IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

JENNIFER DEL PRETE,	)	
	)	
Petitioner,	)	
	)	
vs.	)	**Case No. 10 C 5070**
	)	
SHERYL THOMPSON,	)	
	)	
Respondent.	)	

MEMORANDUM OPINION AND ORDER

MATTHEW F. KENNELLY, District Judge:

In 2005, an Illinois judge convicted Jennifer Del Prete of first degree murder and sentenced her to a prison term of twenty years. Del Prete has petitioned this Court for a writ of habeas corpus pursuant to 28 U.S.C. § 2254.

In her petition, Del Prete alleges that the evidence at trial was insufficient to sustain a conviction of first degree murder and that her trial counsel rendered unconstitutionally ineffective assistance. Her ineffective assistance claim has two distinct parts. Del Prete concedes that she procedurally defaulted one part of the claim, but she contends that the Court should excuse her default because new evidence demonstrates that she is actually innocent of the underlying charge. The Court previously ordered an evidentiary hearing regarding Del Prete's claim of actual innocence. *United States ex rel. Del Prete v. Hulett*, No. 10 C 5070, 2012 WL 774992 (N.D. Ill. Mar. 6, 2012).

For the reasons stated below, the Court finds that Del Prete has established by a preponderance of the evidence that based on all of the relevant evidence, no

reasonable jury would find her guilty beyond a reasonable doubt. This permits the Court to consider the merits of her defaulted ineffective assistance claim.

Background

On December 27, 2002, Del Prete, a mother of two children and a longtime daycare worker, was working alone at a daycare facility in Romeoville when three-month-old I.Z. became unresponsive while in her care. Del Prete called 911 and performed CPR on the infant. When the ambulance arrived at the daycare, the paramedics found that I.Z. was not breathing and did not have a pulse. The paramedics continued CPR and eventually restored her heartbeat. They took I.Z. to Provena St. Joseph Medical Center in Elgin, where she arrived unconscious. As discussed more fully below, a CT scan performed later that day documented abnormalities in I.Z.'s brain. Despite prolonged treatment at three different hospitals, I.Z. never fully recovered. She died a little over ten months later, on November 9, 2003. Del Prete was charged with first degree murder.

A. State court proceedings

1. Del Prete's trial

At Del Prete's trial, I.Z.'s mother testified that she started taking I.Z. and her other son to the daycare center where Del Prete worked on December 6, 2002. She stated that I.Z. had been taking Amoxicillin, an antibiotic, since December 18 for an infection, and that December 27 (the day of I.Z.'s collapse) was the last day of the prescription. She also testified that I.Z. had been hospitalized in late October for a fever and was on an antibiotic at that time via an intravenous feed. She further testified that she had gas drops for I.Z. and told both Del Prete and Gleanne Kehr, the owner of the daycare, to

give I.Z. the drops if she "seemed like she was fussy." Ex. Q at 260. She stated that she had never noticed any problems in feeding I.Z. and had only given her gas drops once. She also testified that neither she nor her husband ever disciplined any of their children physically.

I.Z.'s mother said she had dropped off I.Z. at the daycare around 7:15 a.m. on December 27. She called the center late that morning, and Del Prete told her that I.Z. had just had a bottle and was asleep and that everything was okay.

Gleanne Kehr, the owner of the daycare, testified that she hired Del Prete in early October 2002, based on her observations that Del Prete was an active parent with her own children and was creative with the children in the school that both Del Prete's and Kehr's daughter attended. Specifically, Kehr stated that Del Prete always seemed patient with her younger son, who at the time was "in the midst of his terrible two's . . . ." Ex. Q at 274. Kehr was out of town on December 27, leaving Del Prete alone at the daycare. She testified that she had no concerns about leaving her alone with the children.

a. The prosecution's investigative witnesses

Don Casagrande, a Lockport Fire Department paramedic who responded to the 911 call, testified based on his report that he and his partner received a call from the dispatcher at 1:38 p.m. advising them of the 911 call and that they arrived at the daycare approximately six minutes later. When they arrived, Del Prete was performing CPR on I.Z., who was lying on the floor near the couch. He did not see any signs of trauma to the baby. According to Casagrande, I.Z. was blue and had no pulse or heart rate, and he took I.Z. to the ambulance while continuing to perform CPR. His partner

intubated I.Z. and administered epinephrine, which restored her heartbeat. They took I.Z. to Provena Hospital.

Officer Michael Michienzi testified that he was dispatched to or arrived at the daycare at approximately 2:17 p.m. to assist the Lockport Fire Department in response to Del Prete's 911 call. Michienzi stated that when he entered the home, he saw Del Prete crying and talking to Lockport Fire Department personnel. There were five other children there whom Del Prete was also caring for. Michienzi interviewed Del Prete about I.Z.'s collapse, and Del Prete told him I.Z. had had diarrhea that soaked through her diaper and into her clothes. She reported that she changed I.Z.'s diaper and clothes. After this, I.Z. appeared to be sleeping. Del Prete picked her up and "the baby made a snort sound," and her head fell backwards. Ex. Q, partial Feb. 23, 2005 trial tr. at 28. Del Prete said she tried to give I.Z. a bottle, but she did not suck on the nipple or swallow the milk. Del Prete reported that she then called 911. According to Michienzi, Del Prete reported performing four sets of CPR before the paramedics arrived at the daycare. Del Prete also told him the baby had been on Amoxicillin for nine days for an infection. She said she had contacted I.Z.'s father after calling 911.

Officer Kelley Henson testified that she and Detective Scott McLaughlin also spoke to Del Prete on December 27 at the daycare about I.Z.'s collapse. There were a number of other children there, and those whom Henson saw appeared to be fine. Del Prete said that she prepared a bottle for I.Z. between 1 and 1:30 p.m. When she took I.Z. out of her swing to feed her, Del Prete noticed that the baby had soiled her clothing through her diaper. She changed I.Z. on the couch and propped her up on the couch for a moment while she stepped five feet away to retrieve I.Z.'s diaper bag. (Henson

saw the diaper bag in that spot.) She explained to Henson that she had to get a burp cloth for I.Z. because the baby spit up a lot or had a reflux problem.

Henson testified that Del Prete told her that I.Z. remained exactly where she had left her on the couch, but that when she picked the baby up, she seemed limp. Del Prete cradled I.Z. in her arm to feed her the bottle, telling Henson that I.Z. had taken a bottle while sleeping in the past. Henson stated that she "didn't find that strange, because being a mother, sometimes babies drink when they're sleeping." *Id.* at 46. Del Prete told Henson that when the milk trickled out of I.Z.'s mouth, she wiped I.Z.'s mouth, picked her up underneath her armpits, and held her out, shaking her slightly and saying her name. Henson testified that Del Prete demonstrated for her the slight shaking motion, and she testified she did not see anything inappropriate about what Del Prete said she had done. Del Prete told Henson that she then realized something was wrong, and she checked I.Z.'s mouth for a foreign object and put her fingers on I.Z.'s chest to check her heartbeat. Del Prete reported that she felt I.Z.'s heart still beating, but she told Henson that she was panicked and so called 911. Del Prete said that she followed the 911 operator's instructions regarding CPR, but she did not think it was working. Del Prete told Henson that she completed two rounds of about CPR before the paramedics arrived. Henson retrieved the soiled diaper from the garbage and put it into a plastic bag to preserve it.

Henson stated that when Del Prete told her about finding I.Z. unresponsive, she became more upset and started to cry. She told Henson that she had only left I.Z. alone in the swing once earlier in the day, when she went up the stairs to print a schedule sheet for the other children. Henson testified that Del Prete told her I.Z. was

"pretty much normal all day," *id.* at 50, although she described I.Z. as generally crabby. She also said that I.Z. tended not to be as active as the other infant in the daycare at the time. *Id.* at 50.

Romeoville police detective Scott McLaughlin also testified about the conversation that he heard Henson having with Del Prete at the daycare on December 27. He testified that Del Prete told the police that Isabella was on Amoxicillin but did not report that she had given I.Z. her medication prior to her collapse that day. She said that around 1 p.m., I.Z. was sleeping in her swing, and the other children at the daycare were eating lunch. After they finished, she prepared a bottle for Isabella and then changed her diaper because it was soiled. Isabella was "somewhat fussy" while Del Prete was preparing the bottle. *Id.* at 80. According to McLaughlin, Del Prete said that when or after she changed I.Z., the baby gave an irritated cry and shake, which she said I.Z. did from time to time, and I.Z.'s lip was quivering. McLaughlin stated that Del Prete reported that when she walked across the room to retrieve the diaper bag, I.Z. made a "congested . . . snorting type of sound." *Id.* at 81. She picked up I.Z., who seemed limp, which was not normal for her. She then attempted to feed I.Z. with the bottle, thinking I.Z. might be sleeping and recalling that I.Z. had previously sucked on a bottle while sleeping.

Romeoville detective Kenneth Kroll testified that he first interviewed Del Prete on December 29, when Del Prete voluntarily came to the police station to discuss the incident. Detective McLaughlin was also present. Kroll testified that he asked Del Prete how I.Z. acted at daycare. Del Prete described I.Z. as a "gassy baby," Ex. Q at 292, and fussy eater who cried more than other babies. She also reported that I.Z. would

sometimes clench her fists and shake while she was eating, and Del Prete speculated that this may be due to a problem with acid reflux. She indicated that I.Z.'s mother had provided the daycare center with "gas drops," a medication to control this.

Kroll said that Del Prete told them that I.Z.'s mother brought her to the daycare around 7 a.m. that day. She gave I.Z. a bottle between 8 and 9 a.m. and noticed I.Z.'s fists were clenched during the feeding. Del Prete put I.Z. in her swing, where she slept from approximately 9:30 a.m. until Del Prete changed her diaper in the afternoon. Kroll initially testified that Del Prete told him she changed I.Z. at approximately 12:30 p.m., but he admitted on cross examination that she may have reported feeding the other children before she attended to I.Z. and thus changed I.Z. later than 12:30 p.m.

Kroll testified that Del Prete told him that she took I.Z. out of a swing and briefly placed I.Z. on the couch while she briefly went into the kitchen. According to Kroll, Del Prete said that when she came back, I.Z.'s eyes were half open and she was making a "snoring, labored breathing sound" and was limp. *Id.* at 295. At first she felt I.Z. had fallen asleep. She tried giving a bottle to I.Z., but she was not responsive, and the liquid dribbled out the side of her mouth. Kroll stated that Del Prete reported picking I.Z. up under her arms and gave her a "very slight shake" while speaking her name. *Id.* at 296. When that did not work, Del Prete told Kroll that she turned I.Z. over onto her stomach and gave her three to five pats on the back to dislodge anything that may have been choking her. After further questioning, Del Prete told Kroll that I.Z.'s head flopped more violently when Del Prete turned her onto her stomach than it had when Del Prete had briefly shaken her. She again tried to feed I.Z., who would sometimes such a bottle while asleep, but the contents of the bottle ran out of her mouth. Del Prete became

panicked and then called 911.

Kroll testified that he took a short break at some point in the interview. When he returned, he employed a confrontational interviewing technique, telling Del Prete that he believed that she was involved in I.Z.'s collapse. Kroll stated that Del Prete became upset and began to cry. She repeated that she couldn't remember "exactly how things took place" because of the increasing panic she had experienced as I.Z. remained unresponsive. Kroll testified that Del Prete told him that she "could have shaken [I.Z.] a little harder than she thought." *Id.* at 303. Kroll said that he brought up the concept of shaken baby syndrome and told Del Prete that her statements were not consistent with what the police had learned from doctors. Kroll stated that Del Prete said, "[E]ven if I was panicked, aren't I responsible? Am I going to go to jail?" *Id.* at 339; *see also id. at 304*. According to Kroll, however, Del Prete never indicated that she had tried to hurt I.Z. She maintained throughout the interview that she had not handled I.Z. roughly.

On cross examination, Kroll admitted that Del Prete told him that although she was panicked, she was not rough with I.Z. He stated that when Del Prete admitted she may have shaken I.Z. harder than she thought, she was referring to her attempts to arouse I.Z. after she had collapsed, and she did not say she had shaken I.Z. at any point before she lost consciousness. He testified that he did not consider any of Del Prete's statements to the police to be inconsistent with one another. Finally, Kroll testified that he interviewed some of the children at the daycare, none of whom saw anything unusual in the way that Del Prete interacted with I.Z. Kroll could not recall whether he shared that information with Del Prete during her interview.

b. The prosecution's medical evidence

Dr. Adrian Nica, an emergency room intensive care physician with training in pediatrics, testified that I.Z. was unconscious when she arrived at St. Joseph Hospital on December 27. After stabilizing I.Z., he transferred her to intensive care and put her on a ventilator to permit her to breathe. Nica testified that he ordered blood and urine cultures, a chest x-ray, a spinal tap to test for meningitis, and a CT scan of the brain. He put I.Z. on an antibiotic because she had previously been prescribed an antibiotic by her pediatrician.

Nica testified that I.Z. had a significantly elevated white blood cell count. Specifically, he estimated that I.Z. had a count of 38,000, which was well above the normal level of 20,000–22,000. Nica stated that this could be the result of an infection or stress, such as trauma. He stated that I.Z.'s blood sugar levels were also well above normal, which he testified could be the result of diabetes or significant stress of any type. Nica testified that I.Z.'s spinal tap was very bloody, which was abnormal. He stated that this could have been the result of damage to blood vessels in the process of conducting the test or some other cause, such as a bleed in the brain.

Nica stated that the neurologist at St. Joseph Hospital reported to him that I.Z.'s CT scan showed that she had an "apparent" fracture on the right temporal area of the skull, *see id.* at 366, and both acute (relatively newer) and chronic (relatively older) changes in the brain, which resulted from bleeds in different levels of I.Z.'s brain. *Id.* at 355. He stated that "[p]robably the baby was having some bleeding episode[s] before." *Id.* Nica testified that when confronted with these types of injuries, "if [s]he is not involved in a car accident or so, you have to assume that it was a child abuse or baby

shaking." *Id.* at 355–56. Nica testified that I.Z. needed neurological attention, which he was not equipped to give, so he directed her transfer to the University of Illinois Chicago (UIC) Hospital. He testified that before transferring I.Z., he noted that her pH level—the level of acid in her blood—was improving and becoming less acidic, but she did not regain consciousness or improve neurologically before the transfer. Nica also testified that he ordered an EEG, the result of which returned after I.Z. had already left St. Joseph Hospital. The results of the EEG showed a significant abnormality, which was "significant . . . in this case for bleedings." *Id.* at 361–62.

On cross examination, Nica testified that he did not personally read the CT scan but instead relied on the radiologist's interpretation of the imaging. He agreed that the report said only that there was an "apparent" fracture and that there was no other independent confirmation of an actual fracture. *Id.* at 366. Nica stated that he saw no external signs of injury anywhere on I.Z. Regarding the chronic collections of blood in I.Z.'s brain, Nica said that was a preexisting condition. When asked if there was "a time frame that would constitute chronic," he initially said, "No, I don't think so," and then said it would be "probably days or week [sic] probably before the acute episode if you will." *Id.* at 367. On redirect, Nica said, "[f]or how long they were there, one week, 10 days, I cannot [say]. It's a speculation." *Id.* at 372. He stated that he could not identify a specific time frame that the chronic collection had been there, only that it was more than one day earlier.

Dr. Howard Hast, a pediatric critical care physician, testified as both an expert in that field and as a treating physician. He admitted, that he was not an expert in child abuse cases. He treated I.Z. from December 30, 2002, shortly after she was

transferred to UIC Hospital, through January 16, 2003. I.Z. was on a ventilator when Hast first examined her. He noted that her anterior fontanelle—the soft spot on the top of an infant's head—was slightly full, which Hast opined was indicative of a mild increase in I.Z.'s intracranial pressure. Hast testified that I.Z. withdrew from most stimuli and moved her extremities and reacted to deep painful stimuli by partially opening her eyes. Hast put her on a ventilator to support her breathing and prescribed her an anticonvulsant.

Hast testified that he was present during I.Z.'s retinal examination on December 31. Hast stated that according to I.Z.'s medical records, the ophthalmologist who conducted the exam found a lot of blood within I.Z.'s retinas and vitreous, the clear gel-like substance that fills the eyeball. The retina is a light-sensitive layer of tissue that lines the inner surface of the eye from the ora serrata near the lens of the eye around the back of the eye and up to the ora serrata on the other side of the eye.

Hast opined that he believed that I.Z. had suffered seizures. Specifically, he testified that someone at St. Joseph Hospital had observed "something . . . that was thought to be a seizure" and that I.Z. had had some "focus observed movements that were thought to be seizures" while at UIC Medical Center. *Id.* at 437. Hast testified that he and pediatric neurologist at the hospital "always suspected that she had seizures" based on "a lot of abnormal movements" that they observed. *Id.* at 446. He stated that they were never able to document any of her seizures on an EEG, but they were never able to order a prolonged EEG before I.Z. was transferred to Children's Memorial Hospital. Hast stated that the family did not report a family history of seizures or epilepsy. On cross examination, however, Hast testified that it is possible for an infant

to have a seizure without it being recognizable to an adult. He also said that incontinence is a possible indicator of a seizure.

Hast testified that he ordered a number of x-rays and CT scans for I.Z. while she was at UIC Medical Center. None of the x-rays showed signs of a skull fracture or any other fracture. Hast stated that based on his review of the CT scans, he concluded that I.Z. had bifrontal subdural hematomas. Hast explained that a subdural hematoma is a collection of blood in the space immediately underneath the dura mater, a tough membrane that surrounds the brain and spinal cord and separates them from the skull. Hast testified that I.Z. had subdural hematomas on both sides of her brain near or in the frontal lobe. He stated that he performed multiple neurological examinations of I.Z. and ordered the blood work and chemistries that are done routinely for critically ill patients. According to Hast, he found "no bleeding tendency" or metabolic disease to explain the subdural hematomas. Hast opined that the most likely cause of I.Z.'s subdural hematomas was shaking or "some other acceleration-deceleration injury" (e.g., being dropped or thrown). *Id.* at 448.

Hast testified that on January 10, 2003, I.Z. underwent surgery to drain her subdural hematomas because they were increasing in size. Hast stated that after her surgery, I.Z.'s neurological status improved, and she gradually became more alert. I.Z. had poor control over her throat, however, and Hast testified that she was unable to swallow effectively. Hast recommend a tracheostomy to prevent any secretions from I.Z.'s mouth from blocking her airway. He also ordered a feeding tube for I.Z.

Hast testified that I.Z. had suffered from an apparent life threatening event (ALTE), which describes an infant that stops breathing, experiences a change in muscle

tone (becoming either stiff or floppy), and changes in skin color. In this situation, he said, it is common for a frightened caregiver to attempt to revive the infant through CPR. Hast said that he did not know the cause of the ALTE in I.Z.'s case. On cross examination, Hast admitted that in approximately forty percent of ALTE cases, doctors are unable to come up with a diagnosis to explain the ALTE. He stated that the report regarding I.Z.'s condition when paramedic arrived at the daycare center was consistent with an ALTE. He testified that he would not be able to determine medically whether a baby was shaken before or after an ALTE occurred. Finally, Hast stated that reflux can lead to an ALTE. He stated that he did not test I.Z. for reflux but that there was no report of a family history of reflux.

Dr. Jeff Harkey, a forensic pathologist, testified as an expert in the field of forensic pathology. He stated that he performed an autopsy on I.Z. at the DuPage County Coroner's Office on November 10, 2003, the day after I.Z. died. Before conducting the autopsy, he reviewed medical records from UIC Hospital and a report from Dr. Emalee Flaherty that stated I.Z. had originally been injured in December 2002. He noted several devices to help sustain I.Z.'s life, including a tracheostomy tube to help I.Z. breathe, an intravenous line, and a feeding tube to give her nutrition. Harkey testified that at the time of her death, I.Z.'s head was 17½ inches in circumference. He observed scars on her brain that were indicative of a surgery that I.Z. had received in January 2003 to relieve pressure on her brain from a subdural hematoma—a collection of blood in the space immediately underneath the dural membrane that surrounds the brain. Harkey said that "the entire examination of the brain was less than optimal," *id.* at 384, because the brain was very soft. He attributed this to encephalomalacia—

localized softening of the brain—caused by a prior injury, as well as the fact that I.Z. had spent the twenty-four hours immediately before her death on a respirator, during which time the brain breaks down through a process known as autolysis.

Harkey testified that he observed I.Z.'s brain to be symmetrical and did not see any evidence of bleeding on the outside of the brain. Harkey stated that he believed that her brain weighed approximately 930 grams, which Harkey opined was less than average for a child of I.Z.'s age. Harkey admitted that his opinion was not based on researching the average size of a child's brain, but instead merely based on his "feeling that the skull circumference was less than average and the brain was less than average in weight." *Id.* at 387. Harkey testified that he could not determine I.Z.'s level of neurologic function. After weighing I.Z.'s brain, Harkey placed it into formalin, a substance that preserves the brain tissue. Harkey stated that he did not conduct a microscopic examination of I.Z.'s brain after placing it in the formalin.

Harkey testified that he did not examine I.Z.'s eyes microscopically because there was no indication of a recurrence of trauma, and over time, the retinal hemorrhages that ophthalmologists found in I.Z.'s eyes in January 2003 likely would have healed by the time of her death. Harkey stated that he observed autolysis occurring in I.Z.'s other organs and that his microscopic observations were consistent with multiple system organ failure as a result of a lack of oxygen (hypoxia), a lack of blood flow (ischemia), or some combination of the two (hypoxia-ischemia).

Harkey concluded that the cause of I.Z.'s death was multiple system organ failure resulting from "anoxic-ischemic injuries" that were caused by abusive head trauma. *Id.* at 398. Harkey testified, however, that his conclusion that abusive head trauma caused

the hypoxia-ischemia was based entirely upon I.Z.'s medical records for the preceding eleven months prior to her death (i.e., from her hospitalization in December 2002 through the time of her death). On cross examination, Harkey stated that his conclusion regarding abusive head trauma was based on the findings in Dr. Flaherty's report. He also said he observed no signs of recent or old trauma.

Finally, Dr. Emalee Flaherty, a pediatrician at Children's Memorial Hospital, testified as an expert in the field of pediatrics and child abuse. Flaherty testified that she read all of the EMS and paramedic reports, as well as the police reports. She reviewed all of I.Z.'s medical records from UIC Medical Center, discussed I.Z.'s case with Dr. Hast, and looked at the imaging studies done for I.Z. She also interviewed I.Z.'s parents and examined I.Z. personally once she was transferred to Children's Memorial Hospital on January 30, 2003.

Flaherty opined that based on her review, I.Z. had suffered abusive head trauma, or "shaken baby syndrome," immediately prior to her collapse on December 27. *Id.* at 477. She testified that Del Prete was the only person who could have caused I.Z.'s injuries.

Flaherty described the theory behind abusive head trauma. Specifically, she testified that when an adult shakes an infant, the brain's motion relative to the skull causes the infant's bridging veins to stretch, rupture, and bleed, causing hemorrhage to leak into the subdural or subarachnoid space. Bridging veins are the veins that drain blood from the brain into the superior sagittal sinus, a large vein that runs within the dura directly between the two hemispheres of the brain from front to back.

Flaherty testified that because young infants have weak neck muscles and

proportionally large heads, they have little resistance to being shaken and are therefore at a greater risk than older children. She stated that the forces that adults inflict on infants when adults shake them violently are referred to as acceleration-deceleration forces.

Flaherty stated that the acceleration-deceleration forces that cause an infant's bridging veins to rupture similarly cause hemorrhages within the optic nerve—the fibers connecting the eye to the brain—and the retina. Flaherty testified that "when you see hemorrhages to the ora serrata as in [I.Z.'s] case, those kinds of extensive hemorrhages are only caused by these acceleration/deceleration forces or seen in shaken baby syndrome." *Id.* at 485-86; *see also id.* at 490. Flaherty testified that I.Z. also had vitreous hemorrhages in both eyes.

Flaherty testified that I.Z. had evidence of both subdural and subarachnoid hematomas. She opined that "extensive subdural hematomas like [I.Z.] had over extensive areas of the head, those are only caused by acceleration and deceleration forces." *Id.* at 487. Flaherty did not identify the reports or images from which she concluded that I.Z. had extensive subdural hematomas. She opined, however, that the force required to produce such extensive hematomas would necessarily be so severe that the abuser "would know that [the] child would suffer severe injury." *Id.*

Finally, Flaherty testified that I.Z. had sustained injuries to her axons—nerve fibers transmitting information between nerve cells that comprise the white matter in the brain. Flaherty testified that the axonal injury resulted in the localized softening of the brain known as encephalomalacia. Flaherty opined that the encephalomalacia in I.Z.'s brain was severe and affected critical areas for I.Z.'s functioning.

Flaherty testified that performing CPR on an infant could not cause injuries like those present in I.Z. She agreed that I.Z. could have had seizures without a layperson realizing it but that neither a seizure nor a "simple fall," *id.* at 492, could have caused I.Z.'s injuries. Flaherty stated that I.Z.'s injuries could only have come from being physically abused and that her loss of consciousness "would be immediate" after the abuse occurred. *Id.* at 491. Specifically, Flaherty testified that because Del Prete reported that I.Z. awoke and was "smiling and crabby" at 1 p.m., *id.* at 490, I.Z. had not yet suffered severe brain injury at that point.

On cross examination, Flaherty stated that if CPR causes retinal hemorrhages, this is rare and would produce only a few hemorrhages near the back of the retina (on redirect, she stated that I.Z.'s retinal hemorrhages were not confined to that area). She said, however, that she was unaware of any study documenting retinal hemorrhages caused by CPR. Flaherty agreed that I.Z. had no external signs of abuse but stated that external signs are "not part of the definition" of shaken baby syndrome, *id.* at 498, and she stated that external bruising is "pretty uncommon" in the case of a shaken baby, though she said the reasons for this are not clear. *Id.* at 504. Finally, Flaherty admitted that although she testified during direct examination that I.Z. had subarachnoid hemorrhages, her report made no mention of subarachnoid hemorrhage.

c. Del Prete's defense evidence

After the prosecution rested, Del Prete called a number of witnesses to testify about her reputation as an honest, law-abiding, dependable, well-respected, and peaceful person. These witnesses included parents who had children in activities with Del Prete's children and whose children Del Prete had babysat in daycare or otherwise;

a pastor who hired her as a supervising nursery attendant for services and events at his church; and persons who had worked with Del Prete at the children's room of the local public library.

Del Prete also re-called Gleanne Kehr, the daycare center operator. Kehr testified that she hired Del Prete because she was honest, trustworthy, caring, and good with children. She said that she had never observed Del Prete as anything other than "calm and patient" with children at the daycare. *Id.* at 586.

Kehr further stated that when I.Z. took a bottle, she "tended to tense up and to arch her back." *Id.* at 562. Kehr testified that I.Z. seemed very uncomfortable during and after eating and had to be burped more frequently than most babies. Kehr testified that she had spoken with I.Z.'s mother about the possibility that I.Z. had excess gas, although she conceded that she did not know whether I.Z. was ever diagnosed with a problem relating to gassiness. Kehr also testified that in early December, she observed at the daycare center an incident during which I.Z.'s father physically disciplined her brother (also a daycare resident) when he was uncooperative in putting his shoes on, grabbing him by the foot and dragging him to where the shoes were kept.

Karli Hinton, who worked at the daycare center with Del Prete and Kehr, testified that I.Z. was colicky and cried frequently. She recalled being given "gas drops" for the colic to add to I.Z.'s bottle to help relieve her gas. Hinton described I.Z. as "phlegmy" and said that she frequently had a runny nose and a cough. *Id.* at 603. Steve Blake, whose son also attended the daycare in the fall of 2002, testified that I.Z. "didn't seem well." *Id.* at 616. He stated that I.Z. was frequently crying during the short periods of time that he spent at the daycare.

Christine Murphy, a pediatric intensive care nurse and the mother of three children who attended the daycare, testified that Del Prete called her on December 27 after I.Z. collapsed to ask her husband to pick up their children. She also testified that she knew I.Z.'s family and had seen both parents physically discipline I.Z.'s older brother, R.Z. Ms. Murphy stated that her family and I.Z.'s family had visited a local pumpkin patch together in October 2001, before I.Z. was born. The families were getting onto a small train but R.Z. hesitated and the other people in line took R.Z.'s seat. According to Ms. Murphy, R.Z.'s father got angry, began yelling at R.Z., and dragged him away from the area by his arm. Ms. Murphy testified that she had seen R.Z.'s father physically discipline him on at least ten prior occasions, although she could not specify dates. Ms. Murphy stated that R.Z.'s father would typically grab R.Z.'s arm or would grab the young boy and "toss him onto the couch." *Id.* at 672.

Brennan Murphy, Christine Murphy's husband, also testified that he saw R.Z.'s father discipline him physically when R.Z. was approximately four years old by grabbing him by the arm, pulling him close to his face, and yelling at him. Murphy also testified that he saw R.Z.'s father spank R.Z. at least four separate times. Murphy admitted, however, that he never saw either of the parents physically discipline I.Z.

Finally, Del Prete called Dr. Wayne Tucker, a physician and medical officer for the Department of Defense Military Entrance Processing Station, to testify. Trial counsel sought to qualify Tucker as an expert in the fields of pathology and pediatrics. The prosecution objected to his testimony as an expert witness, arguing that he was not a board-certified pediatrician and had not practiced in the field of pediatrics since 1991 or testified as an expert since 1994. The prosecution further argued that Tucker had

only one publication in the field of pathology and had never published in the field of pediatrics. Finally, the prosecution argued that Tucker admitted that although he had "glanced through some shaken baby articles," he had not attended any conferences or published in the field of shaken baby syndrome. *Id.* at 723.

Defense counsel argued in response that Tucker had over forty years of medical experience and had performed approximately 7,000 autopsies. Counsel argued that Tucker had previously been qualified as an expert in three shaken baby syndrome cases and although he had not been involved in pediatric family practice since 1983, he had provided pediatric services for a long time before that. Finally, counsel argued that "[t]here is nothing that's changed about the make-up of a child" since 1983. *Id.* at 726. The trial court overruled the prosecution's objection and found that Tucker was qualified to testify as an expert in the fields of pathology and pediatrics.

Tucker testified that he reviewed all of I.Z.'s medical records and police reports of her collapse. He opined that based on his review of the records, I.Z. sustained her injuries between eighteen and twenty-four hours before she collapsed. Specifically, he stated that I.Z.'s medical records did not support the theory that her injuries had been sustained just hours earlier because "there was a chronicity to the situation of the frontal hematomas, subdural." *Id.* at 735–36. He explained that a subdural hematoma in a chronic phase "means it's been there up to 10 days . . . 7 to 10 days." *Id.* at 740. In other words, I.Z. had chronic hematomas as well as acute hematomas. Tucker concluded that I.Z.'s injuries could not have been the result of shaken baby syndrome and that he held this opinion within a reasonable degree of medical and scientific certainty.

Tucker stated that he would have considered a seizure as one possible cause of I.Z.'s injuries. He testified that it would be possible for I.Z. to suffer a seizure without twitching or displaying any other external signs of seizure. The fact that I.Z. was on medication for an infection was also significant because she may have had "an allergic toxicity to the drug." *Id.* at 737. He explained that I.Z.'s records reflected that she had been prescribed 250 milligrams of Amoxicillin (an antibiotic), which is an adult dosage, and if I.Z. was allergic to the medication, the toxicity could have caused her to have a seizure. He further opined that I.Z.'s gas drops, which I.Z. had been taking with her bottles to help her feed, could have aggravated a reflux problem, which can lead to an ALTE.

According to Tucker, the fact that I.Z. took a bottle on the morning of December 27 did not rule out the possibility that she sustained her injuries before taking the bottle, because an infant's sucking reflex can override cerebral or physical damage the child may have already incurred. Regarding Dr. Flaherty's testimony about I.Z.'s hematomas, Tucker testified that he had not seen any documentation of subarachnoid hemorrhages in I.Z.'s medical records. He also stated that a variety of benign conditions could cause a chronic subdural hemorrhage to rebleed in an infant, including coughing, sneezing, or gas reflux problems. Finally, Tucker testified that every victim of shaken baby syndrome he had seen had external bruises from the shaking, which I.Z.'s records showed she did not have.

Regarding I.Z.'s retinal hemorrhages, Tucker testified that several conditions can cause retinal hemorrhages in infants, and he stated that it was "not uncommon to have that in any infant under the age of six months." *Id.* at 742. He stated that based upon

his review of the medical records, he could not determine whether I.Z.'s retinal hemorrhages extended as far as the ora serrata, but that events like CPR and seizures may cause retinal hemorrhages that extend to the ora serrata.

On cross examination, Tucker testified that he relied upon the police reports in determining that I.Z. had been prescribed 250 milligrams of Amoxicillin. He said that I.Z.'s medical records did not indicate what dosage she was taking or what time she had last taken the antibiotic. He was, however, shown medical records that, based on the trial transcript, appear to reflect a lesser dosage on December 27. *See id.* at 758-59. Regarding his previous expert testimony regarding shaken baby syndrome, Tucker testified that the three other infants involved all had external bruising. At the time those children suffered their injuries (during the 1980s), the medical technology available was not sophisticated enough to detect subdural hematomas or retinal hemorrhages. Tucker stated that he had seen retinal hemorrhages in children that resulted from sneezing, but that he had never treated those retinal hemorrhages, and he admitted that it had been several years since he had treated any children. Tucker also admitted that the I.Z.'s blood tests were normal, that no other tests found that I.Z. had a toxic level of antibiotics, and that I.Z. was never diagnosed with an organic or metabolic bleeding disorder at any point during her life.

Tucker agreed that when I.Z. arrived at the daycare center on the morning of December 27, she did not have any known structural defect of her brain or neurological system. He testified, however, that she was not evaluated neurologically because the doctors concluded that resuscitation was the priority. Tucker admitted that he could not state within a reasonable degree of scientific or medical certainty that a seizure caused

I.Z.'s injuries.[1]

On redirect examination, Tucker testified that I.Z.'s bilateral frontal subdural hematomas could have been the result of her falling and hitting the back of her head, as a "contrecoup" would occur after the brain initially hits the back of the head and then rebounds to the front of the skull. He testified that if I.Z. experienced a fall of this type before she arrived at the daycare on the morning of December 27, her symptoms may nevertheless not have appeared until the afternoon.

d. The verdict

On March 4, 2005, the trial court found Del Prete guilty of first degree murder. When it announced the verdict, the court did not explain the basis upon which it found Del Prete guilty. The court did, however, comment on its guilty finding at a later date, when it denied Del Prete's motion for a judgment of acquittal notwithstanding the verdict. The court expressed some disbelief at many of Del Prete's statements to the police following I.Z.'s collapse, including her statement that she put I.Z. on the couch after finding that I.Z. had had diarrhea that soaked through her clothes and her statement that she tried to feed I.Z. a bottle after finding the infant limp and unresponsive. The court stated that the prosecution presented evidence that showed beyond a reasonable doubt that I.Z.'s severe injuries were the direct result of Del Prete shaking the infant. The court also noted that the injuries documented were serious and that "[h]er injuries to her eyes, the testimony before me was that only resulted from severe shaken baby cases." *Id.* at 978. The court did not give additional findings of

[1] The transcript reflects that when asked if I.Z. had a seizure on December 27, Tucker responded, "[w]e don't have records of that, but the clinical edition is highly susceptible." *Id.* at 778. It is difficult to say whether this is an accurate transcription of his testimony or a misprint.

fact. On November 30, 2005, following a four-day sentencing hearing, the court sentenced Del Prete to a prison term of twenty years.

2. Appeal and post-conviction proceedings

Del Prete appealed her conviction, arguing that there was insufficient evidence to find her guilty beyond a reasonable doubt. The Illinois Appellate Court denied her appeal and a subsequent petition for rehearing, and the Illinois Supreme Court denied her petition for leave to appeal. Del Prete filed a petition for post-conviction relief in March 2008, arguing ineffective assistance of trial counsel based on counsel's failure to investigate or call expert witnesses to challenge the prosecution's expert testimony and his failure to disclose that he had previously been suspended from the practice of law because of unethical behavior as a prosecutor in Will County. The Will County Circuit Court dismissed her petition upon initial review. The Illinois Appellate Court subsequently denied Del Prete's appeal and petition for rehearing, and on November 25, 2009, the Illinois Supreme Court denied her petition for leave to appeal.

B. Del Prete's habeas corpus petition

Del Prete timely filed a habeas corpus petition in this Court on August 12, 2010. In her petition, Del Prete asserts two claims. First, she contends that the evidence at trial was insufficient to sustain a conviction of first degree murder. Second, she argues that trial counsel was unconstitutionally ineffective for failing to challenge the admission of expert testimony on the theory of shaken baby syndrome and failing to present appropriate expert testimony to dispute the prosecution's theory of shaken baby syndrome.

The parties agree that Del Prete procedurally defaulted the former part of the

ineffective assistance of counsel claim by not raising it in state court. She contends, however, that the Court should excuse the default and consider the merits of her claim under the "fundamental miscarriage of justice" exception. Specifically, Del Prete contends that new evidence shows she is innocent of the crime for which she was convicted.

The Court concluded that Del Prete had presented a plausible claim of innocence and ordered an evidentiary hearing. *See U.S. ex rel. Del Prete v. Hulett*, No. 10 C 5070, 2012 WL 774992 (N.D. Ill. Mar. 6, 2012). The Court conducted the evidentiary hearing on December 17–21, 2012 and January 14–16, 2013, hearing testimony by numerous expert witnesses presented by Del Prete and respondent. In April 2013, Del Prete requested the Court to reopen the evidentiary hearing, based upon her recent discovery of a memorandum written by Detective Kroll regarding Dr. Harkey and his autopsy of I.Z. The Court granted Del Prete's motion and allowed the parties to present testimony regarding that issue on June 21, 2013. The Court then again took the matter under advisement.

C. Evidentiary hearing testimony

The witnesses at the nine-day evidentiary hearing before the Court were called somewhat out of order due to availability issues. In the following discussion, the Court has reorganized the sequence of the witnesses so that corresponding experts for each side are discussed one after the other. The Court summarizes their testimony as following, noting that it does not intend this to be a complete recitation of the testimony.

1. Dr. Patrick Barnes (neuropathologist testifying for petitioner)

Del Prete called Dr. Patrick Barnes to testify about the radiological findings in

I.Z.'s case. Dr. Barnes currently serves as chief of pediatric neuroradiology and co-medical director of the MRI and CT Center at the Lucile Packard Children's Hospital. He is also a professor of radiology at Stanford University Medical Center. Dr. Barnes testified that he co-founded a northern California child abuse task force, referred to as the Suspect Child Abuse and Neglect (SCAN) team, a multidisciplinary team that reviews cases of suspected child abuse and neglect.

In addition to testifying at the evidentiary hearing, Barnes also submitted two reports. The first report, dated June 29, 2012, discussed his assessment of I.Z.'s imaging studies and offered a differential diagnosis—a list of possible causes for abnormal findings in a patient's imaging studies—regarding what caused I.Z.'s neurological problems. Barnes explained that radiologists offer differential diagnoses to pediatricians and other doctors as part of the normal course of their work. Barnes testified that although he later reviewed I.Z.'s medical records and the reports from respondent's experts, his initial interpretation of the imaging was done "totally blindly," that is, without reference to any other expert's report or I.Z..'s medical records. He stated that "this is what a radiologist is supposed to do is not be biased by what the doctors say, what even the medical records say. We're supposed to let the imaging speak for itself . . . ." Hrg. Tr. at 78.

Barnes submitted a supplemental report on December 13, 2012. This included a discussion of the opinions of the other radiologists that the parties consulted in preparation for the evidentiary hearing and the radiologist who interpreted I.Z.'s imaging studies at the time they were taken. Barnes also included various references to medical literature throughout his report, as well as additional conclusions that he reached "after

re-reviewing the medical records, other expert reports, references and so forth . . . ." Hrg. Tr. at 120.

Barnes made reference to literature on "evidence-based medicine," explaining that it has become more accepted in the past decade that medical practice, in particular standards for diagnosis and treatment, must have a firm scientific basis. He stated that improvements in imaging techniques have contributed to advances in this regard. *See* Hrg. Tr. at 68-69.

Barnes testified that in the field of radiology, there are two predominant methods used to depict specific sections of a body's interior. The first method, computed tomography (CT) scan, uses x-rays to generate images of the body's interior. The other method, magnetic resonance imaging (MRI), uses magnetic fields and radio wages to produce images of the body's interior. Barnes stated that because of the more precise technology, MRIs convey a good deal more information about the brain and are able to date the age of hemorrhages[2] or clots more accurately than CT scans.

Doctors treating I.Z. used both of these types of imaging in the days following her collapse. I.Z. had a series of CT scans of her brain taken on the day of her collapse, December 27, 2002. She had another series of CT scans taken the next day, taken both before and after doctors injected a contrast agent (iodine) into a vein to show the flow of blood. I.Z. had several more CT scans throughout January 2003. I.Z.'s first MRI was taken on January 7, 2003, eleven days after she collapsed, and her second and final MRI was conducted on January 30. I.Z. also had several x-rays taken in the weeks following her collapse.

[2] The Court has tended to use the terms "hemorrhage" and "hematoma" somewhat interchangeably in this decision.

Barnes opined that an important finding from I.Z.'s imaging studies was that they showed chronic collections of fluid that appeared between I.Z.'s brain and her skull. He stated that these collections, which he referred to as chronic extracerebral collections, could be several weeks to months old or could even date back to I.Z.'s birth in September 2002. He testified that another important finding was more recent hemorrhage or thrombosis (clotting), found within the chronic collections. Third, Barnes noted that I.Z. had brain injury that was due to a lack of oxygen or blood flow to the brain, commonly known in the medical profession as hypoxia-ischemia. Barnes stated that a final important finding was the absence of any signs of direct traumatic injury to I.Z.'s head, skull, brain, or neck. On the latter point, Barnes stated in particular that Dr. Rorke-Adams's opinion (in examining brain tissue taken ten months later after I.Z. died) that I.Z. had brain contusions was not supported by the imaging done of her brain in December 2002–January 2003.

Barnes stated that I.Z.'s first CT scan, taken on December 27 approximately six hours after Del Prete called 911, depicted a dark band between I.Z.'s skull and the frontal lobe of her brain, which he said constituted old collections of fluid. He stated that those chronic collections were once an area of hemorrhage (bleeding), but that over time the body resolves the bleeding and converts the blood into cerebrospinal fluid. He testified that this collection was at least two to three weeks old but could have existed since I.Z.'s birth about three months earlier. Barnes explained that the CT scan could not age the collection precisely and that other records, such as records of I.Z.'s head circumference in the weeks following her birth, could help indicate the age of the chronic collections. Barnes also testified that there was not yet any evidence of parenchymal

injury to the brain—injury to the substance of the brain itself.

Barnes testified that there were two areas on the same scan that indicated acute activity, which he dated as being anywhere between a few hours and ten days old. First, he pointed to a white area running from the very back of I.Z.'s head toward the front directly down the center. He opined that this line appeared to follow the cerebral falx, a membrane that separates the two hemispheres of the brain from front to back. He testified that he could not determine based upon the December 27 CT scan whether that line represented a hemorrhage in either the subdural or subarachnoid space or whether the blood was contained within the membrane of the falx itself or the nearby inferior sagittal sinus, a large vein that runs along the top of the falx.

Barnes also noted in the image a shorter white line in the right frontal area of I.Z.'s head, surrounded by the chronic collection. He opined that the CT imaging did not provide enough detail to determine whether the acute activity represented a hemorrhage or a thrombosis (blood clot). Barnes explained, however, that the fact that the white line in the frontal right area of the brain appeared to have a structure despite being surrounded by water suggested that it was not free flowing blood, or a hemorrhage. He opined, rather, that the blood appearing on the CT scan was in a membrane (either normal or abnormal) or following a vein. Barnes further opined that the appearance of the white line in the frontal right area was consistent with the course of a cortical vein, or a vein between the brain and the skull.

Barnes testified that the amount of bleeding in this CT scan was not consistent with ruptured bridging veins, "because these hemorrhages or clots are very small." Hrg. Tr. at 46. He stated that bridging veins typically carry a large flow of blood and that if

one or more of those veins had ruptured, he would expected to see a "large white hemorrhage" on the imaging. Hrg. Tr. at 48. Barnes stated that based on this image, he would have recommended that I.Z. be tested for coagulopathy, which he defined as including both disorders in which the patent bleeds too easily and those in which the patient's blood has an undue tendency to clot.

I.Z.'s second CT scan occurred on December 28, after she was transferred to UIC. Doctors at UIC conducted a first set of scans and then injected a contrast agent into a vein and took a second set of scans to observe the blood flow. Barnes opined that the image depicting the lowest section of I.Z.'s brain showed a number of normal vessels that properly collected the contrast agent throughout the vein or artery. He admitted, however, that on the pre-contrast image, there were two white areas along the tentorium, the membrane that separates the cerebral hemispheres above from the cerebellum below. Barnes stated that these areas may or may not indicate a hemorrhage, but even if it so, they were confined by a structure and did not consist of free-flowing blood. He also reaffirmed that this area did not represent hemorrhage from a ruptured bridging vein, because its volume was too small and it was confined.

Barnes testified the post-contrast image revealed that there was no clot in the superior sagittal sinus but instead indicated that there was some acute hemorrhaging around the vein. Additionally, he stated that the falx membrane contained at least some veins that were not thrombosed. Barnes said that this indicated that hemorrhaging should thus continue to be included in the differential diagnoses as a possible cause of I.Z.'s abnormalities.

Turning to the right frontal area of I.Z.'s brain, Barnes testified that the post-

contrast image further indicated that the abnormality there was a clot, not a hemorrhage. He opined that the white line appeared to be incompletely enhanced throughout, with a portion of the white line appearing brighter than the rest. According to Barnes, this uneven coloration is "highly suggestive" that there was a clot blocking the contrast's flow throughout the vein. Hrg. Tr. at 59. He admitted, however, that this was not conclusive and that further testing would be required to confirm that it was a thrombosed vein. Barnes further testified that on the left frontal area of I.Z.'s brain, a number of other cortical veins appeared normal in the post-contrast imaging.

Finally, Barnes testified that other pre-contrast images depicting higher planes of I.Z.'s head showed other areas of possible acute activity near the center of I.Z.'s frontal lobe and on either side of the falx membrane near the top of her head. He opined that the areas could indicate either a hemorrhage or a clot, and that the CT scan was insufficient to determine whether they were small hemorrhages or areas of venous thrombosis. The post-contrast image, however, showed incomplete enhancement, suggesting that it was another area of probable venous thrombosis (clotting).

Barnes concluded, based upon the imaging, that ruptured bridging veins could not have caused the abnormalities present in I.Z.'s brain on December 28. He testified that the amount of acute activity was not large enough to have resulted from ruptured bridging veins. Because bridging veins carry a large volume of blood at a high rate, he explained in detail, a rupture of one or more of these veins would result in much more extensive bleeding, over a larger area, than appeared on I.Z.'s CT scans. Dr. Barnes further testified that post-contrast images depicting the top of I.Z.'s head depicted intact bridging veins with no large hemorrhages.

Instead, Barnes posited that cortical venous thrombosis (CVT) was a likely cause of I.Z.'s brain abnormalities. He testified that when a vein becomes clotted, the clot expands the vein, causing it to partially break down and leak a small amount of hemorrhage outside of the vein into the subarachnoid or subdural spaces. According to Barnes, this could account for any small areas of hemorrhage that appear on I.Z.'s imaging studies. Barnes disagreed with Dr. Hedlund's opinion that the scans showed ruptured and thrombosed bridging veins.

On January 4, 2003, I.Z. had another CT scan of her brain at UIC. Barnes opined that the January 4 CT scan demonstrated that the chronic collections between I.Z.'s brain and her skull were increasing. He noted a decrease in differentiation between the gray and white matter in the substance of I.Z.'s brain toward the back of her head caused by edema (swelling) of the brain. He opined that I.Z.'s edema was the result of hypoxia-ischemia and confirmed that she had a major brain injury.

Barnes testified that the white line that appeared on the CT image in the right frontal area of I.Z.'s brain was still present. He stated that the fact that there were no other white areas around it or in the chronic collection further suggested that the line on imaging was a persistent cortical venous thrombosis. Barnes further stated that imaging of a higher plane of I.Z.'s head depicted another white line, which he posited could represent an additional area of cortical venous thrombosis.

I.Z.'s first MRI occurred on January 7, 2003, eleven days after her injury. Barnes testified that an MRI machine takes multiple images of the patient's brain using a number of techniques. (As noted earlier, Barnes testified that an MRI image is a more detailed and precise image of the brain than the one produced by a CT scan.) In

analyzing I.Z.'s MRI imaging study, Barnes noted that the T2 technique demonstrated that the chronic collections near the front of I.Z.'s head were in fact water (cerebrospinal fluid), although he could not conclude whether the water was normal or abnormal based on the MRI imaging. He further opined that the chronic collection on the right side of I.Z.'s brain was older than the collection on the left, based on the whiter color of the right frontal collection. He also noted a small chronic band of water near the back of I.Z.'s head on the right in the image nearer the base of I.Z.'s brain. Finally, Barnes identified another chronic collection that wrapped around the right side of I.Z.'s brain between her brain and her skull. According to Barnes, this collection was older than seven days at the time of the imaging on January 7 and was probably closer to two or three weeks old. Barnes testified that the light color of these collections further conflicted with a diagnosis of ruptured bridging veins. According to Barnes, if a bridging vein had ruptured, he would expect that area to be all black on the MRI image (indicating a more acute hemorrhage).

Regarding the abnormality on the right frontal area of I.Z.'s brain, Barnes opined that the T2* technique, which is most susceptible to clotted blood, confirmed that the abnormality was a microscopic clot in a cortical vein. Barnes explained that the microscopic iron that the T2* detects in the brain was not dispersed throughout the chronic fluid collection, as it would be if there were a hemorrhage in that area, but instead was confined within a smaller structure within the collection. Finally, Dr. Barnes testified that as the images moved further up the plane of I.Z.'s head, the black area further darkens and branches out, indicating that the affected area is a vein and its branches and that there is clotting within them.

Barnes also testified that the edema and resulting loss of differentiation in the back of brain was also confirmed by the MRI. He also noted that in the images depicting the very top of I.Z.'s head, previously undetected areas of hemorrhage or thrombosis begin to appear. Barnes stated that he believed these to be areas of venous thrombosis and hypothesized that the thrombosis "may be more extensive" than previously suspected. Hrg. Tr. at 73. Barnes testified that these new areas of blood could not be indicative of ruptured bridging veins because they were not distributed throughout a space like would occur in a hemorrhage from a rupture in a bridging vein. Barnes also stated, in response to questions on cross examination, that the imaging did not support Dr. Rorke-Adams's opinion that I.Z. had contusions on her brain.

Barnes stated that the January 7 MRI, which depicted two differently aged chronic collections (some likely several weeks old) and new areas of additional small hemorrhage or thromboses, was consistent with his opinion that I.Z. had cortical vein thrombosis. According to Barnes, his differential diagnosis would have suggested an investigation into possible bleeding or clotting problems, an examination of any problems I.Z. may have had at birth, an investigation into potential changes in I.Z.'s head circumference throughout the first few months of her life, and an exploration of possible recent triggers like infection that may have caused I.Z.'s collapse. Barnes testified that based on I.Z.'s radiological imaging, he would not conclude that I.Z. suffered abusive head trauma on December 27 that led to ruptured bridging veins. "[W]e can't blame everything we see on something happening that day," he stated; "[a] number of the components stretch out long before that . . . ." Hrg. Tr. at 78. He stated that there were other conditions that could explain what appeared on the imaging of

I.Z.'s brain. Barnes stated that the chronic collections were "probably the most important aspect as a predisposing condition," which tended to negate the hypothesis of abusive head trauma. Hrg. Tr. at 79. He agreed on cross examination, however, that based just on the imaging, he could not rule out abuse as the precipitating factor that led to I.Z.'s collapse on December 27. He also agreed that many of the types of abnormalities shown on the images are of the type that can be caused by abusive head trauma, though he did not believe that to be the case here.

Finally, Barnes stated that the images did not support a finding that I.Z. had a retroclival epidural hemorrhage—bleeding in the area of the upper neck / skull base—that respondent's neuroradiologist, Dr. Hedlund said he observed and that constituted a proxy for trauma. Barnes noted that there was no evidence in the imaging of any traumatic abnormalities in that area and stated that the area of the image that Hedlund identified did not represent bleeding.

2. Dr. Gary Hedlund (neuroradiologist testifying for respondent)

Dr. Gary Hedlund, a neuroradiologist from Primary Children's Medical Center in Salt Lake City, testified on behalf of respondent. Hedlund also works as part of the hospital's child protection services team.

Hedlund testified that his review of I.Z.'s case included a review of all I.Z.'s medical records and her imaging studies in the weeks following her collapse. Hedlund stated that he also reviewed the reports by the experts testifying on Del Prete's behalf.

Based on his review, Hedlund made a number of findings. First, he concluded that I.Z.'s imaging studies indicated that she had both acute and chronic subdural hemorrhages in various locations. Consistent with the testimony by Dr. Barnes,

Hedlund stated that there were chronic subdural hemorrhages that already existed as of December 27, 2002 and that were at least two weeks and perhaps as much as three weeks old, or older, at that point. Hedlund testified that the acute hemorrhages ranged in age from a few hours to three days old. He stated that the imaging studies showed a number of hemorrhages of varying ages throughout I.Z.'s head in the subdural space, which he opined was indicative of abusive head trauma. Hedlund stated further that the chronic subdural collections were indicative of prior trauma, separate from the trauma that caused the acute subdural hemorrhages. He testified that the chronic hemorrhages could not have been caused by birth-related trauma, because subdural hemorrhages resulting from birth resolve within the first month of an infant's life.

Hedlund further testified that the imaging studies showed that I.Z. had multiple hemorrhages near the top of her head. He said this strongly suggested ruptured bridging veins. Hedlund testified that ruptured bridging veins are a further indication of abusive head trauma. He described the continuity between cortical veins and bridging veins, stating that cortical veins come together to form bridging veins, which eventually dump venous blood into the even larger sinuses. Hedlund opined that I.Z.'s hemorrhages were the result of injury to the bridging veins, rather than the smaller cortical veins. Hedlund disagreed with Barnes's conclusion that ruptured bridging veins would create larger areas of hemorrhage than were visible on I.Z.'s imaging studies. He opined that ruptured bridging veins do not necessarily cause large hemorrhages but can instead cause several sites of bleeding throughout the subdural space.

Hedlund next testified that he believed that both I.Z.'s CT scan from December 27 and her MRI from January 7 showed evidence of a retroclival epidural hematoma.

Hedlund explained that a retroclival epidural hematoma is a collection of blood on the dura mater in the central skull base. He opined that a retroclival epidural hematoma is a proxy for trauma to the neck, because neck injuries are difficult to identify on imaging. He estimated that this injury was one to two weeks old as of January 7 and between a few hours and seven days old as of December 27, though he conceded that making an aging estimate is imprecise. Hedlund stated that he did not believe that what he was seeing on the image was an "artifact" (i.e. that it did not represent something that was actually present). Hrg. Tr. at 271-72. He agreed, however, that retroclival hemorrhages are "a challenging diagnosis" because of the amount of bone in the space, particularly with a 2003-vintage MRI scan like the one he had reviewed.

Hedlund stated that I.Z.'s chronic subdural collections increased in size after December 27, but he opined that at the time of her collapse, the collections were not large enough to have caused her collapse. He also testified that a metabolic disorder could not have caused the collapse, because metabolic problems are typically accompanied by changes that are reflected in the imaging studies, which were not present in I.Z.'s case. Hedlund also stated that I.Z.'s collapse could not have been caused by an infection, because imaging showed that there was no middle ear or mastoid infection in December 2002. Hedlund conceded that fluid had appeared in I.Z.'s ears by January 3, 2003 but stated that fluid commonly appears in patients following a period of hospitalization. In sum, Hedlund opined, I.Z.'s imaging studies were indicative of abusive head trauma.

On cross examination, Hedlund conceded that the full-body x-rays taken of I.Z. (referred to as skeletal surveys) did not indicate any swelling or injury to I.Z.'s neck and

that no clinician who examined I.Z. had found any abnormalities in the neck area. He also agreed that none of the other examining radiologists had found a retroclival epidural hemorrhage as of December 27. Hedlund testified, however, that the retroclival area was deep within the tissue and likely would be invisible to a clinician. He acknowledged that adults can sometimes develop retroclival epidural hemorrhages spontaneously, though he said he has never seen this occur in children. Hedlund testified that it was possible, though unlikely, that a retroclival epidural hemorrhage could be caused by a lumbar puncture, but he also admitted that retroclival epidural hemorrhages are rarely diagnosed in general. Finally, he agreed that most reports of retroclival epidural hemorrhages are from automobile and automobile-vs.-pedestrian collisions.

Hedlund admitted that the white area of acute activity that he observed in images at the right frontal area of I.Z.'s brain could be a thrombosed cortical vein. He further testified that cerebral venous thrombosis (of which cortical venous thrombosis is a type) can cause seizures, which in turn can cause apnea—cessation of breathing—and temporary heart failure. He agreed that a person with cortical venous thrombosis can present with seizures or drowsiness and that a common underlying condition is an infection. Finally, Hedlund admitted that cerebral venous thrombosis can be difficult to diagnose.

Regarding the chronic collections seen in the images of I.Z.'s brain, Hedlund testified that the chronic hemorrhages could have been three weeks old or older as of December 27. He repeated that in his view, these were the result of previously inflicted abusive head trauma. He further stated that the chronic collections were just as big as

the acute collections, and he characterized both types of collections as small. He stated that although he believed the chronic hemorrhages could not themselves have caused I.Z. to collapse on December 27, they could have contributed to her collapse. Finally, Hedlund testified, consistently with Dr. Barnes, that he found no evidence of lacerations or contusions to I.Z.'s brains based on her imaging studies.

3. Dr. Michael Prange (biomechanical engineer testifying for petitioner)

Del Prete also called Dr. Michael Prange, a biomechanical engineer specializing in injury biomechanics who works for a scientific and engineering consulting firm. He stated that he had done his Ph.D. work in the field of pediatric brain injuries.

Prange testified that he has investigated whether and under what conditions shaking alone could cause the injuries that I.Z. suffered immediately following her collapse. He stated that to confirm whether a purported force can cause a specified injury, both the maximum possible mechanical exposure and the injury threshold must be determined. In a case of a shaken baby, the mechanism that purportedly causes injury is rotational acceleration to the infant's head that causes the brain to move relative to the skull. Prange testified that the maximum possible mechanical exposure is therefore the maximum amount of rotational acceleration that an adult can inflict on an infant's head. Prange stated that in his study, he created a dummy infant with the same head mass and brain mass as a human infant. He further testified that he used a hinge in place of the neck, which he said would create less resistance to the acceleration of the head than a neck would, in order to create even higher levels of rotational acceleration than could be obtained with a real infant. According to Prange, he asked volunteers to shake the dummy as hard as possible and measured the levels of

rotational acceleration within the head.

Prange opined that he was able to extrapolate the injury threshold—the minimum level of acceleration required to produce I.Z.'s injuries—from the results of cadaver and animal experiments. Specifically, Prange testified that previous experiments had determined the level of acceleration required to produce subdural hematomas in piglets and other animals, as well as cadavers. Prange stated that by using mass scaling methods, he was able to ascertain the injury threshold for human infants. He testified that prior studies have validated these scaling methods.

Prange opined that the levels of acceleration that he was able to achieve in his study of actual shaking were well below the threshold for head injury. Prange further explained that the threshold for neck injury is far lower than that for head injury, and he concluded that even if an adult could, by shaking, inflict the levels of acceleration required to inflict head injury on a child, the victim necessarily would sustain serious neck injury as well. Prange therefore concluded that the mechanism of shaking itself was insufficient to produce brain injury without first causing catastrophic neck injury to the victim. Prange also testified that a retroclival epidural hematoma was not sufficiently severe to qualify as the type of neck injury that would accompany a head injury in this situation. He also stated that the levels of acceleration associated with an impact injury are far greater than those associated with shaking alone.

On cross examination, Prange admitted that his test dummies did not have bridging veins, and thus he could not determine the level of acceleration required to rupture an infant's bridging veins. He also conceded that the animal experiments that he relied upon to determine the injury threshold exposed animals to a single loading

event, similar to whiplash, rather than repeated shaking back and forth. He explained, however, that there was no data that blood vessels experience fatigue (i.e., weakening on repeated movement) and thus according to Prange, a single instance of acceleration would cause the same amount of damage as repeated instances of acceleration, assuming that the maximum levels of acceleration are equal. Finally, Prange admitted that there are differences between the anatomy and characteristics of adult and infant brains outside of the differences in mass. He stated on redirect, however, that studies reflect that an infant's brain is more resistant to movement, suggesting that infants are able to tolerate greater levels of acceleration than adults.

4. Dr. Nagarajan Rangarajan (biomechanical engineer testifying for respondent)

Respondent presented the testimony Dr. Nagarajan Rangarajan, a biomechanical engineer and an associate professor in the Neurosciences Research Laboratory at the Medical College of Wisconsin. Rangarajan opined that the science of biomechanics cannot determine the cause of I.Z.'s injury and cannot yet determine the threshold necessary to produce head injuries in infants. He said that animal experiments have been done but that mass scaling, which takes differences in mass into account when extrapolating data, does not sufficiently account for other differences in material properties that exist between animals and infants or between adults and infants. He also stated that infant brains are anatomically different than adult brains, and thus simply adjusting for the differences in mass would not produce reliable injury threshold results. Rangarajan also stated that human cadaver experiments likewise are inadequate, because the brain of a dead person has different properties from that of a living person.

Rangarajan also noted that the animal experiments that Dr. Prange relied upon in determining the injury threshold for head injury subjected the animals to a single whiplash-type event. Rangarajan stated that he did not believe these experiments reliably establish the injury threshold sufficient for head injury in infants as a result of shaking back and forth multiple times. He therefore opined that there is no reliable, well-accepted injury threshold for head injury to an infant as a result of rotational acceleration (i.e., shaking back and forth). Rangarajan also testified that there similarly was no reliable, well-accepted injury threshold established for neck injury in an infant.

On cross examination, Rangarajan testified that mass scaling is an appropriate method of extrapolation, provided that appropriately comparable subjects are used. He stated, however, that he did not believe infant brains could be appropriately compared to either animal or adult brains. He also agreed, of course, that live human testing of infants is not possible.

Finally, Rangarajan stated that Dr. Flaherty, the prosecution's expert at Del Prete's criminal trial, was wrong when she testified that a fall could not produce levels of acceleration as great as shaking alone.

5. Dr. Patrick Lantz (pathologist testifying for petitioner regarding retinal hemorrhages)

Del Prete called Dr. Patrick Lantz, a pathologist currently working at Wake Forest University Medical Center and a professor at that university's medical school, to testify about retinal hemorrhages. Prior to testifying, he reviewed I.Z.'s retinal scans and associated medical records. He stated that the images taken on December 30, 2012 showed numerous retinal hemorrhages, including superficial hemorrhages, some deeper in the layers of the retina, and some pre-retinal hemorrhages. He said that he

did not observe any evidence of perimacular folds, a particular type of retinal hemorrhage, or retinoschisis, a splitting of the retina.

Lantz opined that retinal hemorrhages are associated with a wide variety of conditions, both traumatic and non-traumatic; they are not pathognomonic for (specifically indicative of) abusive head trauma. Specifically, Lantz stated that retinal hemorrhaging, even extending to the ora serrata, can be caused by infections, spontaneous intracranial hemorrhage, and coagulation disorders, and can also result from CPR. In particular, Lantz testified that he had conducted a case study identifying eleven infants with retinal hemorrhages who had died from sudden infant death syndrome (SIDS). These eleven infants had collapsed and been resuscitated through CPR prior to their eventual death from SIDS. Of those eleven children, four infants had retinal hemorrhages that extended to the ora serrata.

Lantz also testified about a case study involving a two-month-old infant who suddenly collapsed while under her family's care. Paramedics administered CPR to the infant and transported her to the hospital. Doctors initially suspected abusive head trauma but subsequently discovered that the child had collapsed due to an aneurysm in her brain. Nevertheless, an ophthalmologist examined the infant soon after her admission to the hospital and found extensive retinal hemorrhages, a retinal fold, and retinoschisis in the infant's left eye. There were no notable abnormalities in the infant's right eye. Lantz testified that the infant eventually died and that he conducted her autopsy. He discovered that her right eye, which had previously had no retinal hemorrhages, had developed spontaneous retinal hemorrhaging at some point during her stay in the hospital. Lantz opined that this was further evidence that retinal

hemorrhages can occur even in the absence of traumatic injury.

Finally, Lantz was asked about Dr. Flaherty's testimony at Del Prete's criminal trial that hemorrhages to the ora serrata are only caused by acceleration and deceleration forces or shaken baby syndrome. He stated that this is not true and said, as described above in detail, that such hemorrhages can be associated with other conditions, including resuscitation efforts.

On cross examination, Lantz testified that he did not believe that the number or distribution of retinal hemorrhages could indicate that a particular cause was more or less likely. He admitted that he has not studied the likelihood of CPR causing retinal hemorrhages but estimated that CPR caused retinal hemorrhages in approximately five percent of cases. Finally, he agreed that his report did not indicate that coagulopathy, cortical venous thrombosis, or seizures as conditions that are associated with retinal hemorrhages.

6. Dr. Brian Forbes (ophthalmologist testifying for respondent regarding retinal hemorrhages)

Respondent called Dr. Brian Forbes, a pediatric ophthalmologist at the Children's Hospital of Philadelphia who also teaches as the Pennsylvania School of Medicine. He reviewed I.Z.'s medical records, the police reports, excerpts of the testimony at Del Prete's trial, and the reports from other experts who testified at the evidentiary hearing. Based on his review, he concluded that there were no reports of any problems with I.Z.'s eyes prior to December 27.

Forbes testified that the day after I.Z.'s collapse, three different ophthalmologists at the UIC Medical Center examined I.Z.'s eyes using an indirect ophthalmoscope, a device used to get a three-dimensional view of the retina in an eye. All three doctors

noted numerous retinal hemorrhages, including intraretinal, preretinal, and vitreous hemorrhages. Preretinal hemorrhages are located on top of the retina and are the biggest in size, and intraretinal hemorrhages are located deep within the tissue of the retina and typically appear in the shape of dots and flames. Forbes testified that subretinal hemorrhages may also occur, but they can be very hard to detect if the retina is bloody. Forbes stated that two of the ophthalmologists indicated trauma as the most likely cause.

Forbes testified that although I.Z.'s eyes were examined on December 28, the photographs (referred to as fundoscopic photographs) depicting her retinal hemorrhages were not taken until December 30. He stated that the fundoscopic photographs from December 30 showed that I.Z. had retinal hemorrhages too numerous to count, including both preretinal and intraretinal hemorrhages. Forbes further stated that the hemorrhages extended all the way to the ora serrata—the foremost part of the retina nearest the lens. He testified that by January 13, 2003, the date the next set of fundoscopic photographs were taken, all but the preretinal hemorrhages had resolved in I.Z.'s eyes. Forbes concluded that he agreed with the ophthalmologists at the UIC Medical Center that abusive head trauma was the most likely cause of I.Z.'s retinal hemorrhages.

Forbes opined that cortical venous thrombosis did not cause I.Z.'s retinal hemorrhages. He stated that he had never heard of cortical venous thrombosis causing retinal hemorrhages and that he has examined twenty-four children with cortical venous thrombosis and found no retinal hemorrhaging in any of them. He admitted that there have been reports of children with cortical venous thrombosis with a few hemorrhages

near the optic nerve (called peripapillary hemorrhages), but he had never heard of cortical venous thrombosis causing the extent of retinal hemorrhaging documented in I.Z.'s eyes. Forbes also opined that the severe retinal hemorrhages present in I.Z.'s eyes on December 28 could not have been the result of CPR, a seizure, or hypoxia. He agreed that an infection can cause retinal hemorrhaging, but to cause hemorrhaging this severe, he said, there would have to be a very serious infection like meningitis, which I.Z. did not have.

Forbes further opined that retinal hemorrhaging can be severe at birth, but the hemorrhages are almost always intraretinal (not preretinal), and they typically resolve within seven to ten days. He stated that if I.Z. had retinal hemorrhaging at birth, the blood would have cleared before December 27. Finally, he testified that disorders associated with bleeding abnormalities can also cause retinal hemorrhaging, but only those disorders that cause a tendency to bleed too easily. Forbes opined that a clotting disorder (for which I.Z. was not tested) could not cause spontaneous retinal hemorrhaging.

On cross examination, Forbes admitted that ophthalmologists cannot identify the precise mechanism in the body that causes retinal hemorrhaging and that medicine has not established a causative relationship between abusive head trauma and retinal hemorrhages. He hypothesized that the hemorrhages may be the result of the vitreous pulling back and forth against the retina as the baby is being shaken, but he admitted that this hypothesis would not explain retinal hemorrhages from other causes, such as blunt force trauma. Forbes admitted that ophthalmologists have not yet identified any mechanism to explain why or how motor vehicle accidents could cause retinal

hemorrhages that extend to the ora serrata.

Forbes testified that he could not identify the specific timing of I.Z.'s hemorrhages. He stated that the intraretinal hemorrhages could have been present in I.Z.'s eyes for up to two weeks before the fundoscopic photographs were taken on December 28, and that the preretinal hemorrhages could have been present for four to six weeks before I.Z. collapsed. Forbes agreed that I.Z. did not have any perimacular folds or retinoschisis, which he agreed are also highly associated with abusive head trauma.

Finally, like Dr. Barnes, Forbes testified that prosecution expert Dr. Flaherty was incorrect when she testified at Del Prete's trial that hemorrhages to the ora serrate are caused only by acceleration or deceleration forces.

7. Dr. Joseph Scheller (pediatric neurologist testifying for petitioner)

Dr. Joseph Scheller testified on Del Prete's behalf. Until recently, Scheller served as a child neurologist at Children's National Medical Center and was an associate professor of pediatrics at George Washington University in Washington, D.C. Scheller currently works at Winchester Valley Medical Center in Winchester, Virginia, where he practices as a child neurologist and serves as a fellow in neuroradiology. Del Prete sought only to qualify him as an expert in child neurology, not as an expert in neuroradiology.

Scheller testified that he reviewed all of I.Z.'s medical records from birth and examined all of her brain imaging studies. Scheller concluded that there was no evidence that I.Z. had suffered any abusive head injury. He testified that he based this opinion on the absence in I.Z.'s medical records of a number of different injuries that

typically result from abusive head trauma. First, he noted that I.Z. had no signs of either external injury or other bodily physical trauma—like broken bones—documented in her medical records. According to Scheller, although it is "theoretically possible" for a child to be abused without signs of external injury, it is more likely that the infant would have external bruising or bleeding or that her x-rays would reveal broken bones. Hrg. Tr. at 844.

Second, Scheller opined that when an infant suffers abusive head trauma, the infant's head immediately begins to swell (the medical term is brain edema). He testified that the scans of I.Z. conducted on December 27 and December 29 showed no signs of brain edema, which he would expect to see in an infant who had experienced a traumatic injury to the brain. Scheller stated that there was also no evidence of parenchymal injury—bruising or bleeding in the cerebrum, the substance of the brain. Although I.Z.'s imaging studies document injuries on the surface of the brain, Scheller testified that the force required to cause an infant's brain to impact against the skull would likely lead to bleeding or other injury in the cerebrum itself and not just the subdural space above the brain.

Scheller also testified about neck injuries. Specifically, he opined that when an infant is shaken violently, her neck is put under a great deal of stress. Thus Scheller found it relevant that I.Z. had no evidence of spinal cord injury or neck ligament injury. Scheller stated that his conclusion that I.Z. had no evidence of neck ligament or bone injury was based on his own examination of I.Z.'s imaging studies; he did not simply rely on the radiologists' findings.

Scheller also testified about a number of factors noted in I.Z.'s medical records

that he found relevant to his conclusion that she did not suffer abusive head trauma. According to Scheller, these factors may have "start[ed] out as something minor or just a slight aberration from normal, . . . in the unusual case, [they] will turn into something dramatic or very serious." Hrg. Tr. at 859. He referred to this phenomenon as a cascade of events. One factor that Scheller noted in I.Z.'s records, going back to October 2002, was a tendency to have high platelet levels, or thrombocytosis. Scheller testified that this made her blood particularly susceptible to clotting. He hypothesized that an infection likely caused the increase in platelets, and he noted that records reflected that I.Z. had a fever and a sinus infection when she was admitted to the hospital on December 27.

Scheller stated that I.Z.'s CT scans taken on December 27–29 showed a blood clot in the brain. He opined that this indicated that I.Z.'s thrombocytosis had caused a serious condition, specifically, cortical venous thrombosis.

Scheller also testified that I.Z.'s head circumference grew at an abnormally fast rate. He stated that I.Z.'s head circumference at birth was just under the fiftieth percentile for infants, but by one month she was at the seventh-fifth percentile, and at approximately two and one-half months her head circumference registered at the ninetieth percentile. Scheller stated that this jump in percentiles was indicative that her head was "growing more than it should" and that "[s]omething must be going on inside of her skull that is contributing to large head growth." Hrg. Tr. at 860-61. Ordinarily, Scheller testified, an infant's head circumference tends to stay within the same percentile as she ages. He conceded that the head circumference of an infant can change in the first few days of life due to molding—an abnormal head shape in an infant

that results from pressure on the head during childbirth—but stated that any abnormality of that type usually disappears after the first week of life and is always gone before one month.

Scheller concluded that in his experience, head growth that jumps percentiles as documented in I.Z.'s case typically results from the development of a chronic subdural fluid collection related to birth. He noted that I.Z.'s CT scans on December 27-29 clearly showed a chronic subdural hemorrhage that "is not at all fresh blood" but rather "is in the process of turning from old blood to spinal fluid" and that this "does not develop in a day or week. That is something that takes weeks to develop." Hrg. Tr. 860.

Scheller opined that I.Z. had a mildly traumatic birth, which caused excess fluid to build up in the subdural mater and resulted in her head growing faster than expected. Specifically, Scheller noted that I.Z. had a cephalohematoma—a collection of blood just underneath the scalp of a newborn's head—when she was born, which is caused by excessive force on the skull of the baby's head. He also noted that she was born with an occipital caput—a bulge on the occipital bone at the back of the newborn's head. Finally, he noted that doctors at the hospital where I.Z. was born gave her free-flowing oxygen for approximately one or two minutes to help her breathe.

Scheller acknowledged that I.Z. also had an acute subdural hemorrhage when she came to the hospital on December 27, not just a chronic subdural hemorrhage. He opined that the only thing that could trigger both acute and chronic subdural hemorrhages in the absence of brain edema—which he said was not present—are seizures. Based on that fact, Scheller testified that he believed I.Z. developed a blood clot in a cortical vein in her brain (cortical venous thrombosis), due to her excessively

high platelet count, and that the clot caused the vein to leak blood into the subdural space. That hemorrhage in the subdural space then leaked into the subarachnoid space, as shown, Scheller stated, by the December 27-29 scans. This, in turn, was "irritating and toxic" to I.Z.'s regular brain function and caused her to have a seizure. Hrg. Tr. at 871. According to Scheller, I.Z.'s seizure then caused hypoxia-ischemia in her brain, which led to delayed brain edema and loss of differentiation between the grey and white matter of the brain.

Regarding I.Z.'s retinal hemorrhages, Scheller testified that both brain hypoxia-ischemia and problems with vein circulation generally can cause children to develop retinal hemorrhages. Although he conceded that retinal hemorrhages can be an indicator of abuse, he testified that they "are not proof of abuse. They're only proof that something is going wrong with the brain venous circulation." Hrg. Tr. at 872. Scheller concluded that there was evidence of a blood clotting problem, not abuse, and thus he concluded that I.Z.'s injuries were not caused by abusive head trauma.

On cross examination, Scheller admitted, with regard to his testimony that I.Z. had an infection, that she did not have a fever upon admission to Provena St. Joseph Hospital on December 27 and that in fact, her body temperature was below normal. He attributed this to the fact that she was "near death" at that point, Hrg. Tr. at 873, and he noted that as her hospital stay continued, her temperature rose to a level that in fact indicated a fever. He agreed that significant trauma can cause a fever by damaging the body's temperature regulating system, but he stated that infection is the most common cause of fever in a child. Regarding an infection, Scheller admitted that none of the doctors treating I.Z. in the days following her collapse diagnosed her with an infection

and that none of the blood, urine, or cerebral spinal fluid tests showed any sign of infection. He stated, however, that none of those tests would have indicated whether or not I.Z. had a sinus infection. He also conceded that none of I.Z.'s CT scans taken in December 2002 showed any signs of a sinus infection.

Regarding I.Z.'s birth, Scheller stated that he had concluded retrospectively that she had a traumatic birth based on her chronic subdural hematomas and her abnormal head circumference growth. He admitted that he could only classify her birth as traumatic in retrospect and that any complications reported in her records were minor and not unusual for childbirth. Hrg. Tr. at 900. He also agreed that I.Z.'s neurological examination immediately following her birth was normal. Scheller also admitted that I.Z.'s pediatrician did not note any problems or concerns at her one-month and two-month evaluations.

Regarding I.Z.'s hemorrhages, Scheller agreed that the chronic subdural hemorrhage was frontal, whereas the acute subdural hemorrhage was diffuse and appeared, in part, in an area where there was no chronic subdural hemorrhage—namely, in the back of I.Z.'s head, in the tentorium. He also agreed that acute subdural hemorrhage can be caused by abusive head trauma. Scheller also admitted that Dr. Barnes's report suggested a possibility that I.Z. had brain edema based on her December 28 CT scan. He explained, however, that although there may have been some slight swelling, he did not include it in his report because he did not consider it significant. Scheller agreed that brain edema can result from abusive head trauma.

Finally, Scheller agreed that the hematologist who examined I.Z. on December 28 found that her "coagulation parameters" were within normal limits and that her

platelets were normal. Hrg. Tr. at 926. Scheller further stated that another hematologist examined I.Z. on January 3, 2003 and concluded that I.Z. did not have a bleeding tendency for several reasons, including the lack of any personal or family history of this tendency. He further acknowledged that the hematologist who examined I.Z. on January 3 performed two tests to determine the blood's ability to clot, both of which that doctor concluded were normal.

On redirect, however, Scheller explained that it was irrelevant to his diagnosis of cortical venous thrombosis whether I.Z. had problems with clotting that resulted from a genetic disorder (a primary cause) or whether she developed a clotting problem in response to an infection (a reactive cause). Scheller stated that he thought I.Z. may have developed a pattern of highly increased platelets in response to infection. He noted that although the records reflected that the hematologist questioned I.Z.'s family regarding any history of a *bleeding* tendency, he did not inquire about any family history of *clotting* problems. Thus the hematologist did not address any possible clotting problem, a problem that might have prompted consideration of thrombosis as a possible cause of I.Z.'s collapse. He also testified that when I.Z. visited the hospital in October 2002 for a fever, her medical records showed that she had elevated platelets. Specifically, she had 685,000 platelets per drop of blood, whereas the normal child will have between 150,000 and 450,000.

Regardless of the primary or reactive nature of the platelet increase, Scheller testified that I.Z.'s medical records reflected that she had a highly elevated platelet count throughout the days following her collapse. He noted that I.Z. had platelet counts of between 557,000 and 768,000 in late December 2002 and between 629,000 and 1.2

million in the first two weeks of January 2003. Scheller testified that platelet counts over a million are quite rare in pediatrics. He stated that he "was very surprised that the hematologist didn't address" it, because platelet counts over a million typically occur only in extreme illnesses.

8. Dr. Carole Jenny (child abuse pediatric physician testifying for respondent)

Respondent called Dr. Carole Jenny to testify. Given the extensiveness of Jenny's testimony, the Court has organized the following discussion by subject matter.

Jenny is the director of the child protection program at Hasbro Children's Hospital and a professor of pediatrics at Brown Medical School in Providence, Rhode Island. She edits a textbook that she considers to be the "definitive text" on child abuse. Hrg. Tr. at 1044.

Jenny concluded, based on her review of the medical records, imaging studies, and the autopsy, that I.Z. suffered an episode of abusive head trauma at Del Prete's hands on December 27 that led to cardiorespiratory arrest and severe brain damage and eventually to her death. She said there was no other viable explanation for I.Z.'s collapse.

Jenny stated that when an infant has suffered abusive head trauma, she experiences primary injuries—including brain contusions, torn bridging veins, and axonal injury—from the forces applied to the head, and those primary injuries cause secondary injuries like hypoxia-ischemia and metabolic collapse. She stated that brain edema begins "[i]n the short term" after an episode of abusive head trauma, but then the brain returns to normal size and eventually contracts, though the process of shrinkage does not show up on imaging studies for days to weeks afterward. Hrg. Tr. at

1047-48. She later stated, however, that the onset of brain edema is not always immediate but rather is "really quite variable" and that it begins to develop between two hours to one to two days after the injury. Hrg. Tr. at 1077-78.

Jenny was asked about the absence of external injuries. She stated, in contrast to Dr. Scheller, that shaking an infant often does not leave external injuries. Referencing a 2004 article by Dr. Rorke-Adams (another witness for respondent), Jenny testified that there are four specific injuries that result from "violent shaking: 1. subdural hematoma, typically between the two cerebral hemispheres; 2. retinal and optic nerve sheath hemorrhages; 3. tears of cerebral white matter, especially corpus callosum; and 4. tears and hemorrhages of cervical or more caudal spinal cord and/or nerve roots." Hrg. Tr. at 1062–63 (quoting Resp.'s Ex. Jenny 3 at 29).

On cross-examination, Jenny conceded—though with some initial reluctance—that a chapter in the textbook she edits that she characterized as "one of the best chapters in the book," Hrg. Tr. at 1179, states that no one has marshalled a coherent argument to support shaking alone as a causal mechanism for abusive head injury, and that the only evidence basis for this proposition consists of perpetrator confessions. *See* Hrg. Tr. at 1179-80. She conceded that she was not aware of the circumstances of confessions relied on in this regard or the tactics used to elicit them. Jenny also stated, however, that parents have made admissions to her and her colleagues of shaking followed by immediate symptoms, though she conceded she did not know whether these parents had tried to minimize by saying they had done nothing more than shake

their children.[3]

Regarding the issue of neck injury, Jenny testified that doctors frequently fail to recognize neck (cervical) injuries in cases of abusive head trauma because of the manner in which autopsies typically are done. According to Jenny, around 2009, Dr. Rorke-Adams and others at the Children's Hospital in Philadelphia began to remove both the brain and the attached spinal cord as a single unit when doing an autopsy. Jenny stated that Rorke-Adams concluded that about 70 percent of the children who had suffered abusive head trauma had bleeding in the cervical spinal cord or the nerve roots surrounding it. Rorke-Adams's article also noted that "MR imaging failed to identify the cervical injuries among inpatients." Resp.'s Ex. 4 at 237. Jenny also said that if such injuries occurred in a patient who survived for another eleven months, the injuries likely would heal in the interim and would not be observable on autopsy. Jenny conceded on cross-examination, however, that Rorke-Adams's findings have not been validated by other studies.

Regarding retinal hemorrhages, Jenny opined that severe multi-layered retinal hemorrhages—like those seen in I.Z. in the days following her collapse—are typically associated only with severe trauma, sepsis, coagulopathy (which she defined as a tendency to clot too little, not to clot too much or too quickly), or a combination of those conditions. Jenny also stated that seizures cannot by themselves, without some underlying medical condition, cause a child to develop retinal hemorrhages.

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[3] With regard to Del Prete's statements to the authorities, Jenny initially stated that she considered Del Prete to have made inconsistent statements. When pressed on cross-examination, however, she conceded that Del Prete's statements in fact were not inconsistent on the key issues. She also conceded that this undercut a part of her conclusion that I.Z. experienced abusive head trauma at Del Prete's hands. *See* Hrg. Tr. at 1186.

Jenny opined that in severe cases, abusive head trauma can result in immediate neurological collapse. She referenced a 2004 study which found that of the 57 cases of suspected abusive head trauma where caretakers described the onset of symptoms, 91 percent of them described the symptoms as occurring immediately after the trauma. Jenny testified that according to Del Prete's statements to police, I.Z. fed normally between 8 a.m. and 10 a.m. on the morning of December 27. She stated that infants need coordination in order to suck and swallow, and she would not expect a child who had already suffered a near-fatal brain injury to be able to perform those functions.

On cross-examination, Jenny testified, initially, that she believes that an infant does not have a "lucid interval" following an episode of abusive head trauma. Hrg. Tr. at 1178. She agreed that if there can be a lucid interval of more than four or five hours after abusive head trauma, then Del Prete was not the only possible perpetrator. Upon further questioning, Jenny conceded that symptoms appear more slowly in some victims, though she said that an infant would not appear "normal" after a serious brain injury. She agreed, however, that "not normal" does not necessarily mean immediate loss of consciousness or cessation of breathing, but rather can involve listlessness, sleeping a lot, irritability, or vomiting. *See also* Hrg. Tr. at 1197 ("[M]ost pediatricians would say that after an abusive head trauma episode . . ., you'll see vomiting, irritability in the absence of fever and increased sleepiness and lethargy as signs of trauma."). The Court notes that these are signs that Del Prete told the police that I.Z. had shown on December 27. Jenny said that these sorts of signs could be mistaken as the result of "colic," acid reflux, or a stomach virus, and she agreed that there was some evidence from daycare workers other than Del Prete that I.Z. had displayed these signs prior to

December 27. Jenny also agreed that quivering lips (another sign reported by Del Prete) can be a sign of a seizure. She stated, however, that although symptoms can progress slowly, this means over a matter of hours, not over days, "[i]n an injury that's as devastating as this one." Hrg. Tr. at 1193. That said, Jenny agreed that more recent studies have indicated that there can be a lucid interval after abusive head trauma in which a baby does not appear perfectly normal but yet does not crash.[4] She also agreed that this makes it harder to pinpoint the timing of the trauma. Significantly, she also agreed that one can no longer accurately say that the head trauma must have been caused by the last person to see the baby conscious.

Regarding I.Z.'s subdural hemorrhages, Jenny agreed that the CT scans of I.Z.'s head ordered at Provena St. Joseph Hospital showed both acute and chronic subdural hemorrhages. On cross-examination (and again on recross), Jenny stated that she believed that I.Z.'s chronic subdural hemorrhages were caused by a prior episode of abusive head trauma that had ruptured I.Z.'s bridging veins, at some point *before* December 27. When asked if she agreed with Dr. Hedlund that the chronic subdural hemorrhage was at least two weeks old or more at the time of I.Z.'s hospital admission, she said, "I would leave that to the radiologists," and she stated (contrary to respondent's expert Dr. Rorke-Adams, *see infra*) that pediatricians generally rely on what radiologists say in this regard. Hrg. Tr. 1155.

Jenny also said that I.Z.'s chronic hemorrhage was too small to compress her brain sufficiently to cause her collapse sooner. She conceded, however, that the chronic hemorrhage was larger than the acute subdural hemorrhages and that the

[4] Jenny stated, however, that one would not expect the child to be normal for days to weeks after injury "and then suddenly collapse." Hrg. Tr. at 1060.

increasing size of the chronic hemorrhage eventually (post-hospitalization) required surgery to relieve intracranial pressure.

Jenny stated that subdural hemorrhages are typically a marker of trauma, rather than themselves the cause of brain injury. She opined that most infants who suffer from abusive head trauma do not die because of their subdural hemorrhages. Rather, they die because the brain edema compromises the blood's ability to circulate throughout the brain, and brain tissue dies as a result. She explained that the hypoxia-ischemia that kills brain tissue is a secondary injury that results from brain edema, which is the direct result of abusive head trauma.

Jenny agreed that if a chronic subdural hemorrhage is of significant size, it can cause other veins to stretch and rupture with additional trauma, including minor, unintentional trauma. She testified, however, that I.Z.'s acute hemorrhages could not have resulted from a rebleed of the chronic subdural hemorrhages, because the acute hemorrhages were also found in the falx and tentorium, whereas the chronic hemorrhages were found only in I.Z.'s frontal lobe. Jenny also opined that a rebleeding hemorrhage could not produce the amount of hemorrhage documented in I.Z.'s imaging studies. Instead, she stated, rebleeds in hemorrhages appear on imaging as small outlines around the outside of the chronic hemorrhage. She further opined that rebleeding hemorrhages do not cause infants to suffer brain injury or to deteriorate and that I.Z.'s chronic hemorrhage could not have caused her to collapse. The chronic hemorrhage, Jenny stated, was not particularly large and thus did not, in her view, cause increased intracranial pressure. "Another event," Jenny stated, "would have had to precipitate the failure of her brain." Hrg. Tr. at 1150. She stated that ruptured

bridging veins, which carry significantly more blood than a capillary found in a membrane of a chronic hemorrhage, were more likely to have caused the amount of bleeding documented on I.Z.'s imaging. She clarified, however, that a ruptured bridging vein would not necessarily "cause so much bleeding that the child needs emergency surgery." Hrg. Tr. at 1117.

There were also questions that concerned attempting to date I.Z.'s chronic subdural hemorrhage. Jenny agreed that a chronic subdural hemorrhage can manifest itself externally through an increase in head circumference. On direct examination, she testified that I.Z.'s head circumference started at the 50th percentile, increased to the 90th percentile over her first month-and-a-half, and then grew at that level through late December. She initially characterized this as a stable growth pattern and stated that I.Z.'s head grew a total of 4½ centimeters over the course of six weeks, which she said was similar to the average gain of two centimeters per month.[5] On cross-examination, however, Jenny conceded, after further examination of the data, that I.Z.'s head circumference actually may have increased more quickly than she had testified on direct examination, as compared to a normal infant's head growth. Jenny also agreed that I.Z.'s head grew just under 4 centimeters between birth and her one-month examination and that this is greater than average growth.

Jenny testified, however, that she could not determine "one way or the other" whether this indicated that I.Z. may have developed the chronic subdural hematoma during that period of more rapid head growth. Hrg. Tr. at 1170. She testified that I.Z.'s

[5] Jenny testified on direct examination that the effects of molding may have accounted for I.Z.'s head growth. On cross examination, she stated that she did not know how long molding lasts, but she conceded that she had never seen the effects of molding last up to an infant's second month of life.

anterior fontanelle—the soft spot at the top of an infant's head—was described as soft and flat each time she was examined before her collapse, which indicated that there was no increased intracranial pressure and thus the increased head circumference was no cause for concern. She stated that doctors did note that her fontanelle was bulging on December 28, the day after her collapse. According to Jenny, this timeline indicated that I.Z.'s brain was not under unusual pressure until "the final event" occurred. Hrg. Tr. at 1284. She admitted, however, that an infant may have a subdural hematoma and nonetheless have a fontanelle that appears normal. In summary, however, Jenny said that the head circumference increase did not assist in pinpointing the date when I.Z.'s chronic subdural hemorrhage first appeared.

Jenny rejected the possibility that I.Z.'s condition could have resulted from birth trauma. She testified that the medical records reflected that I.Z. had a normal childbirth without any labor complications. She noted that I.Z. was given oxygen but stated that most newborns receive oxygen for a short period to "pink[ ] them up." Hrg. Tr. at 1090. According to Jenny, the cephalohematoma and occipital caput that I.Z. had at birth are very common and are caused by traction on the skull during the birth process. She stated that I.Z.'s high Apgar scores showed a strong transition to extrauterine life and that I.Z.'s two-day stay in the hospital without any visit to the neonatal intensive care unit was a further indication that she did not suffer any trauma from birth. Jenny noted that I.Z. was discharged from the hospital as a "[n]ormal newborn" and was described as "healthy" in both her one-month and two-month evaluation. E.R. 1091–93. Jenny also agreed that subdural hemorrhage can result from birth but stated that in that event, the hemorrhage is typically located in the tentorium, not the frontal lobe where I.Z.'s was

found.

Jenny testified that although I.Z. was admitted to the hospital for a fever on October 23, 2002, the hospital tested her blood and urine and found no infections and therefore discharged her. She described this visit as "routine conservative care." Hrg. Tr. at 1094. Jenny acknowledged that I.Z. had an elevated platelet count documented during this hospital stay but stated that this condition, thrombocytosis, is common in infants who have a fever. She opined that I.Z.'s thrombocytosis was secondary, not primary (though she declined to rule out that the increased platelet count was associated with the prior abusive head trauma that she believed caused the chronic hemorrhage).

Jenny stated that because I.Z.'s thrombocytosis was reactive, it could not have caused clotting problems, even when her platelet levels increased to over a million platelets per drop of blood. She acknowledged some support in the literature for an association of "thrombotic complications" with reactive thrombocytosis but interpreted the literature as indicating this occurs in children with an underlying serious illness.

Jenny agreed that I.Z. had highly elevated platelet counts at certain points but interpreted this as a response to stress or trauma. In particular, she testified that the thrombocytosis documented in I.Z.'s medical records on December 27 meant "that she was very stressed and her body was responding vigorously." Hrg. Tr. at 1113. Jenny stated that the fact that I.Z.'s platelet count returned to normal by the time she arrived at Children's Memorial Hospital in January 2003 further indicated that her thrombocytosis was secondary, rather than primary, and that her platelet level decreased once the stress to her system was removed. According to Jenny, I.Z.'s platelet level remained

within the normal range for most of the remainder of her life. In addition, she opined that if I.Z. had thrombophilia, one would have expected to see abnormal clots throughout her body, and not just in her head.

Jenny rejected seizures as a possible cause of I.Z.'s collapse. She stated that none of the electroencephalograms (EEGs) done on I.Z. at Provena St. Joseph Hospital, UIC Hospital, and Children's Memorial Hospital showed any seizures.

Jenny also rejected the possibility that cortical venous thrombosis could have caused I.Z. to collapse. She stated that cortical venous thrombosis is typically associated in young children with illness and severe dehydration, and it rarely occurs in the absence of severe vomiting and diarrhea (which causes the dehydration). She agreed with Dr. Scheller that an infection can cause cortical venous thrombosis, but she opined that if that were the case, the thrombosis would be located near the site of the infection, rather than diffuse around the brain. Jenny stated that Dr. Leestma's finding of recent fibrin platelet thrombi in several small cortical veins within the cerebrum (*see infra*) did not, in her view, indicate that I.Z. previously had cortical venous thrombosis. Instead, she opined that those thrombi could have been caused by the fact that I.Z. was brain dead in the 24 to 36 hours preceding her death and thus would not have had good circulation throughout her brain.

9. Dr. Jan Leestma (neuropathologist testifying for petitioner)

Del Prete called Dr. Jan Leestma, a neuropathologist currently in private practice, to testify. Leestma testified that he conducted a neuropathological examination of I.Z.'s brain with Dr. Teas, a forensic pathologist and one of Del Prete's experts, and Dr. Tourtellotte, a neuropathologist from Northwestern University who was there on behalf

of respondent, and that a representative from the Illinois Attorney General's office, which represents respondent, observed the examination.

Leestma stated that the brain had already been sectioned into coronal planes by Dr. Harkey during I.Z.'s autopsy in 2003. He stated that the brain was friable—quite mushy—and that it came apart easily upon contact. He also stated that there were several places where the brain had already come apart—which Leestma referred to "artifacts"—which made handling difficult. Leestma testified that the friability of I.Z.'s brain was the result of respirator brain—a term that describes mushiness in the brain caused when the patient has been on a respirator for a period of time, as had been the case with I.Z. He stated that the passage of time between the 2003 autopsy and the 2012 neuropathological examination would not have led to further softening of the brain, because the formaldehyde solution in which the brain was fixed at the original autopsy would have stopped any further deterioration.

According to Leestma, he first removed the dura, which was largely intact, and cut into the sagittal sinus, which was free of clots. He then arranged the coronal sections from front to back on a table top and examined and photographed them. He then collected samples by cutting out pieces from the brain and dura to be prepared into microscopic slides. He had primary responsibility for collecting the brain samples but stated that Dr. Tourtellotte may have done some of the cutting as well. He testified that while he and Dr. Tourtellotte were cutting, Dr. Teas was taking notes of where in the brain each piece of tissue was located.

Regarding the dura, Leestma opined that he observed a neomembrane that was approximately three to four millimeters thick. He stated that this neomembrane

indicated that there were previous subdural hemorrhages that had largely resolved. He explained that when a subdural hemorrhage occurs, the body creates cells to enclose the blood in a membrane and eventually resolve it. As the healing process continues, capillaries appear in the membrane and may cause rebleeds. Leestma testified that spontaneous rebleeding of a hematoma is normal and results in creation of additional layers of membrane to resolve that bleeding. According to Leestma, as this process continues, it becomes increasingly difficult to date the age of the hematoma that originally triggered this process. He stated that examination also showed there had also been recent bleeding shortly before I.Z.'s death in November 2003 (eleven months after Del Prete's last contact with her).

Leestma disagreed with Dr. Rorke-Adams's conclusion (*see infra*) that I.Z.'s there was a contusion on the underside of I.Z.'s frontal lobe. He testified that he did not find any contusions or lacerations on the brain itself, either grossly or microscopically. Leestma also stated that these are rare in three-month-old infants because their heads are malleable. Leestma testified, credibly and persuasively in the Court's view, that the microscopic slide that Rorke-Adams contended (contrary to the slide's labeling) was the gyrus rectus was in fact correctly labeled as coming from the cerebral cortex in the back of the brain, and he showed in court, in detail, the evidence that demonstrated this. Leestma also stated that what Rorke-Adams contended was evidence of a contusion was actually the result of necrosis—death of the tissue—from hypoxia. He stated further that although the tissue in shown in a particular slide or slides had traces of iron present, that indicated nothing more than the presence of blood in that tissue at some point, which was caused by one of several other possible causes, not a contusion.

Finally, he noted that the slide was from brain tissue taken eleven months or more after I.Z.'s injuries in December 2012 and that a contusion that old would "look like a sponge, a kitchen sponge," without any recognizable brain tissue. Hrg. Tr. at 508-09.

Leestma stated that he found no evidence of clotting in the sagittal sinus. He did, however, find thrombi (clots) in several areas in the cerebral cortex. Leestma testified that one of the microscopic slides that he had prepared depicted three separate veins in the cerebral cortex (the surface of the brain) that had fibrin-platelet thrombi. He opined that these fibrin-platelet thrombi, as compared to other types of thrombosis, indicated that the clotting likely happened immediately prior to I.Z.'s death.

On cross examination, Leestma agreed that his initial report, dated August 20, 2012, did not identify that any of I.Z.'s blood vessels had thrombi. Leestma testified that he realized his mistake and supplemented his report after reviewing the photographs taken of I.Z.'s brain in 2012 and speaking with Teas about his report. Finally, he testified that the thrombosed cortical veins he had identified on the microscopic slides of I.Z.'s brain were not the cause of her collapse on December 27. Hrg. Tr. at 527.

10. Dr. Lucy Rorke-Adams (pediatric neuropathologist testifying for respondent)

Respondent called Dr. Lucy Rorke-Adams, a pediatric neuropathologist currently serving as a consultant for the Medical Examiner's Office in Philadelphia, Pennsylvania. Rorke-Adams reviewed all of the medical reports, police and paramedic reports, the autopsy report and photographs, microscopic slides of I.Z.'s brain prepared in July 2012, trial testimony, and the reports by Dr. Teas, Dr. Hedlund, and Dr. Forbes.

Rorke-Adams testified that the photographs of I.Z.'s brain taken at the autopsy in (which slowed the sectioned slices of brain laid out on an examination table) indicated

that I.Z. had hardly any residual tissue on the bottom surface of her frontal lobe. Rorke-Adams stated that the photograph of the sliced coronal sections of I.Z.'s brain showed that the frontal part of the brain, which she concluded was placed near the middle of the table at the bottom, was severely damaged, "falling to pieces," and was "hardly recognizable as brain." Hrg. Tr. at 697. The section of the brain immediately posterior to the frontal section was also damaged and showed an area of tissue that was missing from the brain.

Rorke-Adams also testified about her review of microscopic slides prepared by Dr. Leestma along with Dr. Tourtellotte and Dr. Teas. Rorke-Adams stated that she believed that one of the slides had been mislabeled. Specifically, she testified that slide 16, labeled the "Periventricular Posterior Cortex and White Matter," an area located toward the back of the brain, did not have "the anatomical configuration of what [she] would expect the brain to look like in that region." Hrg. Tr. at 712. Based upon that observation, she believed that the slide actually depicted the gyrus rectus, which is located toward the front of the brain, on the underside of the frontal lobe. According to Rorke-Adams, the gyrus rectus is a common site of injury in infants who suffer from abusive head trauma because it is located just above a very rough bone that forms the floor of the skull. When an infant's soft brain tissue is forced across that surface, she testified, the brain tissue suffers contusions and lacerations.

Rorke-Adams testified that slide 16 showed that I.Z.'s gyrus rectus had been injured severely. Specifically, she stated that the outer layer of cerebral cortex had been "practically totally destroyed," Hrg. Tr. at 719, and that the staining of the tissue, a process used to show the presence of any reactive cells responding to injury, was

irregular. Rorke-Adams concluded that irregular staining was indicative of severely damaged tissue of varying degrees. She also testified that the presence of iron within that tissue, as shown by the staining, indicated that the damage must have appeared before death, because the breakdown of blood sufficient for iron to appear microscopically takes some time. She further opined that the microscopic slides depicting I.Z.'s corpus callosum—the band of fibers connecting the two hemispheres of the brain—showed signs of scarring and degeneration. Rorke-Adams concluded that the scarring in the corpus callosum indicated a previous injury, and she testified that trauma is the most common cause of damage to the corpus callosum. She opined that although hypoxia-ischemia can cause necrosis and scarring in the outer cerebral cortex of the brain, it was less likely to cause damage to the corpus callosum, located within the white matter of the brain, because of its low vulnerability to lack of oxygen. Rorke-Adams thus concluded that the damage to the corpus callosum was likely the result of trauma rather than hypoxia-ischemia.

Rorke-Adams disagreed with Dr. Leestma's conclusion in his report that one of the slides depicted thrombosed cortical veins that had thrombosed prior to I.Z.'s death. She opined that the clots pictured in the slide were quite recent and had not yet undergone organization. She also stated that these were small, isolated thromboses that had no pathological significance and did not indicate any sort of coagulopathy. She explained that this type of thrombosis can occur when there is a breakdown of normal circulation of the blood.

Instead, Rorke-Adams concluded that I.Z.'s brain suffered a number of injuries. First, she concluded I.Z. had subdural hematomas. She stated that these were chronic

(old) at the time of her death but that they did exist prior to December 27, 2002. (In this regard, Rorke-Adams differed from every other witness on both sides who testified on this topic.) Second, she concluded that I.Z. had a fronto-orbital contusion (the claimed injury to the gyrus rectus she had previously referenced). Third, she determined that I.Z. had multiple areas where tissue from both the outer cerebral cortex and the internal white matter had begun to die or scar as a result of the cardiorespiratory arrest she experienced at the time of the injury on December 27. Fourth, she concluded that I.Z. had a site of chronic damage to the cerebellum, which Rorke-Adams also attributed to the cardiorespiratory arrest that I.Z. suffered on the day of her collapse. Fifth, she concluded that I.Z. had suffered injury in an area of her brain stem that Rorke-Adams opined was particularly susceptible to injury following a period of cardiac arrest.[6]

Rorke-Adams concluded that all of these injuries were the result of abusive head trauma, more specifically, a single incident of abusive head trauma that took place on December 27, 2002. *See* Hrg. Tr. at 754. Her conclusion was based on part on contusions and lacerations that she claimed to have observed in the autopsy photographs of the sectioned brain. *See* Hrg. Tr. at 727-28. She stated that the single incident of trauma caused I.Z. bilateral subdural hematomas, contusions, and lacerations on her brain and eventually led to cardiorespiratory arrest.

Rorke-Adams opined that I.Z. was subjected to abusive head trauma by shaking, and that "[t]here may have been an impact associated with the attack." . Hrg. Tr. at 754. She acknowledged that there was no evidence of impact but justified this aspect

[6] Rorke-Adams also included a sixth diagnosis that immediately preceded I.Z.'s death in November 2003 and that she said was not related to I.Z.'s collapse on December 27, 2002.

of her conclusion by stating, "this is a phenomenon which may occur at the time of the shaking and show no evidence of impact because the impact is against a soft surface." Hrg. Tr. at 756. After being pressed further on the issue of impact, however, Rorke-Adams backed off, saying that impact was not part of her diagnosis, and she agreed, "we can throw it out." Hrg. Tr. at 758.

Rorke-Adams rejected alternative explanations for I.Z.'s injuries, including cortical venous thrombosis, birth trauma, or an infection complicated by hypoxia-ischemia. She stated that if I.Z.'s condition had been caused by cortical venous thrombosis, the pattern of damage to her brain would have been different from what was observed. Regarding birth trauma, Rorke-Adams said there was no indication of significant birth trauma, Regarding hypoxia-ischemia, she stated that although some of I.Z.'s injuries were related to hypoxia-ischemia, that could not account for the contusions and lacerations or the subdural hematoma.

Rorke-Adams also rejected the idea that I.Z.'s collapse could have been caused by rebleeding from a previously existing chronic subdural hemorrhage. In this regard, she opined, as noted above, that I.Z. did not have a chronic subdural hemorrhage prior to December 27, 2002. She rejected the conclusions by both sides' radiologists to the contrary,[7] explaining this by stating that "radiologists agree with each other." Hrg. Tr. at 733. She testified on redirect that the reason she rejected the radiologists' conclusion that I.Z. had a chronic subdural hematoma is that subdural hematomas contain both

[7] These included Dr. Forbes, Dr. Hedlund, Dr. Smith, an expert for respondent, Dr. Barnes, Dr. Julie Mack, and the radiologists at Provena St. Joseph Hospital and UIC Hospital who contemporaneously reviewed I.Z.'s imaging scans in December 2002 – January 2003. *See* Hrg. Tr. at 733-34.

cerebrospinal fluid and blood, which makes the hematoma hard to distinguish in terms of chronicity based on imaging alone.

Rorke-Adams testified that even if I.Z. did have a chronic subdural hematoma prior to her collapse, that would not change her opinions because, she said, "it was asymptomatic," Hrg. Tr. at 734, and small chronic subdural hematomas are not problematic in infants. She admitted, however, that she had not examined I.Z.'s imaging studies to assess the size of the chronic subdural hematoma. She stated that any chronic hematoma must have been small, because there was "no clinical manifestation of central nervous system dysfunction" prior to her collapse. Hrg. Tr. at 738. Rorke-Adams further testified that minor trauma could have caused any of the chronic subdural hematomas. She admitted, however, that if the acute subdural hemorrhages were the same size as the chronic ones, the same type of minor trauma theoretically could have caused the acute subdural hemorrhages.

Rorke-Adams appeared to agree with Dr. Leestma's conclusion that I.Z.'s dura contained multiple layers of neomembranes, and she stated that this could indicate multiple incidents of hemorrhage. She agreed that the dura is a vascular structure that can easily bleed without any inflicted trauma. She testified on redirect, however, that intradural bleeding is not uncommon for infants and would have no clinical significance.

On the question of cortical venous thrombosis, Rorke-Adams stated, again in contrast to experts on both sides (including respondent's expert Dr. Hedlund), that this condition is easy to diagnose, and that the fact that it had not been diagnosed in I.Z. is why she believed it was clear that she did not have that condition. *See* Hrg. Tr. at 743. Rorke-Adams testified that she based her view about ease of diagnosis on the fact that

clinicians at the hospital where she works diagnose children with cerebral vein thrombosis "not infrequently . . .," Hrg. Tr. at 747, though she acknowledged that she had no way to tell how often the diagnosis is missed. Rorke-Adams disagreed with published reports stating that cortical venous thrombosis can be difficult to diagnose. She also said that if it were the case that imaging showed I.Z. had a thrombosed cortical vein, this would not affect her opinion. *See* Hrg. Tr. at 749. She admitted that cortical venous thrombosis can cause a child to seize, which in turn can cause a child to stop breathing and cause cardiac arrest. She also agreed that if I.Z. had cortical venous thrombosis prior to December 27, abuse would not even have been suspected. *See, e.g.*, Hrg. Tr. at 749. She said, however, that patients with cortical venous thrombosis do not present with bilateral subdural hematomas. Rorke-Adams also said that if I.Z. had suffered from significant cortical venous thrombosis that caused her clinical picture, she would have had large areas of hemorrhage through the cerebral cortex and white matter of the brain due to the back-up of the veins, which she did not have.

Regarding her testimony that there were contusions and lacerations on I.Z.'s brain, Rorke-Adams acknowledged that no other expert on either side had reached this conclusion. She also acknowledged that the Dr. Harkey, the medical examiner who conducted the autopsy, had not reported any contusions or lacerations on the brain, and she agreed that medical examiners who conduct autopsies are well-trained in looking for contusions and lacerations.

Upon further questioning, Rorke-Adams acknowledged that what she considered to be trauma-caused damage to the frontal part of I.Z.'s brain was the same on the top and bottom, even though only the bottom (underside) of the frontal lobe has the

potential to scrape against rough bone as she described. Asked to explain this, Rorke-Adams said, somewhat vaguely, that "there must have been so much force in the movement of the brain that something interfered with the – all of the tissue . . . ." Hrg. Tr. at 837. She characterized the damage to I.Z.'s brain as "horrible," even as compared to other trauma-damaged brains she has seen in her work. *Id.*

Rorke-Adams stated that in her opinion, the conditions that she considered to be contusions and lacerations on I.Z.'s brain could not have occurred when the medical examiner removed the brain during the autopsy. She stated that medical examiners are generally well-trained in removing the brain without causing damage. She disagreed with the finding by Dr. Harkey, the medical examiner who conducted the autopsy, the whole brain was soft and mushy. (There was no real attempt to reconcile Rorke-Adams's statement that a medical examiner like Harkey is generally good at extracting a brain from a skull without damaging it with her apparent conclusion that he was completely deficient in recognizing brain lacerations and contusions.) Rorke-Adams agreed that a "respirator brain" is mushy overall and will "fritter[ ] away when you try to handle it." Hrg. Tr. at 803. She stated on redirect, however, that the rest of I.Z.'s brain did not "look like a respirator brain" and repeated that she believed the frontal lobes showed severe damage. Hrg. Tr. at 821.

Rorke-Adams conceded that she could not date the contusions and lacerations she claimed to see, other than to say they were "months" old at the time of I.Z.'s death in November 2003. She could not put an outer limit on the age of these injuries, saying they conceivably could date back to her birth. *See* Hrg. Tr. at 804. Finally, she testified that I.Z. *did not* have a left frontal contusion, and that Dr. Flaherty, the prosecution's

expert at Del Prete's criminal trial, was wrong when she testified to the contrary.

It was apparent from Rorke-Adams's testimony that her claim that I.Z. had brain contusions and lacerations was largely dependent on her understanding of how the brain sections were laid out on the autopsy photo she reviewed and her claim that the aforementioned microscopic slide prepared by Dr. Leestma under the supervision of Dr. Tourtellotte and Dr. Teas had been mislabeled. On the latter point, Rorke-Adams disagreed with the participants' own statements regarding how they had prepared the slides. *See* Hrg. Tr. 771-72. Rorke-Adams's testimony on these points was, the Court finds, completely unbelievable and unreliable. Her own testimony and later questioning of Dr. Teas showed that she had viewed the autopsy photo of the brain sections upside-down and had drawn erroneous and unwarranted conclusions from this, and that she did not take into account other factors that accounted for the physical damage she observed, specifically the mushy condition of the brain at autopsy and the likelihood of damage that occurred in removing it. And the testimony of Dr. Leestma, discussed earlier, established to the Court beyond peradventure that the microscopic slide that Rorke-Adams interpreted as showing damage in the gyrus rectus was, contrary to her testimony, correctly labeled. Dr. Rorke-Adams drew an erroneous conclusion about the part of the brain that the slide depicted.

11. Dr. Shaku Teas (forensic pathologist testifying for petitioner)

Del Prete called Dr. Shaku Teas, a forensic pathologist, to testify on her behalf. After a fourteen-year stint with the Cook County Medical Examiner, she continued to conduct autopsies for various county coroners, including DuPage County. She was also a member of one of nine Illinois child death review teams. She currently works as

a consultant.

Teas reviewed all of the available medical records, police and paramedic reports, DCFS reports, Dr. Harkey's autopsy report, and the transcript from Del Prete's criminal trial, as well as consulting Dr. Barnes, Dr. Julie Mack (who did not testify at the evidentiary hearing), Dr. Leestma, and Dr. Lantz. She stated that she additionally prepared a clinical history for I.Z., with the assistance of someone from Del Prete's legal team.

Teas first testified about conducting the neuropathological exam of I.Z.'s brain on July 17, 2012, with Dr. Leestma and Dr. Tourtellotte, who was there on behalf of respondent's counsel. She stated that Leestma processed I.Z.'s brain at Tourtellotte's request, while Teas, Tourtellotte, a lawyer from the Attorney's General office, and a technician from the coroner's office observed. According to Teas, Leestma first removed the dura and examined it and then opened the sagittal sinus to examine it as well. Leestma then began cutting slices of I.Z.'s brain and calling out the name of each slice as Teas recorded the name on a piece of paper towel, which is standard procedure. Teas testified that the brain was soft and discolored, with several "removal artifacts," which she opined were typical in a brain of someone who has been on a respirator prior to death.

Teas was asked about Dr. Rorke-Adams's opinion that photographs of I.Z.'s brain showed contusions on the frontal lobe. Teas testified that Rorke-Adams had misidentified the section of the brain she reference as being from the front of the brain, and explained this in detail in a credible and persuasive way. Regarding the photograph of the coronal sections of the brain, Teas said that she could not determine

how the brain was laid out on the table because the tissue was so friable and distorted. Teas stated that if I.Z. had a brain contusion, it would have appeared on the January 4, 2003 MRI of her brain, which it did not. Teas concluded that the gnarly quality of I.Z.'s brain was due to respirator brain, and not the result of any contusions, lacerations, or damage from trauma.

On extensive questioning on cross examination and redirect regarding Dr. Rorke-Adams's testimony about seeing evidence of a brain contusion, Teas indicated that there was uncertainty about how the brain sections were laid out in the photos taken at the 2003 autopsy. Upon further questioning, however, it was clearly and compellingly demonstrated that Dr. Rorke-Adams had drawn her conclusions regarding the part of the brain she claimed was contused and lacerated after viewing the pertinent photograph upside-down. *See* Hrg. Tr. at 1538-41.

Teas stated that even if Dr. Rorke-Adams correctly identified the section of brain she assessed from the photographs, the photograph did not depict a brain contusion. She explained on cross and redirect, credibly and persuasively, that the "gnarliness" identified by Rorke-Adams represented the effect of physically removing a mushy, friable brain from the skull. This process, which requires the physician conducting the autopsy to reach into the skull with his fingers in the area where Rorke-Adams said she saw damage, itself would have caused damage or deformity to the brain tissue. *See* Hrg. Tr. at 1547-53, 1563-64. Thus what Rorke-Adams said she observed could not accurately be described as damage that already existed at the time of death. Teas also disagreed with Rorke-Adams's testimony that I.Z.'s brain had atrophied, saying that the brain weight was within the normal range.

Teas testified that in evaluating a child like I.Z. who had a chronic subdural hemorrhage, it is important to do a thorough history to attempt to assess how it occurred. She stated that based on I.Z.'s medical records, her birth was somewhat traumatic and that the evidence indicated she suffered some oxygen deprivation. She also had an occipital caput and cephalohematoma when she was born. These findings may not have been viewed as significant at the time, Teas said, but in retrospect, given the chronic subdural hemorrhage and I.Z.'s later collapse, she believed they were relevant. Teas stated that I.Z.'s chronic subdural hemorrhage may have been the result of birth trauma.

Teas also opined that I.Z.'s head circumference grew abnormally quickly during the first months of her life—particularly her first month—"more rapidly than it should have at that particular point." Hrg. Tr. at 1366. She stated that this may have been a sign of a chronic subdural hematoma that already existed at that time.

Teas agreed with Dr. Scheller that I.Z.'s records reflected thrombocytosis in October 2002 when she visited the hospital because of a fever. She stated that I.Z.'s medical records documented that I.Z. had anemia and also an ear infection in the days prior to December 27, both of which are known risk factors for cortical venous thrombosis. She testified that either of these conditions, or both, could have caused I.Z.'s platelet levels to increase, which in turn likely caused I.Z. to develop some type of clotting problem and ultimately resulted in the thrombosed vein that Dr. Barnes detected on I.Z.'s imaging studies. Teas conceded that I.Z.'s thrombocytosis may have been reactive, as Dr. Jenny stated, but she testified that this was irrelevant, because I.Z. remained at risk irrespective of the reason for the condition. Teas acknowledged that it

is rare for reactive thrombocytosis to lead to thrombotic (clotting) issues, but she said that I.Z.'s platelet count was unusually elevated, as high as she has seen.

Teas concluded, based on her review of the medical records and autopsy photographs, together with her own neuropathological examination of the brain, that I.Z.'s collapse resulted from cortical venous thrombosis. She repeated that I.Z. had several risk factors for cortical venous thrombosis, which she detailed. Teas explained that cortical venous thrombosis is a difficult diagnosis to catch and stated that she herself likely had missed it several times during autopsies over the years. She opined that cortical venous thrombosis can cause blood to leak out of a thrombosed vein into the dural layer. According to Teas, these hemorrhages were intradural, not subdural, as they existed throughout the dura. She opined that the dural hemorrhage likely caused I.Z. to develop seizures and cortical venous thrombosis, and perhaps rebleeds from the chronic hemorrhage. These conditions, in turn, led to her collapse on December 27. Teas found nothing to support a claim that the collapse was caused by trauma, including abusive head trauma.

Teas disagreed with Dr. Jenny's conclusion that the EEG results foreclosed the possibility that I.Z. suffered from seizures. Specifically, Teas testified that Del Prete reported that I.Z.'s lips quivered and she shook when she fed from the bottle on the morning of December 27. She stated that this may well have represented a seizure. Additionally, Teas opined that an EEG cannot always document seizures, particularly if the patient has been given an anti-convulsant. Teas testified that I.Z. began taking Phenobarbital, an anti-convulsant, upon her admission to the hospital, which may have suppressed her seizures and made it impossible to detect them on an EEG.

Regarding lucid intervals, Teas stated that it has recently been recognized in medical literature that a child can remain conscious even after suffering abusive head trauma. She disputed Dr. Jenny's testimony to the extent it indicated otherwise, as well as Dr. Flaherty's testimony at Del Prete's criminal trial that I.Z.'s crash would have immediately followed a head injury, which Flaherty had said pointed to Del Prete as the perpetrator. Teas noted that Jenny's own finding of a prior incident of abuse that led to the chronic subdural hemorrhage, without any indication of a collapse at that time, itself showed that an infant, and in particular I.Z., could experience a significant lucid interval following an incident of abuse.

On cross examination, Teas said that she does not believe that the scientific evidence supports the proposition that subdural or subarachnoid hemorrhages or retinal hemorrhages can result from shaking alone.

Teas conceded that many of the types of birth complications she stated I.Z. had experienced are not unusual during childbirth. Teas also agreed that I.Z.'s Apgar scores indicated a healthy response in the minutes immediately following her birth. She repeated, however, that although there was not "great birth trauma," I.Z.'s birth "wasn't as atraumatic as some people may think" for the reasons she previously described. Hrg. Tr. at 1452. Teas also acknowledged that I.Z.'s one-month and two-month examinations did not reflect any problems, and that her pediatricians stated that her anterior fontanelle was soft and flat.

Teas also agreed that Del Prete had told police that I.Z. appeared fine the morning of December 27, up until the point when Del Prete noticed her diarrhea. She acknowledged that various bacterial and viral tests done on I.Z. at the hospital following

her collapse were negative and that reports of CT scans did not describe any indication of a sinus infection. Finally, Teas admitted that cortical venous thrombosis has been reported relatively rarely in infants, though she testified that this may be in part because the condition is so difficult to diagnose.

12. Testimony at the reopened hearing on June 21, 2013

On June 21, 2013, Del Prete called four additional witnesses to testify regarding a recently-discovered November 2003 memo from Detective Kroll to Dr. Flaherty, the prosecution's expert at Del Prete's trial. The Court had granted Del Prete's request to reopen the hearing after her counsel received the memo from the Northwestern University School of Journalism Medill Innocence Project, which obtained it pursuant to a Freedom of Information Act request to the Romeoville Police Department. Del Prete represented that her counsel had not previously obtained the memo.

Kroll's memo to Dr. Flaherty stated:

> If you haven't already heard, [I.Z.] died 11-09-03. I'm writing to inform you of a "twist" in our case presented by the DuPage County Medical Examiner. On 11-09-03, I received a phone call from an Attorney who notified me that Isabella would undergo a "post" medical exam on 11-10-03. This Attorney specifically called to inform me that the pathologist scheduled to perform the autopsy does not agree with SBS [shaken baby syndrome], and has testified for the defense in two DuPage County SBS cases.
>
> On 11-10-03, I spoke to a Plainfield Police Evidence Tech (ET) who was present at the autopsy. The ET advised that Dr. Jeff Harky [sic] did in fact question the diagnosis of SBS. I was told that Dr. Harky specifically looked for fractures in the rib cage (adult grabbing point) and found none. Dr. Harky intends to summons all of [I.Z.'s] medical records to see who determined this was SBS, and why they reached that diagnosis.
>
> I have great confidence in your findings, and our investigation. This correspondence is FYI. However, I anticipate having to answer several questions for my prosecuting Attorney. Please call me when you have a few minutes to discuss the case.

THANKS!!!

Dkt. No. 106-1.

Detective Kroll testified that he recalled Officer Tracy Caliendo, who was present at the autopsy, calling him when the pathologists opened I.Z.'s skull to report that her brain "kind of poured out like oatmeal." Suppl. Hrg. Tr. at 19. He did not specifically recall Caliendo telling him that Harkey questioned the diagnosis of shaken baby syndrome, but he assumed his memo was accurate in this regard. He agreed that the medical examiner's questioning of the diagnosis of shaken baby syndrome would be unfavorable to the prosecution. Kroll said he did not specifically recall discussing Harkey's views with anyone and did not recall if he gave his memo to Will County prosecutors. He did recall, however, that he spoke with the prosecutors about the subject of his memo one to two months before I.Z.'s trial in February 2005. Finally, Kroll stated that he did not specifically recall discussing Harkey's views with Flaherty. He stated, however, that he most likely had done so, because she was punctual about returning phone calls related to the case (as he had requested in the memo). He did not know if his memo had been given to Del Prete's defense attorney.

Plainfield police officer Tracy Caliendo testified that she was present at I.Z.'s autopsy in her capacity as an evidence technician. She recalled only that Harkey noted no fractures or external injuries. She stated that she did not recall Dr. Harkey questioning the diagnosis of shaken baby syndrome and did not recall discussing the autopsy with Kroll. Caliendo believed there was another Plainfield officer present, but she conceded that her case report did not indicate this.

Dr. Flaherty testified that she did not recall receiving the memo from Detective

Kroll. She likewise did not recall whether she spoke to Kroll or anyone else regarding the memo's contents.

Dr. Harkey testified that did not recall telling anyone at the autopsy that he had found no evidence of fractures on I.Z. at the "adult grabbing point" but that this was something he would have looked for at the time. He stated on cross examination, however, that a baby can be abused without there being resulting fractures or bruising.

Harkey stated that he did not specifically recall whether he had spoken to anyone about doubting the diagnosis of shaken baby syndrome in I.Z.'s case. He stated, however, that he had concerns with a diagnosis of shaken baby syndrome, because he did not believe there was any finding that could distinguish injuries caused by blunt force trauma from those caused by shaking alone. In other words, he said, "when I am looking at pathology in an autopsy, I don't believe that I can say this child was shaken rather than this child was hit." Suppl. Hrg. Tr. at 42.

Harkey also testified that he has a problem with a diagnosis of shaken baby syndrome or abusive head trauma pointing to particular perpetrator. He stated that a child may have a lucid interval after an incident of abusive head trauma and may "go unresponsive" only much later, Suppl. Hrg. Tr. at 43, and thus the onset of unresponsiveness does not necessarily indicate that the caretaker present at the time was responsible for inflicting the injury. Harkey also stated that a child can feed from a bottle after being subjected to abusive head trauma even if the trauma caused subdural hemorrhage and retinal hemorrhage. He explained that his concern about a diagnosis of shaken baby syndrome is that it purports to identify the perpetrator of abuse based on the onset of the symptoms.

Harkey noted, however, that his job as medical examiner was not to identify a perpetrator, but only to determine the cause of death. He reaffirmed his testimony at trial that I.Z. died as a result of abusive head trauma, and he said this was not based on his autopsy findings, because "[t]hat trail had gone cold" by the time I.Z. died. Suppl. Hrg. Tr. at 45. Rather, his testimony on this point was dependent entirely on other doctors' conclusions.

Harkey testified that if a hemorrhage in the brain from a rebleeding chronic subdural hematoma leaked into the subarachnoid space, the hemorrhage could trigger a seizure which could cause a child to collapse. He did not consider this in I.Z.'s case, however, because he was not aware that I.Z. had a chronic subdural hematoma. He testified that he did not know whether he received any medical records documenting a subdural hematoma in I.Z. but acknowledged that Flaherty's reports and letters did not mention a chronic subdural hematoma.

Harkey also reaffirmed his testimony that I.Z.'s brain showed no contusions or lacerations, either in the front or the back. He stated that this was something he had specifically looked for while conducting the autopsy. Harkey also stated that the brain was "excessively soft," Suppl. Hrg. Tr. at 51, as he would expect for a child who had been on a respirator.

Discussion

Before a federal court may address the merits of a habeas corpus petition from a state prisoner, the petitioner must give each level of the state's courts a fair opportunity to review her federal claims. 28 U.S.C. § 2254(b)(1)(A); *Baldwin v. Reese*, 541 U.S. 27, 32 (2004); *O'Sullivan v. Boerckel*, 526 U.S. 838, 844–45 (1999). A petitioner who fails

to properly assert a federal claim before the state courts has procedurally defaulted the claim. Thus the federal court is barred from addressing the merits of the claim, unless the petitioner can demonstrate both cause for and prejudice from the default or that a miscarriage of justice will occur if the Court fails to address the merits. *See, e.g., House v. Bell*, 547 U.S. 518, 536 (2006); *Woods v. Schwartz*, 589 F.3d 368, 373 (7th Cir. 2009). The miscarriage of justice exception requires the petitioner to show that "in light of new evidence, 'it is more likely than not that no reasonable juror would have found petitioner guilty beyond a reasonable doubt.'" *House*, 547 U.S. at 536–37 (quoting *Schlup v. Delo*, 513 U.S. 298, 327 (1995)).

The parties agree that Del Prete procedurally defaulted part of her ineffective assistance of counsel claim. Specifically, Del Prete concedes that she failed to argue before the Illinois state courts her claim that trial counsel was unconstitutionally ineffective for failing to challenge the admissibility of Flaherty's expert testimony on shaken baby syndrome. Del Prete argues that the default should be excused. She contends that in light of new evidence, it is more likely than not that no reasonable juror would find her guilty beyond a reasonable doubt.

Respondent argues in its post-hearing brief that the Court should not address Del Prete's miscarriage-of-justice argument because the underlying ineffective assistance claim is doomed to fail on its merits. The Court previously denied an identical request by respondent in July 2012. The Court adopts the rationale it expressed then and only summarizes here. At the time, the Court asked respondent's counsel whether respondent was giving up the procedural default defense to Del Prete's claim. Respondent's counsel expressly declined to do so. The Court inquired whether this

meant that if the Court ended up finding Del Prete's defaulted ineffective assistance claim to have merit, respondent would then insist on the procedural default defense and require Del Prete to then establish the miscarriage of justice exception. Respondent's counsel said yes. Therein lies the problem. Respondent has a right to assert the procedural default defense, but it is not entitled to insist that the Court put the cart before the horse. The Court sees no reason to revisit its earlier ruling. *See Gomez v. Jaimet*, 350 F.3d 673, 679 (7th Cir. 2003) ("When a petitioner has procedurally defaulted a claim, a federal court cannot reach the merits of that claim unless the petitioner demonstrates . . . that enforcing the default would lead to a fundamental miscarriage of justice." (internal quotation marks omitted)).

As the Court has stated, to pass through the miscarriage-of-justice gateway and have her claim considered on the merits, Del Prete must show that in light of new evidence, it is more likely than not that no reasonable juror would have found her guilty beyond a reasonable doubt. She must support her claim "with new reliable evidence—whether it be exculpatory scientific evidence, trustworthy eyewitness accounts, or critical physical evidence—that was not presented at trial." *Schlup*, 513 U.S. at 324; *Coleman v. Hardy*, 628 F.3d 314, 319 (7th Cir. 2010).

The Supreme Court has emphasized that the standard articulated in *Schlup* is demanding and allows review of a procedurally defaulted claim in only the "extraordinary" case. *House*, 547 U.S. at 538; *see also McQuiggin v. Perkins*, 133 S. Ct. 1924, 1936 (2013). The reviewing court need not, however, have "absolute certainty about a petitioner's guilt or innocence" in order to find that the petitioner has satisfied her burden at the gateway stage. *Coleman*, 628 F.3d at 319.

In determining whether a petitioner has met her burden, the reviewing court is not bound by rules of admissibility that would govern at trial. Instead, the court should consider all of the evidence, including relevant evidence that was excluded or unavailable at trial. *Schlup*, 513 U.S. at 327–28. A court must consider all of the evidence, both old and new, and on the entire record "make a probabilistic determination about what reasonable, properly instructed jurors would do." *House*, 547 U.S. at 538; *Coleman*, 628 F.3d at 319 (in assessing impact on jury, it must be presumed jurors obey instruction requiring proof beyond a reasonable doubt).

1. Respondent's claim of bias

The Court first addresses respondent's attack on a number of Del Prete's witnesses on the ground that they are biased. Respondent contends that these witnesses' testimony is unreliable for that reason. *See* Resp.'s Post-Hrg. Br. at 41-43. The Court finds respondent's contentions unpersuasive.

Respondent's argument regarding Dr. Teas is representative of the claim of bias. Respondent argues that Dr. Teas testifies only for defendants in criminal cases, thereby showing her bias, and that she blinded herself to evidence of abuse in this case. Neither argument is availing. For years, Dr. Teas testified on numerous occasions in her capacity as a medical examiner, both for Cook County and other Illinois counties, including DuPage County. The overwhelming majority of this testimony was on behalf of prosecutors. She now has a private forensic pathology consulting practice, and it is therefore unsurprising that her work now is largely *not* for prosecutors, who tend to have access to forensic pathologists who work for county medical examiners or coroners. Respondent also claims that Teas is biased against claims of child abuse and that this

is shown by her testimony that she saw no evidence that I.Z. was subjected to abuse on December 27, 2002. The Court disagrees. Teas did not ignore evidence; rather, she found it insufficient to show that I.Z.'s injuries were inflicted by someone else.

In addition, Teas's disagreement with the "shaken baby syndrome" hypothesis is hardly a sign of bias. One of respondent's own experts, Dr. Jenny, conceded that a chapter in her child abuse text (which she characterized as one of the best in a text that she considers the authoritative text in the field) makes it clear that the evidence base for the hypothesis that shaking alone can cause injury of the sort that I.Z. suffered consists exclusively of perpetrator admissions, the circumstances of which Jenny conceded she was unaware. A reasonable person—including a reasonable medical professional like Dr. Teas—could find this to be unscientific and thus unsupportable. Furthermore, respondent's expert in biomechanical engineering said that it is not yet possible for that science to establish an injury threshold for head injuries in infants. And it appears from the evidence at the hearing that the mechanism by which shaking purportedly causes these sorts of injuries is as yet unclear, assuming it exists at all. All of this, given what one of Del Prete's experts referred to as a renewed emphasis on "evidence-based medicine," makes it less than surprising, and certainly not a sign of bias, that a medical professional like Teas would decline to adopt the causation and related testimony offered by Dr. Flaherty at Del Prete's trial and several of respondent's experts who testified before this Court, or the hypothesis underlying that testimony.

What the Court finds more significant in evaluating the witnesses' testimony is whether it appears that a witness's claimed bias affected his or her testimony. The Court did not and does not see that in the content of the testimony of Teas or Del

Prete's other witnesses whom respondent attacks, or in their demeanor. The testimony of each of these witnesses may be more or less persuasive, as the Court will address, but the Court does not find a basis to adopt respondent's invitation to discount their testimony altogether.

The Court reaches the same conclusion regarding the purported bias of each of the witnesses for Del Prete whom respondent targets, namely Drs. Teas, Barnes, Scheller and Leestma. The Court saw nothing in the content of these witnesses' opinions that suggested it was shaped by their claimed bias. These witnesses disagreed on certain points with respondent's corresponding experts, but disagreement does not equate to bias. The Court makes the following additional comments regarding Barnes, Leestma, and Scheller:

Barnes: Barnes is anything but a partisan. He founded the child abuse and neglect team at Lucille Packard Children's Hospital, which partners with Stanford University Medical Center. Through his work as part of this team, Barnes testifies as a fact witness in criminal cases, and hospital policy precludes his testimony as an expert in cases his team investigates.

Leestma: The Court notes that in addition to his testimony for defendants in criminal cases, Dr. Leestma is also working on matters on which he will testify for the prosecution. *See* Hrg. Tr. at 512. Respondent sees bias in Leestma's supplementation of his written report to correct an inaccuracy. The Court found Leestma's explanation for the modification credible and not an indication of bias. The Court also notes that a good deal of Leestma's testimony was consistent with that of experts who testified for respondent. His disagreement with certain conclusions by Dr. Rorke-Adams, a witness

whose testimony on those points lacked credibility (as the Court has discussed), is certainly not a basis to conclude that Leestma's purported bias impacted his testimony. Finally, the Court notes that a key subject of Leestma's testimony, concerning the process of sectioning of the brain and preparing slides for microscopic examination, involved work he did together with respondent's consulting expert Dr. Tourtellotte. Respondent had the ability to call Tourtellotte to testify if there was a basis to challenge the accuracy of Leestma's testimony in this regard.

Scheller: Respondent mischaracterizes, or at least misinterprets, a statement in Scheller's written report that "it is one thing to be suspicious, and another to be certain, without witnesses, that someone has harmed a child." *See* Resp.'s Br. at 42. The Court agrees with Del Prete that this simply states the obvious, specifically that a physician's testimony should be based on medical evidence, and that physicians should be cautious in ascribing a particular injury to child abuse. This is anything but an indication of bias.

2. New evidence

The *Schlup* test focuses in part on whether the petitioner has supported her claim of miscarriage of justice with new evidence. There is plenty of it here. A good deal of it involves the medical approach to claimed shaken baby cases. Dr. Barnes testified about the current emphasis on "evidence-based medicine," requiring solid scientific support for diagnosis as well as for expert testimony. *See, e.g.,* Hrg. Tr. at 68-69. Dr. Prange testified regarding the need to establish an injury threshold for the types of injuries claimed to have resulted from abusive head trauma and his attempt to establish whether this threshold can be attained by shaking alone. Respondent's corresponding

expert, Dr. Rangarajan, testified that the science of biomechanics is not yet able to establish an injury threshold in this area. If true, this statement provides a newfound basis for skepticism about causation and mechanism testimony offered at Del Prete's trial as well as similar testimony offered by respondent at the hearing before this Court.

Dr. Jenny's testimony regarding the aforementioned chapter in her textbook, which makes clear that the evidence basis for the proposition that shaking alone can cause injuries of the type at issue here is arguably non-scientific, specifically, perpetrator admissions, is equally new and equally significant. Jenny herself testified, albeit with some reluctance, that medicine has come to understand that a child victim of abusive head trauma can have a lucid interval after suffering brain injury from abuse. This is an important fact that tends to undercut Dr. Flaherty's testimony at Del Prete's trial that Del Prete, and only Del Prete, could have caused I.Z.'s injuries. As Jenny conceded, given current medical thinking on this issue, one can no longer say automatically that the last person with the infant was responsible for abuse—a significant opinion that is at odds with Dr. Flaherty's testimony at Del Prete's trial.

At least as significant is the testimony presented at the hearing regarding I.Z.'s chronic subdural hemorrhage. Its existence was known at the time, but the testimony regarding its aging is new. A number of experts from both sides testified at the hearing that the chronic hemorrhage was present at least two weeks before December 27 and possibly more. As the Court will discuss this, too, points away from Del Prete as having caused I.Z.'s death. Beyond this, Dr. Jenny, in what is unquestionably new evidence, testified that this chronic hemorrhage was caused by an earlier episode of abusive trauma (as did Dr. Hedlund). In addition to establishing the validity of the "lucid interval"

hypothesis, the proposition that I.Z. had earlier abusive trauma again tends to point away from Del Prete as a perpetrator of abuse or at least suggest other potential perpetrators.

Finally, there is at least some evidence, also new, suggesting that *minor* trauma in the presence of I.Z.'s chronic subdural hemorrhage would have caused rebleeding from that hemorrhage, leading to further injuries. Though this evidence would not necessarily rule out Del Prete as the immediate cause of I.Z.'s collapse, it tends to undercut Dr. Flaherty's testimony at the criminal trial that I.Z. was subjected to trauma on December 28 that the perpetrator would have to know would cause severe injury. This testimony was a key underpinning for the charge of first degree murder.

3. Evaluation of the evidence

The Court evaluates the new evidence together with the evidence presented at Del Prete's trial and the other evidence presented at the evidentiary hearing to determine whether any reasonable juror who heard all of it could find Del Prete guilty beyond a reasonable doubt. The answer to that question is a rather resounding no.

The prosecution relied heavily on Dr. Flaherty's expert testimony to convict Del Prete, and the trial court cited to Flaherty's conclusions several times in denying Del Prete's motion for acquittal notwithstanding the verdict. At trial, Flaherty opined that I.Z.'s injuries were unequivocally the result of abusive head trauma and that the onset of her symptoms would have occurred immediately following the abuse. It was undisputed that Del Prete was the only adult at the daycare when I.Z. collapsed, and thus Flaherty's testimony led to only one possible perpetrator of I.Z.'s injuries: Del Prete. At the evidentiary hearing, however, experts for both sides flatly rejected various aspects of

Flaherty's testimony and undercut her conclusions regarding I.Z.'s collapse and eventual death.[8]

Significantly, a majority of both sides' experts opined that I.Z. had injuries that existed prior to her collapse on December 27, 2002. Barnes and Hedlund agreed that I.Z. had subdural chronic collections that were at least two to four weeks old as of December 27, and perhaps older. Other witnesses on both sides agreed. The only witness who disputed the existence of the chronic subdural collections was Dr. Rorke-Adams, who said there were none. Her testimony in this regard was not credible or persuasive. It would require a finding that all of the radiologists (experts for both sides, as well as treaters) who saw those collections were dead wrong. Rorke-Adams waved away all of this evidence with a sweep of her hand. Her explanation for doing so did not hold water, and her credibility was otherwise severely damaged by her erroneous claim, previously discussed, that I.Z.'s brain had contusions and lacerations. Just as importantly, the testimony of the other witnesses who testified about the chronic collections was credible and persuasive.

If I.Z.'s chronic subdural hemorrhage was caused by earlier abusive trauma, as respondent's experts Jenny and Hedlund opined, this evidence points away from Del Prete as the perpetrator. There is no evidence in the record, old or new, to suggest that she was in any way responsible for any prior abusive trauma or that even that she had

[8] In addition to the points noted below, the Court notes that respondent's expert in ophthalmology, Dr. Forbes, like petitioner's pathologist Dr. Lantz, directly rejected Dr. Flaherty's testimony that retinal hemorrhages extending to the ora serrata can only be caused by shaking. Forbes further opined that the retinal hemorrhages could have predated I.Z.'s collapse by as much as two weeks. Thus even if the Court accepts the testimony from respondent's experts that retinal hemorrhages are highly associated with abusive head trauma, that association suggests possible perpetrators other than Del Prete.

any prior opportunity to abuse I.Z. Among other things, there was no evidence that Del Prete had been alone with I.Z. prior to December 27, a date on which daycare center owner Gleanne Kehr was out of town.[9] Thus the testimony of Jenny and Hedlund directly undercuts Dr. Flaherty's statement at the criminal trial that Del Prete was the perpetrator.

In addition, the testimony by Dr. Jenny and others, including Dr. Harkey at the reopened hearing, regarding lucid intervals travels in tandem with the testimony regarding I.Z.'s chronic subdural hemorrhage and further points away from Del Prete as a perpetrator of abusive trauma. These witnesses testified that an infant victim of head trauma can have a lucid interval after being subjected to head trauma. Though Jenny added that the victim would not appear "normal," that is contradicted to some extent by her own testimony that I.Z. had, in fact, suffered abusive trauma weeks earlier, when considered in light of the relative absence that I.Z. displayed symptoms of significant neurological problems in the period preceding December 27. And even if one disregards this, there is evidence of behavior by I.Z. at the daycare center that would suggest that whatever trauma she experienced came earlier and from elsewhere.

One way or another, however, the evidence regarding lucid intervals directly undercuts the prosecution's theory at Del Prete's criminal trial. At that trial, Dr. Flaherty testified that because I.Z. was conscious and responsive on the morning of December 27, she must have been neurologically intact at that time. She concluded from this that I.Z.'s collapse had to have been the result of abusive head trauma inflicted later that

[9] Respondent, who was aware well before the hearing that her experts would testify there was prior abusive head trauma, offered no evidence of prior occasions on which Del Prete was alone with I.Z.

day, during a period when Del Prete was her only caregiver. This conclusion is unsupportable, given the testimony regarding lucid intervals. Indeed, Dr. Jenny went one step further, stating directly that one can no longer assume that the last caregiver with an infant who dies of abusive head trauma must have been the perpetrator. Dr. Harkey's testimony at the reopened hearing was of similar import.

In sum, this evidence, considered as a whole, undercuts Dr. Flaherty's testimony that Del Prete was the perpetrator of abusive head trauma. And Dr. Flaherty aside, the testimony of respondent's own experts at the hearing points away from Del Prete as having criminal responsibility for I.Z.'s death. That is so given Jenny and Hedlund's testimony about prior abusive head trauma; the absence of evidence of a prior opportunity by Del Prete to inflict such trauma; the existence of evidence of other possible perpetrators; and the evidence regarding lucid intervals, all of which the Court has already discussed. This evidence gives rise to abundant doubt, not merely reasonable doubt, regarding Del Prete's guilt. Finally, even if one were to disregard all of this, the testimony indicating that even minor trauma could have caused bleeding from I.Z.'s chronic subdural hemorrhage and further injury would undermine a claim of criminal responsibility on Del Prete's part and further give rise to reasonable doubt regarding her guilt.

For these reasons, in light of the all of the evidence presented at Del Prete's trial and at the evidentiary hearing before this Court, the Court finds that Del Prete has established that it is more likely than not that no reasonable juror would have found her guilty of murder beyond a reasonable doubt.

The evidence offered by Del Prete's experts goes well beyond the reasonable

and logical inferences from the testimony by respondent's experts that the Court has discussed; it points to a cause for I.Z.'s death unrelated to any abuse by anyone. As should be clear from the preceding discussion, the Court need not adopt this testimony as persuasive in order to find in Del Prete's favor on her miscarriage-of-justice claim. That said, this testimony further reinforces the Court's determination that no reasonable juror who heard all of the evidence could find Del Prete guilty of murder beyond a reasonable doubt.

Respondent argues that the opinions of certain of Del Prete's experts that I.Z.'s collapse and death did not result from abusive head trauma are unpersuasive in describing the events of December 27 and explaining I.Z.'s collapse and death. This argument fundamentally misunderstands the nature of the inquiry that the Court undertakes. Though the Court is not prepared to say that these experts' opinions describe what actually happened, that is not the question the Court is called upon to consider. As the Supreme Court has stated, "[t]he court's function is not to make an independent factual determination about what likely occurred"; rather, a court in this situation "assess[es] the likely impact of the evidence on reasonable jurors." *House*, 547 U.S. at 538.

To be fair, the Court is unsure whether the causation testimony offered by Del Prete's experts would be sufficient to carry the day in a trial in which she bore the burden of proof.[10] But that is not the issue either. The inquiry that the Court undertakes

[10] Among other things, the Court is not persuaded that the experimental testing cited by Dr. Prange definitively establishes that shaking alone cannot cause injuries of the type that I.Z. suffered. But it is at least equally important that, as respondent's expert Dr. Rangarajan testified, science cannot even yet establish an injury threshold. This, in addition to the other more recent developments in this area previously discussed,

takes into account the requirement of proof beyond a reasonable doubt. The applicable standard does not require Del Prete to prove her alternative theory by a preponderance of the evidence. Rather, it requires her to show by a preponderance that no reasonable juror, hearing all of the evidence both old and new and properly instructed on the prosecution's burden of proof, would have found her guilty beyond a reasonable doubt—"or, to remove the double negative, that more likely than not any reasonable juror would have reasonable doubt." *Id.* The standard likewise does not require the Court to accept the credibility of the prosecution's witnesses at the underlying trial, *see id.* at 539-40, because a miscarriage-of-justice claim "requires the federal court to assess how reasonable jurors would react to the overall, newly supplemented record." *Id.* at 539. Given the applicable standard, the Court finds that the testimony by Del Prete's experts regarding an alternative cause for I.Z.'s collapse and death, though perhaps not altogether persuasive in its own right, reinforces to the determination the Court has made that no reasonable juror, hearing all of the evidence including that from Del Prete's experts, could find her guilty beyond a reasonable doubt.

Conclusion

For the reasons stated above, the Court finds that Del Prete has established by a preponderance of the evidence that based on all of the relevant evidence, no reasonable jury would find her guilty beyond a reasonable doubt. The Court will therefore address on the merits each of the claims that Del Prete has asserted in her habeas corpus petition. At the upcoming status hearing, counsel should be prepared to discuss whether there is a need for an evidentiary hearing on Del Prete's ineffective

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arguably suggests that a claim of shaken baby syndrome is more an article of faith than a proposition of science.

assistance claim (and if so, to schedule a prompt hearing) and whether the briefing on her claims is otherwise complete.

MATTHEW F. KENNELLY
United States District Judge

Date: January 27, 2014