THAT WILL BE USEFUL FOR ANESTHETIC MANAGEMENT OR CHANGE IN ANESTHETIC MANAGEMENT. IT SEEMS THAT THIS RELATIVELY SIMPLE CONCEPT OFTEN IS FORGOTTEN, ALBEIT FOR QUITE UNDERSTANDABLE AND LEGITIMATE REASONS. MONITORING CAN RANGE FROM THE SIMPLE COUNTING OF A PULSE TO THE MOST SOPHISTICATED DELIVERY OF INFORMATION OF PHYSIOLOGICAL

ACTIVITY EMANATING FROM ALMOST ANY PART OF THE BODY. THE TECHNOLOGY AVAILABLE IS FANTASTIC AND HAS ADVANCED AT AN ENORMOUS PACE, IN RESPONSE TO THE DESIRE ON THE PART OF ANESTHESIOLOGISTS TO HAVE THE INFORMATION WHICH CAN THEN BE USED FOR BETTER CARE OF PATIENTS.

THE REACTION TO HIGH TECHNOLOGY IS ALWAYS A FASCINATING ONE TO BEHOLD. THERE ARE MANY PEOPLE WHO ARE ENCHANTED BY INSTRUMENTATION AND THE ABILITY TO DISPLAY OR ACQUIRE ALL KINDS OF INFORMATION WITH GREAT SOPHISTICATION AND GREAT SKILL. THERE ARE ALSO THOSE WHO HAVE RESISTANCE TO HIGH TECHNOLOGY AND USUALLY RATIONALIZE THEIR OBJECTIONS BY STATING THAT THE PRACTICE OF ANESTHESIOLOGY IS AN ART AND THAT WE HAVE BECOME TOO DEPENDENT UPON THE TECHNOLOGICAL ASPECTS OF MONITORING.

THERE ARE INDUSTRIAL COUNTERPARTS TO THESE VARYING VIEWS. THERE ARE PEOPLE WHO PARTICIPATE IN EFFECTING TECHNICAL CHANGE AND THEREFORE ENJOY IT AND THERE ARE THOSE WHO VIEW THEMSELVES AS THE VICTIMS OF CHANGE AND EXPRESS IT IN A FORM OF RESISTANCE TO THE PRODUCTS OF THOSE CHANGES. FOR INSTANCE, AT THE BEGINNING OF THE INDUSTRIAL REVOLUTION IN GREAT BRITAIN, AS MACHINES WERE DEVELOPED, THERE WAS A REVOLT OF THE WORKING CLASS PEOPLE KNOWN HISTORICALLY AS **THE REBELLION OF THE LUDDITES**, WHO FELT THAT THE MACHINES WOULD BE PUTTING THEM OUT OF WORK, AND THEREFORE, MACHINES HAD TO BE DESTROYED. THERE WAS NO

UNDERSTANDING AND NO ATTEMPT TO REALIZE THAT MACHINES WERE DEVELOPED TO MAKE WORK EASIER, TO MAKE MORE PRODUCTS AND SERVICES AVAILABLE THAT HAD NOT EXISTED BEFORE, AND IN THIS FASHION TO CONTRIBUTE TO THE "GOOD LIFE". THE LUDDITES WERE SUPPRESSED BY FORCE. PEOPLE BEGAN GRADUALLY TO UNDERSTAND THAT THEY COULD FIND OTHER KINDS OF EMPLOYMENT DEPENDING ON THEIR LEVEL OF EDUCATION. BETTER STILL WAS THE REACTION THAT THE MACHINE COULD BE USED AS A SERVANT RATHER THAN AS A MASTER. WE ARE SEEING THE SAME KIND OF PROBLEM TODAY IN THE USE OF ROBOTICS. REPLACING MAN IN MANY INSTANCES HAS PROVOKED THE SAME KINDS OF DISLOCATION OF WORKERS, RESULTING IN UNEMPLOYMENT STRIKES AND VIOLENCE.

SOLUTIONS ARE NOT EASY, BUT THE ATTEMPTS TO STEM AND RETARD PROGRESS WILL, IN THE END, ALWAYS BE SELF DEFEATING. THE DEVELOPMENT OF NEW KNOWLEDGE AND ITS APPLICATION IS A CONSTANT PART OF OUR CULTURE. WE MUST LEARN TO ENJOY ITS GOOD EFFECTS AND SOLVE THE CONSEQUENCES OF ITS NEGATIVE IMPACT.

TO TURN TO THE RELATIONSHIP OF TECHNOLOGY TO ANESTHETIC PRACTICE, THERE HAS BEEN AN EXTRAORDINARY DEVELOPMENT OF HIGH TECHNOLOGY PROVIDING INFORMATION THAT MOST ANESTHESIOLOGISTS EITHER DO NOT USE, OR DO NOT KNOW HOW TO USE PURPOSELY FOR PATIENT CARE. THE SOLUTIONS TO THIS UNDESIRABLE SITUATION ARE TO DECIDE, FIRST, WHETHER THE INFORMATION IS WORTH HAVING OR NOT.

IF IT IS NOT WORTH HAVING, THE SPECIFIC MONITORING MODALITY SHOULD BE ABANDONED. IF THE INFORMATION IS USEFUL, THEN ANESTHESIOLOGISTS MUST LEARN HOW TO USE THAT INFORMATION. WE ARE IN THE EVOLUTION OF THE USE OF MONITORING SOMETHING IN THE MIDDLE. MY SUGGESTION IS THAT WE SHOULD URGE THE DEVELOPMENT OF AS MUCH INFORMATION DISPLAY AS IS CONSISTENT WITH SENSIBLE ANESTHETIC CARE AND LEARN HOW TO USE THAT INFORMATION. WE SHOULD ALSO STIMULATE OUR ENGINEERING AND INDUSTRIAL COLLEAGUES TO DEVELOP EQUIPMENT THAT IS USEFUL FOR PATIENT CARE AND IS NOT MERELY A GREAT ENGINEERING ACHIEVEMENT!

NEXT I WOULD LIKE TO CONSIDER MECHANICAL VENTILATION FROM THE STANDPOINT OF THE EVOLUTION OF ANESTHETIC CARE.

AFTER MANY YEARS SINCE THE DISCOVERY OF ANESTHESIA IN THE MID 19TH CENTURY, IT WAS CONSIDERED ESSENTIAL THAT ANESTHETIZED PATIENTS SHOULD BREATHE SPONTANEOUSLY. THERE WERE AT LEAST THREE, AND PROBABLY MORE DEVELOPMENTS, THAT GAVE RISE TO THE IDEA THAT ASSISTED AND THEN CONTROLLED RESPIRATION (BOTH ARE ARTIFICIAL) MUST BE INTRODUCED FOR PROPER ANESTHETIC CARE. ONE OF THE MOST IMPORTANT OF THESE CONSIDERATIONS WAS THE SURGICAL ABILITY TO ENTER THE CHEST FOR OPERATIVE PURPOSES. SPONTANEOUS RESPIRATION, UNASSISTED, LED TO HYPOVENTILATION AND TO SERIOUS TROUBLE AND OCCASIONALLY TO DEATH. THE DEVELOPMENT OF CYCLOPROPANE IN THE 1930'S WAS ANOTHER PROBLEM IN THAT IT CAUSED



A DEPRESSION OF RESPIRATION FROM THE OUTSET AND REQUIRED SOME KIND OF HELP OF RESPIRATION FOR THE PATIENT. A MAJOR ADDITIONAL FACTOR WAS THE DEVELOPMENT OF MUSCLE RELAXANTS, WHICH IN ALL INSTANCES CAUSE A DEPRESSION OF RESPIRATION OR APNEA.

DISEASE OR INJURY CAN ALSO CAUSE APNEA OR HYPOVENTILATION. IN THE LAST DANISH POLIOMYELITIS EPIDEMIC IN 1952, PHYSICIANS, NURSES AND MEDICAL STUDENTS AND OTHER PERSONNEL WERE BREATHING ARTIFICALLY FOR HYPOVENTILATING OR APNEIC PATIENTS THROUGH A BREATHING BAG AND A CARBON DIOXIDE ABSORBER ATTACHED TO AN ENDOTRACHIAL TUBE. THIS PROGRAM WAS ESTABLISHED BY A YOUNG ANESTHESIOLOGIST IN COPENHAGAN, NAMED BJORN IBSEN.

THE IMPETUS TO MECHANICAL AND AUTOMATIC VENTILATION WAS THEREFORE DERIVED FROM THE FACT THAT CERTAIN DISEASES, INJURIES OR DRUGS, INCLUDING ANESTHETIC AGENTS AND MUSCLE RELAXANTS INTERFERE WITH NORMAL BREATHING AND THAT SOME FORM OF ASSISTANCE IS REQUIRED.

THERE WAS STRONG DEBATE AT THE TIME, AS TO WHETHER MANUAL OR MECHANICAL VENTILATION WAS BEST FOR PATIENTS. THE EXTRAORDINARY DEBATE IN THE EARLY 1950'S CENTERED AROUND THE VALUE OF BEING ABLE TO "FEEL" THE BREATHING BAG. ADVOCATES OF MANUAL CONTROLLED VENTILATION WERE OPPOSED TO MECHANICAL VENTILATION (A BIT LIKE THE LUDDITES OF OLD). THEY TALKED ABOUT THE VALUES OF THE "EDUCATED

HAND" IN BEING ABLE TO FEEL THINGS THAT NO MACHINE COULD FEEL!

THE ABILITY TO MONITOR VENTILATION IN THE CORRECT SENSE OF THAT WORD, BECAME POSSIBLE WITH THE ABILITY TO MEASURE BLOOD GASES DEALING WITH RESPIRATION. THE NEED FOR MECHANICAL VENTILATION AND ITS SUPERIORITY TO MANUAL FORMS WAS THE RESULT OF ITS RELIABILITY AND COULD BE FURTHER ASSURED BY THE ABILITY TO MONITOR THE EFFECTIVENESS OF THE VENTILATOR. THE TYPES OF MECHANICAL VENTILATORS WHICH WERE USED AT FIRST TO REPLACE MANUAL RESPIRATION WERE ALSO INVOLVED IN DEBATE. THE CHARACTERISTICS OF A MECHANICAL VENTILATOR WERE DISCUSSED AND REVOLVED AROUND WHAT SHAPE OR CURVE OF GAS PRESSURES IT PRODUCED. WHATEVER ALL OF THESE THINGS ACCOMPLISHED, THE EVOLUTION OF ANESTHETIC PRACTICE HAS BEEN SUCH THAT IT IS A MOST UNUSUAL PATIENT WHO BREATHES SPONTANEOUSLY AND IS NOT VENTILATED MECHANICALLY TODAY.

THE TECHNOLOGICAL DEVELOPMENT OF VENTILATORS WITH APPROPRIATE AND SIGNIFICANT FLEXIBILITY FOR VARIOUS KINDS OF PROBLEMS IN PATIENTS MAKES THIS ONE OF THE GREAT ADVANCES IN ANESTHETIC PATIENT CARE. WHAT HAS HAPPENED ON THE NEGATIVE SIDE IS A CURIOUS BEHAVIOR PATTERN OF ANESTHESIOLOGISTS - BY NO MEANS ALL OF THEM, AND BY NO MEANS IN ALL CASES. HOWEVER, THE HIGH TECHNOLOGY OF MONITORING AND MECHANICAL VENTILATION IS TOO OFTEN ASSOCIATED WITH THE PHYSICAL DISCONNECTION BETWEEN ANESTHESIOLOGIST AND PATIENT, ESPECIALLY SINCE

ANESTHETIC RECORDS CAN ALSO NOW BE DISPLAYED AUTOMATICALLY WITH THE AID OF COMPUTER AND RELATED TECHNOLOGIES. THE ANSWER OBVIOUSLY IS NOT TO ABANDON THE ACCOMPLISHMENTS OF HIGH TECHNOLOGY, BUT TO USE ITS FRUITS AS A BETTER MEANS TOWARD TAKING BETTER CARE OF PATIENTS.

I BELIEVE IN MORE EMPHASIS ON THE PART OF EDUCATORS, CLINICIANS, AND SCIENTISTS TO DRIVE HOME CONTINUALLY THE POINT THAT THESE MONITORING AIDS SHOULD BE VIEWED IN THE LIGHT OF IMPROVING PATIENT CARE AND NOT AS A SUBSTITUTE FOR PERSONAL AND INTIMATE INVOLVEMENT WITH WHAT IS HAPPENING TO PATIENTS.

OUTSIDE OF THE OPERATING ROOM ENVIRONMENT, THE ANESTHESIOLOGISTS' PRACTICE HAS EVOLVED OVER TIME TO A PARTICIPATION IN THE INTENSIVE CARE OF CRITICALLY ILL PATIENTS AND IN MANY CASES IN THE MANAGEMENT OF THE UNITS DESIGNED FOR THAT PURPOSE IN THIS COUNTRY AND ABROAD. WE ARE ALSO INCREASINGLY INVOLVED IN THE MANAGEMENT OF PATIENTS WHO HAVE CHRONIC AND ACUTE PAIN PROBLEMS.

THERE ISN'T TIME NOR IS THERE PURPOSE IN DESCRIBING THESE ACTIVITIES IN GREATER DETAIL, EXCEPT TO INDICATE THAT THE MAINTENANCE OF VITAL FUNCTION OR ITS RESTORATION FROM THE ABNORMAL TO THE NORMAL IS PART OF THE DAILY WORK OF THE ANESTHESIOLOGIST. THE INTENSIVE CARE PARTICIPATION AND LEADERSHIP CLEARLY IS DERIVED FROM THOSE FUNCTIONS. SINCE ONE OF THE PRIMARY PURPOSES OF ALL

ANESTHESIA IS THE PREVENTION OF PAIN DURING SURGICAL PROCEDURES A LOGICAL EXTENSION OF THIS KIND OF KNOWLEDGE AND WORK TO THE MANAGEMENT OF NON-OPERATIVE PATIENTS IN PAIN BY ANESTHESIOLOGISTS WAS ALSO A EVOLUTIONARY DEVELOPMENT.

AS A SMALL DIGRESSION, IT IS OF INTEREST TO NOTE THAT YOUNGER ANESTHESIOLOGISTS HAVE TENDED TO BE MORE INVOLVED WITH INTENSIVE CARE WORK AND OLDER ANESTHESIOLOGISTS, OFTEN AFTER THEIR RETIREMENT FROM OTHER FORMS OF ANESTHETIC PRACTICE, TO BECOME INVOLVED IN THE MANAGEMENT OF PATIENTS WITH PAIN. I HAVE NO REFLECTIONS ON THIS CONTRAST BETWEEN QUASI PEDIATRIC AND QUASI GERIATRIC ANESTHESIOLOGISTS BUT JUST NOTE IT IN PASSING. WHATEVER PARTICIPATION, IN AN EVOLUTIONARY SENSE, THE ANESTHESIOLOGIST HAS IN THESE AREAS, THE OPINION OF PROFESSOR WILLIAM MUSHIN, IS ALSO MINE, I.E., THAT THE MOTHER LODE OF NOURISHMENT OF ANESTHESIA ACHIEVED BY WORKING WITH SURGICAL PATIENTS IN OPERATING ROOMS SHOULD NEVER BE ABANDONED WHATEVER ELSE THE ANESTHESIOLOGIST DOES.

THERE IS ALSO EVOLUTION FROM SOCIOLOGICAL POINTS OF VIEW IN ANESTHETIC PRACTICE. A FEW OF THESE MUST BE MENTIONED BUT THERE IS INSUFFICIENT TIME TO DELVE IN DEPTH INTO ANY OF THEM TONIGHT. CLEARLY THE ANESTHESIOLOGIST FROM THE STANDPOINT OF SOCIETY AT LARGE, IS A USEFUL PERSON IN HIS ABILITY TO SERVE IN THE CARE OF A VARIETY OF PATIENTS IN MANY ROLES.

IN THE PERIOD OF INTELLECTUAL FERMENT BEFORE WORLD WAR II AND IN SUBSEQUENT POST-WAR DEVELOPMENT, IT WAS THE EXPECTATION OF MANY OF US, IN A HIGHLY OPTIMISTIC ENVIRONMENT, THAT THERE WOULD BE A CLEAR AND FAST RESOLUTION OF THE RELATIONSHIP OF THE ANESTHESIOLOGIST TO THE NURSE ANESTHETIST. THIS OPTIMISTIC NOTE OF FORTY YEARS AGO HAS NOT BEEN JUSTIFIED BY EXPERIENCE. IN MY JUDGMENT, THE PROBLEMS, HOWEVER THEY ARE GENERATED, ARE MORE INTRACTABLE THEN EVER BEFORE. THIS PHASE OF EVOLUTION HAS BEEN, AT BEST AN INCOMPLETE SUCCESS AND AT WORSE A SIGNIFICANT FAILURE.

ANOTHER FASCINATING EVOLUTIONARY CHANGE IS THE INCREASE IN THE EARLY 1980'S OF THE NUMBER AND THE QUALITY OF PHYSICIANS WHO ARE ENTERING THIS FIELD AS A SPECIALITY. THERE IS NO GOOD AGREEMENT AMONG OUR PRESENT LEADERS ON THE REASON FOR THE INCREASE IN BOTH NUMBERS AND ABILITY BUT IT IS A GOOD THING TO HAPPEN BY ANY STANDARD. MY OWN OBSERVATIONS, INACCURATE AND TENTATIVE AS THEY MUST BE, SUGGEST THAT THE ATTRACTION OF EPISODIC MEDICAL CARE, HIGH TECHNOLOGY, ALLEGED LUXURIOUS INCOMES AND A RELATIVELY CONTROLLED AND FAVORABLE WAY OF LIFE HAVE BEEN FACTORS IN THE ATTRACTION TO ANESTHESIOLOGY OF YOUNG PEOPLE. IN MY OPINION WE WILL PROBABLY SEE A LEVELING OF THIS PROCESS AND PERHAPS EVEN A DECLINE. THE IMPACT ON THE **EVOLUTION OF ANESTHETIC PRACTICE** HAS BEEN FAIRLY OBVIOUS. THE EMPHASIS HAS CHANGED FROM RECRUITMENT TO SELECTION, AND

IN THE DECADE TO COME THE RESULTS OF THOSE SOCIOLOGICAL PROCESSES SHOULD BECOME MORE APPARENT. WE OUGHT TO HAVE BETTER PEOPLE DOING BETTER THINGS FOR PATIENTS THAN WE WERE ABLE TO DO IN THE PAST.

FINALLY, I WOULD LIKE TO COME TO SOME ASSESSMENT OF THE THINGS WE HAVE CONSIDERED TOGETHER. HAVE WE MADE MUCH PROGRESS? **YES**, OF COURSE WE HAVE! HAVE WE MADE ENOUGH PROGRESS? IN MY OPINION **NO!** THERE ARE LEADERS TODAY IN THE FIELD WHO THINK WE NOW KNOW ENOUGH TO TAKE SAFE AND EFFECTIVE CARE OF ANESTHETIZED PATIENTS UNDER ANY CIRCUMSTANCES THAT MAY BE PRESENTED TO US. MY REASON FOR BELIEVING THAT WE HAVE NOT YET REACHED THAT UTOPIA IS THAT THE PRECISE UNDERSTANDING OF THE MECHANISMS OF THE ANESTHETIC PROCESS ITSELF IS STILL ELUSIVE. THERE ARE PROMISING VIEWS THAT THE KNOWLEDGE GENERATED BY MOLECULAR BIOLOGISTS MAY BE OF IMPORTANCE IN BRINGING THIS EMPIRICAL ERA INTO BETTER RATIONAL CONTROL AND UNDERSTANDING. I THINK THERE ARE ALMOST NO LIMITS TO WHAT ONE CAN DO IF WE UNDERSTOOD THE ANESTHETIC PROCESS EXACTLY. PERHAPS OF COURSE WE ARE DESTINED TO BE FOREVER EMPIRICAL OR PARTIALLY EMPIRICAL. THE SERIOUS CONCEPTUAL QUESTION REMAINS IS: **DOES IT MATTER OR NOT WHETHER WE REMAIN EMPIRICAL OR HAVE A PRECISE UNDERSTANDING OF ANESTHETIC MECHANISMS?** THIS KIND OF QUESTION HAS NO GOOD ANSWER, BUT IT IS WORTHWHILE TO PONDER FOR ALL OF US.

IN OUR HABIT OF THOUGHT, SINCE WE DEAL WITH CONSCIOUSNESS AND UNCONSCIOUSNESS AS WELL AS PAIN AND ABSENCE OF PAIN, COULD WE HELP UNRAVEL THE MYSTERY OF **WHAT IS LIFE? IS IT WHAT ONE IS AWARE OF?**, AND THAT RELATES TO THE STATE OF CONSCIOUSNESS WHICH WE DELIBERATELY SUSPEND DURING GENERAL ANESTHESIA. MY HOPE IS THAT WE CAN CONTRIBUTE TO RESEARCH FOR BETTER UNDERSTANDING AND THAT WE SHOULD CERTAINLY TRY TO USE OUR SPECIAL KNOWLEDGE AND INSIGHTS FOR THIS GREAT OPPORTUNITY TO LEARN MORE ABOUT THE FUNDAMENTAL NATURE OF CONSCIOUSNESS AND LIFE.

A FINAL NOTE NEEDS TO BE MADE. **LOU ORKIN** AND I AND OTHERS IN THIS ROOM, HAVE BEEN FORTUNATE TO HAVE BEEN BOTH PARTICIPANTS AND WITNESSES OF **THE EVOLUTION OF ANESTHESIOLOGY** FROM THE EQUIVALENT OF A FRAIL BI-PLANE AIRCRAFT TO ONE OF SUPER-SONIC CAPABILITY. IF WE ARE TO DO BETTER IN THE FUTURE AND TO ENJOY IT MORE, WE MUST ALL DEVELOP AN INCREASED TOLERANCE TO CHANGE. WE MUST ALSO LEARN HOW TO BEAR UNCERTAINTY DURING CHANGE. CHANGE IS NOT IPSO FACTO, IMPROVEMENT - BUT IMPROVEMENT COMES **ONLY** WITH CHANGE.

I STILL BELIEVE, AS I ALWAYS HAVE, THAT THE **BEST** IS YET TO COME. **THE BEST IS ALWAYS YET TO COME.**