

## **EXHIBIT A**

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**EXPERT OPINION**  
**of**  
**Dr. David Sawatzky**

*Tuvell v. Boy Scouts of America, PADI, Blue Water Scuba of Logan, Lowell Huber, Corbett Douglas, Bear Lake Aquatic Base and Great Salt Lake Council of the Boy Scouts of America*

**AUTHOR PROFESSIONAL BACKGROUND:**

All of the opinions I express in this report are to a reasonable degree of medical and professional certainty in accordance with my experience and qualifications.

My qualifications to comment on this case include the fact that I am a medical doctor who has specialized in diving medicine since 1982 and I have a Master of Science degree in Diving/Exercise Physiology. I have had over 300 articles published on diving medicine and have written a book (Dr. Sawatzky's Diving Medicine Notes) that went through five editions. I have written a regular column on diving medicine for Diver Magazine Canada since 1993 and Sport Diving Australia since 2007. I have taught on a large number of diving medicine courses and I have been a Consultant in Diving Medicine since 1986.

I have been an active recreational/cave/technical diver since 1982 and I am an Instructor Trainer with IANTD for many forms of diving including Technical, Cave, Wreck, Trimix, and Closed Circuit Rebreathers. I have performed approximately 2,000 scuba dives of which almost 1,000 were in flooded caves, mostly original exploration and survey. I have been a member of the IANTD International Board of Advisors since 2000 and a Medical Advisor to ACUC International since 1994. IANTD and ACUC are large, international diving certification agencies.

I have been an expert witness in diving accident investigations since 1986 but I have been an expert witness at trial or by deposition in only two cases during the past few years: Barrett v. Ambient Pressure Diving et al. in New Hampshire (expert report and expert witness) in 2008 and DeWolf v. Richard Kohler et al. in Houston (expert report, deposition and expert witness) in 2011-13.

During the past several years I have prepared expert reports and/or consultations for several additional legal cases of injured or deceased divers; Sylvain Cormier in Quebec (report in 2005 and supplemental report in 2007), Eric Gauvreau in Quebec (report in 2001, supplemental

reports in 2005 and 2007), Ann Jordan in Hawaii (2009), Virginia McDougal in Florida (2009), Mahatma Robles in California (2010) and Michael Riopel in Florida (2010). I currently charge US\$250/hour for my services.

For additional professional details, please refer to the provided full CV.

## **DESCRIPTION OF THE ACCIDENT:**

On 13 July 2011, 12 year old David Tuvell died while participating in a PADI Discover Scuba (DSD) dive in Bear Lake at the Bear Lake Aquatics Base (BLAB), a summer camp owned and operated by the Great Salt Lake Council (GSLC) of the Boy Scouts of America (BSA) in northeastern Utah.

The DSD was taught by PADI Instructor Corbett Douglas using equipment belonging to Blue Water Scuba of Logan, a company owned by Lowell Huber. There were two other students on the DSD course, Michael Perry and his son MP (a minor). Michael was the scoutmaster of the troop in Las Vegas to which David Tuvell and MP belonged.

The DSD program is designed so that a person with no previous experience in scuba diving can do one scuba dive under the supervision of a PADI scuba instructor. One instructor is allowed to take up to four students at the same time.

The DSD program teaches the students some basic information about scuba diving, allows them to become familiar with the equipment in shallow water and then concludes with a guided dive if the students are comfortable and doing well.

On this course all of the students did very well, had no problem learning the material, becoming familiar with the equipment, and swimming around in shallow water. Corbett then took the three students out into the lake, following a thick line on the bottom to a wreck at 30-40 feet depth. The students all did well, were correctly weighted, and neutrally buoyant. On the swim back in towards the shore, at about 15 feet of depth, David Tuvell indicated to Corbett that he had 750 pounds per square inch (psi) pressure left in his dive tank (the pressure at which the gauge turns red). At approximately the same time, Michael Perry made an uncontrolled ascent to the surface.

Corbett could see the surface from the bottom and noticed that during the dive the wind had picked up and the lake had developed two to three foot high waves (it had been calm when they started the dive). He signaled the two boys to stay on the line on the bottom and ascended to the surface to check on and assist Michael Perry. Michael was uninjured. Corbett assisted Michael and returned to the bottom with him. According to data obtained from Corbett's dive computer, his ascent to the surface, interaction with Michael on the surface and return to the bottom with Michael took only 48 seconds.

When Corbett and Michael returned to the bottom, visibility had deteriorated to only two to three feet and the boys were not visible. However, Corbett noticed silt stirred up along the rope leading in towards shore so he assumed the boys had set off along the line. Thinking the boys were right in front of them on the line, Corbett proceeded with Michael along the line toward shore, scanning for the boys and expecting to encounter them at any moment. When they reached shallow water at the dock and stood up, the boys were not on the surface or at the dock.

Corbett directed Michael to watch for the boys from the dock while he returned to look for the boys at the last place he had seen them. After a short, unsuccessful search Corbett surfaced and found MP on one of the platforms so he took MP to the dock where his father was.

Corbett then had his wife call for help and continued to search for David Tuvell. Don Jones and Lowell Huber arrived; donned scuba gear and the three divers started an organized search. Don Jones found David very quickly, mask off, regulator out, floating face down at a 45 degree angle with only his fins touching the bottom. He grabbed David and attempted to walk along the bottom with him to reach shore only to realize that he was going the wrong direction. Don then removed David's dive equipment, brought him to the surface, and was assisted to shore by scouts in boats. EMS had arrived by then, immediately started CPR, and took David to the hospital in Logan, about an hour away. Resuscitation was attempted on the way to the hospital and after arrival at the hospital but David had shown no signs of life and was pronounced dead.

Approximately six months after the accident, MP recounted in a videotaped interview exactly what happened during the dive and after Corbett went to the surface to help his father. MP said that the dive was fun and uneventful until this point, that he and David were about the same size and wearing an equal amount of weight, they were neutrally buoyant and neither boy had any problems with their equipment. He stated that he and David clearly understood Corbett's instruction to stay on the bottom and wait for him while Corbett went to the surface to assist MP's father.

Ten to twenty seconds after Corbett ascended to assist Michael Perry, David indicated to MP with a thumbs-up signal that he wished to ascend. MP returned the signal, asking "Go up"? David confirmed that he wanted to ascend and started up. MP went up with him, slowly, face to face for most of the ascent, and surfaced. When David did not surface, MP looked down and saw David just below the surface, within reaching distance, not moving, eyes open, regulator out of his mouth, and with bubbles coming out of his mouth.

MP tried to pull David to the surface but was unable and David eventually sank to the bottom. MP then swam towards shore and reached the platform. He felt as though he ran out of air on the swim on the surface in very rough conditions (according to Lowell Huber, MP's tank had 50 psi air remaining in it after the dive). MP stated that he had no idea why David wanted to ascend rather than obey Corbett's instruction to remain on the bottom, and that David seemed relaxed.

In summary, everything appears to have been going well until David suddenly lost consciousness, just below the surface, while neutrally buoyant, after doing a slow controlled ascent from approximately 15 feet of depth.

## **WHY DID DAVID TUVELL SUDDENLY LOSE CONSCIOUSNESS?**

There are very few reasons why a relatively healthy 12-year-old boy would suddenly lose consciousness in this situation. To be thorough a sudden cardiac event, epilepsy, drowning, pulmonary barotrauma and arterial gas embolism (AGE) have to be considered.

Sudden cardiac events do cause sudden loss of consciousness. However, most of the causes can be identified at autopsy and there is nothing in the Medical Examiner's files or the other information I reviewed to suggest David had or was at increased risk of a cardiac problem.

Epilepsy does happen and everyone who develops epilepsy has to have a first seizure. However, there was nothing in the information I reviewed to suggest David had or was at increased risk of epilepsy and MP does not mention anything about David that suggests that he had a seizure during the dive.

Drowning simply refers to someone who dies while in the water and David definitely died while in the water but this was only after he suddenly lost consciousness. The far more important question is why David suddenly lost consciousness. He had 750 psi in his dive tank shortly before this event, the tank still contained 550 psi when it was recovered to the shore (some air had been used to float the gear and recover it), and the tank still contained 350 psi of air several days later when the equipment was examined by Sgt. Wendell Nope at the Medical Examiner's office. Clearly David did not run out of air and drown for that reason.

Drowning also has to be considered because David was wearing a wetsuit and 30 pounds of lead on his weight belt. An experienced diver might see this amount of lead as excessive for a 12-year-old boy in a fresh water lake. However, David was wearing a thick, 7mm Farmer John-style wetsuit, which places two layers of neoprene over the diver's torso and traps a layer of air in between, adding to the diver's buoyancy. Moreover, David was overweight with a BMI of 27.7. He was shorter and fatter than MP. MP also wore 30 pounds of lead and he stated that both he and David were neutrally buoyant during the buoyancy testing before the dive and during the dive. That David Tuvell was neutrally buoyant was also confirmed by the deposition testimony of Michael Perry, Corbett Douglas and Don Jones. Corbett testified that everyone's buoyancy was carefully checked before and during the dive and in fact it appears that David originally had 25 pounds on his weight belt and had to add the additional five pounds to be neutral. When David was found he was floating at a 45-degree angle, head higher than his feet, with only his fins touching the bottom. This is further proof that he was correctly weighted. From all the facts obtained in discovery, David appears to have been wearing enough lead to make him neutrally buoyant in Bear Lake and no more.

However, it would be a mistake to assume that all fresh water has the same density. In fact, Bear Lake is known to contain a high level of sedimentation, including calcium carbonate and salt, and it is fed by the Bear River which contributes 60 percent of the water and sedimentation and salt to the Great Salt Lake to the southwest. Consequently, Bear Lake contains more salt and other dissolved minerals than the ocean. The net effect of these unique features of the water in Bear Lake is that it is denser than the ocean and more lead would be required to attain neutral buoyancy in Bear Lake than in the ocean, and more lead is required to dive in the ocean compared to diving in fresh water. It is impossible to determine – or to opine – exactly how much lead was too much or not enough for David to obtain neutral buoyancy in Bear Lake on 13 July 2011 without considering the density, salinity and sedimentation of the water at the BLAB on that date, but this is unnecessary because the testimony of four eye-witnesses to this dive uniformly confirms that David was wearing enough weight to achieve neutral buoyancy and he was, in fact, neutrally buoyant when found unconscious on the bottom. Therefore, drowning due to overweighting can be excluded as a cause of David's death.

Drowning also has to be considered if there was equipment failure during the dive. However, the testimony of MP, Michael Perry, Corbett Douglas, Lowell Huber and Don Jones confirms that David's equipment was working properly during the dive, as do photographs of the equipment taken at the scene immediately after the equipment was recovered from the water. I have reviewed the videotape of an equipment inspection conducted by Sgt. Wendell Nope of the Utah State Police Dive Team approximately one week after the accident, as well as the deposition testimony of Sgt. Nope, Officer Richard Driesbeke and Sheriff Dale Stacey. However, this information simply confirms that the equipment was damaged sometime after it was recovered – likely during transport to Salt Lake City in the bed of Sheriff Stacey's pickup truck – and, as Sgt. Nope admitted, it shows nothing about the actual condition of the equipment

during David's dive one week earlier. Indeed, the equipment as examined by Sgt. Wendell Nope several days after the dive clearly could not have been in that condition during the dive. The second stage of the backup regulator was separated from the low pressure hose. In this situation, if the tank had been turned on air would have quickly exited through the low pressure hose, a huge cloud of bubbles would have formed and the tank would have quickly been emptied of air. None of these events happened during the dive or when the equipment was recovered. Clearly the second stage of the back-up regulator was not detached during the dive.

Furthermore, when Sgt. Wendell Nope examined the equipment the buoyancy compensator (BC) did not hold air. However, the testimony of the other divers and post-recovery photographs all confirm that the BC was not in this condition during the dive. If the BC had been leaking during the dive there would have been many bubbles visible to David and the other divers and David would have continuously become negatively buoyant during the dive. In fact, the other divers in their depositions stated that there were no bubbles and David was neutrally buoyant. MP stated that David was hanging motionless just under the surface with bubbles coming out of his mouth and only sank after a period of time. When Don Jones found David he was floating at a 45 degree angle with only his fins touching the bottom. When Lowell Huber recovered the equipment he wrapped the weight belt around the BC and inflated the BC to bring the gear to the surface and float it into shore. Clearly the BC was not leaking during the dive and all of the equipment appears to have been working correctly.

After the equipment was recovered, Lowell Huber and Corbett Douglas examined it and everything seems to have been working. The gear was then placed in Richard Driesbeck's vehicle and driven around the lake. It was then placed in the bed of Sheriff Dale Stacey's pickup truck and driven to Salt Lake City, 145 miles away. It was then moved into/around the Medical Examiner's office for several days before Sgt. Wendell Nope examined it. The second stage of the back-up regulator has to have become separated from the low pressure hose and the BC has to have been damaged during this time period. When scuba gear is moved by individuals not familiar with the gear, damage frequently happens as a result of the heavy weight belt and/or tank being set down on top of the other more sensitive equipment, and/or the equipment rolling around in a moving vehicle.

The only plausible reason for David to suddenly lose consciousness after slowly ascending from approximately 15 feet of depth to near the surface is as a result of pulmonary barotrauma and arterial gas embolism. The question then becomes, why would David have suffered from pulmonary barotrauma and AGE?

## **WHAT ARE PULMONARY BAROTRAUMA AND ARTERIAL GAS EMBOLISM?**

On the surface, we are exposed to the weight of the atmosphere and at sea level that is 14.7 pounds per square inch (psi). This can also be described as one atmosphere pressure (1 ata). When a person goes scuba diving they are also exposed to the weight of the water above them. As they go deeper this weight increases.

At a depth of 34 feet in fresh water (33 feet in the ocean) the weight of the water is the same as the weight of the atmosphere at sea level. Therefore, at a depth of 33 feet in the ocean the total pressure on a diver is twice the pressure on the surface or 29.4 pounds per square inch (14.7 pounds due to the weight of the air and 14.7 pounds due to the weight of the water), two atmospheres pressure (2 ata).



Air is a gas and the volume of a gas is inversely proportional to the pressure. In simple English this means that if you increase the pressure on a volume of gas, the volume will become smaller and conversely, if you reduce the pressure on a gas the volume will increase. This relationship was worked out by Robert Boyle and is known as "Boyles Law" ( $P_1V_1=P_2V_2$ ).

Therefore, if you have 5 liters of air in your lungs and you dive down to 33 feet depth holding your breath, the volume of air in your lungs will be reduced to 2.5 liters because the pressure will have gone from one atmosphere (14.7 psi) to two atmospheres (29.4 psi). When you return to the surface the air in your lungs will expand back to 5.0 liters (no problem).

The problem with scuba diving is that you are breathing air at a pressure equal to your depth. Therefore, if you were diving at a depth of 33 feet in the ocean you would be breathing air at a pressure of 2 atmospheres. At a depth of 33 feet, if you take a breath off a scuba tank so that you have 5 liters of air in your lungs and hold your breath while ascending to the surface, the air in your lungs will expand to 10 liters. Our lungs are not capable of holding 10 liters of air.

Therefore, the lungs will expand as much as possible but once this limit has been reached the pressure in the lungs will increase and the lung tissue will tear. Lung tissue is very fragile and once the lungs have reached their maximum volume the pressure change caused by ascending two to three feet in the water is sufficient to cause them to tear. This is called pulmonary barotrauma. In simple English, this means "lung damage due to a change in pressure".

The lungs are composed of airways that end in little balloon like sacs called alveoli. A normal person has approximately six million alveoli in their lungs and the total surface area of all these alveoli is roughly equal to the area of a tennis court.

Each alveolus is surrounded by a very thin layer of blood. Oxygen from the air diffuses across the alveolar walls into the blood and binds to hemoglobin in the red blood cells while carbon dioxide diffuses from the blood into the air in the alveoli. When we breathe out we get rid of the carbon dioxide and when we breathe in we take in more oxygen.

The walls of the alveoli are composed of one very thin cell and the blood is also contained in a capillary with a very thin one cell thick wall. Therefore, the air in the alveoli is separated from the blood in the capillary by two very thin cells. That is why it takes such a small pressure change to tear this tissue.

When an alveoli is stretched beyond its maximum volume and tears, most of the time air is injected into the capillary (approximately 80%). Far less commonly it will get into the tissues of the lung and track back to the tissues around the heart (mediastinal emphysema) (approximately 20%). From the mediastinum it will sometimes track up under the skin in the neck (subcutaneous emphysema). Very rarely the air will escape from the lung and enter the potential space between the lung and the chest wall (pneumothorax) (less than 1%).

When air is injected into the capillaries of the lung, it is carried by the blood to the left atrium of the heart, where it moves into the left ventricle and is pumped out to the body. The first major branches off the aorta after the blood leaves the heart are the carotids. They supply 80% of the blood to the brain. If the diver is also vertical in the water when this happens, it is even more likely that bubbles will enter the carotid arteries and be carried to the brain.

When the bubbles enter the brain, they will be carried into smaller arteries where they will become stuck, stopping blood flow to that part of the brain. The signs and symptoms that result depend on which areas of the brain are deprived of blood flow/oxygen and stop working.

If this happens to a person who has not been scuba diving, small amounts of gas usually result in relatively minor symptoms. Small amounts of gas enter the circulation relatively

frequently during medical procedures and the results are usually minor or undetectable. However, if the person has been diving a completely different situation exists.

When a person breathes air at increased pressure (goes scuba diving), nitrogen from the air dissolves in the blood as it goes through the lungs and is carried to the tissues of the body, where it moves from the blood into the tissues. The amount of gas that will dissolve in a tissue is proportional to the partial pressure of the gas (Henry's Law of Solubility). The partial pressure of nitrogen in air increases as the diver goes deeper.

The brain has a very large blood supply, so a large amount of nitrogen is carried to the brain and dissolves in the brain tissue when a person goes scuba diving. When the diver returns to the surface, the excess nitrogen in the brain will move back into the blood, be carried to the lungs and breathed out.

The brain (and other tissues of the body) can tolerate a certain amount of excess dissolved nitrogen but, if too much nitrogen has dissolved in the tissue during the dive, the diver must stop at a shallow depth and wait for some of the nitrogen to leave the body before they surface. If they surface without stopping they can develop decompression sickness. This is why divers need to be aware of decompression tables and most divers now wear a computer to keep track of their decompression status during the dive.

The dive profile that David did on this PADI Discover Scuba course was shallow and short enough that the risk of developing decompression sickness after ascending directly to the surface was very small. However, the dive was deep and long enough so that he would have had a significant amount of excess nitrogen dissolved in the tissues of his brain.

When a few small bubbles are injected into the arteries supplying the brain of an animal that has been exposed to pressure changes equal to scuba diving, something amazing happens. The bubbles get trapped in the small arteries of the brain and stop moving. Over the next few seconds, nitrogen dissolved in the brain of the animal moves into the bubble causing it to become larger. The bubble cannot expand forwards because it is stuck, it cannot expand sideways because of the strong walls of the artery. Therefore, the only direction it can expand is back up the artery. As it does this, every time it passes a branch artery blood flow to another part of the brain is stopped. In only a few seconds the entire arterial tree of the brain is filled with gas and most of the blood flow to the brain is stopped.

When this happens in divers, they very rapidly lose consciousness and often die due to the embolism or due to drowning.

There are two situations where this can occur in divers. One is when the diver holds his breath and ascends (common in panic), or the diver coughs or for some other reason closes their throat and traps air in the lungs during ascent. It is for this reason that the PADI Discover Scuba course emphasizes always continuing to breathe while under water, especially while ascending. Young MP during his interview 6 months after the fatal dive proved that he had been taught and knew to continue to breathe while ascending.

The second situation where pulmonary barotrauma can occur is if the person has an abnormality in their lungs whereby an area of the lung is supplied by a small or partially obstructed airway. What happens in this situation is that as the diver descends the area of the lung supplied by the small airway collapses (no problem). If they surface immediately the collapsed area of the lung will re-expand to its normal volume (no problem).

However, if the diver spends time at depth breathing off a scuba tank, air will slowly move through the small or partially obstructed airway and the collapsed area of lung will expand back to its' normal volume (no problem). The problem is that when the diver ascends, the air in



the partially obstructed area of the lung will expand. If it expands faster than it can escape through the small or partially obstructed airway, the pressure in that part of the lung will rise and pulmonary barotrauma/AGE will result. This will happen even if the person continues to breathe normally.

In addition, the greatest volume changes occur as the diver nears the surface. Therefore, pulmonary barotrauma is a shallow water problem and is far more likely to occur when the diver is shallow and ascending rather than deep and ascending.

Also, these volume changes become greater if the dive is conducted at altitude. This is not intuitively obvious so some explanation is required. At sea level the pressure change from a depth of 33 feet to the surface is from two atmospheres to one. The pressure is reduced by 50% and the volume doubles. If the dive is conducted at altitude where the surface pressure is less, the pressure ratio change becomes greater.

For example, if the surface pressure were 0.5 atmospheres, the pressure at 33 feet depth during the dive would be 1.5 atmospheres (0.5 ata pressure from the atmosphere and 1.0 ata from the weight of the water). When the diver surfaces the pressure would change from 1.5 ata to 0.5 ata. The pressure is reduced by 67% and the volume of air will triple. Therefore, five liters of air will expand to 15 liters as compared to 10 liters if the dive had been conducted at sea level.

Bear Lake, Utah is at an elevation of almost 6,000 feet and the atmospheric pressure would be 0.8 ata. Therefore, the pressure change from 33 feet depth would be from 1.8 ata to 0.8 ata and the volume change would be 2.25 times or 25% more than would occur if the dive had been conducted at sea level.

This would be the situation if the water in Bear Lake was sea water. If the water was fresh, the same pressure/volume changes would occur ascending from 34 feet of depth (compared to 33 feet in sea water). However, we know that the water in Bear Lake has a higher density and is heavier than sea water because it has a high level of sedimentation and salinity. This makes the total pressure at depth greater and the volume changes in the air in a diver's lungs larger as the diver ascends.

Therefore, because Bear Lake is at altitude and the water in Bear Lake is heavier than sea water, pulmonary barotrauma/AGE is more likely to occur at Bear Lake than during a dive in the ocean or in a fresh water lake at sea level.

When a diver dies from AGE and a very careful autopsy is performed, the area of damage in the lungs is usually very small, approximating the same size as the tip of your finger. Therefore, a very small area of altered lung function can be fatal when scuba diving.

By far, the most common causes of altered lung function that increase the risk of pulmonary barotrauma and AGE are reactive airways disease (RAD) and asthma. In a normal lung, the airways expand when we breathe in and constrict when we breathe out. This reduces the movement of dust and other impurities in the air we breathe in and helps force them out when we exhale.

In RAD and asthma the airways constrict too much and wheezing results as we try to force air through these small airways. The airways can react to many different stimuli and several of these stimuli are commonly encountered in scuba diving.

The air you breathe when diving is dry and usually cold, both can be stimuli for airway constriction in RAD and asthma. A diver is often working fairly hard and/or excited, two more stimuli that can cause airway constriction in RAD and asthma. The arid environment at Bear Lake and the BLAB contain further stimuli that can trigger RAD and asthma, including dry air, dust, and potentially allergens.

In addition, in RAD and asthma the lungs usually produce more mucous than normal (allergies). Mucous is produced to help trap dust and other impurities we may breathe in. The mucous is then moved by the lungs up into our throat and we swallow it. If too much mucous is produced, it partially obstructs the airways increasing the risk of pulmonary barotrauma and AGE.

It is for these reasons that RAD and asthma are universally raised as concerns in anyone who is thinking about trying or taking up scuba diving. They are specifically mentioned on the BSA and PADI forms, as well as every scuba training agency form and are very important topics on every course in diving medicine.

It is possible for some individuals with mild RAD and asthma to scuba dive relatively safely but this determination requires special investigations, including pulmonary function testing, methacholine challenge testing and often inspiratory as well as expiratory CT scans of the lungs. In addition, these investigations have to be evaluated and interpreted by a physician with advanced training in diving medicine.

### **WHAT EVIDENCE IS THERE THAT DAVID TUVELL WAS AT INCREASED RISK FOR PULMONARY BAROTRAUMA AND ARTERIAL GAS EMBOLISM?**

The medical records from Anthem Hills Pediatrics provide an interesting history for David. He was seen on 22 January 2007 for ear and sinus pain for several days. He was seen again on 17 July 2007 with an infection of his left middle ear. The next summer on 17 July 2008 he was seen for another left ear ache that had resolved. That fall he returned with sore throat, cough, and fever for three days. The following summer he was seen on 10 June 2009 with right ear pain for 4 days. He was treated and when seen two weeks later appeared to have recovered.

Most interestingly, David was seen several times in the spring, summer and fall of 2010 with respiratory problems. On 26 March he presented with an allergic flare-up, congestion and cough for five days. He was treated with Singulair (montelukast, a pill used to treat allergies, asthma, reactive airways disease, and exercise induced bronchospasm) and Zyrtec (cetirizine, used for allergies). A month later on 28 June David was seen with complaints of coughing for two to three weeks. Coughing is frequently a symptom of asthma. He was still taking Zyrtec and Singulair and was diagnosed with acute bronchitis and reactive airways disease (RAD). Albuterol (Proventil, an inhaled bronchodilator used to treat asthma, RAD, and bronchospasm) was added to the Zyrtec and Singulair. On this visit, David was seen by the Physician Assistant Brian Shrawder, who suggested that pulmonary function testing be done. However, Shrawder's suggestion was apparently refused by the pediatrician, Dr. Kim Lamotte-Malone, and David Tuvell was never given a pulmonary function test (PFT).

Reactive Airways Disease is a general term used to describe wheezing due to bronchial constriction. Children younger than five years often wheeze for many reasons and RAD is often used to describe them as many of them will not go on to develop asthma. However, in older children and adults, RAD is often used interchangeably with asthma (as it was here in the various medical records describing David's condition).

Asthma is diagnosed in children after age five who present with episodic symptoms of airflow obstruction or reactive airways that is reversible with bronchodilators. David certainly appears to fit this description but it is impossible to know for sure if he had RAD/asthma and

how serious it was because the testing required to clarify the extent of his disease was never performed.

David was seen again on 7 July and had not improved even though he had been using Singulair, Albuterol and Zyrtec for the previous month. He had been coughing until he vomited for the previous week. David was treated with Flovent (fluticasone, an inhaled steroid used to treat and reduce the risk of recurrence in moderately severe asthma) as well as continuing the Albuterol and Singulair. An x-ray done the same day for “wheezing” was clear (the expected finding with RAD/asthma), ruling out pneumonia.

He was evaluated again on 10 August and seemed to be doing fairly well. The Singulair and both inhaled medications for RAD/asthma were continued. On this visit David was noted to be 55 inches tall (25-50%) and he weighed 111 pounds (90-95%) indicating that he was definitely overweight if not clearly obese.

David was seen again on 20 September for a sore throat, congestion, runny/stuffy nose. He was treated with antibiotics and at least the Albuterol for his RAD/asthma was continued. At this point David appears to have been on multiple, continuous medications to control his respiratory symptoms since at least March.

The next spring, David presented on 9 May 2011 with a throat infection was well as cough. He commented: “I think I have bronchitis”. David was treated with antibiotics and weighed 117 pounds and 8 ounces on this visit.

Several additional pieces of evidence provide further information on David’s health. The Annual BSA Health and Medical record filled in on David by his mother (Sherry Tuvell, a licensed Respiratory Therapist) on 27 September 2010 says that he had asthma as well as ear and sinus problems. It also lists his current medications as Albuterol as required for asthma/wheezing and Singulair daily for allergies. As mentioned above, Singulair is also used to prevent asthma attacks. Asthma is frequently triggered by allergies. The form also lists Michael Perry as the Scout unit leader.

On 1 October 2010, the rest of this form was completed by Brian Shrawder, the Physician’s Assistant who worked at Anthem Hills Pediatrics, indicating that David was medically fit to participate in every Scouting activity including Scuba diving. The form indicates that examination of David’s lungs was normal. This is hard to believe given the severe and extensive history of wheezing/RAD/asthma for the previous several months requiring several medications to get under control. In addition, the form clearly indicates, right beside Brian Shrawder’s signature block, that restricted approval should be given for uncontrolled asthma, and for scuba diving, the use of medications to control asthma.

It appears that Brian Shrawder did not read the form, chose to ignore it, or did not understand the significance of respiratory problems and scuba diving. Indeed, Shrawder admitted in his deposition testimony that he did not examine David on the day he signed the form, he had no knowledge of scuba diving or hyperbaric medicine, and his experience with aquatics did not extend beyond taking swimming lessons in college. A typical physician’s assistant would not necessarily have understood implications of respiratory problems and diving – Brian Shrawder clearly did not understand these implications, and he did nothing to educate himself before he cleared David for participation in scuba diving.

It is very surprising that David’s mother, a Respiratory Therapist, also chose to ignore the warning about scuba diving and lung problems. Certainly her training would have made her well aware of the potential problems with pressure changes and lung disease.

It is also of note that this form, clearing David as medically fit to scuba dive, was completed 9.5 months before the dive actually took place. During this entire period, the Tuvells apparently did no research into the implications of respiratory problems on scuba diving, they never had their son's fitness for diving evaluated by a physician who was familiar with scuba diving, and they even failed to consult or comply with the Boy Scout's own protocols for determining whether David could safely perform scuba diving.

In summary, David clearly had allergies, RAD and most likely asthma. Pulmonary function studies were suggested but never performed. David clearly had moderately severe pulmonary disease as he required inhaled steroids to control his symptoms and needed to use a number of potent medications for several months.

From a diving medical perspective, it does not matter whether David's respiratory problems were RAD or asthma. The significance of RAD and asthma for scuba diving are the same. They both greatly increase the risk of a diver suffering from pulmonary barotrauma and arterial gas embolism, even with a slow and controlled ascent. David Tuvell should not have been scuba diving on 13 July 2011, and his parents and medical care providers should have known this before they allowed him to do so.

### **WHAT IS THE EVIDENCE THAT DAVID TUVELL ACTUALLY LOST CONSCIOUSNESS AS A RESULT OF PULMONARY BAROTRAUMA AND ARTERIAL GAS EMBOLISM?**

The preceding section of this report clearly establishes that David had significant disease of his lungs and that he was at greatly increased risk of suffering from pulmonary barotrauma and AGE while scuba diving.

The evidence provided by the witnesses gives a very clear and detailed record of the dive and what happened. The only plausible explanation for David suddenly losing consciousness after ascending slowly and in control from approximately 15 feet depth to very near the surface is that he suffered pulmonary barotrauma and AGE.

In diving fatalities, the most common factor that led to death was AGE until approximately 30 years ago when heart attacks became more common. When scuba diving started, most divers were young and fit with very low risk of heart attacks. As divers became older, fatter and less healthy, many of them started to have heart attacks while diving due to the exercise component of diving. Recreational diving has roughly the same exercise demands as playing basketball. Arterial gas embolism remains the second most common factor in divers who die while diving. A heart attack is highly unlikely in a 12-year-old boy with no history of cardiac problems.

As a result of these facts, special autopsy procedures were developed to be used on divers to determine whether they had in fact suffered pulmonary barotrauma and AGE. The reason special autopsy procedures are required is because the manner in which a standard autopsy is performed destroys the evidence of pulmonary barotrauma/AGE and makes it impossible to determine if these events occurred during the dive or not.

When David Tuvell's autopsy was performed, these special procedures should have been used. They were not. A standard autopsy was performed based on the assumption that David had drowned while scuba diving because he ran out of air. The only other consideration on the autopsy report was the possibility of carbon monoxide poisoning.

Therefore, it is highly likely that David Tuvell suddenly lost consciousness and drowned during this dive as a result of pulmonary barotrauma and arterial gas embolism, but the opportunity to prove this was permanently lost when the special autopsy procedures required to conduct a proper autopsy on a person who dies while scuba diving were not done.

### **SHOULD DAVID TUVELL HAVE BEEN ON THE PADI DISCOVER SCUBA COURSE IN THE FIRST PLACE?**

The chain of events that ultimately resulted in David Tuvell's death stretches back to the spring, summer and fall before the dive. David clearly suffered from serious medical problems with his lungs. Whether these problems were due to allergic reactive airways disease or asthma does not matter as both diagnoses place the person at greatly increased risk of suffering pulmonary barotrauma and arterial gas embolism if they go scuba diving.

The first step in the chain of events that lead to David's death is the fact that Brian Shrawder requested that pulmonary function testing be done on David on 28 June 2010 but the pediatrician refused to do this investigation. Based on the history contained in the Anthem Hills medical records on David, it is highly likely that pulmonary function testing would have been abnormal, potentially highly abnormal. This additional data may have caused at least one of the people in this chain of events to question if David was medically fit to go scuba diving.

The next step in the fatal chain of events was the very surprising fact that David's mother, Sherry Tuvell, a respiratory therapist with extensive training in lungs and their function, did not see any problem with her son going scuba diving. She even filled in on David's Boy Scout Medical form that he had asthma.

Next we have David being medically cleared by Brian Shrawder, a Physician Assistant who was well aware of David's respiratory history. He certified on the form that he examined David and his lungs although he actually did not. It is also highly unlikely that examination of David's lungs on 1 October 2010 would have been normal as he had required multiple powerful medications to control his respiratory symptoms for the preceding several months.

In addition, David clearly required Singulair to control his symptoms and the form specifically mentions this kind of medication as being a problem in divers. In his defense, a physician's assistant would not be expected to be knowledgeable about medical problems in divers.

However, a physician's assistant, assists a physician – in this case a pediatrician. The pediatrician should have been knowledgeable about the effects of RAD and asthma in divers, fitness for diving, and children and diving, before she approved Brian Shrawder's clearance of David Tuvell for diving. It appears however, that Dr. LaMotte-Malone never knew that Brian Shrawder approved David for diving. There is no record of David being examined on 1 October 2010, nor is the medical form that Shrawder signed contained within the records of Anthem Hills Pediatrics. Therefore, the failure of a physician to review the work of her assistant – an assistant with only two years of experience in the medical profession at that time and no experience with the water beyond taking swimming lessons in college – provides yet another link in the causal chain.

Next, the medical form completed by Brian Shrawder on 1 October 2010 clearing David Tuvell as medically fit to go scuba diving was a Boy Scouts of America form that can be signed by a medical doctor, DO, nurse practitioner or a physician's assistant. However, the 2011 Boy



Scout's *Guide to Safe Scouting* under the BSA Scuba Policy section (page 11) clearly states that to be cleared for scuba diving the form must be signed by a physician. The BSA Guide goes on to specifically state "Scuba diving is prohibited for the following conditions, ... History of asthma or RAD unless resolution confirmed by methacholine testing (Persons who have been asymptomatic and medication free for the previous five years are exempt from the methacholine testing requirements)." David was clearly not symptom and medication free for five years before the accident and was clearly unfit for scuba diving according the BSA policy.

The policy goes on to specifically state that the "BSA may allow exceptions to general medical prohibitions based on individual diving fitness evaluations by a medical specialist who is knowledgeable about diving medicine." Brian Shrawder was neither a physician, medical specialist, nor knowledgeable about diving medicine. It is highly likely that if David had been evaluated by a medical specialist who was knowledgeable about diving medicine he would have been found unfit scuba diving and would never have taken the PADI Discover Scuba course.

Ironically, David's father, Christopher Tuvell, was the Assistant Scoutmaster for his son's Boy Scout troop and, according to the deposition testimony of Michael Perry, he had been given a copy of the current *Guide to Safe Scouting* and had undergone training on how to keep boys safe prior to the trip to Bear Lake. Michael Perry had also undergone this training, and the troop leadership was supposed to be familiar with the Boy Scout's policies and procedures for ensuring the safety of the boys in their care. Both Michael Perry and Christopher Tuvell failed to do so. It appears that neither father was familiar with the Boy Scout's policies and procedures for ensuring the safety of boys who were interested in participating in scuba diving, and they certainly did not follow them. Indeed, Michael Perry testified that he had possession of David's medical form for 9.5 months before the accident and he knew David had asthma, but he never suggested that David be examined by a physician familiar with scuba diving before the adults signed up David for scuba diving at Bear Lake.

The final step in the chain of events that culminated in David's death, other than David disobeying the express instructions of his instructor, was the fact that this medical form was completed, clearing David to go scuba diving, 9.5 months before the dive on which he died. There was apparently no requirement for his medical fitness to dive to be evaluated closer to the time of the actual dive to determine if his medical condition had changed.

In fact David had presented to Anthem Hills Pediatric on 9 May 2011, two months before the fatal dive, with self-diagnosed bronchitis. Significantly, information about David's history of respiratory illness was not revealed to Corbett Douglas. None of the adults that had regular conduct with David in the year before his death and were responsible for his safety did anything to stop David from scuba diving on 13 July 2011, and they did nothing to give Corbett the information he needed to properly evaluate David's fitness for this dive and prevent this tragedy from occurring. If they had done so, it is unlikely that David would have been under the water that day and this accident would not have happened.

## CONCLUSION:

David Tuvell, a 12-year-old boy, died on a PADI Discover Scuba dive on 13 July 2011 in Bear Lake, Utah. He almost certainly lost consciousness after ascending slowly from a depth of approximately 15 feet to near the surface as a result of pulmonary barotrauma and arterial gas embolism. This cannot be proven to a one hundred percent degree of certainty as the autopsy



performed on David did not follow the special procedures required in divers who die while diving; however, it is more likely than not what happened based on all of the other evidence produced in the case.

David suffered from significant respiratory problems and should have been prevented from engaging in scuba diving; at least until his lung function had been specifically assessed. This should have been done by pulmonary function testing, methacholine challenge testing, and a high resolution inspiratory and expiratory CT scan of his lungs.

Based on the information contained in this report and in accordance with my experience and qualifications, it is my opinion to a reasonable degree of medical and professional certainty that if David had undergone these tests and investigations the results would have been such that a medical specialist knowledgeable about diving medicine would have found David unfit scuba diving and he would not have taken the PADI Discover Scuba course.

From all the information I have been provided to review, it is my professional opinion that Corbett Douglass did an excellent job of running this PADI Discover Scuba course and supervising the guided dive. Corbett was denied the information he needed to make a professional assessment of David's fitness for diving and, as he testified, he would not have permitted David to go diving without a physician's clearance if he had known about David's significant and recent respiratory illnesses. It is highly likely that David Tuvell would have suffered pulmonary barotrauma and arterial gas embolism even if he had ascended with Corbett when Corbett surfaced to assist Michael Perry. David may even have suffered pulmonary barotrauma and arterial gas embolism if he had surface by swimming in to shore along the rope on the bottom although pulmonary barotrauma becomes less likely in this scenario due to the very slow ascent to the surface that would have resulted from swimming in along the bottom of the lake.

It is regrettable that Corbett Douglas momentarily lost contact with David when he was forced to ascend to assist Michael Perry, but this was not the cause of David's death. Nor was overweighting or equipment failure the cause of David's death. Instead, it is my opinion, to a reasonable degree of medical and professional certainty, that it is more likely than not that David's death was caused by pulmonary barotrauma/arterial gas embolism, which was most likely precipitated by a pre-existing medical condition and triggered by environmental factors inherent in scuba diving, altitude and/or the arid environment at Bear Lake.

Dr. David Sawatzky  
Consultant in Diving Medicine

14 Dec 2014

In the matter of:

*Tuvell v. Boy Scouts of America, PADI, Blue Water Scuba of Logan, Lowell Huber, Corbett Douglas, Bear Lake Aquatic Base and Great Salt Lake Council of the Boy Scouts of America*

## **Appendix of Materials Reviewed**

### Deposition transcripts or videos of the following witnesses:

MP (video) taken 2 Feb 2012

(age 13, diver, David Tuvell's buddy)

Lowell Huber taken 29 Jul 2014

(instructor, owner of Blue Water Scuba, recovered gear, owned gear)

Richard Droesbeke taken 30 Jul 2014

(Park Manager Bear Lake State Park, part-time Deputy Sheriff)

Wendell M. Nope taken 30 Jul 2014

(instructor at Police Academy, trainer Public Safety Dive Team, equipment exam)

Donald R. Jones (pages 40-48) taken 23 Sep 2014

(diver, found David Tuvell)

Corbett Douglas taken 23/24 Sep 2014

(instructor on course)

Summary of deposition testimony of Michael Perry, MP, Kim Lamotte-Malone, M.D. and Brian Shrawder, P.A. (to be confirmed by review of deposition transcripts when they become available)

### Documents produced by:

Anthem Hill Pediatrics (David Tuvell medical records)

Rich County Ambulance Service (David Tuvell EMS incident report)

Logan Regional Hospital (David Tuvell medical records)

Boy Scouts of America BWS01463-65

- David Tuvell annual BSA health and medical record 27 Sep 2010

- 2011 BSA *Guide to Safe Scouting*.

Rocky Mountain Emergency Specialists (David Tuvell emergency account)

Medical Examiner's report and accompanying records (David Tuvell autopsy)

Department of Natural Resources Parks and Recreation Officer Report (Richard Droesbeke)

Department of Natural Resources Parks and Recreation Officer Sup Report (Richard Droesbeke)

Rich County Sheriff's Office incident narrative (Dale Stacey)

Lowell Huber, Corbett Douglas and Blue Water Scuba of Logan

Screen shots of data and the dive profile obtained from Corbett Douglas dive computer

### Court Records:

Plaintiff's Complaint filed 14 Jun 2012

Amended Answer to Complaint filed 3 Jul 2013

Amended Complaint filed 17 Nov 2014

Blue Water Defendant's Answer to Amended Complaint filed 1 Dec 2014

Additional Research:

Research articles on the salinity and sedimentation of Bear Lake Utah/Idaho and the Great Salt Lake Basin, including:

James David and Mark Milligan, "Why is Bear Lake so Blue? And other commonly asked questions," Public Information Series 96, Utah Geological Survey, Utah Dept. of Nat. Resources (2011).

"Facts About Utah's Great Salt Lake," Mineral Resources, Int'l (available at <http://www.mineralresourcesint.com/facts-about-utah-s-great-salt-lake>) (obtained Dec. 4, 2014).

"Great Salt Lake Basin Watershed Description," Utah Water Research Laboratory at Utah State University, under funding from the Utah Department of Natural Resources (available at <http://www.greatsaltlakeinfo.org/Background/>) (obtained Dec. 4, 2014).

## CURRICULUM VITAE

**KEITH DAVID SAWATZKY**  
S.C., C.D., B.Med.Sc., M.D., M.Sc.

### PERSONAL INFORMATION

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E-mail: david.sawatzky@forces.gc.ca  
Date of Birth: 20 April 1954, Edmonton, Alberta, Canadian Citizen  
Passport: Canadian QE770275, Exp. 02 Apr 2017

### LICENSURE

Licentiate of the Medical Council of Canada (L.M.C.C., #50837)  
College of Physicians and Surgeons of Nova Scotia (#014255)

### EDUCATION

High School: ME Lazerte CHS, Edmonton, Alberta, Grade 12 honors 1972  
Undergraduate: Briercrest Bible Institute, Caronport, Saskatchewan, Diploma 1974  
B.Med.Sc., University of Alberta, Edmonton, Alberta 1978  
Medical School: M.D., University of Alberta, Edmonton, Alberta 1980  
Internship: Royal Alexandra Hospital, Edmonton, Alberta 1980-1981  
Graduate Studies: Canadian Forces (CF) Basic Medical Officer's Course 1981  
CF Basic Field Medical Operations Course 1982, Advanced Field MOC 1985  
CF Submarine & Diving Medical Officer Course 1982  
CF Flight Surgeon Course 1983  
M.Sc., York University, Toronto, Ontario 1991  
CF Advanced Hyperbaric, Exercise Physiology, Military Medicine Quals 1992  
Canadian Securities Course 1996 and 2007  
CF Joint Reserve Command and Staff Program 2009  
CF Submarine Medicine Course 2010  
Emergency Medicine: Advanced Cardiac Life Support, Halifax, Mar 2009  
Advanced Trauma Life Support, Toronto, Jun 1997  
British Columbia Cave Rescue Course, July 1998, 1988, 1987  
Diving: ACUC: Open Water Diver 1982, Oxygen Administration 2000 (#OX-135), River Diver  
Instructor 1992, Instructor Trainer 1996 (#IT378FA)  
Canadian Forces: Ship's Diving Officer 1983, Requal. Courses, 1986, 1989, 1993  
NSS-CDS: Cavern, Basic Cave 1988, Full Cave, Recovery Diver 1989, Sidemount, Stage,  
DPV 2002  
SBCA: VIP Inspector 1992  
IANTD: Nitrox Diver 1993 (#5900), Megalodon CCR Trimix Diver 2005, Optima CCR Diver 2011  
Nitrox Instructor 1997 (#2305),  
Adv. Nitrox Instructor Trainer 2000 (#305), Technical IT, Technical Cave IT, Technical  
Wreck IT, Trimix IT, Trimix Gas Blender IT, Inspiration CCR IT, CCR Cave IT,  
CCR Wreck IT, CCR Trimix IT,  
WCB-BC: Commercial (Occupational) Scuba Diver 1999 (#0014-99)  
DAN: O2 for Diving Accidents 1995 (#247055), O2 for Scuba IT 2000 (#9055),  
Aquatic O2 IT, REMO2 IT, Hazardous Marine Life Injuries IT, On-site Neurological  
Assessment for Divers IT  
Climbing: Climb Nova Scotia Level 1 Instructor 2008

**PROFESSIONAL EXPERIENCE**

Occupational Physician, 12 Wing Shearwater, Nova Scotia, 2012 - present  
 Medical Columnist, Sport Diver Magazine, Australia, 2007 - present  
 Board of Advisors, International Association of Nitrox & Technical Divers, 2000 - present  
 Medical Advisor, ACUC International, 1994 - present  
 Medical Columnist, Diver Magazine, Canada, 1993 – present  
 Expert Witness in Diving Accident Investigations, 1986 – present

Commanding Officer, Canadian Forces 33 Field Ambulance, Halifax, 2007 - 2014  
 Deputy Commander, Canadian Forces 4 Health Services Group, 2011 - 2012  
 Occupational Physician, Fleet Support Medical Officer, CFB Halifax, 2010 - 2012  
 LFAA Casualty Support Advisor, Halifax, 2008-2009  
 LFAA Area Surgeon, JTFA Deputy Regional Surgeon, Halifax, 2007-2008  
 Occupational Physician, Lifemark/Columbia Medical Services, 2007  
 Occupational Physician, Atlantic Offshore Medical Services, 2006-2007  
 Medical Staff, Humber River Regional Hospital, Toronto, Ontario, 1995-2006  
 Consultant in Diving, Aviation, Occupational Medicine, DRDC Toronto, Ontario, 1998-2005  
 Senior Medical Officer, Canadian Forces Support Unit Toronto, Toronto, Ontario, 1993-1998  
 Consultant Occupational Physician, Assure Health Management, Toronto, Ontario, 1997  
 Medical Advisor, Canadian Association of Nitrox Divers Inc., 1994-1997  
 Deputy Director Medical Operations, Canadian International Airshow, Toronto, Ontario, 1993-1996  
 Head of Diving Medicine, DCIEM, Toronto, Ontario, 1986-1993  
 Base Surgeon, CFB Shearwater, Dartmouth, Nova Scotia, 1984-1986  
 Medical Officer, HMCS Preserver, Halifax, Nova Scotia, 1983-1984  
 Medical Officer, Canadian Airborne Regiment, Petawawa, Ontario, 1981-1983

**HONOURS AND AWARDS**

Star of Courage, Governor General of Canada, 1996 (SC)  
 Canadian Forces Decoration, 1990 (CD), First Bar, 2009  
 Explorer's Club – Fellow of the Explorer's Club, 2007  
 CFEME School of Operational Medicine Award for excellence in Diving Medicine Training, 2005  
 Undersea and Hyperbaric Medical Society-GLC – Dr. Mary Anne Rokitka Award, 2004  
 National Speleological Society – Fellow of the NSS, 1994  
 NSS Cave Diving Section – Henry W. Nicholson Safety Award (500 cave dives), 2001  
 NSS Cave Diving Section – Abe Davis Safety Award (100 cave dives), 1987

**SOCIETIES & ASSOCIATIONS**

Canadian Medical Association (#48265), Doctors Nova Scotia (#15246)  
 Explorers Club (#6118, Fellow)  
 National Speleological Society (NSS #30362, Fellow, Life member)  
 National Speleological Society Cave Diving Section (NSS-CDS, Life member)  
 International Association of Nitrox and Technical Divers (IANTD)  
 American Canadian Underwater Certifications (ACUC)  
 Ontario Underwater Council (OUC), Etobicoke Underwater Club (EUC, Honorary member)  
 Diver's Alert Network (DAN #247055), Climb Nova Scotia  
 Toronto Caving Group (TCG) and Alberta Speleological Society (ASS)  
 British Columbia Speleological Federation (BCSF), Vancouver Island Cave Exploration Group (VICEG)  
 Undersea & Hyperbaric Medical Society (UHMS 1982-present)  
 Aerospace Medical Association (ASMA 1983-93) –active article reviewer until 2007

**DIVING, CAVING and CAVE DIVING EXPERIENCE**

- 1975-7 Discovered and surveyed major new passages (2 km) in Cadomin Cave, Alberta.
- 1976-81 Extremely active caving, exploring, surveying in the caves of Alberta and BC.  
Developed a cave map program, tested on all the major cave systems in Alberta.
- 1978-80 Member of caving expeditions to Mexico, Vancouver Island, Castleguard Cave Alberta
- 1983-6 Caving and cave diving in Nova Scotia and New Brunswick.
- 1986-98 Explored and surveyed Ottawa River Cave System (10.7 km, all underwater)
- 1987 Medical support and cave diving, McMaster University Castleguard Cave Expedition
- 1987-9 Member annual week long Cave Diving Expeditions on Vancouver Island  
Discovered and surveyed almost 10 km of new cave passage.
- 1988 Instructor, week long BC Cave Rescue Course
- 1995 Executed 3rd ever rescue of missing cave diver (1st of a trained cave diver)
- 1996 Assistant Instructor, High Angle/Cave Rescue Workshop, 3 days, Toronto
- 1998 Instructor, week long BC Cave Rescue Course
- 1998 Lead cave diving expedition to Windermere Well in BC
- 1995-9 Lead annual 10 day caving/cave diving expeditions to northern Vancouver Island
- 2000-6 Senior Researcher exploring/surveying Leopard Frog Cave, Tobermory National Park
- 2000-4 Lead several cave diving expeditions to Vancouver Island (minimal results, weather problems)
- 2002-3 Member UK/Maltese technical diving expeditions to Malta and Tunisia
- 2005 Caving/cave diving expedition to Vancouver Island (dived 3 new locations, all continue)  
Member HMCS Regina documentary film technical diving team, Cornwall, England
- 2007 Member Mine Quest 2007 technical diving team, Bell Island Mine #2, Newfoundland
- 2008 Member Canadian/American Xe Bang Fai River Cave Expedition, Laos

**FEATURED in ARTICLES / INTERVIEWS****2008**

'St. John, New Brunswick', interviewed by Steven Webb, CBC radio, 16 January 2008

**2006**

'Sounds Like Canada', interviewed by Shelagh Rogers, CBC radio, 11 April 2006

Caves Under the Ottawa River, by David Savoie, Le Droit newspaper, 24 March 2006

Caveman of the Ottawa, by Shannon Proudfoot, Ottawa Citizen newspaper, 19 March 2006

**2004**

An Interview with David Sawatzky, by Ian MacKenzie, Canadian Caver, Pg. 13-18, #61, May 2004

60 Minute House Call, by Robert Choquette, Scuba Press Magazine, Pg. 18-19, Vol. 1-1, Spring 2004

**2001**

The Man With Tunnel Vision, by Mike Randolph, Explore Magazine, Pg. 41-5, 91-3, May/June 2001

**1998**

Devil's Bath, by Barb Roy, Diver Magazine, Vol. 24-7, Pg. 20,21,35, Oct/Nov 1998

**1997**

Into the Unknown, by Jerry Kobalenko, Outdoor Canada, Pg. 50-4,76-7, Summer 1997



**PUBLICATIONS****Books**

- 2009** Dr. Sawatzky's Diving Medicine Notes, 5<sup>th</sup> edition, 277 pages
- 2007** Dr. Sawatzky's Diving Medicine Notes, 4<sup>th</sup> edition, 262 pages
- 2005** Dr. Sawatzky's Diving Medicine Notes, 3<sup>rd</sup> edition
- 2003** Dr. Sawatzky's Diving Medicine Notes, 2<sup>nd</sup> edition
- 2002** Dr. Sawatzky's Diving Medicine Notes
- 1991** The Relationship between Doppler Detected Intravascular Gas Bubbles and Decompression Sickness after Bounce Diving in Humans, Master of Science Thesis, York University, Toronto, Ontario, 117 pages

**Book Chapters**

- 2008** Cave Diving: Articles and Opinions, eds. J. Heinerth and B. Oigarden, Chapter 4, Survival Psychology, Pg. 17-119, Chapter 5, Hypothermia and Cave Diving, Pg. 157-159, Thermal Protection and Cave Diving, Pg. 160-164, Doppler and Decompression Sickness, Pg. 173-180
- Exploration and Mixed Gas Diving Encyclopedia by Mount and Dituri, Chapter 3, Oxygen and its Effect on the Diver, Pg. 41-50
- 2005** IANTD Tek Lite Manual; The Complete Guide to Advanced Nitrox & Advanced Recreational Trimix, Chapter 3, Oxygen, Pg. 30-34; Chapter 5, Decompression Sickness, Pg. 43-49
- IANTD Tek Closed Circuit Rebreather Manual, Chapter 2, Oxygen and the Diver, Pg. 32-42; Chapter 3, Carbon Dioxide and the Diver, Pg. 43-50
- 1992** NSS-CDS Cave Diving Manual, eds. J. Prosser, HV Grey, Chapter 9, Introduction to Nitrox and Mixed Gas Diving, Pg. 142-171

**Articles**

- Corrective Dive Masks, Diver Magazine, Vol. 40-1
- Mental Health and Diving, Sport Diving, Feb/Mar 2015
- Bone/Joint Surgery, Sport Diving, Dec 2014/Jan 2015
- Lung Squeeze and Free-Diving, Sport Diving, Oct/Nov 2014
- 2014**
- 351) Presbyopia, Contacts, Diver Magazine, Vol. 39-8, Pg. 54-5, 2014
- 350) Common Refractive Errors, Diver Magazine, Vol. 39-7, Pg. 56-7, 2014
- 349) Osteoporosis and Diving, Sport Diving, Issue 165, Pg. 44-5, Aug/Sep 2014
- 348) Vision Underwater, Diver Magazine, Vol. 39-6, Pg. 54-5, 2014
- 347) Mind Games and Diving P2, Diver Magazine, Vol. 39-5, Pg. 56-7, 2014
- 346) Exercise and DCS Risk, Sport Diving, Issue 164, Pg. 52-3, Jun/Jul 2014
- 345) Mind Games and Diving P1, Diver Magazine, Vol. 39-4, Pg. 54-5, 2014
- 344) O2 Toxicity and CCR Diving, Sport Diving, Issue 163, Pg. 56-7, Apr/May 2014
- 343) Myocarditis and Diving, Diver Magazine, Vol. 39-3, Pg. 58-9, 2014

342) LBP-Mechanical, Sport Diving, Issue 162, Pg. 44-5, Feb/Mar 2014

341) Healthy Eating, Diver Magazine, Vol. 39-2, Pg. 58-9, 2014

340) Rebreather Fatalities, Diver Magazine, Vol. 39-1, Pg. 52-3, 2014

## 2013

339) LBP-Muscle, Sport Diving, Issue 161, Pg. 44-5, Dec 2013/Jan 2014

338) How Rebreathers Work, Diver Magazine, Vol. 38-8, Pg. 54-5, 2013

337) PFO and Diving, Diver Magazine, Vol. 38-7, Pg. 56-7, 2013

336) Hemoglobinopathies, Sport Diving, Issue 160, Pg. 44-5, Oct/Nov 2013

335) Hernias and Diving P2, Diver Magazine, Vol. 38-6, Pg. 56-7, 2013

334) Anemia and Diving, Sport Diving, Issue 159, Pg. 54-5, Aug/Sep 2013

333) Hernias and Diving P1, Diver Magazine, Vol. 38-5, Pg. 60-1, 2013

332) Rescue of an Unresponsive Submerged Diver, Sport Diving, Issue 158, Pg. 47-9, Jun/Jul 2013

331) Rescue of an Unresponsive Submerged Diver, Diver Magazine, Vol. 38-4, Pg. 54-6, 2013

330) External Ear and Diving, Sport Diving, Issue 157, Pg. 48-9, Apr/May 2013

329) How to Lose Weight and Keep it Off, Diver Magazine, Vol. 38-3, Pg. 56-7, 2013

328) Obesity. Divers Beware 'Saturated Fat', Diver Magazine, Vol. 38-2, Pg. 56-7, 2013

327) Sudden Hearing Loss (ISSHL), Sport Diving, Issue 156, Pg. 44-5, Feb/Mar 2013

326) Immune Modulators, Diver Magazine, Vol. 38-1, Pg. 60-1, 2013

## 2012

325) Performance and the Aging Diver, Sport Diving, Issue 155, Pg. 36-7, Dec 2012/Jan 2013

324) Dysbaric Osteonecrosis P2, Diver Magazine, Vol. 37-8, Pg. 56-7, 2012

323) Dysbaric Osteonecrosis P1, Diver Magazine, Vol. 37-7, Pg. 60-1, 2012

322) Anticoagulants and Diving, Sport Diving, Issue 154, Pg. 46-7, Oct/Nov 2012

321) Diving With Osteoporosis, Diver Magazine, Vol. 37-6, Pg. 60-1, 2012

320) Factor V Leiden and Diving, Sport Diving, Issue 153, Pg. 48-9, Aug/Sep 2012

319) Benign Paroxysmal Positional Vertigo (BPPV), Diver Magazine, Vol. 37-5, Pg. 56-7, 2012

318) Caffeine and Diving, Sport Diving, Issue 152, Pg. 54-5, Jun/Jul 2012

317) Pulmonary Nodules and Diving, Diver Magazine, Vol. 37-4, Pg. 58-9, 2012

316) Oxygen Toxicity – Signs and Symptoms, Sport Diving, Issue 151, Pg. 64-5, Apr/May 2012

315) Pulmonary Embolism and Diving, Diver Magazine, Vol. 37-3, Pg. 54-5, 2012

314) Migraines and Diving, Sport Diving, Issue 150, Pg. 64-5, Feb/Mar 2012

## 2011

313) Oxygen Toxicity – How Does It Occur, Sport Diving, Issue 149, Pg. 50-1, Dec 2011/Jan 2012

312) Lupus (SLE) and Diving, Diver Magazine, Vol. 37-2, Pg. 60-1, 2011

311) Oxygen – Anoxia and Hypoxia, Sport Diving, Issue 148, Pg. 48-9, Oct/Nov 2011

310) Raynaud's and Diving, Diver Magazine, Vol. 37-1, Pg. 60-1, 2011

309) Oxygen – Physics and Physiology, Sport Diving, Issue 147, Pg. 48-9, Aug/Sep 2011

308) Buoyancy Control, Diver Magazine, Vol. 36-8, Pg. 58-9, 2011

307) Myocarditis and Diving, Sport Diving, Issue 146, Pg. 52-4, Jun/Jul 2011

306) Diving Fatalities, Diver Magazine, Vol. 36-7, Pg. 58-9, 2011

305) Heart Attacks While Diving, Sport Diving, Issue 145, Pg. 52-4, Apr/May 2011

304) Narcosis P2, Diver Magazine, Vol. 36-6, Pg. 58-9, 2011

303) Gout and Diving, Sport Diving, Issue 144, Pg. 52-3, Feb/Mar 2011

302) Narcosis P1, Diver Magazine, Vol. 36-5, Pg. 58-9, 2011

## 2010

301) ADD and Diving, Sport Diving, Issue 143, Pg. 52-4, Dec 2010/Jan 2011

300) Coughing While Diving, Dive Log Australasia, Issue 268, Pg. 58, Nov 2010

- 299) Sport Drinks, Diver Magazine, Vol. 36-4, Pg. 58-9, Oct/Nov 2010
- 298) Glaucoma and Diving, Sport Diving, Issue 142, Pg. 52-3, Oct/Nov 2010
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- 32) Canadian Cave Diving News, Union Internationale de Spéléologie Cave Diving Magazine, Vol. 4, Pg. 58 (July 1992)
- 31) Western Canada Cave Diving Recovery & Rescue Manual, Book review in, Union Internationale de Spéléologie Cave Diving Magazine, Vol. 4, Pg. 60-61 (July 1992)
- 30) Pulmonary Barotrauma, Contact (ACUC Instructor's Magazine), Pg. 3-9, December 1992

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- 28) Non-Pulmonary Barotrauma, Etobicoke Underwater Club Newsletter, Dec. 1991
- 27) Canada's Longest Cave Dive: The Ottawa River Caves, The Northeastern Caver, Vol. 22, No. 4, Pg. 120-123, Dec. 1991
- 26) Assessment of Inter-rater Agreement on the Grading of Intravascular Bubble Signals, Sawatzky KD & RY Nishi, Undersea and Biomedical Research, Vol. 18(5-6), Pg. 373-396 (Sep-Nov 1991)
- 25) Canada's Longest Cave Dive: Ottawa River Cave, Union Internationale de Spéléologie Cave Diving Magazine, Vol. 3, Pg. 18-23 (Aug 1991)
- 24) Canada's Longest Cave Dive: Ottawa River Caves, Underwater Speleology, Vol. 18-1, Pg. 6-11 (Jan/Feb 1991)

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- 22) Recent Cave-Diving Explorations in Western Canada, Pollack & Sawatzky, Underwater Speleology, Vol. 17-2, Pg. 12-13
- 21) Canada's Longest Cave Dive - The Ottawa River Cave, Canadian Caver, Vol. 22-1, Pg. 8-10, Spring 1990

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- 20) The Ins and Outs of Cave Diving, Diver Magazine, Vol. 15-8, Pg. 34-36
- 19) Canadian Clearance Diving Apparatus - Medicus; The Medical Branch Journal, Pg. 20-22
- 18) Recent Diving Exploration in BC, Pollack & Sawatzky, Canadian Caver, Vol. 21-2, Pg. 16-17
- 17) St. Croix River Cave, The Canadian Caver, Vol. 21-2, Pg. 8-10
- 16) Cave Diving in Florida (Silt Farmers in Paradise), Canadian Caver, Vol. 21-1, Pg. 32-36

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- 15) Canadian Cave-Diving Fatality, Underwater Speleology, Vol. 15-6, Pg. 4
- 14) Vancouver Island 1988 Cave-Diving Camp, Canadian Caver, Vol. 20-2, Pg. 10-17
- 13) Cave Diving Fatality, Canadian Caver, Vol. 20-2, Pg. 4
- 12) Editorial: Safe Caving?, Canadian Caver, Vol. 20-2, Pg. 2-38
- 11) Recent Discoveries on Northern Vancouver Island, Canada, Pollack & Sawatzky, Underwater Speleology, Vol. 15-5, Pg. 6
- 10) A Canadian Cave-Diving Camp, BC, Canadian Caver, Vol. 20-1, Pg. 41-46

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- 9) Canadian Cave Diving Camp, BC, Underwater Speleology, Vol. 14-5, Pg. 4
- 8) Rescue Seminar, BC, Canadian Caver, Vol. 19-2, Pg. 36-37
- 7) Diving in Castleguard, Alberta, Canadian Caver, Vol. 19-2, Pg. 22-28
- 6) ...from Ontario, Ontario, Canadian Caver, Vol. 19-2, Pg. 9-10
- 5) Castleguard Cave - The Canadian Rockies, Pollack & Sawatzky, Underwater Speleology, Vol. 14-3, Pg. 3-4
- 4) Ottawa River Cave Dive Update, Ontario, Canadian Caver, Vol. 19-1, Pg. 7-14,

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- 3) Underground Lake, New Brunswick, Canadian Caver, Vol. 18-2, Pg. 53-55
- 2) Ottawa River Cave Dive, Ontario, Canadian Caver, Vol. 18-2, Pg. 30-32
- 1) Diving in Diogenes, Nova Scotia, Canadian Caver, Vol. 18-1, Pg. 16-20

**PRESENTATIONS** (last 10 years)**2014**

Nov 18 Decompression Sickness, CF Submarine Medicine course, Halifax  
 Nov 18 Oxygen Toxicity, CF Submarine Medicine course, Halifax  
 Nov 18 Pulmonary Barotrauma, CF Submarine Medicine course, Halifax

**2013**

Nov 19 Decompression Sickness, CF Submarine Medicine course, Halifax  
 Nov 19 Oxygen Toxicity, CF Submarine Medicine course, Halifax  
 Nov 19 Pulmonary Barotrauma, CF Submarine Medicine course, Halifax

**2012**

Oct 12 Rebreather Physiology, DAN Diving Medicine course, Bonaire  
 Oct 11 Alternative and Adjunctive Tx in DCS, DAN Diving Medicine course, Bonaire  
 Oct 10 Case Histories, DAN Diving Medicine course, Bonaire  
 Oct 9 The Eye and Diving, DAN Diving Medicine course, Bonaire  
 Oct 8 Laos Xe Bang Fai River Cave, DAN Diving Medicine course, Bonaire  
 Oct 8 Drugs and the Aging Diver, DAN Diving Medicine course, Bonaire  
 Oct 7 Breathing Gas Effects, DAN Diving Medicine course, Bonaire  
 May 25 Spirometry Interpretation, CDU5 Staff, Halifax  
 Feb 9 Fleet Support Medical Services, New CO and XO course, Halifax

**2011**

Nov 17 Fleet Support, CF HSvcs C(A) Professional Development Day, Halifax  
 Nov 16 Staff Assistance Visits, CF Submarine Medicine course, Halifax  
 Nov 15 Medical Repatriation, CF Submarine Medicine course, Halifax  
 Nov 14 Diving Medicine Review, CF Submarine Medicine course, Halifax  
 May 4 Diving Physics, Circulatory System, Respiratory System, Non-Pulmonary & Pulmonary Barotrauma, Nitrogen Narcosis, Decompression Sickness, Carbon-monoxide & Carbon-dioxide Poisoning, Underwater Blast Injury, Caving in Laos, Combat Diver's Course, Gagetown, New Brunswick  
 Feb 10 Fleet Support Medical Services, New CO and XO course, Halifax  
 Feb 9 Myocarditis – An Underdiagnosed cause of Sudden Death, Maritime Med Conf, Halifax  
 Jan 11 Anatomy of the Lower Limb, 33 Fd Amb, Halifax

**2010**

Nov 18 Staff Assistance Visits, CF Submarine Medicine course, Halifax  
 Nov 16 Medical Repatriation, CF Submarine Medicine course, Halifax  
 Nov 15 Diving Medicine Review, CF Submarine Medicine course, Halifax  
 Oct 29 Rebreather Physiology, UHMS Diving Medicine course, Curacao  
 Oct 28 Laos Xe Bang Fai River Cave, Diving Medicine Case Histories, Nitrox Diving: Basic, Advanced, Technical, UHMS Diving Medicine course, Curacao  
 Oct 27 Non-pulmonary Barotrauma, UHMS Diving Medicine course, Curacao  
 Oct 26 Alternative Tx and Adjunctive Therapies for DCS, DCS Pathophysiology and Risks, UHMS Diving Med course, Curacao  
 Oct 14 Submarine Rescue, Diving Medicine Review, Smashex 2010, Halifax, Nova Scotia  
 Sep 30 Periodic Health Exams, Spirometry, Fleet PA conference, Halifax, Nova Scotia  
 Apr 22 In-water Treatment Table for DCI, Laos Xe Bang Fai River Cave, DMA course, DRDC Toronto, Ontario  
 Apr 21 Alternative Treatment Options for DCI, DMA course, DRDC Toronto, Ontario  
 Apr 20 Laos Xe Bang Fai River Cave, EUC club, Nobleton, Ontario

Apr 20 Dysbaric Osteonecrosis, DMA course, DRDC Toronto, Ontario  
 Apr 19 Adjunctive Therapies for Decompression Sickness, DMA course, DRDC Toronto, Ont.  
 Apr 19 Medical Issues, CUMA Trimix Experimental Dive Series, DRDC Toronto, Ontario

**2009**

Nov 16 Diving Medicine Review, CF Submarine Medicine course, Halifax  
 Nov 13 Technical Diving Overview, Big Push Dives and Failures, DAN Diving Med, Dominica  
 Nov 12 Oxygen Toxicity and Nitrogen Narcosis, Case Reports, DAN Diving Med, Dominica  
 Nov 11 The Eye and Diving, DAN Diving Medicine course, Dominica  
 Nov 10 Laos Xe Bang Fai River Cave, DAN Diving Medicine course, Dominica  
 Nov 09 Dive Computer and Bubble Theory, DAN Diving Medicine course, Dominica  
 Aug 15 Laos Xe Bang Fai River Cave, Explorer's Club chapter meeting, Chester, Nova Scotia  
 Apr 30 Laos Xe Bang Fai River Cave, DMA course, DRDC Toronto, Ontario  
 Apr 29 Alternative Treatment Options for DCI, DMA course, DRDC Toronto, Ontario  
 Apr 29 The Four Minute Neurological Exam, DMA course, DRDC Toronto, Ontario  
 Apr 28 Dysbaric Osteonecrosis, DMA course, DRDC Toronto, Ontario  
 Apr 28 Diving Accident Case Histories, DMA course, DRDC Toronto, Ontario  
 Feb 02 Laos Xe Bang Fai River Cave, LFAA HQ, Halifax, Nova Scotia  
 Jan 31 Laos Xe Bang Fai River Cave, 33 Fd Amb PD Weekend, Charlottetown, PEI  
 Jan 29 Laos Xe Bang Fai River Cave, Ocean Quest Resort, St. John's, Newfoundland

**2008**

Nov 20 CF Medical Entitlement of Reservists, LFAA G1 Conf, Halifax  
 Nov 17 Diving Medicine Review, CF Submarine Medicine course, Halifax  
 Nov 13 33 Field Ambulance Update, 4 Health Services Gp HQ CO&RSM Conf, Halifax  
 Oct 07 Primary Reserve Medical Entitlements, JTFA/LFAA Medical Conference, Halifax  
 Jun 23 JTFA/LFAA Medical Resources, LFAA Change of Command, Halifax  
 Apr 29 Drowning, Barotrauma, DCS, ITLS Course, Halifax  
 Apr 25 JTFA Medical Resources, JTFA HQ, Halifax  
 Jan 16 DCS, Nitrox, Cooke Aquaculture, St. George, New Brunswick

**2007**

Nov 25 Subcutaneous and Intramuscular Injections, 33 Fd Amb MCSP training, Halifax  
 Nov 19 Diving Medicine Review, CF Submarine Medicine course, Halifax  
 Nov 6 CF Medical Entitlement of Reservists, LFAA G1 Conf, Halifax  
 Oct 24 CF Medical Support to the Reserves, LFAA Comd Conf, Aldershot  
 Oct 9 CF JTFA Medical Records Project, LFAA Transformation, Halifax  
 Sep 27 4 H Svcs Gp HQ Det Hfx Function, LFAAHQ Orientation Day, Halifax

**2006**

Nov 20 Diving Medicine Review, CF Submarine Medicine course, Halifax  
 Apr 23 Diving Medicine Panel, WorkSafeBC, Vancouver  
 Apr 22 Diving and Respiratory Problems, Fitness to Dive, WorkSafeBC, Vancouver  
 Mar 24 Ottawa River Caves, Karst Hydrological Environmental Considerations, Canadian Museum of Nature and Canadian Wildlife Federation HD Film Festival, Ottawa  
 Jan 31 Medical Considerations for Helicopter Underwater Escape Systems, Canadian Association of Petroleum Producers, Halifax

**2005**

Oct 21 Diving Computers Safely, Myths of Diving Panel, UHMS-GLC, Hamilton  
 May 9 Rebreather Physiology, DMA, DRDC Toronto  
 May 6 Technical and Cave Diving, DMA, DRDC Toronto



May 3 Altitude Diving, DMA, DRDC Toronto  
 Apr 29 Nitrox Diving – Basic, Advanced and Technical, DMA, DRDC Toronto  
 Apr 27 Dysbaric Osteonecrosis, Corneal Eye Surgery and Diving, DMA, DRDC Toronto  
 Apr 26 Adjunctive Therapy for DCS, Alternative Treatment Tables, In-water Treatment Tables for DCS DMA, DRDC Toronto  
 Apr 25 Compement, Bubbles and DCS, DMA, DRDC Toronto  
 Apr 21 Diving Medicine Review, Decompression Terminology, DMA, DRDC Toronto  
 Apr 12 Trimix, Cave, Tech, CCR Diving, CLDO Course, DRDC Toronto  
 Apr 11 Diving at Altitude, Adjunctive Therapy, CLDO Course, DRDC Toronto  
 Apr 8 Alternative Treatment Tables, CLDO Course, DRDC Toronto  
 Apr 6 Oxygen Toxicity, CLDO Course, DRDC Toronto  
 Apr 5 Barotrauma: Non-Pulmonary & Pulmonary, Underwater Blast Injury, Inert Gas Narcosis, Nitrox Diving, CL6B Course, DRDC Toronto  
 Apr 4 Topographical Anatomy, Respiratory System, Lung Physiology and Diving, CL6B Course, DRDC Toronto  
 Jan 31 Intro to the Atmosphere, Flight Surgeon Course, DRDC Toronto  
 Jan 20 IANTD Nitrox Diver course, DRDC Toronto

**2004**

Dec 8 Sarcoidosis, Salt Water Aspiration, Migraines, PFOs and Diving, Adjunctive Treatment of DCI, Treatment Tables for DCI, DM Refresher Course, Victoria  
 Dec 7 Med. Aspects of Diving Physics and Barotrauma, Asthma, PFTs and Diving, Risk Factors and DCS, DM Refresher Course, Victoria  
 Nov 4 Table Development and Doppler Monitoring, DMB Course, DRDC Toronto  
 Nov 1 Oxygen Toxicity, DMB Course, DRDC Toronto  
 Oct 29 Diving Respiratory Physiology, Inert Gas Narcosis, DMB Course, DRDC Toronto  
 Oct 27 Decompression Sickness, DON, DMB Course, DRDC Toronto  
 Oct 26 Non-pulmonary & Pulm. Barotrauma, UW Blast, DMB Course, DRDC Toronto  
 Oct 25 Corneal Eye Surgery and Diving, DMB Course, DRDC Toronto  
 Oct 23 Fitness and Diving, Myths of Diving Panel, UHMS-GLC, Hamilton  
 Aug 11 Decompression Theory, Etobicoke Underwater Club, Toronto  
 May 10 Technical and Cave Diving, Rebreather Physiology, DMA, DRDC Toronto  
 May 04 Altitude Diving, DMA, DRDC Toronto  
 Apr 30 Nitrox Diving – Basic, Advanced and Technical, DMA, DRDC Toronto  
 Apr 28 Corneal Eye Surgery and Diving, DMA, DRDC Toronto  
 Apr 27 In-water Treatment Tables for DCS, DMA, DRDC Toronto  
 Apr 26 Compement, Bubbles and DCS, DMA, DRDC Toronto  
 Apr 23 Adjunctive Therapy for DCS, Alternative Treatment Tables, DMA, DRDC Toronto  
 Apr 22 Diving Medicine Review, Decompression Terminology, DMA, DRDC Toronto  
 Feb 15 Diabetes, Smoking, Exercise and Diving, Steel City Diver's, Hamilton

**2003**

Nov 5 Oxygen Toxicity, DMB Course, DRDC Toronto  
 Oct 30 Inert Gas Narcosis, DMB Course, DRDC Toronto  
 Oct 29 Decompression Sickness, DON, DMB Course, DRDC Toronto  
 Oct 28 Non-pulmonary & Pulm. Barotrauma, UW Blast, DMB Course, DRDC Toronto  
 Oct 27 Diving Respiratory Physiology, DMB Course, DRDC Toronto  
 Sep 22 Rebreather Fatalities, UHMS-PCC meeting, Vancouver  
 May 12 Rebreather Fatalities, DMA Course, DRDC Toronto  
 May 09 Technical and Cave Diving, DMA Course, DRDC Toronto  
 May 02 Star of Courage, Runnymede Montessori Private School, Toronto

May 02 Altitude Diving, DMA Course, DRDC Toronto

May 01 Pathology of Neuro DCS and AGE, In-water Treatment of DCS, DMA Course, DRDC Toronto

Apr 29 Corneal Eye Surgery and Diving, Nitrox Diving, Dysbaric Osteonecrosis, DMA Course, DRDC Toronto

Apr 28 Compliment Bubbles and DCS, DMA Course, DRDC Toronto

Apr 25 Decompression Terminology, Adjunctive Therapy of DCI, Alternate Treatment Tables for DCI, DMA Course, DRDC Toronto

Apr 24 Diving Medicine Review, DMA Course, DRDC Toronto

Apr 15 PFOs and Diving, Eye Surgery and Diving, Adjunctive Treatment of DCI, Treatment Tables for DCI, DM Refresher Course, Victoria

Apr 14 Med. Aspects of Diving Physics and Barotrauma, O2 Toxicity, Narcosis, Risk Factors and DCS, DM Refresher Course, Victoria

Apr 4 Inert Gas Narcosis, DMB Course, DRDC Toronto

Apr 2 Underwater Blast Injuries, DCS, DON, DMB Course, DRDC Toronto

Apr 1 Non-pulmonary, Pulmonary Barotrauma, DMB Course, DRDC Toronto

Mar 31 Diving Respiratory Physiology, DMB Course, DRDC Toronto

Feb 11 Adjunctive Therapy, CLDO Course, DRDC Toronto

Feb 10 Tech, Cave & Trimix Diving, CLDO Course, DRDC Toronto

Feb 7 Alternative Treatment Tables, Diving at Altitude, CLDO Course, DRDC Toronto

Feb 5 Oxygen Toxicity, Narcosis, Nitrox Diving, CLDO Course, DRDC Toronto

Feb 4 Underwater Blast Injury, CLDO Course, DRDC Toronto

Feb 4 Barotrauma: Non-Pulmonary & Pulmonary, CL6B Course, DRDC Toronto

Feb 3 Topographical Anatomy, Respiratory System, CL6B Course, DRDC Toronto

Jan 24 Altitude Diving, TUUM Course, Cayman Brac

Jan 22 Hypothermia, Nitrox/Tech Diving, TUUM Course, Cayman Brac

Jan 21 Non-pulmonary, Pulmonary Barotrauma, Temple University Underwater Medicine Course, Cayman Brac

**CONTINUING PROFESSIONAL EDUCATION (last 5 years)****2014**

Dec 3 Insomnia, Webinar, Halifax (1 Mainpro-M1 credit)  
 Nov 20 Adult Immunization, Webinar, Halifax (1 Mainpro-M1 credit)  
 Nov 20 Obesity and Bariatric Surgery, Stad, Halifax (1 Mainpro-M2 credit)  
 Nov 18 Review of Diving Medicine, Sub Med course, Halifax (4 Mainpro-M2 credits)  
 Nov 6 Congenital Heart Disease in Adults, IWK, Halifax (2 Mainpro-M1 credit)  
 Nov 5 Chronic Kidney Disease, Webinar, Halifax (1 Mainpro-M1 credit)  
 Oct 22 Maternal Vaccination, Webinar, Halifax (1 Mainpro-M1 credit)  
 Oct 8 Cancer: A Practical Guide, Webinar, Halifax (1 Mainpro-M1 credit)  
 Sep 25 Alcohol: Low Risk Guidelines, Webinar, Halifax (1 Mainpro-M1 credit)  
 Sep 23 Psychiatric Issues, Halifax (2 Mainpro-M1 credit)  
 Jun 19 Liver Enzymes-Handling Abnormal Results, Halifax (1 Mainpro-M2 credit)  
 May 29 Accuro EMR, Halifax (2 Mainpro-M2 credits)  
 May 22 Peripheral Neuropathy, Webinar, Halifax (1 Mainpro-M1 credit)  
 May 15 Diabetes in the CF, Halifax (1 Mainpro-M2 credit)  
 May 14 Medical Cannabis, Webinar, Halifax (1 Mainpro-M1 credit)  
 May 10 Shared Care in Urology, Halifax (3 Mainpro-M1 credits)  
 May 7 Hemochromatosis, Webinar, Halifax (1 Mainpro-M1 credit)  
 Apr 24 Lyme Disease, West Nile, Rabies, Webinar, Halifax (1 Mainpro-M1 credit)  
 Apr 9 Thyroid Nodules, Webinar, Halifax (1 Mainpro-M1 credit)  
 Mar 12 Cochran Collaboration, Webinar, Halifax (1 Mainpro-M1 credit)  
 Feb 27 Cosmetic Surgery, Webinar, Halifax (1 Mainpro-M1 credit)  
 Feb 12 Sleep Disorders P2, Webinar, Halifax (1 Mainpro-M1 credit)  
 Feb 8-9 Disaster Medicine, Pulmonary Asphyxiates, ACLS Drugs, EKG patterns, Approach to Trauma, Charlottetown, PEI, (33 Fd Amb, Holland College)  
 Jan 30 Sleep Disorders P1, Webinar, Halifax (1 Mainpro-M1 credit)

**2013**

Dec 4 Assessing Decision-Making in Adults, Webinar, Halifax (1 Mainpro-M1 credit)  
 Nov 21 Commonly Missed Dx in the ER, Webinar, Halifax (1 Mainpro-M1 credit)  
 Nov 6 Imaging of Skull and Spine, Webinar, Halifax (1 Mainpro-M1 credit)  
 Nov 2 UHMS-Cdn Chapter Mtg, Halifax (7.25 hrs)  
 Oct 30 Annual Flight Safety Brief, Shearwater (2 hrs)  
 Oct 23 Anxiety in Children and Teens, Webinar, Halifax (1 Mainpro-M1 credit)  
 Oct 9 Pituitary Disease / Dysfunction, Webinar, Halifax (1 Mainpro-M1 credit)  
 Jun 26-7 ACLS, Halifax (8 Mainpro-C credits)  
 Jun 19 Medicolegal Pitfalls, Truro (3 Mainpro-M1 credits)  
 May 23 Anemia, Webinar, Halifax (1 Mainpro-M1 credit)  
 May 15 Pediatric Dermatology Pearls, Halifax (2 Mainpro-M1 credits)  
 Apr 18 Lipids in Primary Prevention, CF H Svcs C(A), Halifax (1 Mainpro-M1 credit)

**2012**

Dec 6 Antibiotics, Shearwater (1 Mainpro-M1 credits)  
 Nov 22 Dermatology, Halifax (2 Mainpro-M1 credits)  
 Oct 6-12 DAN Diving & Hyperbaric Medicine, Bonaire (23 AMA PRA Cat 1 hours)  
 Sep 26 Rapid Atrial Fib Mgt, Dartmouth Gen, Halifax (1 hour)  
 Jun 25-28 UHMS Conference, Phoenix, Arizona (approx. 34 hours)  
 May 10 Submarine Medicine, DCS, AGE, SMERAT, CF H Svcs C(A), Halifax (2 hours)  
 Apr 26 Obstructive Sleep Apnea, CF H Svcs C(A), Halifax (1 hour)

Apr 19 Evidence Based Antibiotic Use, CF H Svcs C(A), Halifax (1 hour)  
 Mar 22 Lifestyle Counseling, Addictions, CF H Svcs C(A), Halifax (3 hours)  
 Feb 29 Tinnitus and Hearing Loss, CF H Svcs C(A), Halifax (1 hour)  
 Feb 28 Normal and Abnormal Stress Responses, CF H Svcs C(A), Halifax (1 hr)  
 Feb 23 iPro2 Glucose Monitoring, CF H Svcs C(A), Halifax (1 hour)

**2011**

Nov 24 Issues in Hypertension, CF H Svcs C(A), Halifax (1 Mainpro-M1 credit)  
 Nov 22 Neuropathic Pain, CF H Svcs C(A), Halifax (1 hour)  
 Nov 17 CF HSvcs C(A) Professional Development Day, Halifax (1/2 day)  
 Nov 16 Staff Assistance Visits, CF Submarine Medicine course, Halifax (1 hour)  
 Nov 15 Medical Repatriation, CF Submarine Medicine course, Halifax (2 hours)  
 Nov 14 Diving Medicine Review, CF Submarine Medicine course, Halifax (3 hours)  
 Nov 1 HBO and Necrotizing Fasciitis, Halifax, NS (1 hour)  
 Oct 20 Major Depressive Disorder, Halifax, NS (1 Mainpro-M1 credit)  
 Oct 12 Peripheral Vascular Disease, Halifax, NS (2 hours)  
 Apr 12 Dental Emergencies, Halifax, NS (1 hour)  
 Apr 1-2 Current Concepts in Sports Medicine, Halifax, NS (10 Mainpro-M1 credits)  
 Apr 1 Low Back Pain Workshop, Halifax, NS (4 hours)  
 Mar 29 Depression, Halifax, NS (1 hour)  
 Feb 9-11 Maritime Medicine Conference, Halifax, Nova Scotia (3 days)

**2010**

Nov 15-Dec 3 CF Submarine Medicine course, Halifax (39.75 Mainpro-M1 credits)  
 Oct 24-29 UHMS Diving Medicine and HBO course, Curacao (24 AMA PRA Cat 1 credits)  
 Oct 21 Compression Socks, Halifax (1 hour)  
 Sep 30 Fleet Physician Assistant conference, Halifax (7 hours)  
 Jun 10 Diabetes 2010: Insulin Analogues and SMBG, Halifax (1 hour)  
 Apr 29 2009 Lipid Guidelines update, Halifax (1 hour)  
 Apr 15-23 Advanced Diving Medicine Course, Toronto, Ontario

**2009**

Nov 8-13 DAN Diving Medicine course, Dominica (24 AMA PRA Cat 1 credits)  
 Oct 28-31 Family Medicine Forum, Calgary, Alberta (19 Mainpro-M1 credits)  
 Jun 24-27 UHMS Conference, Las Vegas  
 Jun 5-7 Envisioning EMS Tomorrow, St. John's, Newfoundland  
 Jun 2 Airways With Unstable C-Spine, QEII-Infirmery, Halifax, Nova Scotia  
 Jun 1-2 Contracting Certification Course,  
 Apr 28-May 4 Advanced Diving Medicine Course, Toronto, Ontario  
 Mar 23-4 Advanced Cardiac Life Support, Halifax, Nova Scotia  
 Jan 28-9 CF Assisting Officer Course, St. John's, Newfoundland