

No. 94-2034
In the 299th District Court of Travis County, Texas
And
In the Court of Criminal Appeals of the State of Texas

Ex Parte Cathy Lynn Henderson

Affidavit of John J. Plunkett, M.D.
In Support of
First Subsequent Application for a
Post-Conviction Writ of Habeas Corpus

STATE OF MINNESOTA)
) SS.
COUNTY OF DAKOTA)

JOHN J. PLUNKETT, first duly sworn, deposes and says:

My name is John J. Plunkett. I am a doctor of medicine, and I am the author of a Report in this case, which is set forth in my letter of May 9, 2007 to George A. Cumming, Jr. The contents of that Report, and each statement contained in that Report, are a true and correct account of my own personal knowledge and professional opinion.

It is my professional opinion, to a reasonable degree of medical certainty, that the fatal injury sustained by Brandon Baugh is entirely consistent with, and could well have resulted from, his having accidentally fallen to the floor of Ms. Henderson's home from her arms, a "drop" of approximately four feet. I base this opinion on the following considerations:

1. New scientific studies published in the peer-reviewed literature critically evaluate the mechanisms for infant head injury. I have cited and discussed these studies in my Report. Physicians were taught and most believed (prior to approximately 2001) that "short-distance" falls of four feet or less in an infant could not cause serious injury or death, and could not cause a complex fracture. The new literature indicates that this belief was incorrect.
2. New scientific studies published in the peer-reviewed literature highlight the seminal role of injury biomechanics and biomechanical reconstruction in infant injury evaluation. I have cited and discussed these studies in my Report. Pathologists and other physicians were seldom aware of the necessity for biomechanical analysis prior to 2001. Biomechanical reconstruction of real-life fatal events involving infants indicates the potential lethality of a

"short-distance" fall of four feet or less, and the potential that such a fall may cause a complex, depressed skull fracture.

3. Dr. Peter J. Stephens' analysis of Brandon's injury, which he described in his April 17, 2007 Report. He cites new scientific studies to support his conclusions. Dr. Stephens also stresses the need for biomechanical analysis to understand correctly the nature and potential causes of an infant's injury. He indicates that a failure to understand infant skull and brain biomechanical properties and injury mechanisms explains the errors in the Affidavit of George A. Edwards, M.D. dated March 29, 2007. I agree with Dr. Stephens' opinions and conclusions, and agree with the errors of fact that he has noted in the Affidavit of Dr. Edwards.
4. Dr. Kenneth L. Monson's analysis of Brandon's injury, which he described in his April 16, 2007 Report. I also received and reviewed his May 11, 2007 Report. His May 11 Report recalculates the Peak Force, Peak Linear Acceleration, and Head Energy of a "spin" scenario, based on new measurements of Ms. Henderson's height, her reach, and her shoulder to fingertip length. The new calculations for the "spin" scenario are slightly lower than his original calculations. The "drop only" analysis does not change, and the Peak Force, Peak Linear Acceleration, and Head Energy of a "drop only" are slightly lower than a "spin" scenario. I have discussed his April 16 report with him, and have explained his evaluation in my own Report. Dr. Monson used standard and accepted biomechanical methods of analysis of infant head trauma. He concluded that if Brandon Baugh had sustained an accidental fall to the floor from Ms. Henderson's arms (a "drop only" of approximately four feet), his head may have struck the floor with a degree of force well in excess of that required to cause the skull fracture and fatal head trauma described by Dr. Bayardo in his autopsy report.

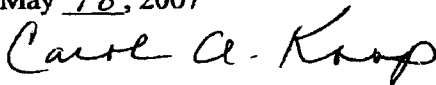
Neither I nor Dr. Monson, nor anyone else, can prove that Brandon's injury and death was an accident. However, because of the new scientific information and analysis now available to scientifically evaluate Brandon's injury and death, neither may anyone prove that Ms. Henderson intentionally caused it. It is impossible for any qualified scientist or physician to conclude, whether to a reasonable degree of medical certainty, or beyond a reasonable doubt, that any intentional and deliberate act by Ms. Henderson caused Brandon Baugh's death, or that the Brandon's injuries are such as to rule out an accidental cause.

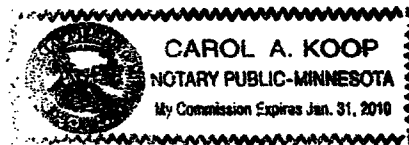
Dated: May 18, 2007



John J. Plunkett, M.D.

Subscribed and sworn to before me,
A Notary Public of the State of Minnesota
on May 18, 2007





State of Texas)
)
County of Travis)

Affidavit of Roberto J. Bayardo, M.D.

ROBERTO J. BAYARDO, first duly sworn, deposes and says: My name is Roberto J. Bayardo, M.D. I was the Chief Medical Examiner for Travis County, Texas for 28 years until my retirement in 2006. On February 8, 1994, I performed the autopsy of Brandon Baugh. In January 1995, I testified as an expert witness called on behalf of the State of Texas during Cathy Henderson's trial, State of Texas vs. Cathy Lynn Henderson.

I recently reviewed the affidavit and written report of Peter J. Stephens, M.D. dated April 17, 2007, the written report of John Plunkett, M.D. dated May 9, 2007, the head impact calculations prepared by Kenneth L. Monson, Ph.D., the affidavit of George A. Edwards, M.D. dated March 29, 2007, the Medical Examiner's Report I prepared at the time of Brandon Baugh's autopsy, the testimony offered at Cathy Henderson's trial by myself, Sparks Veasey, M.D., and Kris Sperry, M.D., and the amended death warrant and amended execution order dated April 4, 2007.

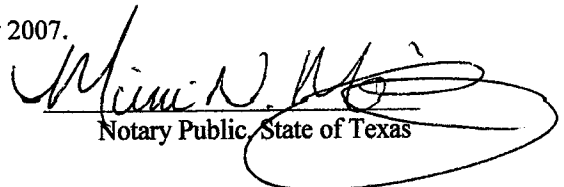
Since 1995, when I testified at Cathy Henderson's trial, the medical profession has gained a greater understanding of pediatric head trauma and the extent of injuries that can occur in infants as a result of relatively short distance falls, based in part on the application of principles of physics and biomechanics. Specifically, and as shown in the reports that I have read, even a fall of a relatively short distance onto a hard surface can cause the degree of injury that Brandon Baugh experienced. If this new scientific information had been available to me in 1995, I would have taken it into account before attempting to formulate an opinion about the circumstances leading to the injury.

I have reviewed the affidavit of John Plunkett dated May 18, 2007, and I agree with his opinion. Based on the physical evidence in the case, I cannot determine with a reasonable degree of medical certainty whether Brandon Baugh's injuries resulted from an intentional act or an accidental fall. In fact, had the new scientific information been available to me in 1995, I would not have been able to testify the way I did about the degree of force needed to cause Brandon Baugh's head injury.

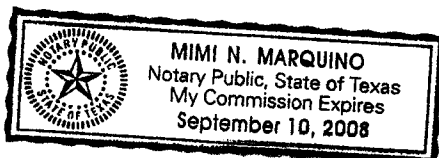
I have not received any payment or non-pecuniary compensation for my statement.


Dr. Roberto Bayardo, MD

Subscribed and sworn to before me on this 19th day of May 2007.


Notary Public, State of Texas

My Commission Expires. September 10, 2008



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May 9, 2007

Mr. George A. Cumming, Jr.
Morgan, Lewis & Bockius LLP
One Market, Spear Tower
San Francisco, CA 94105

Mr. Cumming:

I have reviewed the following at your request concerning State v. Henderson:

1. Birth and neonatal records for Brandon Baugh, DOB October 16, 1993;
2. A videotape of the "crime scene and autopsy";
3. Photographs of the Henderson home;
4. The autopsy report, including microscopic slides, photographs and diagrams, and a postmortem skull X-ray;
5. Transcripts of Drs. Bayardo, Veasey, and Sperry's trial testimony, including an artist's rendition of Brandon's fracture;
6. Dr. George A. Edwards' Affidavit, dated March 29, 2007;
7. Dr. Kenneth L. Monson's analysis and report, dated April 16, 2007;
8. Dr. Peter J. Stephens' letter and Affidavit, dated April 17, 2007; and
9. Cathy Henderson's undated clemency petition.

I will not repeat the information in the various records that I reviewed.

You have asked me to:

- Describe my background;
- Review and evaluate the Prosecution and Defense medical experts' trial testimony;
- Explain changes in the scientific approach to infant injury evaluation that have occurred since Ms. Henderson's trial and conviction; and
- Explain Dr. Monson's analysis of Brandon's injury and death in plain language.

Background:

I am an anatomical, clinical, and forensic pathologist. I have attached a summary of my education and experience (CV).

I was the Regina Medical Center Laboratory/Pathology Director, Medical Education Director, and

the Minnesota Regional Coroner's Office (MRCO) Coroner or Assistant Coroner from 1978, when I completed my training, through December 2004. I retired as the Laboratory Director and Assistant Coroner at the end of December 2004, and as the Medical Education Director at the end of December 2005. I continue to consult, research, and write on the topic of infant injury evaluation. Regina is a small community hospital at the junction of the St. Croix and Mississippi Rivers approximately 25 miles southeast of Saint Paul, Minnesota.

The MRCO is a division of the Regina Laboratory/Pathology Department. It is a contracted service for seven Minnesota counties with a total population of approximately 750,000. Three American Board of Pathology-certified forensic pathologists direct and staff the service. The office performed over 2,000 death investigations and 300 autopsies in 2005. I have personally performed over 3,000 autopsies, including over 200 on children under the age of two. I have performed two autopsies on children whose death was due exclusively to inflicted head trauma (what others may classify as "shaken-baby syndrome" [SBS]).

I graduated from the University of Minnesota Medical School in 1972. I completed my post-graduate training (general internship, residencies in anatomical and clinical pathology, and fellowship in forensic pathology) in 1978. Nothing in my training addressed the fact that head-injury mechanisms and thresholds are significantly different between infants and toddlers and between toddlers /older children and adults. I knew, perhaps subliminally, that there are differences, but this did not seem important or relevant during the first few years of my practice.

This changed in 1986 or 1987. A defense attorney in Minneapolis asked me to review the death of an 18-month-old child. The mother stated that the child had been standing on the arm of a sofa, approximately 30 inches above the ground, when she apparently lost her balance and fell to a linoleum-covered wood floor, striking the floor on the side of her head. She was almost immediately unconscious. Her mother called emergency personnel, who transported the child to a tertiary care pediatric hospital. She had a large-volume acute subdural hematoma (SDH), and died approximately two days after the event.

Her physicians stated (and subsequently testified at trial) that a fall as described could not have caused her injury or death. These physicians stated, unequivocally, that "SBS" caused the death. ("SBS" was introduced in the medical literature during my residency. I was aware of the literature, but had no reason to discount it. It seemed to be a reasonable hypothesis at the time.) However, when I reviewed the autopsy photographs, I noticed that there was a clearly-defined impact injury in the scalp above one of the child's ears. I asked, if there were an impact injury, how is it possible to differentiate the results of impact from those of a "shake"? Pediatricians and most pathologists, including forensic pathologists, told me, "We can differentiate it because a low-velocity impact, such as a fall described by the mother, is incapable of causing significant injury or death." I asked, "How do we know this?" These same physicians told me, "We know it because we never see significant injury or death from a low-velocity impact." This was circular reasoning, and I began to question what I had been taught during medical school, internship, residency, and fellowship, and what I had learned during my post-graduate education.

I was a general and forensic pathologist with significant laboratory, forensic pathology, and continuing education responsibilities from 1978 through my retirement at the end of 2004. I simply did not have a lot of time to pursue this interest in infant head injuries. However, I

continued to read the relevant medical literature. My interest peaked in the late fall of 1997, when a group of physicians published an on-line letter concerning the so-called “nanny” case (Commonwealth of Massachusetts v. Woodward) ⁽¹⁾. The journal *Pediatrics* subsequently published this letter as a Letter to the Editor in February 1998 ⁽²⁾. I thought that known data and studies regarding infant head injury likely contradicted the statements made by the authors. The authors assertions and other then-current beliefs in the medical literature included:

- A low-velocity fall cannot cause serious injury or death ⁽³⁻⁵⁾;
- The location of an SDH indicates an ultimate cause of the injury (accidental versus inflicted) ⁽⁶⁻⁹⁾;
- A child with an ultimately fatal head injury does not have a period of time during which he/she appears to be “normal”, *i.e.*, have a lucid interval ⁽¹⁰⁾; and
- Retinal hemorrhage with specific characteristics indicates an ultimate cause, *i.e.*, accidental versus “SBS”? ⁽¹¹⁻¹⁶⁾

I discussed these issues in an article titled “Shaken baby syndrome and the death of Matthew Eappen - a forensic pathologist’s response”, published in the March 1999 issue of the *American Journal of Forensic Medicine and Pathology* ⁽¹⁷⁾. The *American Journal of Forensic Medicine and Pathology* is a peer-reviewed journal and is the official journal of the American National Association of Medical Examiners. The article did not attempt to prove or disprove the assertions in the *Pediatrics* letter, but rather to examine the bases for the statements. I concluded that the assertions were scientifically unsound and not based on acceptable reasoning or methodology.

I think that it is fair to say that many physicians, and in particular pediatricians and some forensic pathologists, did not greet publication of this article with joy. I had questioned whether the above dogmatically-stated beliefs were science or opinion. Other physicians reminded me that “vast clinical experience” validated not only the diagnosis of “SBS”, but also all of its corollary diagnoses. The diagnosis was “well-established” and there was no reason or need to question it.

However, I continued to question it. Approximately seven years ago, I studied the U.S. Consumer Products Safety Commission (CPSC) database for fatal head injuries associated with the use of playground equipment. I did this study to determine if there were observed accidental events resulting in fatal brain injury. There were eighteen such events in the CPSC database. *The American Journal of Forensic Medicine and Pathology* published the results of this study in March 2001 ⁽¹⁸⁾. This study disproved the beliefs that a low-velocity impact cannot cause fatal head injury; that a lucid interval does not occur in a fatal head injury; that SDH in a particular location indicates an ultimate cause; and that retinal hemorrhage with particular characteristics indicates whether the injury was “accidental” or was “inflicted”.

The publication of this latter article caused somewhat of an uproar in certain segments of the medical community. I had questioned long-held beliefs and proved them wrong.

I knew by 1999 or 2000 that almost everything taught in medical school and in formal post-graduate medical education, and published in the *medical* literature regarding infant head injury was wrong. I realized that if I were to understand head injury mechanisms and differences between infants and toddlers, and toddlers and adults, I needed to be familiar with

the relevant *biomechanical* literature.

Biomechanics applies the principles of mechanics (Newton's laws of motion) to living tissues. This discipline is literally hundreds of years old. There are undergraduate and graduate programs in Biomechanics at more than 100 colleges and Universities throughout the world. Engineers and other scientists have used biomechanics to design safer automobiles and roads; protective equipment for contact sports; devices for fracture repair; stents for blood vessel replacement; playground equipment; safer flooring surfaces; and industrial and household items, among others. Many if not most non-physicians assume that physicians, skilled in the art of medicine, must have particular knowledge of injury mechanisms. This assumption is wrong. Medical schools and post-graduate residency programs (except for orthopedic surgery, physical medicine/physiatry, and occasionally neurosurgery and vascular surgery) do not teach injury mechanics. Unfortunately, the *scientific discipline* of mechanics, and the *practice* of medicine did not interact very often. The biomechanicians did their thing, defining injury thresholds and suggesting better safety devices, and practicing physicians did theirs, diagnosing and treating patients with head injuries. This was not a problem until physicians ventured from diagnosis and treatment into speculation of an ultimate mechanical cause for an injury.

At the age of 52, I sought out and learned from the experts in the field of injury biomechanics. Ultimately, I had the opportunity to collaborate with arguably the world's leading expert on impact, Professor Werner Goldsmith from the University of California, Berkeley, to write a paper devoted to an in-depth analysis of the biomechanical causes of traumatic brain injury in infants and children. The *American Journal of Forensic Medicine and Pathology* published this article in June 2004 ⁽¹⁹⁾. Professor Goldsmith died in August 2003, prior to publication of the article. I have attached his obituary from the NY Times. Dr. Kenneth Monson was his last graduate student. Among other accomplishments, Dr. Monson, collaborating with neurosurgeons from the University of California at San Francisco, performed pioneering experiments on bridging vein failure. These experiments were important because they described the maximum that these veins, which connect the inner surface of the dura to the outer surface of the brain, could stretch before they would break. Bridging vein rupture is the cause of traumatic SDH. He published these studies in the *Journal of Biomechanics* ⁽²⁰⁾ and *The Transactions of the American Society of Mechanical Engineering* ⁽²¹⁾. These journals are the leading peer-reviewed biomedical engineering journals. I had the privilege of meeting Ken for the first time in 2000, when he was still a student.

A number of different mechanical and physiological causes, including impact trauma, natural disease, and inherited abnormalities of metabolism may lead to identical clinical signs and symptoms. This is why it is necessary to have a differential diagnosis when evaluating an infant or child who presents to the physician's office or hospital with apparent head trauma, or who dies and is autopsied. This is why it is necessary to understand injury mechanisms if one is to speculate regarding an ultimate mechanical cause. There are no "intent" receptors in the brain or eye. Neither structure knows whether a physiologic derangement was caused by an intentional or an accidental impact, by anoxia (lack of oxygen), or by any of a variety of natural diseases. "Intent" does not determine the physiological response of the skull, brain or the eye to an injury.

The disagreements described above have not been resolved. The differences are primarily

between the pediatric and pediatric subspecialty community on the one hand, and forensic pathologists, neuropathologists, and biomechanicians on the other. Medical school faculties teach that the mechanism for traumatic brain injury in infants is “shaking”. “Forensic pediatricians” and some forensic pathologists state that low-level falls are not fatal unless the resulting damage is “contact-type”, *i.e.*, a large-volume acute SDH. Many practicing physicians continue to teach that only “shaking” causes retinal hemorrhage with specific characteristics⁽²²⁾; that “diffuse axonal injury” is the mechanism by which “shaking” causes injury⁽²³⁻²⁴⁾; that a chronic SDH does not “rebleed” and cause signs or symptoms unless there is proximate new major trauma (“shaking”); and that anoxia plays no role in the damage⁽²⁵⁾. These disagreements persist because biomechanics is not part of the Medical School curriculum. Residency programs do not teach biomechanics except to future orthopedic and neurosurgery residents. Dr. Edwards’ statement in his Affidavit that “Brandon received a very high-energy blow...” exemplifies the continued disconnect between medicine and science in the area of injury evaluation. *Qualitative* terms such as “high-energy” have no place in injury evaluation. There must be a reconstruction of the event, and the energy, force, and/or stress measured. The reconstruction may be a mathematical analysis such as Dr. Monson performed, or may be an actual experiment using a surrogate (dummy) such as the Child Restraint Air Bag Interaction (CRABI) model. The CRABI model is *biofidelic*. A *biofidelic* model incorporates the known characteristics of the tissues or portions of the body to which an acceleration is applied. The model is fixed with sensors, and the measured and recorded output is similar if not identical to the response of an actual living human being. The reconstructionist then compares the *quantitative* measurements to known injury or failure thresholds.

My interest and involvement in these issues began almost twenty years ago. It progressed slowly for the subsequent ten years, and then rapidly for the past ten. Today, I am part of a group of over 80 physicians and scientists with diverse backgrounds and experience, from 8 countries and 5 continents, who have the common goal to examine infant head injury mechanisms rigorously. Physicians have an opportunity to learn from non-physicians, and must do so.

Trial testimony regarding Brandon Baugh’s death:

I agree with Drs. Bayardo, Veasey, and Sperry that an impact head injury caused Brandon’s death. However, significant portions of Bayardo’s, Veasey’s, and Sperry’s testimony are incorrect. For example:

1. Bayardo testified (page 853): “You have to have special type of injury to the brain where – where the injury causes the brain to vibrate or ricochet inside the – inside the cranial cavity...”. Vibration or ricochet has nothing to do with a SDH in a three-month-old infant. Deformation (inbending) of the infant skull during an impact causes SDH^(19,26). The inbending may or may not be accompanied by a fracture. If there is a fracture, either the inbending itself or the fracture may rupture the bridging veins. Correctly understanding the mechanism for SDH in an infant is not an academic exercise. Testimony that “vibration” or “ricochet” caused Brandon’s SDH suggests an incorrect mechanism (“shaking”) implying violent behavior.
2. Bayardo testified (pages 854-855):

“Q. Okay, Dr. Bayardo, I’d like to ask you: Based on your training and experience, do you have

an opinion as to whether the injury that you observed on the head of Brandon Baugh could have been caused by a fall of four to four-and-a-half feet?

A. No that would have been impossible.

Q. And why do you say that?

A. Because of the severity of the injury.

Q. What type of injury would you expect to find on an infant if he's three months of age, one month premature, that had fallen from a height of four to four-and-a-half feet?

A. The most I would have expected to find would have been a short -- by that I mean less than half an inch -- linear fracture on most probably on the sides of the head in the parietal bones.

Q. And you stated that's the most you would expect?

A. That's correct.

This testimony was wrong. The stress (force/cross-sectional area) causing a skull fracture in a three-month-old infant is approximately 500 psi^(19, 26-27). This is ten percent of the stress required in an adult. A gravitational fall of less than 2.5 feet to a non-yielding surface exceeds this threshold. The additional stress causing a complex or depressed fracture such as Brandon's is only marginally higher than the stress resulting in a simple fracture. Studies published prior to 1995 showed the potential for a complex fracture from a short-distance fall⁽²⁸⁻²⁹⁾. I have reviewed at least two cases involving infants in which an accidental fall (one case) or "drop" (one case) of less than 4.5 feet caused fractures virtually identical to Brandon's.

3. Bayardo testified (page 866) regarding the significance of the fractures crossing suture lines: "That's what tells us that this was not an accidental injury. Tells us that a severe degree of force was applied to the baby's head..." and "A less severe degree of force usually dissipates along the suture line." This testimony was mistaken. Whether or not a fracture crosses a suture line has nothing to do with a "severe degree of force". The sutures in an infant do not "dissipate force". In 1995, Bayardo's testimony regarding the ability of sutures to "dissipate force" was a common belief among pathologists. Studies published since 2000 indicate that this belief was incorrect⁽²⁶⁾.
4. Bayardo's testimony (page 872) that Brandon weighed "About 25 pounds" is an error. I don't know whether this was simply a mistake or indicates an inability to convert grams to pounds.
5. Veasey (page 896) uses Barlow's 1983 study⁽³⁰⁾ to support his testimony that low-level falls do not cause the type of injury seen in Brandon. This article is an inappropriate reference for Brandon's injury. It is a study of 61 children in New York City who fell more than one story and were transported to hospital emergency rooms. The article does not delineate the impact surface characteristics other than to state that "most" were to concrete or to "piles of garbage between buildings". (Falling to a concrete sidewalk is not the same as falling into a pile of refuse.) The article does not describe the part of the body that struck the ground. If a child was dead at the scene, emergency personnel did not transport the child to the hospital, and therefore he/she was not part of the study. Only two patients were under the age of one.

Barlow's study is an analysis of the outcome for those children who make it to the hospital alive after a fall from a height. It is not an analysis of the potential lethality of such a fall. Her study tells you nothing about what may happen if someone "drops" a 3-month-old infant 4 feet to a non-yielding surface. Her study tells you nothing about what may happen if a person is holding an infant in a horizontal position while "spinning", then accidentally release the baby, causing him to strike a carpeted or concrete floor.

6. Sperry's testimony appears to have been limited to the issue of "intent". By inference, he did not understand the potential causes of Brandon's injury. He was just as wrong as were Bayardo and Veasey. His testimony reflects how widely held were incorrect beliefs regarding infant skull fracture at the time of Ms. Henderson's trial.

Changes in scientific knowledge regarding infant head injury:

There has been a fundamental change in physician's understanding of pediatric head injury since I wrote my first article in 1999. This change involves at least ten distinct areas:

1. The potential lethality of short-distance falls;
2. The potential for a "lucid interval" prior to collapse or the onset of signs/symptoms;
3. The specificity of retinal hemorrhage (RH) for inflicted injury or a specific injury mechanism;
4. The specificity of subdural hemorrhage (SDH) in an interhemispheric intracranial distribution for inflicted trauma;
5. The role of traumatic axonal injury (TAI, often referred to as DAI) in pediatric brain damage;
6. The application of the principles of biomechanics to infant injury evaluation;
7. The natural disease "mimics" for inflicted trauma, and the concept of a "differential diagnosis";
8. The unlikelihood of "shaking" as a mechanism for *brain* injury;
9. The validity of "confessions" to support a medical diagnosis; and
10. The application of principles of evidence-based medicine to evaluate the scientific literature regarding pediatric head injuries.

I will summarize those changes most relevant to Brandon's death below.

Short falls, lucid interval, SDH, and RH: I studied these areas in two articles, one published in 1999⁽¹⁷⁾ and the second in 2001⁽¹⁸⁾. I described the background and conclusions of the articles above.

Biomechanics: Professor Goldsmith and I discussed the relevance of the principles of biomechanics to infant injury evaluation in the 2004 article described above⁽¹⁹⁾. Ommaya, Uscinski, and Prange have also emphasized the contribution of mechanics to infant injury analysis^(27, 31-33).

Biomechanical analysis shows that the mechanism of head injury in an infant or toddler is fundamentally different from that in an older child or an adult^(19, 27). A scalp impact in an infant

will cause the skull to inbend, or deform. The inbending skull will cause the brain itself to deform and move. This movement may cause subdural hemorrhage, and will cause functional and in some cases gross structural damage to the brain. The functional brain damage may precipitate seizures, breathing difficulties, and/or unconsciousness. The damage will cause a change in cerebral blood flow, resulting in an increase in intracranial pressure. A significant pressure increase (above mean arterial pressure) will alter brain blood flow further, leading to anoxic brain damage. These latter changes are “secondary” or “cascade” phenomenon and may be rapid, or “malignant”. The cascade responses are poorly understood, although it is clear that they are significantly different from that of an adult or older child⁽³⁴⁻³⁵⁾. Genetically determined responses, only recently described and appreciated, are another important source of response differences among individuals. The cascade events are the proximate cause of damage in most cases of infant head injury. There may be no skull fracture and no direct brain damage in the form of contusions or tears. However, the structural movement of the brain secondary to skull deformation precipitates all of the secondary events. Dr. Lindenberg and Ms. Freytag’s 1969 paper⁽³⁶⁾ demonstrated the importance of deformation as the injury mechanism in infants who have a unique type of brain contusion. Dr. Kirk Thibault did his PhD thesis on infant skull properties⁽³⁷⁾ and published a paper in 2000 that defined the structural and mechanical characteristics of deformation in the infant skull⁽²⁶⁾.

In contrast to the mechanism of injury in an infant, differential motion (acceleration) of the brain relative to the scalp and skull during an impact is the most common non-penetrating cause of brain injury in an older child or adult with a rigid skull⁽¹⁹⁾. This differential acceleration may cause bridging veins to stretch and rupture at a point remote from the impact, and may cause both coup and contra-coup brain bruises. This differential acceleration also causes traumatic axonal injury deep within the brain itself, and again remote from the area of impact. The injury pattern, in addition to the injury mechanism, is fundamentally different from that of a deformable-skull impact.

Physicians (except as above) need not know or apply injury mechanics if they are responsible for diagnosis and treatment. For example, it is not necessary to know whether a fall from a ladder or a blow from a baseball bat caused a fracture. However, if a physician ventures from diagnosis and treatment to speculation about an ultimate mechanical cause for an injury, he/she *must* understand mechanics and the relevant literature. Only a few practicing physicians understood these concepts in 1995. The transcripts indicate that none of the medical witnesses in Ms. Henderson’s trial understood them.

Application of the principles of mechanics to infant injury assessment is the significant change in the past several years that is directly applicable to the evaluation of Brandon’s death. Today, the minimum standard for impact head injury evaluation is mathematical analysis such as Dr. Monson performed. While the State and Defense doctors could have performed those calculations in 1995, it was not well recognized that they should do. In addition, it is possible to today to do a more refined reconstruction using the CRABI model. The CRABI reconstruction not only measures the accelerations, but also preserves a visual record. (A picture is worth a thousand words.) The CRABI models are very expensive (approximately \$250,000), and only few private testing facilities and government agencies, and even fewer educational institutions,

own them. However, a scientist or physician who does not own one of the models can contact a certified testing facility and arrange a reconstruction.

The significant changes in medicine since 1995 are not limited to the use of biomechanics. New information and approaches to infant head injury evaluation is only one example among many of the advances that medicine has made since 1995. For example, the “Back to the back” program, which encouraged parents and caretakers to put infants on their backs to sleep, significantly decreased the number of sudden unexpected infant deaths. Prior to the early ‘90s, pediatricians taught parents to put infants on their bellies to sleep, since if they were on their backs, they might spit up and aspirate. This advice was wrong. When appropriate studies disproved the old teaching, the change in parental advice decreased the number of apparent Sudden Infant Death Syndrome (SIDS) deaths by almost 75%⁽³⁸⁾.

Dr. Monson’s report:

Dr. Monson’s report may seem complicated. However, he used high-school physics (simple Newtonian mechanics) and high-school algebra to calculate the impact velocity of a gravitational 4-foot “drop”. He then used high-school trigonometry and vector analysis to estimate the contribution of a “spin” to the “drop” velocity. Next, he estimated the time it took for Brandon’s skull to go from 12 mph or so to zero during the impact. This change in velocity over time was Brandon’s acceleration. (Negative acceleration is commonly called deceleration.) Acceleration is the usual measure of injury potential. Monson then used trigonometry to estimate the contribution of Brandon’s head weight to the energy of impact. Finally, he compared his calculated results to fracture and brain injury thresholds established only during the past few years. He concluded that a simple “drop” of four feet to a non-yielding surface could have caused Brandon’s fracture, and ultimately his death.

Summary:

In summary, Bayardo’s and Veasey’s testimony at Ms. Henderson’s trial included opinions not supported, and often contradicted, by actual scientific evidence available at that time. Both Bayardo and Veasey appear to have been unaware of the potential for a reconstruction to assist in the evaluation of Brandon’s fracture. Their testimony that the force was massive and equivalent to a motor vehicle accident or multi-story fall was wrong. Qualitative terms convey no meaningful information regarding force or energy, especially when they are used to compare the outcome of an event, such as Brandon’s skull fracture, to other events, such as a multi-story fall or motor vehicle accident that are not comparable.

Neither I nor Dr. Monson, nor anyone else, can prove that Brandon’s injury and death were an accident. Neither can anyone prove that Ms. Henderson intentionally caused it. Dr. Bayardo states (page 878):


Q. Okay. Dr. Bayardo, if a person explains these injuries by describing a fall such as the one that I have described to you in my hypothetical, a person the size of the defendant says it was dropped from her arms, would you find that to be a credible explanation?

A. No, that's incredible.

Many physicians would have agreed with him in 1995, even though analysis and reference to known injury data would have shown the opinion to be incorrect. Even Sperry, the defense consultant, apparently concurred. However, this belief is not justifiable today.

I will retain the records until I hear from you. Please call or write if you have any questions or if I can be of further assistance to you.

Sincerely,



John Plunkett, M.D.

JP:dp

Annotations:

1. Amaya M, Bechtel K, et al [50 signatories]. Shaken baby syndrome and the death of Matthew Eappen. Available at: <http://silcon.com/~ptave/shaken.htm>. November 11, 1997.
2. Chadwick DL, Kirschner RH, et al (82 signatories). Shaken baby syndrome--a forensic pediatric response. *Pediatrics* 1998;101:321-23.
3. Chadwick DL, Chin S, et al. Deaths from falls in children: how far is fatal? *J Trauma* 1991;31:1353-5.
4. Williams RA. Injuries in infants and small children resulting from witnessed and corroborated free falls. *J Trauma* 1991;31:1350-2.
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7. Merten DF, Osborne DRS. Craniocerebral trauma in the child abuse syndrome. *Pediatr Ann* 1983;12:882-7.
8. Merten DF, Osborne DRS, Radkowski MA, Leonidas JC. Craniocerebral trauma in the child abuse syndrome: radiologic observations. *Pediatr Radiol* 1984;14:272-7.
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10. Willman KY, Bank DE, Senac M, Chadwick DL. Restricting the time of injury in fatal inflicted head injury. *Child Abuse Negl* 1997;21:929-40.
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12. Greenwald MJ, Weiss A, et al. Traumatic retinoschisis in battered babies. *Ophthalmology* 1986;93:618-24.
13. Rao N, Smith RE, et al. Autopsy findings in the eyes of fourteen fatally abused children. *Forensic Sci Int* 1988;39:293-9.
14. Elnor SG, Elnor VM, et al. Ocular and associated systemic findings in suspected child abuse: a necropsy study. *Arch Ophthalmol* 1990;108:1094-101.
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16. Rosenberg NM, Singer J, et al. Retinal hemorrhage. *Pediatr Emerg Care* 1994;10:303-5.
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18. Plunkett J. Fatal pediatric head injuries caused by short distance falls. *Am J Forens Med Pathol*

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19. Goldsmith W, Plunkett J. A biomechanical analysis of the causes of traumatic brain injury in infants and children. *Am J Forens Med Pathol* 2004;25:89-100.
 20. Monson KL, Goldsmith W, Barbaro NM, Manley GT. Significance of source and size in the mechanical response of human cerebral blood vessels. *J Biomech* 2005;38:737-44.
 21. Monson KL, Goldsmith W, Barbaro N, Manley G. Axial mechanical properties of fresh human cerebral blood vessels. *J Biomech Eng* 2003;125:288-94.
 22. Am Acad Ophthalmol. Shaken Baby Syndrome Resources. Available at: http://www.aao.org/education/library/shaken_baby.cfm. Date accessed: May 9, 2007.
 23. Case ME, Graham MA, et al. Position paper on shaken baby. Adopted by the Board of Directors, United States National Association of Medical Examiners, San Francisco, October 30, 1998. St. Louis: The National Association of Medical Examiners.
 24. Case ME, Graham MA, et al. Position paper on fatal abusive head injuries in infants and young children. *Am J Forens Med Pathol* 2001;22:112-22.
 25. Punt JF, Bonshek RE, et al. The 'unified hypothesis' of Geddes et al. is not supported by the data. *Ped Rehab* 2004;7:173-84.
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 32. Uscinski R. Shaken baby syndrome: an odyssey. *Neurol Med Chir* 2006;46:57-61.
 33. Prange MT, Coats B, Duhaime A-C, Margulies SS. Anthropomorphic simulations of falls, shakes, and inflicted impacts in infants. *J Neurosurg* 2003;99:143-150.
 34. Mander M, Larysz D, Wojtacha M. Changes in cerebral hemodynamics assessed by transcranial Doppler ultrasonography in children after head injury. *Childs Nerv Syst* 2002;18:124-8.
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 36. Lindenberg R, Freytag E. Morphology of brain lesions from blunt trauma in early infancy. *Arch Pathol* 1969;87:298-305.
 37. Thibault KL. Pediatric head injuries: the influence of brain and skull properties 1997. Ph.D. Dissertation, Univ. Pennsylvania.
 38. American Academy of Pediatrics. The changing concept of Sudden Infant Death Syndrome: Diagnostic coding shifts, controversies regarding the sleeping environment, and new variables to consider in reducing risk. *Pediatr* 2005;116:1245-55.

September 4, 2003

Werner Goldsmith, 79, Who Studied Mechanics of Impact, Dies

By ANAHAD O'CONNOR

Dr. Werner Goldsmith, an authority on the mechanics of collisions who went on to become a leader in the study of head injuries, died on Aug. 23 at his home in Oakland, Calif. He was 79.

A professor of mechanical engineering at the University of California, Dr. Goldsmith published his classic textbook "Impact: The Theory and Physical Behavior of Colliding Solids" in 1960. The seminal text, which was reissued in 2001, examines the mathematics of impact theory and shows how different materials, like cars in crashes, react to rapidly applied stress.

"It was the first organized collection of work in the field," said Dr. Jerome L. Sackman, an emeritus professor of engineering science at Berkeley and a former colleague. "The book had a tremendous impact when it was published because it was during the cold war and it had a lot of information on defense-related items — ballistics and penetration of armor, for example. It was a huge hit and helped get a lot of people interested in the field."

By the mid-60's, Dr. Goldsmith had shifted his focus to the biomechanics of head and neck injuries, a new area of scientific inquiry. In 1966, he became chairman of the Head Injury Model Conference of the National Institutes of Health, a project with neurosurgeons to help understand the head's response to impact.

In later years, he did extensive research on the symptoms resulting from violently shaking an infant or child.

Because falls and chronic bleeding in the brain unrelated to an injury can also cause this type of brain damage, some people responsible for the care of children have been falsely accused of child abuse, Dr. Goldsmith reported.

A sign that an infant was killed by violent shaking is soft tissue damage in the neck, his research showed. Medical examiners, he added, seldom checked for those injuries.

As a result of his research, he became a highly sought expert witness, testifying for the prosecution in the Los Angeles police brutality case involving Rodney G. King in 1992, among many others.

Born in Düsseldorf, Germany, in 1924, Werner Goldsmith immigrated to the United States by himself in 1938 to escape Nazi persecution. He earned his bachelor's degree from the University of Texas and his Ph.D. from Berkeley.

He began teaching at Berkeley in the early 50's and retired in 1987, only to return shortly afterward to continue his research. On his 70th birthday, an entire issue of the *International Journal of Impact Engineering* was devoted to his work.

He is survived by his wife, Penelope Goldsmith; a son, Stephen, of Santa Rosa, Calif.; two daughters, Andrea Goldsmith of Menlo Park, Calif., and Remy Margarethe Goldsmith of Oakland; and four grandchildren.

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CURRICULUM VITAE

John Jerome Plunkett
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Welch, MN 55089
E-mail: plunkettj@frontiernet.net

PERSONAL:

Date of Birth: April 15, 1947
Place of Birth: St. Paul MN
Citizenship: United States of America
Family: *Spouse:* Donna McFarren Plunkett
Children: Matthew James - 1971
Benjamin John - 1973

EDUCATION:

University of Minnesota, Minneapolis MN, 1966 - 1969 (BS, History and Chemistry, 1972)
University of Minnesota, Minneapolis MN, 1969 - 1972 (MD, 1972)

POSTGRADUATE TRAINING AND EXPERIENCE:

St. Paul Ramsey Medical Center, St. Paul MN, 1972-1973 (Rotating internship)
St. Paul Ramsey Medical Center, St. Paul MN, 1973-1978 (Anatomic and Clinical Pathology Residency)
Hennepin County Medical Examiner's Office, Minneapolis MN, 1975- 1976 (Forensic Pathology Fellowship)

BOARD CERTIFICATION:

American Board of Pathology, 1978 (Anatomic Pathology, Clinical Pathology and Forensic Pathology)

MEDICAL LICENSURE:

Minnesota and Wisconsin

EMPLOYMENT:

Hennepin County Deputy Medical Examiner (1975 - 1984)

Hennepin County Assistant Medical Examiner (1984 - 1985)

Laboratory and Medical Education Director, Regina Medical Center (1978-2004)

Laboratory Director, Cannon Falls Community Hospital (1981- 2004)

Coroner, Minnesota Regional Coroner's Office (1980-1998)

Assistant Coroner, Minnesota Regional Coroner's Office (1999-2004)

PROFESSIONAL ORGANIZATIONS:

Ramsey County Medical Society

Minnesota Medical Association

American Medical Association

American Society of Clinical Pathologists (Fellow), 1976-2004

College of American Pathologists (Fellow)

Minnesota Society of Pathologists, 1978-2001 (Minnesota Medical Association Interspeciality Council Representative [1991-1998] and Member of the MSP Executive Committee)

Twin City Society of Pathologists, 1984-2001

Minnesota Coroners and Medical Examiners Association, 1974-2001 (President, 1981 and 1985)

National Association of Medical Examiners

American Academy of Forensic Sciences

SPECIAL APPOINTMENTS:

College of American Pathologists, Inspector, Laboratory Accreditation Program, 1984-1994

Minnesota Coroners and Medical Examiners Association, Executive Committee, 1978-1998

Regina Medical Center Operating Board, 1991-1996

Regina Medical Center Medical Staff Executive Committee, 1985-94 (President of the Medical Staff, 1987-1990)

Regina Medical Center Infection Control Committee, Chairman, 1978-1990, 1993-1999

Minnesota Department of Health, Epidemiology Section, Emerging Infectious Diseases Program (appointed member, Hospital-based physician)

Reviewer, The Lancet (London)

Reviewer, Forensic Science International (Finland)

HOSPITAL STAFF APPOINTMENTS:

Regina Medical Center (Active)

Cannon Falls Community Hospital (Active, retired 2004)

PUBLICATIONS AND NATIONAL PRESENTATIONS:

1. Tan RE, Noreen JP, Plunkett JJ. Chronic intussusception following intestinal bypass surgery for morbid obesity. *Abdominal Surgery* 1981;23:76-8.
2. Plunkett J. Sudden death and myocardial infarction in Minnesota. *NEJM* 1984;310:1187-9 (letter).
3. Plunkett JJ, Amatuzio JC. Clostridial sepsis and sudden death. Abstract presented at the AAFS National Meeting, February 1985.
4. Plunkett JJ, Amatuzio JC. Sudden infant death: I: Cost analysis of investigative procedures. Abstract presented at the ASCP Fall Meeting, 1985.
5. Plunkett JJ, Amatuzio JC. Sudden infant death: II: Ten years experience in three Minnesota counties. Abstract presented at the ASCP Fall Meeting, 1985.
6. Plunkett JJ, Amatuzio JC. Sudden infant death: III: Sudden non-SIDS natural deaths in infancy. Abstract presented at the AAFS Annual Meeting, February 1986.
7. Amatuzio JC, Plunkett JJ. Hemophilus influenzae sepsis in an asplenic adult. Abstract presented at the AAFS Annual Meeting, February 1985.
8. Plunkett J, Amatuzio JC. Electrical injury and death in three Minnesota counties. Abstract presented at the AAFS Annual Meeting, February 1986.
9. Plunkett J. Serum tests for diagnosis of iron deficiency. *AJCP* 1990;94:524-5 (letter).
10. Plunkett J. Minnesota infant death investigation guidelines. Minnesota Coroners and Medical Examiners Association, October 5, 1990.
11. Plunkett J, et al. Guidelines for Blood Component Transfusion. American Red Cross North Central Blood Services, ARC/NCBS (1997).
12. Plunkett J. Restricting the time of injury in fatal inflicted head trauma. *Child Abuse Negl* 1998;22:943-4 (letter).
13. Plunkett J, Thomas LC. Medical examiner and coroner systems. *JAMA* 280:325, 1998 (letter).
14. Plunkett J. Shaken baby syndrome and the death of Matthew Eappen: a forensic pathologist's response. *Am J Forens Med Pathol* 1999;20:17-21,1999.

15. Plunkett J. Sudden death in an infant caused by rupture of a basilar artery aneurysm. *Am J Forens Med Pathol* 1999;20:211-214.
16. Plunkett J. Recognizing abusive head trauma in children. *JAMA* 1999;282:1421-1422 (letter).
17. Plunkett J, Plunkett M. Physiologic periosteal changes in infancy. *Am J Forens Med Pathol* 2000;21:213-216.
18. Plunkett J. Clarity on the diagnosis line. *Ann Diagn Path* 2000;4:134 (letter).
19. Plunkett J. Fatal pediatric head injuries caused by short-distance falls. *Am J Forens Med Pathol* 2001;22:1-12.
20. Plunkett J. Author's response to Drs. Spivack and Levin. *Am J Forens Med Pathol* 2001;22:417-19 (letter).
21. Plunkett J. Author's response to fatal pediatric head injuries caused by short distance falls. *Am J Forens Med Pathol* 2002;23:103-04 (letter).
22. Geddes JF, Plunkett J. The evidence base for shaken baby syndrome. *Br Med J* 2004;328:719-20 (Editorial).
23. Goldsmith W, Plunkett J. A biomechanical analysis of the causes of traumatic brain injury in infants and children. *Am J Forens Med Pathol* 2004;25:89-100.
24. Miller M, Leestma J, Barnes P, Carlstrom T, Gardner H, Plunkett J, et al. A sojourn in the abyss: hypothesis, theory, and established truth in infant head injury. *Pediatr* 2004;114:326 (letter).
25. Plunkett J. Resuscitation injuries complicating the interpretation of premortem trauma and natural disease in children. *J Forens Sci* 2006;51:127-30.

INVITED LECTURES, PRESENTATIONS AND CONFERENCES (1989-1994):

1. "Fundamentals of Death Investigation", Minnesota Bureau of Criminal Apprehension, March 7, 1990, Brainerd MN (7 hours, POST approved).
2. "Preleukemia and Dysmyelopoietic Syndromes", Regina Medical Center Medical and Professional Staff, March 28 and April 4, 1990 (1 hour, AAFP prescribed credit and AMA Category I credit approved).
3. "Arterial Blood Gas Analysis and Monitoring", Northfield City Hospital Medical and Professional Staff, April 18, 1990 (1 hour, AAFP prescribed credit approved).
4. "Cancer Genetics, Epidemiology and Primary Prevention", American Cancer Society, October 3, 1990 (1.5 hours, Nursing CEU approved).
5. "Fundamentals of Death Investigation", Minnesota Bureau of Criminal Apprehension, October 11, 1990, St. Paul MN (7 hours, POST approved).

6. "Plasma Cell Dyscrasias and Hypercalcemia of Malignancy", Regina Medical Center Medical and Professional Staff, January 2, 1991(1 hour, AAFP prescribed credit and AMA Category I credit approved).
7. "Plasma Cell Dyscrasias and Hypercalcemia of Malignancy", Northfield City Hospital Medical and Professional Staff, January 8,1991 (1 hour, AAFP prescribed credit and AMA Category I credit approved).
8. "A Critical Analysis of Recommendations for Hepatitis Immunization", Regina Medical Center Medical and Professional Staff, January 10, 1991 (1 hour, AAFP prescribed credit and AMA Category I credit approved).
9. "A Rational Approach to Evaluation of an Anemic Patient", Visiting Professor Series, University of Illinois, College of Medicine at Urbana-Champaign, February 21, 1991 (1 hour, AMA Category I credit approved).
10. "Evaluation of Thyroid Function", Visiting Professor Series, University of Illinois, College of Medicine at Urbana-Champaign, February 21, 1991 (1 hour, AMA Category I credit approved).
11. "The Triumph of Hope over Science and Sanity: The Cholesterol Myth", Visiting Professor Series, University Of Illinois, College of Medicine at Urbana-Champaign, February 22, 1991 (1 hour, AMA Category I credit approved).
12. "Infant Death Investigation", Visiting Professor Series, University of Illinois, College of Medicine at Urbana-Champaign, February 22, 1991 (1 hour, AMA Category I, credit approved).
13. "Infant Death Investigation", Regina Medical Center Medical and Professional Staff, February 27, 1991 (1 hour, AAFP prescribed credit and AMA Category I credit approved).
14. "Fundamentals of Death Investigation", Minnesota Bureau of Criminal Apprehension, March 20, 1991, Worthington MN (7 hours, POST approved).
15. "The Autopsy and the Role of a Pathologist in Wrongful Death Cases", Minnesota Trial Lawyers Association, May 2, 1991, Minneapolis MN (1 hour, CLE approved).
16. "Death Investigation", Scott County Law Enforcement, June 6, 1991 (2 hours, POST approved).
17. "Physiologic Effects of Firearms", Dakota County Law Enforcement, June 12, 1991, Rosemount MN (2 hours, POST approved).
18. "Fundamentals of Death Investigation", Minnesota Bureau of Criminal Apprehension, August 14, 1991, Grand Rapids MN (7 hours, POST approved).
19. "Selected Topics in Surgical Pathology", Regina Medical Center Medical and Professional Staff, September 4, 1991 (1 hour, MFP prescribed credit and AMA Category I credit approved).
20. "How to Exam Medical Experts", Minnesota State Bar Association, October 1, 1991 (8 hours, CLE approved).
21. "Implication of Laboratory Test Results for Nursing Personnel", South Suburban Medical Center Nursing Staff, October 29, 1991 (1.5 hours, Nursing CEU approved).

22. "Peripheral Morphology, Bilirubin Determinations and Acute Leukemia", Regina Medical Center Medical and Professional Staff, October 30, 1991 (1 hour, AAFP prescribed credit and AMA Category I credit approved).
23. "Selected Topics in Laboratory Medicine", Northfield City Hospital Medical and Professional Staff, November 19, 1991 (1 hour, AAFP prescribed credit approved).
24. "Infant Death Investigation", Minnesota Bureau of Criminal Apprehension, Advanced Child Abuse Investigations, November 20, 1991, Rochester MN (2.5 hours, POST approved).
25. "Death by Natural Causes", Minnesota Chiefs of Police Association, March 25, 1992 (1 hour, POST approved).
26. "Infant Death Investigation", Minnesota Chiefs of Police Association, March 25, 1992 (1 hour, POST approved).
27. "Infant Death Investigation", Minnesota Bureau of Criminal Apprehension, April 1, 1992, St. Paul MN (2.5 hours, POST approved).
28. "Cervical Cytology and the Bethesda Classification System", Regina Medical Center Medical and Professional Staff, May 27, 1992 (1 hour, AAFP prescribed credit and AMA Category I credit approved).
29. "Infant Death Investigation", Minnesota Bureau of Criminal Apprehension, October 8, 1992, Alexandria MN (2.5 hours, POST approved).
30. "Fundamentals of Death Investigation", Minnesota Bureau of Criminal Apprehension, October 14, 1992, New Ulm MN (2.5 hours, POST approved).
31. "The Laboratorian's Role in Forensic Medicine", Divine Redeemer Memorial Hospital, October 2, 1992 (1 hour, AMA Category I credit approved).
32. "Decision Analysis in Laboratory Medicine", Northfield City Hospital Medical and Professional Staff, December 15, 1992 (1 hour, AAFP prescribed credit approved).
33. "How to Examine Medical Experts", Minnesota State Bar Association, March II, 1993, Minneapolis MN (8 hours, CLE approved).
34. "Medical Investigation of Motor Vehicle Fatalities", Minnesota Chiefs of Police Association, March 24, 1993 (2 hours, POST approved).
35. "Infant Death Investigation", Minnesota Bureau of Criminal Apprehension, May 27, 1993, Fairmont MN (2.5 hours, POST approved).
36. "How to Examine Medical Experts", Minnesota State Bar Association, October 14, 1993, Minneapolis MN (8 hours, CLE approved).
37. Invitational Working Conference, Vulnerable Adult Act Issues, State of Minnesota, Office of the Attorney General, November 9, 1993.

38. "Time of Death Determinations", Northfield City Hospital, EMT/Paramedics, March 14, 1994 (1 hour, EMT/Paramedic CEU).
39. "How to Examine Medical Experts", Minnesota State Bar Association, March 24, 1994, Minneapolis, MN (8 hours, CLE approved).
40. "Selected Topics in Laboratory Medicine", Regina Medical Center Medical and Professional Staff, March 30, 1994 (1 hour, AAFP prescribed credit and AMA Category I credit approved).
41. "Decision Analysis in Laboratory Medicine and Pathology", Minnesota Society of Pathologists, April 29, 1994 (1 hour, AMA Category I credit approved).

SPECIAL INTERESTS:

Decision Analysis in Laboratory Medicine and Pathology

Continuing Education for the Medical and Legal Profession, Law Enforcement and the Community

Head injury in children