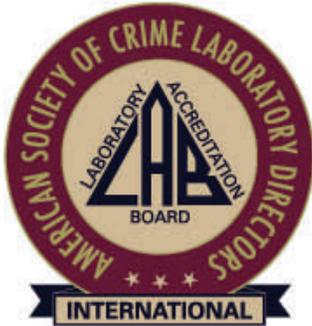


# Annual Report 2010

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ASCLD/LAB-International  
accredited since  
December 10, 2009

## Message from the Laboratory Director, Frank C. Dolejsi

Strides were made to improve efficiency in the DNA processing in 2010 based on robotics and new processing and tracking software secured through federal grants. The case backlog in nuclear DNA has been cut in half with corresponding improvements in processing times.

The controlled substance group participated in a “process mapping” exercise that has resulted in a majority of cases now being completed in 30 days or less.

The Intoxilyzer “source code” court issues resulted in the consolidation of thousands of implied consent and criminal DWI cases that were heard before Judge Jerome Abrams of the First Judicial District in December. The attorneys filed briefs on January 31, 2011 and the judge has up to three months to rule.

We are in the process of rolling out new breath testing equipment for use in Minnesota in 2011. The Datamaster DMT-G has been selected as the new breath testing instrument for use in Minnesota. Training and deployment will begin in the south and continue northward (by State Patrol District), with an anticipation that it will take approximately one year for

completion. Transition training will last approximately six hours with no charge to law enforcement agencies. Each agency will be notified by the BCA when and where operator training will occur. Every operator's Intoxilyzer certification has been extended until they receive training on the DMT.

The project is supported by a \$3.9 million grant from the National Highway Safety Traffic Administration (NHTSA). Working closely with the Minnesota Department of Public Safety (DPS) Office of Traffic Safety and the Bureau of Criminal Apprehension (BCA) Minnesota Justice Information Services (MNJIS), the new units will be integrated into the new DWI e-charging initiative under future phases of the grant. Phase one is the initial deployment of the units.

The DPS has embarked on a complete revamp of its website. Watch for improvements that should be in place for the BCA Forensic Science Service in the spring of 2011.

If you have questions or concerns regarding either our Saint Paul or Bemidji Laboratories feel free to call me at 651-793-1008 or email to [frank.dolejsi@state.mn.us](mailto:frank.dolejsi@state.mn.us)



Example of calcified tissue—molar

## Mitochondrial DNA

The Minnesota BCA continues to function as a FBI Regional Mitochondrial DNA Laboratory. The BCA began offering mitochondrial DNA (mtDNA) testing in 2005 after spending approximately a year and a half preparing the laboratory space, training and conducting validation studies. The BCA is one of a handful of laboratories in the United States to offer this highly sensitive and potentially powerful DNA typing tool. Currently, the BCA is supported to offer mtDNA testing for law enforcement agencies all over the United States; however, under the cooperative agreement with the FBI, 25 percent of our caseload can be dedicated to

the state of Minnesota. Over the last five years, the BCA has conducted mtDNA testing for cases from 34 states. Cases that typically end up in the mtDNA section include recent and cold cases involving homicides, kidnappings and sexual assaults. Additionally, mtDNA testing is an integral part of human remains identification and cases involving the missing. Mitochondrial DNA testing at the BCA is most commonly needed for cases involving human hair, bones, teeth, and other biological samples that may be compromised or degraded.

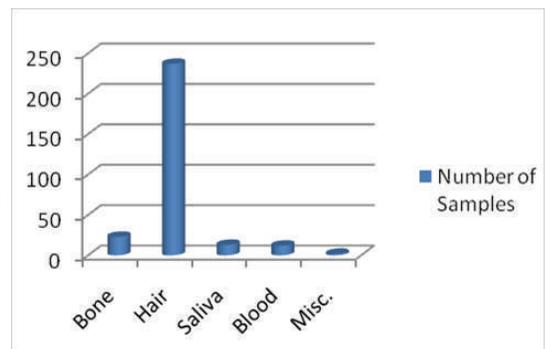
### mtDNA Statistics—2010

In 2010, 106 cases were submitted for mtDNA testing. Twenty cases were submitted by Minnesota law enforcement agencies and 86 cases were submitted from out of state agencies.

In addition to mtDNA laboratory analysis, data interpretation and reporting, the scientists in the mtDNA section are responsible for providing courtroom testimony when needed. During 2010, mtDNA Examiners provided testimony in New York, Michigan, Alabama, Kansas and Massachusetts.

Mitochondrial DNA profiles generated for unidentified human remains cases and those involving the missing are entered into the Combined DNA Index System (CODIS). People who are missing a family member can submit samples for mtDNA testing. A

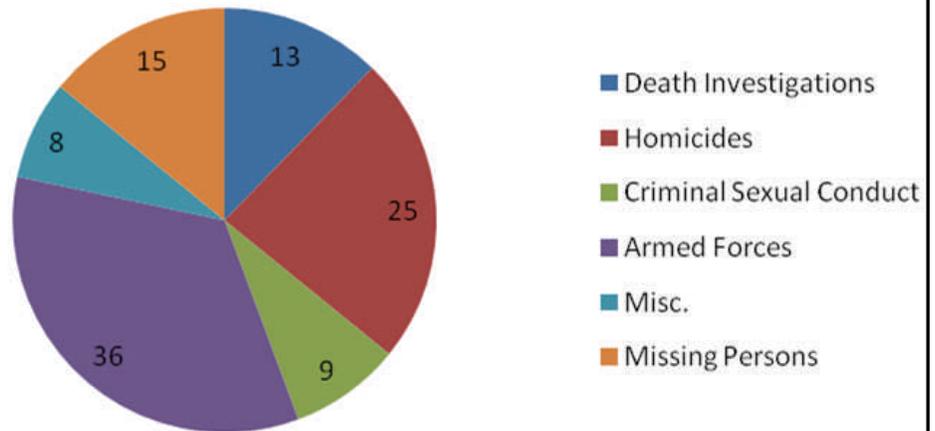
newly implemented module of CODIS is dedicated to comparing samples like this to DNA profiles obtained from unidentified human remains. The mtDNA section uploaded a total of 14 profiles to CODIS in 2010. The section works closely with the newly formed Missing Persons Section in a concerted effort to provide missing persons cases with the attention they deserve.



Sample Types Submitted to the mtDNA Section in 2010

*mtDNA profiles generated for unidentified human remains cases and those involving the missing are entered into the Combined DNA Index System (CODIS).*

**Breakdown by Case Type from the mtDNA Section in 2010**



## mtDNA Section Research and Validation

*The mtDNA section received a new PLEX-ID System which combines PCR with high precision electrospray ionization mass spectrometry.*

The mtDNA section continues to participate in ongoing research in the field of forensic mtDNA analysis.

- Following several months of validation experiments, a new procedure was implemented for the extraction of DNA from calcified tissues (bones and teeth). The new procedure allows for greater DNA yields using less material with less processing time. The improved sensitivity of this procedure has resulted in mtDNA profiles from samples that

had proven troublesome in the past. Since the implementation of this new protocol, we have been able to obtain mtDNA profiles from 80 percent of the bones that have failed to give results during previous attempts, allowing for the upload of these samples into CODIS.

- The mtDNA section received a new PLEX-ID System which combines Polymerase Chain Reaction (PCR) with high precision electrospray ionization

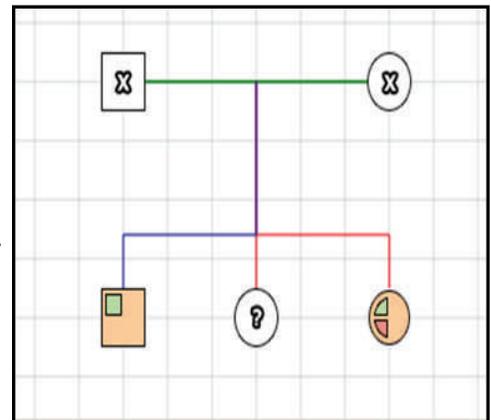
mass spectrometry. A mass spectrometer interprets mtDNA profiles in a completely different way than what is currently being used in the field of forensics. The expected benefits of the system include increased throughput, mtDNA mixture resolution and flexible processing using other DNA technologies. Systems similar to the PLEX-ID System are currently used by the Department of Defense and the Center for Disease Control.

## Missing Persons DNA

In 2009, the BCA entered into a cooperative agreement with the FBI to provide nuclear DNA testing for cases involving missing persons and unidentified human remains from all over the United States. The BCA was the only laboratory in the country to secure this funding. The newly formed Missing Persons Section spent the first half of 2010 validating protocols and establishing case processing policies. By August 2010, the section was fully staffed and operational. The section received over 200 cases from 35 states, including Minnesota. One hundred sixty-six of those cases involved unidentified human remains. Due to the nature of the evidence being submitted to the section, there is an ongoing effort to continue with research and development of new tools for processing these difficult samples. The Missing Persons Section currently employs two highly sensitive autosomal short tandem repeat (STR) DNA testing systems as well as a Y-STR one (short tandem repeat on the Y chromosome). The BCA Missing Persons Section is one of a few laboratories in the United States with the capability to provide such a comprehensive testing approach for missing persons cases.

*The BCA Missing Persons Section is one of a few laboratories in the United States with the capability to provide such a comprehensive testing approach for missing persons cases.*

DNA profiles generated from unidentified human remains cases and those involving the missing are entered into the Combined DNA Index System (CODIS). People who are missing a family member can submit samples for DNA testing. A newly implemented module of CODIS is dedicated to comparing samples like this to DNA profiles obtained from unidentified human remains. This new module allows for the creation of pedigrees that facilitate searching all available samples submitted by a family against profiles obtained from unidentified human remains. Non-DNA information, known as metadata, can also be used during pedigree searches. Useful information such as date of last contact, missing person gender, scars and tattoos can be assigned to the pedigree.



The Missing Persons section uploaded a total of 77 profiles to CODIS in 2010. This section works closely with the Mitochondrial DNA Section in a concerted effort to provide missing persons cases with the attention they deserve.

The following pedigree example has one missing person (marked as '?') where two biological siblings have been typed and uploaded. The parents (marked as 'x') have not been typed.

## Nuclear DNA

2010 was another productive year for the Nuclear DNA Section. 3,840 reports were issued on 2,857 cases. This represents an 18 percent increase from 2009. Case turn-around continues to improve as we have implemented the use of robotics to perform some laboratory functions.



Tecan EVO Robot

The section continues to work on cold case homicides; using powerful DNA technologies to reexamine evidence from unsolved cases with the hope that today's procedures can pull information from yesterday's evidence.

We are also using a new genetic analyzer, which has increased our capacity and sped up the processing of case samples.

The cooperative agreement between the BCA and the Minneapolis Police Department (MPD), originally signed in 2007, funded two scientists to perform serological and DNA tests on MPD cases. In 2009, the agreement was expanded to fund a total of four scientist positions. All four scientists are now completely trained and are actively working MPD cases. In 2010, 813 reports were issued on 561 cases.



ABI 3130 Genetic Analyzer

We continue to use the Tecan EVO robot for known samples (reference samples from case principals). By using the Tecan EVO, we are able to utilize high throughput technology while separating the known samples from the casework (crime scene) samples.

In 2010, we also implemented the use of the Maxwell® 16 for extraction of DNA from casework samples. This automated technique has also helped to expedite the processing of forensic casework.



*Case turnaround continues to improve as we have implemented the use of robotics to perform some laboratory functions.*



## Offender DNA Database

In 2010, the BCA Laboratory was able to assist 734 criminal investigations using information obtained from the Combined DNA Index System (CODIS). This was almost 400 more investigations aided than in 2009!

Throughout the past year, the Offender DNA Database Section has consistently been able to upload convicted offender (CO) DNA profiles to the National DNA Index System (NDIS) within 30 days of the date of receipt. Two additional scientists have been added to the Offender unit and have greatly assisted in the timely processing of CO samples.

We continue to use the Tecan EVO for extraction of DNA from CO and casework known samples. This automated method streamlines the processing of criminal cases as Offender group scientists perform the processing of casework knowns using high throughput procedures; allowing casework scientists to focus on crime scene evidence items.

Offender group scientists are also either trained or in training to perform serological and/or casework DNA analysis.

*The Offender DNA Database Section assisted in almost 400 more investigations in 2010 than in 2009.*

Month Aided	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total-10	%
Homicide	2	4	1	0	1	1	0	1	2	2	2	1	17	2.3
Sex Assault	7	12	17	19	17	25	12	15	24	9	9	26	192	26.2
Assault	0	0	0	1	1	2	2	4	1	2	2	1	16	2.2
Burglary	6	20	36	33	34	22	22	11	18	18	18	28	266	36.3
Robbery	1	8	5	1	3	3	4	0	2	1	1	4	33	4.5
Theft	2	11	13	11	10	16	5	16	14	7	6	14	125	17.0
Auto Theft	2	1	7	1	4	6	3	2	1	0	0	3	30	4.1
Weapons	0	0	2	0	0	2	0	2	0	1	1	1	9	1.2
DWI	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
Vandalism	1	0	2	3	0	2	1	3	2	0	0	3	17	2.3
Other	0	1	2	1	4	1	0	2	2	12	0	3	28	3.8
<b>Total</b>	<b>21</b>	<b>57</b>	<b>85</b>	<b>70</b>	<b>74</b>	<b>81</b>	<b>49</b>	<b>56</b>	<b>66</b>	<b>52</b>	<b>39</b>	<b>84</b>	<b>734</b>	<b>100.0</b>

The table above illustrates the breakdown of the 734 criminal investigations aided by month and case type.

## Drug Chemistry

The primary responsibility of the Drug Chemistry section includes analyzing items of evidence for the presence of controlled substances and to testify in court regarding their findings. The items of evidence submitted were comprised of solids in various forms (crystalline material, powders, plant material, tablets, and capsules) and liquids.

The most significant change that affected the Drug Chemistry Section was the closing of the Minneapolis Department of Health and Family Support Laboratory, which increased the number of cases from 2009 to 2010 by approximately 1,000 cases.

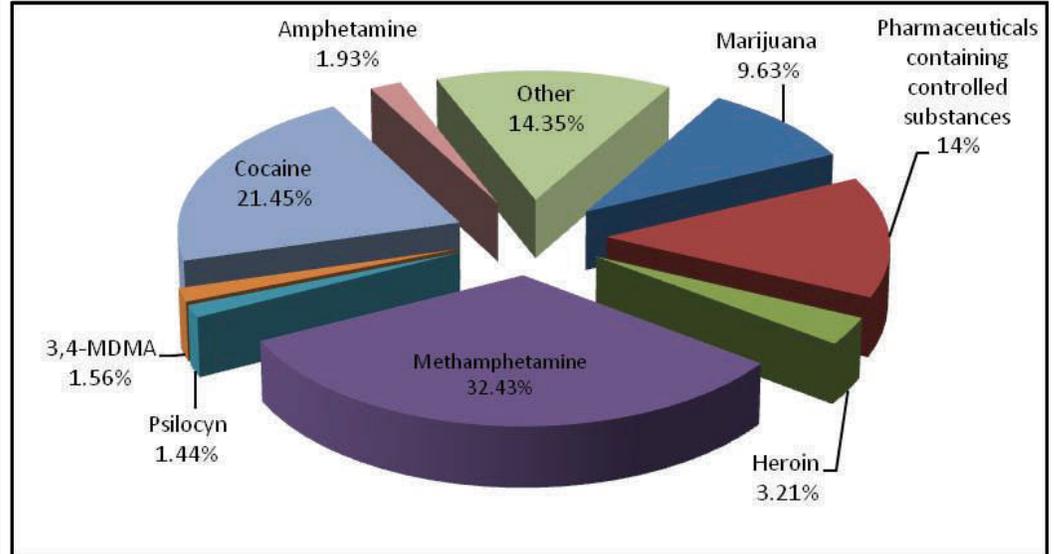
In 2010, The Drug Chemistry section received 3,666 cases and reported out 3,802 cases. Despite the increase in number of cases received, the Drug Chemistry Section still maintained and even decreased their turnaround time by about 10 percent. Utilizing opportunities to streamline the operational processes identified during the process mapping exercise played an important role in the reduced turn around time.

Of the 6,350 items reported, 2,059 items were reported as containing methamphetamine. Cocaine was the second most reported controlled substance with 1,350 items. Approximately 800 items of pharmaceutical products containing controlled substances (such as Vicodin, Xanax, Klonopin, and Valium) were analyzed. Marijuana was reported in 608 items this year. This resulted in approximately a three percent increase from last year's numbers. The number of marijuana items reported appears low due to the section's policy on only analyzing suspected marijuana samples with a court date.

*Utilizing opportunities to streamline the operational processes identified during the process mapping exercise played an important role in the reduced turn around time.*



## Controlled Substances Reported by Drug Chemistry in 2010



### New Trends

In 2010, the Drug Chemistry noted an increased amount of submissions from agencies requesting the analysis of synthetic cannabinoids. Although they are called “synthetic cannabinoids,” they do not necessarily have similar cannabinoid chemical structures. They are marketed as herbal mixtures called “SPICE” or “K2”. 1-Pentyl-3-(1-naphthoyl)indole or JWH-018 (one



Examples of K2/Spice seen in the laboratory

of the many possible compounds found in Spice/K2) has been identified as a substance that has some pharmacological similarities to marijuana. Currently, JWH-018 and other synthetic cannabinoids are being scheduled as controlled substances in Minnesota, following in the footsteps of other states and countries.

Other new substances that have been observed in the Drug Chemistry Section



Clandestine Paul Frank MDPV Tablets

are 3,4-methylenedioxymethcathinone (methylone), 4-methylmethcathinone (mephedrone) and methylenedioxypropylone (MDPV). Methylone and mephedrone have been found in powders, whereas MDPV has been found in powders and Ecstasy mimic tablets. These substances are stimulants and/or hallucinogens depending upon the dosage.

Currently, JWH-018 and other synthetic cannabinoids are being scheduled as controlled substances in Minnesota.

## Trace Evidence

### What is Trace Evidence?

Trace evidence is small, perhaps even microscopic evidence that is primarily examined using a microscope.

Most of the exams the trace evidence section performs are comparative exams. We compare two objects to see if they could have had a common source.

Here are some examples:

- A hair found on a hat left at a scene compared to a known hair sample from a suspect.
- Glass found on a suspect's clothes to glass from the scene.
- Shoeprints left at a scene and shoes from the suspect.
- Tape from a bound victim and a roll of tape from the suspect's car.

*In addition to these cases the FBI Mitochondrial DNA hair examiners completed 33 cases for the regional program.*

### Evidence Examined by BCA Trace Evidence Section in 2010

Type of Evidence	# of Cases
Hair (non-comparison)	68
Hair (comparison)	4
Shoeprints	44
Paint	14
Glass	10
Fibers, Fabric Impressions, Fabric Damage, Rope	22
Metal	3
Physical Match	2
Rubber	1
Red Phosphorous/Iodine	1
Wood	1
Soil*	1
Misc	23
<b>Total</b>	<b>194</b>

\*No longer examined at the BCA.

Trace cases, in general, tend to be quite involved and sometimes quite large, for example in one case a carpet was searched for hairs and roughly 4,000 hairs were recovered for analysis.

### FBI Mitochondrial DNA Program

The Trace Evidence section has two scientists that perform hair comparison exams for the Regional FBI Mitochondrial DNA Program. They receive cases from all over the country to analyze. Visit the FBI lab mitochondrial DNA webpage for more information. <http://www.fbi.gov/about-us/lab/mtdna>

## Shoeprint Examinations

Shoeprint examinations are one of the most often requested exams. Evidence collection in shoeprint cases is often times difficult because the evidence cannot be physically collected. If an impression is found in snow or dirt for instance, we cannot just dig it up and send it to the lab. The impression may be cast, but this can be difficult, especially in snow. In these types of cases we rely heavily on photographs and the photography skills of the investigators and officers at the scene. It is imperative that these photographs are of high quality and are taken properly. An impression may have details that could lead to an identification, but if the photograph has not been taken properly, the examiner may be limited in their conclusion. Every year there are cases in which our results are restricted by the photographs taken at the scene. Check out the new BCA website in the spring of 2011 from some helpful tips on taking impression photographs.

## Evidence Submitted Less Frequently to the Trace Section

### Physical Match

Pieces left at a scene can often times be physically fit back into their source. Microscopes are often times used to examine and record microscopic features that can possibly identify a piece as coming from a particular source. Here are some examples where a physical match examination could be done:

- Tape from a victim's wrists could be matched back to a roll of tape found in the suspect's car.
- Glass from a suspect's clothing could be physically matched back to a window at a scene.
- Matches left at an arson scene could be physically matched back to the book of matches in the suspect's pockets.

### Tape

If the ends of the tape from the scene do not physically match back to the roll, microscopic and chemical analyses can be performed to determine if the two tapes could have come from a common source. This type of exam may be important in kidnapping cases, assault or burglary cases.

- The tape wrapped around the handle of the hockey stick left at the scene is similar to the tape found in the suspect's car.
- The tape around the bags containing the body is consistent with the tape found in the suspect's home.

*An impression may have details that could lead to an identification, but if the photograph has not been taken properly, the examiner may be limited in their conclusion.*

## Plastic Bags

Plastic bags are manufactured in rolls or in boxes with a number of other bags. Sometimes a plastic bag (especially the roll type) can be physically matched back to the roll or the bag previously produced in the manufacturing process. The optical, chemical and physical characteristics of plastic bags can be compared to determine if they came from a common source. This type of exam may be important in homicide and assault cases.

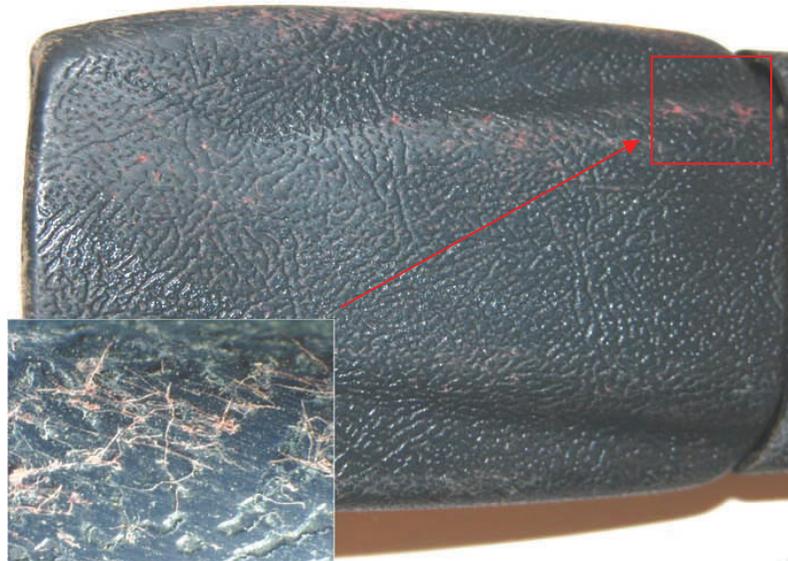
- The plastic bag found in a landfill that contains bloody rags may be similar to the roll of bags found in the suspect's home.
- The plastic bag found wrapped around the head of the victim is similar to the bags found in the suspect's car.

## Fibers

Many things in our environment are made of fabric from which fibers can be transferred. The optical, physical and chemical properties of these fibers can be analyzed and compared. A transfer of fibers can link people to places, objects or other people. This type of evidence may be found in any type of case.

- The fibers found in the trunk of the suspect's vehicle are similar to the fibers of the victim's coat.
- The fibers found on the driver's side seat belt clip are similar to the fibers from the suspected driver's shirt.
- The fibers found on the tape wrapped around the victim, is similar to the fibers of the gloves found in the suspect's pockets.

*Many things in our environment are made of fabric from which fibers can be transferred.*



Fibers infused in seat belt

## Chemical Testing



The Evolution of a Fire Debris Sample

The Chemical Testing (CT) group currently has two areas of interest. First, the people in CT analyze items of evidence for the presence of ignitable liquids. Most of the samples that come into the lab are fire debris samples or samples related to a fire scene. This is the largest number of cases received in Chemical Testing. The other area of concern is in chemical unknowns. This is a highly varied area consisting of samples such as lachrymators (tear gas), acid and/ or base identification, identification of adulteration or contamination of different materials, and chemical reaction devices.

*The analysis of fire debris is important for the fire investigator, because it helps in their determination of origin and cause.*

The analysis of fire debris is important for the fire investigator, because it helps in their determination of origin and cause. Using National Fire Protection Association (NFPA) 921, the investigator follows a scientific method to develop a theory of where the fire started and how it began. If having eliminated all causes, electrical, accidental, gas, etc., and having decided that the fire was intentional, the investigator will then need to look at whether the fire was accelerated using a material that is easily lit and can contribute to the spread of the fire. Common ignitable liquids are used frequently to accelerate fires. Gasoline is still the most prevalent liquid used to start fires. Approximately 28 percent of our cases are found to contain gasoline. CT uses methods developed by *ASTM, International*, which are used worldwide and have a unique classification system. The analysts in Chemical Testing use these methods and classification system to analyze fire debris for ignitable liquid residues. Their reports of their findings go back to the investigator to aid in their investigations and ultimately, may be used in court along with the analysts' expert testimony. Currently 93 percent of the cases that come into CT are related to fire debris. Last year, 537 items of evidence were examined for ignitable liquids.

*We have literature available on suggested practices for the sampling and packaging of ignitable liquid residues and another for chemical unknown samples.*

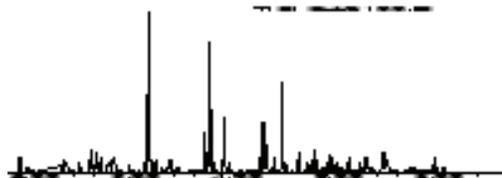
We not only examine charred items for ignitable liquids, we also use our time and talents to further the knowledge and understanding of the forensic aspects of fire investigation. We have spoken for college classes, fire and law enforcement training sessions and to attorneys concerning the different areas that affect the samples received and results reported. We feel that by helping to foster a better understanding of the sampling, packaging and preservation of items of evidence, we can do a better job of analyzing fire debris samples and reflect a more accurate picture of what happened at that scene being investigated. We also bring in students to work on intern projects to further our capabilities to serve our customers with new, improved techniques and instrumentation, expand into new areas of analysis and, most importantly, bring up the next generation of forensic scientists to serve the people of the State of Minnesota.

While seven percent of the cases in CT were chemical unknowns, we have developed contacts to other departments and laboratories that can better serve the customers

when we do not have the instrumentation and capabilities to do the analyses ourselves. The samples we have analyzed in the past year run the gamut from concerns of adulteration — to “MacGyver” devices — to mouthwash — to terrorist threats. This may be a small sampling of our casework, but we feel that it is an extremely important area of pursuit. If there are questions concerning our capabilities of analysis in chemical unknowns, we are always willing to answer questions from law enforcement personnel. We will try our utmost to serve our clientele or direct them to those that can assist them the best.

We have literature available on suggested practices for the sampling and packaging of ignitable liquid residues (fire debris) and another for chemical unknown samples. We feel that communication with our clients is very important and welcome any questions or concerns that you might have concerning sampling, packaging and preservation of your samples, our analyses or our reports. Please feel free to call, email or fax us with your concerns.

## GASOLINE...



this is how we see it...



and this is how you see it.

## Latent Prints

Over 1,000 cases were reported for the Latent Print section during 2010 and they were able to reduce their turnaround time nearly 10 percent. Latent prints were developed on a variety of surfaces including guns, knives, bales of marijuana, adhesives surfaces, threatening letters and even some footprints on a windshield. In one notable case, a minute portion of a palm print was developed on a rifle shell casing and identified to the suspect.



The Automated Fingerprint Identification System (AFIS) continued to aid in identifications. Over 1,500 latent prints were searched resulting in 254 “hits” which were subsequently confirmed as identifications of previously unknown persons. Several latent prints from the AFIS Unsolved Latent File were re-plotted and re-entered. This resulted in 72 hits (and subsequent identifications) from cases ranging from one to five years old.

The section’s technical leader has been representing the latent print discipline on the Scientific Working Group for Friction Ridge Analysis Study and Technology (SWGFAST) and the National Institute for Justice/National Institute of Standards and Technology (NIJ/NIST). These groups develop standards, terminology and procedures to advance the examination of fingerprint evidence and the reporting of results. In addition, the technical leader has been involved in ground-breaking research studying statistical and evaluative tools for examiners to include error rates, accuracy and precision. He is also nearing completion of his doctoral presentation.

*Over 1,000 cases were approved for the section during 2010 and they reduced their turnaround time nearly 10 percent.*



Exterior view of the Saint Paul BCA

## Questioned Documents



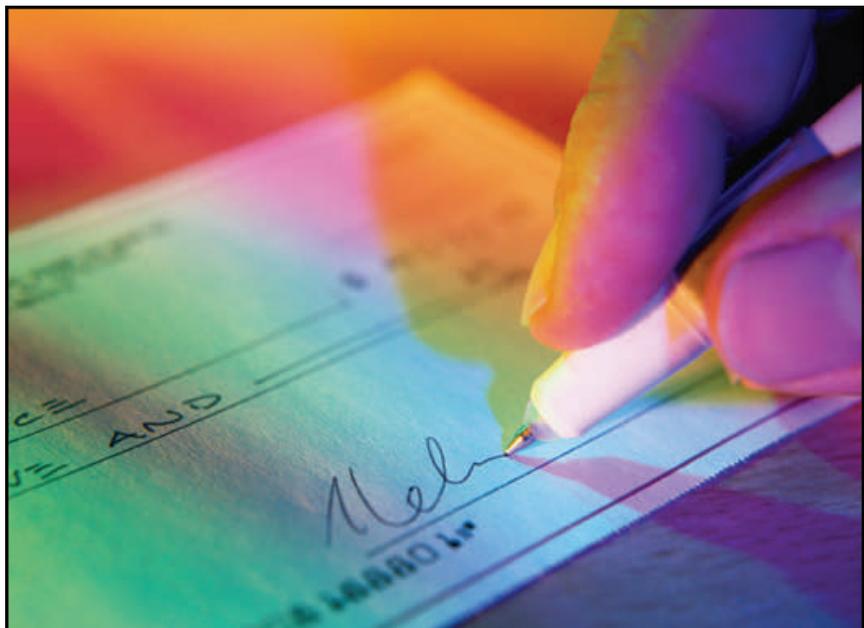
The Questioned Documents section examined 40 cases in 2010. The low number does not account for the painstaking work that goes into examining handwriting and other documents. One case can take several weeks or months depending on the number of items submitted for examination. One such case involved multiple threatening letters which suddenly ceased when the law enforcement agency finally confronted the suspect.

With available technology, differences in inks can be determined. This was observed in a medical prescription where the amount had allegedly been changed from “six” to “sixty”. During initial observation of the document, it appeared the “sixty” was written at the same time in the same color of ink. However, under examination by the Video Spectral Comparator (VSC) it was apparent, due to the use of a different ink, that the “ty” had been added.

During 2010, the section’s technical leader was the program chair for the Midwest Association of Forensic Scientists (MAFS), organizing speakers and workshops for the document examiner attendees.

Of particular note, the section’s technical leader was awarded a grant of \$400,000 by the national Office of Justice Programs to study the development of individual handwriting characteristics. This study will follow the handwriting of a particular school district class from second grade through high school; the class of 2021. This study is in response to recent requests for additional scientific data to support basic premises of individuality in handwriting.

*One case can take several weeks or months depending on the number of items submitted for examination.*



## Firearms and Toolmarks

The Firearms and Toolmarks section reported on 371 cases and was also able to reduce their turnaround time about 10 percent.



The section's firearms technician examines and test fires various firearms and enters the cartridge cases into the National Integrated Ballistics Identification Network (NIBIN). This is a database maintained by the Bureau of Alcohol, Tobacco and Firearms (BATF) which consists of images of fired shell casings entered by various forensic laboratories and law enforcement agencies across the nation. The technician entered 478 shell casings resulting in 39 "hits" which were subsequently identified by an examiner. In the Twin Cities area, NIBIN entry stations are maintained by the Minneapolis Police Department and the Hennepin County Sheriff's Office. Multiple cases are connected through this system indicating the same weapon was used during the commission of various crimes; an excellent tool for law enforcement investigators.

A firearms examiner was involved in a very complicated NIBIN case. She handled 112 shell casings, 14 bullets, four shot shells, 23 cartridges and four firearms. Six different law enforcement agencies were involved. There were only four "hits" in the NIBIN system, but the comparison work and linking to other jurisdictions continues. Very time consuming work which generated 129 pages of exam documentation. A "routine" firearms case would contain about five pages or less. In another case, the examiner was able to connect four separate local robbery scenes by comparing spent shell casings, indicating that one firearm had been used. The expedited effort was proven to be invaluable to investigators.

*Multiple cases are connected through NIBIN indicating the same weapon was used during the commission of various crimes; an excellent tool for law enforcement investigators.*

During 2010, the examiner in training successfully completed a rigorous four month in-residence training program for firearms examiners at the National Firearms Examiner Academy (NFEA) sponsored by the BATF in Maryland. She returned to the Academy four months later to participate in a mock trial to solidify her skills. She continued her training at the BCA and will soon be a qualified firearms examiner.

## Crime Scene



The Saint Paul Laboratory Crime Scene Team (CST) consists of 12 forensic scientists from different sections of the Laboratory. Teams responded to 47 requests for assistance during 2010 which consisted of homicides, other death investigations and eight officer involved shootings. Great strides were made during 2010 to publish the initial field reports of crime scene responses within 30 days; the average turnaround time was 21 days.

Three cases will be highlighted.

The CST assisted the Saint Paul Police Department (SPPD) on an incident. A suburban officer had been shot dead and two suspects had fled the scene. Later in the day, as SPPD was processing that scene, a Saint Paul officer confronted one of the suspects. A struggle ensued and the officer sustained multiple head wounds from a heavy object. He was able to access his firearm and shoot the suspect, ending the struggle. The second suspect was rounded up without incident shortly thereafter. A BCA CST processed the second shooting scene at

the request of SPPD. An excellent job was done by the team in this high profile incident in the midst of intense media scrutiny.

Another scene involved the death of a mother and two of her children, ages 9 and 11. The father, who was suspected in the deaths, fled with a five year old child. He was subsequently caught without incident and without any harm to the child. This scene was very traumatic for the team, as are most scenes where children are involved. They were able to stay on task, however, documenting and collecting forensic evidence. The father subsequently entered a guilty plea and has been sentenced for his crimes.

One last case was initially reported as a "missing persons" but a body was discovered while the CST was en route to the scene. By using a fluorescent chemical to identify traces of blood, the team was able to identify a vehicle that had most likely been used to transport the body; the bed of a pickup truck. The body had been partially burned and decomposed so in order to make a positive identification with fingerprints, the skin had to be removed to capture a quality print for comparison.

This is often difficult work, but necessary in order to provide quality forensic products to our clients, the law enforcement agencies of Minnesota.

*Great strides were made during 2010 to publish the initial field reports of crime scene responses within 30 days; the average turnaround time was 21 days.*

## Toxicology

### Breath Testing, Alcohol and Drug Analysis of Blood and Urine Samples

#### Source Code:

Litigation escalated in 2006 following the Underdahl ruling, which stated that petitioners should be allowed access to the source code for the Intoxilyzer 5000EN used to perform the breath test in their case.

As part of the State's process in acquiring the Intoxilyzer 5000EN, the RFP prepared stated that the State gained ownership of a portion of the source code.

This language was misconstrued to imply that the State owned the source code that operates the instrument and courts began to order it when a sufficient case was made by petitioners/defendants.

In fact, the source code is NOT in the possession of the State and a lawsuit

by the State against CMI was required to begin the process of gaining access. Cases that had source code granted, were now held up until a code review was allowed. A federal court ruled that CMI must provide access to source code and set the conditions under which source code would be provided.

Defense attorneys pooled resources and recruited clients and formed a loosely based group called the "Source Code Coalition". Petitioners/defendants that joined this group could then be represented by the Coalition (for a fee) and have access to the code for their case.

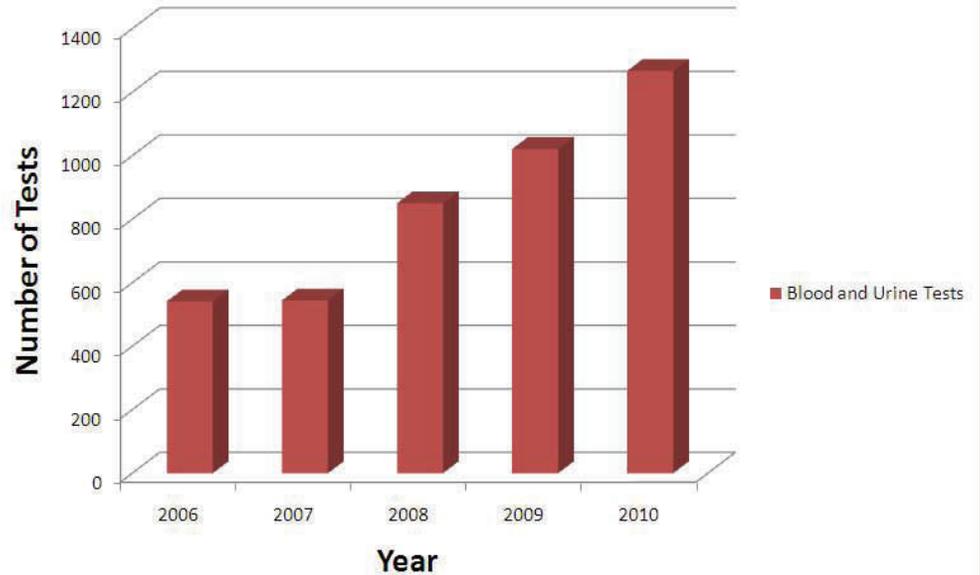
As of August 1, 2010 it is estimated between 3500 and 4000 individuals have joined the Coalition.

*Backlogs continue to rise but efforts are being made to deal with a situation that will be resolved with our new breath test instrument.*

#### Blood and Urine Kits:

Due to the fact that agencies/counties are not using the Intoxilyzer as much, the submission of body fluid testing has risen by 40 percent since 2008. Backlogs continue to rise but efforts are being made to deal with a situation that will be resolved with our new breath test instrument. Plans are also in place to open an alcohol laboratory at the Bemidji facility.

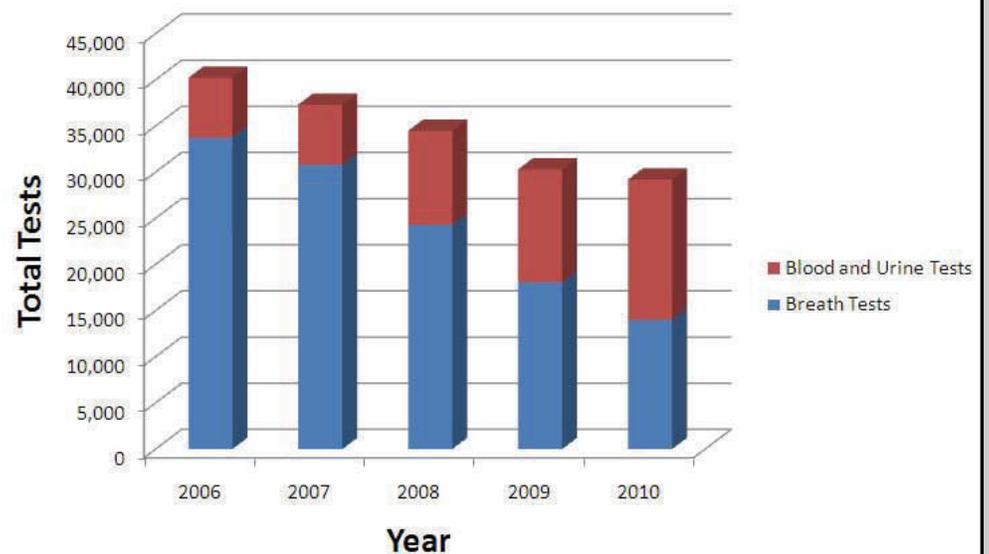
### Monthly Average of Fluid Tests from 2006-2010



In 2006, the Toxicology section was averaging 541 fluid tests (blood and urine) per month. In 2008, the monthly average had risen to 850. This past year, the monthly average was an astonishing 1,267 fluid tests.

*Due to the fact that agencies/counties are not using the Intoxilyzer as much, the submission of body fluid testing has risen by 40 percent since 2008.*

### Five Years of Toxicology Testing



The chart above provides a clear picture of the dramatic impact the Intoxilyzer situation had on the Toxicology section. The trend over the past five years was a steady decline in breath test submissions and an unprecedented rise in blood and urine tests.

**Today:**

After several months of discovery and motion practice, the Source Code hearing commenced on December 8, 2010 and lasted until December 23, 2010. Experts hired by both the State and the Source Code Coalition determined that the Intoxilyzer 5000EN instruments in use in the State provide valid breath alcohol measurements and function as designed. A final ruling on the 3,500+ cases still rests in the hands of Judge Abrams but we are moving forward with the program. Agencies now need to feel comfortable returning to breath testing and prepare for the new generation of instrument.

**Instrument Replacement:**

The BCA Breath Test Enhancement and Integration (BTEI) Project will replace the existing breath test instruments in Minnesota and integrate them through the Criminal Justice Data Network (CJDN) to the BCA and eCharging system. This project will integrate the certified breath, blood and urine test results with the DWI administrative forms already developed by eCharging project at the BCA and will submit them directly to Minnesota Driver Vehicle Services (DVS).

**DataMaster DMT-G with Fuel Cell Option**

*Experts hired by both the State and the Source Code Coalition determined that the Intoxilyzer 5000EN instruments in use in the State provide valid breath alcohol measurements and function as designed.*

**New Features**

- Dual technology allows for AC measurements using IR and fuel cell. Also prevents interfering chemicals from adding to the alcohol result.
- Dry gas allows for tighter control test results.
- Lightweight, portable unit capable of being used on AC power or 12VDC.
- Powerful embedded PC.
- Real-time touch screen graphics display of breath profile and alcohol curve during a subject test.
- Full color printouts of breath profile and alcohol curve on the test ticket.
- Standard white paper (no more pink!).
- Real-time critical instrument data such as internal voltages, temperatures, etc...(locally or remotely).
- Local access to previous tests.
- Operator comments included in downloaded record.
- Breath test results are transferred in near real time for immediate use with eCharging.

**The Solution:**

The BCA Laboratory and Minnesota Justice Information Services, in partnership with the DPS Office of Traffic Safety, will replace all the existing breath test instruments in Minnesota and connect them to the BCA via a secure network. The new breath testing instruments will be integrated with the eCharging system which provides a method for law enforcement to electronically file forms to administratively revoke a person’s driver’s license and criminally charge a person for driving impaired. In addition to the breath analysis results, this project will include integrating blood and urine results from the BCA laboratory with the eCharging system. By integrating the new breath testing instruments and blood and urine results with eCharging, the alcohol concentration level and all information collected by the instrument will automatically be added to the DWI administrative forms that will be transmitted to Minnesota DVS.

**Project Phases:**

**Phase I:** This phase will include the RFP, evaluation and selection of new instruments. Comprehensive testing will be done to insure new instruments Minnesota’s needs. It will also include connection of the new instrument via secure CJDN that will allow information to be sent both ways. Statewide training and certification will also occur.

**Phase II:** This phase will enable law enforcement to send BCA certified Breath Test results via eCharging DWI forms (currently in pilot) directly to DVS.

**Phase III:** This phase will enable law enforcement to send BCA certified Laboratory blood and urine alcohol results via eCharging DWI forms directly to DVS.

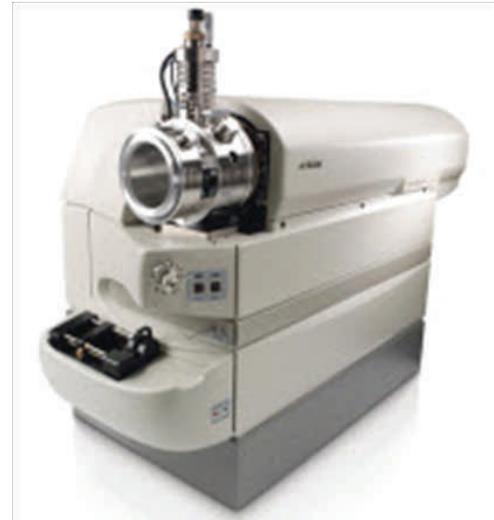
**About BTEI:**

- **280 instruments purchased to replace all aging instruments and to add to the fleet to address the more populated areas.**
- **Near real time monitoring of fleet performance.**
- **Changes to instruments implemented from a central location.**
- **Ability to reproduce entire test record anytime (including officer comments).**
- **Specific instrument usage data distribution without download delays.**
- **Increased security using unique operator identification for instrument access.**
- **Benefits for Public Safety**
  - Enhanced public safety
  - Expanded capabilities
  - Increased productivity
  - Provides mobile testing potential
  - Cost savings
- **Laws already changed to allow for this format.**

*The BCA Breath Test Enhancement and Integration (BTEI) Project will replace the existing breath test instruments in Minnesota.*

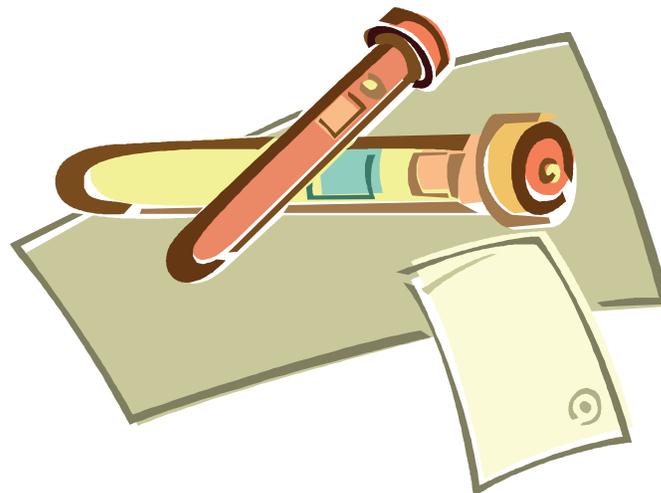
## Advancements in Toxicology Testing:

The BCA was able to purchase two new instruments to enhance our drug testing capabilities (3200 QTrap LC-MS/MS System for screening and a high performance bench top triple-quadrupole Atmospheric Pressure Ionization (API) LC/MS/MS system for confirmations). As we move toward newer technologies and faster techniques we will be able to offer our clients more drug testing capabilities. Our turn around times and backlog have gradually decreased as we made huge strides to keep up with the incoming DWI cases. As agencies return to breath testing our focus in Toxicology will be to get newer assays online to address the most needed and up and coming types of drugs.



3200 Q Trap LC-MS/MS System

*As agencies return to breath testing our focus in Toxicology will be to get newer assays online to address the most needed and up and coming types of drugs.*



# BCA Forensic Science Service Grants

## Federal Grants

### 2009 DNA Backlog Reduction Grant

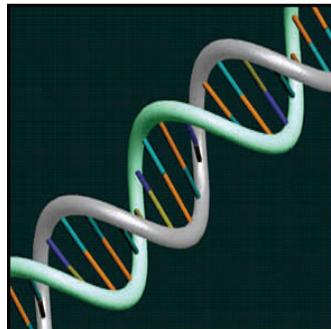
The 2009 DNA Backlog Reduction grant, administered through the National Institute of Justice, made funds available to state and local forensic laboratories with the goal of reducing DNA sample turnaround time, increasing the capacity of laboratories to analyze DNA evidence, and to reduce the overall backlog of DNA cases. The BCA Forensic Science Service was awarded approximately \$569,000 toward those goals.

The BCA laboratories used the majority of the grant, approximately \$350,000, to supplement the purchase of reagents and consumable supplies used to perform DNA analysis in casework. The laboratory sought to increase capacity by using grant funding to upgrade two genetic analyzers, one in Bemidji and one in the Saint Paul laboratory. Each new genetic analyzer has four times the capacity to analyze DNA samples than the instruments they replaced. Both of these instruments were validated and were placed in service in 2010. The BCA also used grant funding to purchase two liquid handling systems, one for each laboratory. The liquid handling systems will allow rapid and repeatable pipetting of liquid samples and reagents during the DNA analysis process. Validation of these instruments is scheduled to be completed in 2011.

*Grant money was used to purchase two genetic analyzers, one in Bemidji and one in Saint Paul. The new analyzers have four times the capacity to analyze DNA samples than the instruments they replaced.*

Grant funding was also used to fund overtime for DNA scientists to work on backlogged DNA cases. The grant also funded a temporary position which supports DNA scientists by preparing reagents, performing scheduled quality control procedures, and assisting in the validation of new techniques and instruments.

As a result of the efforts of the DNA section, the entire DNA case backlog for the BCA Forensic Science Service system was reduced from 788 cases at the beginning of the grant period, to 460 cases at the end of 2010.



## 2010 Paul Coverdell Forensic Science Improvement Grant

The Paul Coverdell Forensic Science Improvement Grants program is also administered through the National Institute of Justice. Forensic laboratories from state and local units of government can apply for project funding that improves the quality and timeliness of forensic science services. The BCA Forensic Science Service was awarded approximately \$186,000 for Federal Fiscal Year 2010.

The BCA utilized the Coverdell grant to increase the capacity of existing personnel by funding overtime for non-DNA scientists to work on backlogged cases and crime scene responses. Coverdell funding was also used to pay annual costs associated with upkeep of ASCLD/LAB accreditation.

The majority of Coverdell funding was used for the purchase of a Digital Image Management System (DIMS). The software, Mideo CASEWORKS, will allow for secure storage and maintenance of digital images used in forensic casework. Since CASEWORKS is compatible with the B.E.A.S.T, the Laboratory Information Management System (LIMS) currently used by the Lab, it will be used as an extension of that program. CASEWORKS has several built-in enhancement and annotation tools and will track any changes made to digital images while assuring that the original image is preserved. The software will be used primarily by the Latent Print, Trace and Crime Scene disciplines.

*The majority of Coverdell funding was used for the purchase of a Digital Image Management System (DIMS).*

*This will allow for secure storage and maintenance of digital images used in forensic casework.*

## State Grants

### Auto Theft Prevention Grant

The 2009 Auto Theft Prevention Grant is a two year grant that offers funding to Minnesota State law enforcement agencies for programs that would reduce the number of auto thefts and support the investigation of auto theft cases. The BCA Forensic Science Service was awarded approximately \$170,000 in July of 2009 to fund a two year program. The BCA's Auto Theft Prevention program takes a two prong approach. The grant funds one temporary latent print processing technician, whose duties are to support the latent print examiners by processing evidence submitted in auto theft and other cases. The presence of the technician allows the examiners more time to perform comparison examinations of latent print evidence that has already been processed.

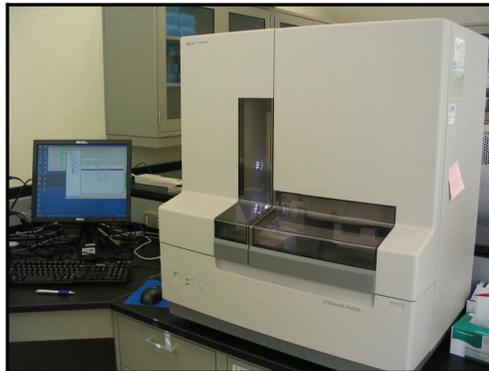
The other part of the program is to provide a one day class to law enforcement officers on the subject of processing a recovered vehicle for physical evidence. The class is taught by a retired BCA Field Agent. The training is weighted heavily toward latent print processing and all officers who attend the training are provided with a specially designed latent print processing kit. In 2010, the BCA offered 21 classes attended by a total of 260 officers from 86 different law enforcement agencies.

## Bemidji Laboratory

Although the Bemidji Laboratory did not have any changes in personnel in 2010, the laboratory made steps to improve the services offered and increase the capacity of the current services.

The Biology section added three new pieces of equipment. A Sperm Hy-liter system that makes use of a fluorescent stain to allow Bemidji scientists to more easily visualize spermatozoa under a microscope was brought on-line in February. In June, the laboratory replaced the single capillary genetic analyzer with the Applied Biosystems 3130 Genetic Analyzer. While the old instrument could analyze one DNA sample at a time, the new instrument is capable of analyzing four samples at a time. Finally, a Promega Maxwell 16 robot was brought on-line in September. This instrument allows for an automated DNA extraction from certain types of evidence samples and is capable of extracting sixteen samples at one time. Both the AB 3130 and Promega Maxwell 16 robot were purchased with a federal DNA Backlog Reduction grant.

*In 2010, the Bemidji Laboratory made steps to improve the services offered and increase the capacity of their current services.*



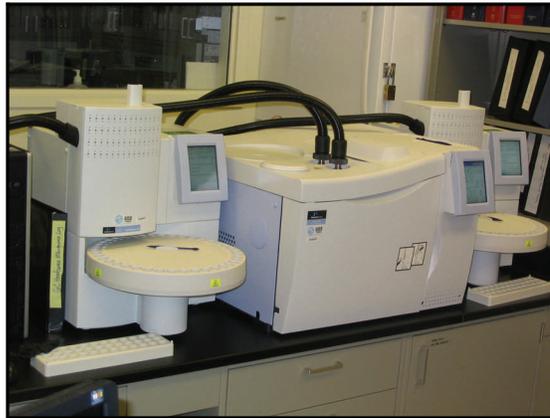
Applied Biosystems 3130



Promega Maxwell 16 Robot

The Bemidji Laboratory also began Trace examinations in the area of hair examinations. A Drug Chemist with previous Trace experience was cross-trained to examine hair to determine if they are of human origin and, if so, are suitable for DNA analysis. The Bemidji laboratory did not have this capability previously and therefore had to send hairs to the Saint Paul laboratory for this type of examination.

Toward the end of 2010, the Bemidji Laboratory began the process of adding Blood and Urine Alcohol testing to its services. To that end, a new Perkin Elmer GC-Headspace instrument was purchased and validation of the instrument began in November. Two Drug Chemists also began cross-training in this discipline. We anticipate that the validation of the instrument and training of the scientists will be completed in March 2011. At that time, the Bemidji Laboratory will start to receive and analyze blood and urine kits for alcohol concentration in DWI cases.



Perkin-Elmer GC Headspace Instrument

*We anticipate that by March 2011, the Bemidji Laboratory will be able to receive and analyze blood and urine kits for alcohol concentrations in DWI cases.*