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- INTELLIGENCE ALERT -

HEROIN IN THE FOAM BACKING OF A WOODEN TRAY TABLE SEIZED IN MIAMI, FLORIDA

The DEA Northeast Laboratory (New York, New York) recently received a multi-part submission consisting of a large, decorated, wooden coffee tray with fold-down legs, plus four pictures mounted on wood (see Photo 1, note the clear, one foot long ruler leaning against the back edge of the tray), suspected as containing heroin. The exhibits were initially seized by the Immigration and Customs Enforcement Service Miami, Florida Office from a Federal Express shipment (origin not reported), and were submitted to the laboratory after an attempted controlled delivery in the New York City area. The pictures did not contain any controlled substances; however, the tray contained a backing of yellow rubberized foam that field-tested

Photo 1

positive for heroin (see Photo 2). Analysis of the foam (total net mass 333.6 grams) by GC-FID, GC/MS, and FT-IR confirmed 86 percent heroin hydrochloride. The laboratory has previously received foam and rubberized mats containing heroin, but never before as part of a tray table.

Photo 2

[Editor's Notes: Previous "heroin foam" exhibits have all derived from South American processors. 86 percent heroin in a foam sample is unusually high, and suggests a possible breakthrough in this technology.]

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- INTELLIGENCE ALERT -

N–METHYLPYRROLIDINONE IN A *GAMMA*-HYDROXYBUTYRATE SOLUTION IN COPLEY, OHIO

The DEA North Central Laboratory (Chicago, Illinois) recently received a clear liquid in a one pint, opaque plastic bottle, labelled: "DIR DRINK ¼ CUP AFTER DINNER", suspected to be a solution of either *gamma*-hydroxybutyric acid (GHB) or sodium *gamma*-hydroxybutyrate (Na^+GHB^-), total net volume 470 milliliters (see Photo 3). The exhibit was acquired in Copley, Ohio by the DEA Cleveland Resident Office (Copley is located just west of Akron). Analysis of the liquid by GC/MS, IR, and 1H-NMR (including COSY), however, indicated an aqueous solution containing a 2:1 mixture of Na^+GHB^- and N–methylpyrrolidinone (NMP, also known as N-methylpyrrolidone), an industrial solvent (not further quantitated). Isolation of NMP for formal identification was achieved by evaporation of the water followed by extraction of the residue with hexane. This was the first ever sample of NMP submitted to this laboratory.

Photo 3

[Editor's Notes: N–methylpyrrolidinone (NMP) is a so-called dipolar aprotic solvent. The Material Safety Data Sheet indicates that NMP is toxic, and that ingestion will cause nausea, vomiting, and irritation of the GI tract. Long-term effects are unknown; however, the unusual solvating properties of this solvent would suggest highly negative consequences for intentional ingestion, especially multiple times. It is unclear whether the production of this mixture was accidental or intentional. A quick review of the major drug abuse websites indicates (as of late January 2004) very little on NMP. However, there is some low-level experimentation occurring with *gamma*-aminobutyric acid (GABA), and comments indicate that the users believe that GABA will form GHB *in vivo*. This suggests that

the producers may believe that NMP will form N–methyl-GABA *in vivo*. It is unknown whether this postulation is accurate, or if accurate whether N-methyl-GABA would have any pharmacological similarity to GHB. Regardless, these reports suggest that suspected GHB or GBL solutions should also be screened for NMP whenever anomalous results are obtained.)

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- INTELLIGENCE ALERT -

"COCAINE GRINDER" IN FAIRBANKS, ALASKA

The DEA Western Laboratory (San Francisco, California) recently received a small, metal "herb grinder" contaminated with a white residue, suspected cocaine (see Photo 4). The exhibit was seized at a residence in Fairbanks, Alaska by agents from the DEA Fairbanks Post of Duty and the Alaskan State Police. The grinder was approximately 2 5/8 inches in diameter and 1 inch tall. When opened, each half was studded with diamond-shaped metal teeth (see Photo 5). When closed and twisted, the teeth shred or grind whatever substance is in the container. An Internet search revealed that similar products are sold as "herb grinders." Analysis of the residue by color testing, IR, and GC/MS confirmed cocaine hydrochloride (not quantitated). This is the first submission of this type to the laboratory.

Photo 4

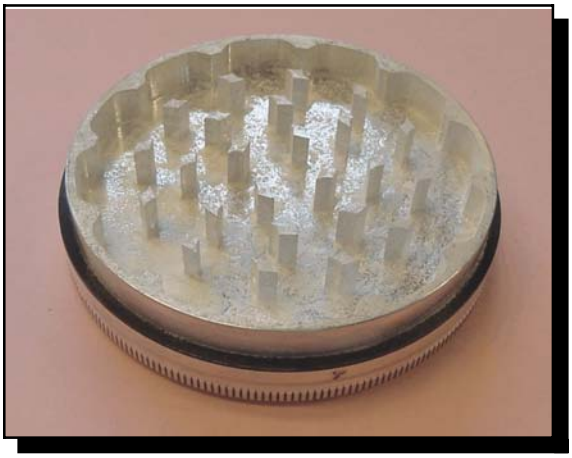

Photo 5

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- INTELLIGENCE ALERT -

CRYSTAL METHAMPHETAMINE CONCEALED IN BATTERIES

[From the NDIC *Narcotics Digest Weekly* 2004;3(4):2
Unclassified, Reprinted with Permission.]

In two separate incidents that occurred in November and December 2003, law enforcement personnel in Idaho and Utah seized crystal methamphetamine concealed in modified 12-volt

automobile batteries. In November 2003 Ada County Metro Narcotics Unit (ID) authorities executed a search warrant that resulted in the seizure of 4 pounds of crystal methamphetamine, a quarter-pound of cocaine, and $20,000 concealed inside a 12-volt automobile battery. When the officers inspected the battery, they located a small pinhole on the side of its case and found that the top was loose, indicating that the battery may have been modified. The officers discovered that they could access a hidden compartment in the battery by sliding the end of a paper clip or similar object into the pinhole on the side of the battery case, triggering a solenoid switch and releasing the top of the battery. Similarly, on December 2, 2003, Utah Highway Patrol troopers in Beaver County seized 3 pounds of crystal methamphetamine concealed in a 12-volt automobile battery during a routine traffic stop. The battery also had a small pinhole in the side of its case and loose terminals.

NDIC Comment: The use of vehicle batteries to conceal drugs and currency is not a new technique; however, in the past most seizures have involved heroin or powder cocaine. In addition, batteries previously seized with false compartments typically were not functional; however, in both seizures noted above the batteries contained a smaller 6-volt motorcycle battery that provided enough power to start the vehicles. State law enforcement officials in Utah suspect that more of these specially modified batteries have been fabricated and that Mexican criminal groups in the Northwest and West are using them to transport crystal methamphetamine and illicit drug proceeds.

[Editor's Notes: A very similar exhibit was reported in the January 2004 issue of *Microgram Bulletin* (including photos). In that case, the battery had been buried inside a tub of joint compound, and contained about 5.5 kilograms of cocaine hydrochloride. That battery also had a smaller battery inside that provided power to the terminals.]

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- INTELLIGENCE BRIEF -

2C-I TABLETS IN THE BALEARIC ISLANDS (SPAIN)

The Laboratory of Drugs in the Balearic Islands (Spain), recently, received twelve separate submissions of white tablets with displaying an "i" logo on one side and single score on the opposite face, diameter and width 6 x 3 millimeters, suspected Ecstasy (photos not available). The tablets (numbering 43 in total, averaging 154 milligrams each) were seized by the Guardia Civil from various visitors and vacationers on Ibiza island. Analysis by color testing (Marquis - green), GC-FID, and GC/MS, however, indicated not MDMA but rather 2,5-dimethoxy-4-iodo-phenethylamine (2C-I; not quantitated). This is the first time that either 2C-I or "i" logo tablets have been encountered at the laboratory.

[Editor's Notes: A short Intelligence Brief on 2C-I tablets from the Europol *Drugs Intelligence Bulletin* was reprinted in the May 2003 issue of *Microgram Bulletin*; this Brief includes photos of "i" logo tablets of 2C-I that appear to be the same as those described above). The following comments (next page) were taken from the January 2004 issue of the *Forensic Drug Abuse Advisor* (unclassified; reprinted with permission):

Another new product, which originated in California, was synthesized by famed chemist Alexander Shulgin. It is called 2C-I (2,5-dimethoxy-4-iodophenethyl-amine, also known as 4-iodo-2,5-dimethoxyphenethylamine, [2,5-dimethoxy-4-iodophenyl]-2-aminoethane and 4-iodo-2,5-dimethoxyphenethylazan). Europol, the drug arm of Interpol, reports that 2C-I first appeared in Denmark in the spring of 2002. Seizures have also been reported in Germany, Sweden and the UK. In addition, according to a report in the DEA's journal, *Microgram*, 2C-I has also been seized in Toronto and Milwaukee.

Other than the fact that Shulgin created it (details can be found in his book "PIHKAL"), not much else is known. The dose is said to be between 15-20 milligrams, the time to onset is at least one-half hour, and it is thought to be very long acting, perhaps even exerting its effects the next day. The delay of the drug's effect may cause some users to take additional doses or other drugs which may increase the risk of toxicity or accidental over dosage. According to the United Nations, at the present time "there are no animal or human data concerning general toxicity, reproductive toxicity, neurotoxicity or the mutagenicity and carcinogenic potential of 2C-I."]

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- INTELLIGENCE BRIEF

FENTANYL LOZENGES IN TAMPA, FLORIDA

The Florida Department of Law Enforcement Tampa Crime Laboratory (Tampa, Florida) recently received a polydrug submission that included eight boxes of ACTIQ brand oral transmucosal fentanyl citrate, 1600 micrograms per lozenge. The exhibits had been seized by the Hillsborough County Sheriff's Department from a residence in Hillsborough County (near Tampa), pursuant to an investigation of a case of prescription drug fraud. Seven of the boxes were unopened and were labelled as containing 30 dosage units each. Analysis of one lozenge from the opened box (see Photo 6) by GC and GC/MS confirmed fentanyl (not quantitated). A second exhibit in the case included three manufacturer's bottles containing a total of 240 tablets marked WATSON 540 (photo not provided). Analysis by GC and GC/MS confirmed hydrocodone (not quantitated). This is the first time fentanyl lozenges have been encountered at the laboratory.

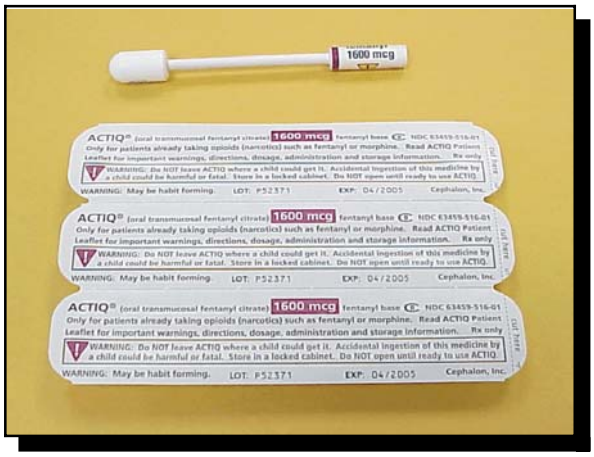

Photo 6

[Editor's Notes: Commercial Watson 540 tablets contain 10 milligrams of hydrocodone bitartrate and 500 milligrams of acetaminophen per tablet.]

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- INTELLIGENCE BRIEF -

LSD LABORATORY IN HARRISONBURG, VIRGINIA

Chemists from the DEA Mid-Atlantic Laboratory (Largo, Maryland) recently participated in the seizure of a boxed polydrug laboratory in Harrisonburg, Virginia, suspected to be for production of methamphetamine, MDMA, and LSD. The storage boxes were seized from an apartment by agents from the DEA Winchester (Virginia) Post of Duty. The exhibits included a variety of chemicals and glassware, including numerous petri dishes and plastic cups containing fungal growth (see Photos 7 and 8). Analysis and evaluation indicated that the clandestine laboratory operator (a biology student at a local University) was attempting to produce lysergic acid from an uncommonly used strain of ergot fungus, *Claviceps Paspali*, and appeared to be in the early stages of determining optimal growth media and conditions. The chemicals, extensive literature, and notes found at the site confirmed that the operator was following the lysergic acid, N,N-carbonyldiimidazole, diethylamine synthesis (production routes for methamphetamine and MDMA not specified). All necessary chemicals needed for the syntheses of all three substances were present; however, no final products were recovered at the site. This was the first LSD laboratory encountered by laboratory personnel.

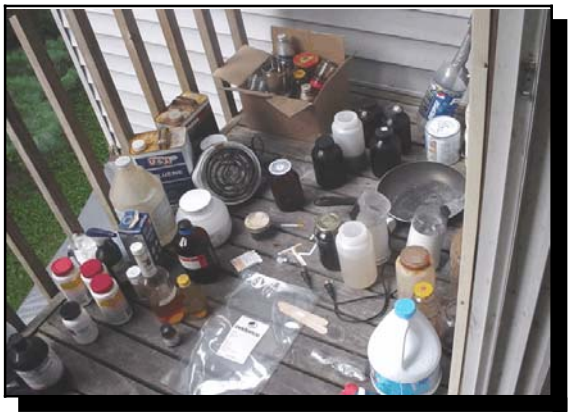

Photo 7

Photo 8

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- INTELLIGENCE BRIEF -

UNUSUAL "ICE" METHAMPHETAMINE LABORATORY SEIZED IN GUAM

The DEA Southwest Laboratory (Vista, California) was recently involved in the seizure of an "Ice" methamphetamine laboratory in Guam. Methamphetamine HCl was being "iced out" via recrystallization from concentrated solutions in acetone and water. Unusually, the products were not all *d*-methamphetamine HCl, but rather *d*-, *l*-, *d,l*-, and non-racemic mixtures of *d*- and *l*-methamphetamine HCl. The finished products included 889 grams of *l*-methamphetamine HCl (97%), 58 grams of *d*-methamphetamine HCl (96%), and three exhibits (5 grams each) of *d,l*-methamphetamine HCl (98%). A nearly colorless liquid found in the refrigerator consisted of 3.2 liters of *l*-methamphetamine HCl, at a concentration of 948 milligrams/milliliter. Two other

light brownish liquids on the stove each contained about 1.8 liters of non-racemic *d*- and *l*-methamphetamine HCl, each at a concentration of over 600 milligrams/milliliter. The ratios of the *l*-isomer to *d*-isomer in these two solutions was 60:40 and 80:20. [The isomeric ratios were determined by GC analysis of the TPC derivatives and direct analysis by CE with a cyclodextrin buffer.] The total weight of pure methamphetamine HCl in the lab was over 6.4 kilograms. Based on the unusual isomeric results, the methamphetamine being "iced up" obviously came from different sources or batches, or were derived from mixed isomer precursors.

[Editor's Comments: "Ice" methamphetamine is legally defined as high purity (> 80 percent) *d*-methamphetamine HCl. The classic form of "Ice" is large, transparent or nearly transparent, colorless crystals. Over the past two years, however, submissions of *l*-, *d,l*-, and non-racemic mixtures of *d*- and *l*-methamphetamine HCl in similarly appearing crystals have dramatically increased. Although these exhibits look like "Ice" (and are often so termed), by definition they are not, and therefore they do not qualify for the higher penalties prescribed for "Ice" in Federal sentencing guidelines. This means that forensic chemists need to be judicious in their use of the term "Ice", and also mandates isomer determination when apparent "Ice" is submitted.]

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- INTELLIGENCE BRIEF -

ANALYSIS OF HEROIN FROM THE AUSTRALIAN SEIZURE OF A NORTH KOREAN CARGO VESSEL

The DEA Special Testing and Research Laboratory (Dulles, Virginia) recently received 100 sample packets of white powder heroin from the DEA Country Office in Canberra, Australia. The samples were provided to the DEA by the Australian Federal Police, and were taken from a large shipment of heroin seized by the Australian authorities from a North Korean cargo vessel off the coast of Australia. That seizure consisted of 50 kilograms found on the vessel and another 75 kilograms that had already been off-loaded, and was of particular interest due to the long-suspected involvement of North Koreans in heroin production.

Standard alkaloid analysis of the exhibits determined that they contained heroin HCl and acetylcodeine HCl in varying ratios, that when combined totaled between 90 - 100 percent. The heroin purities ranged from 60 - 90 percent, while the acetylcodeine purities ranged from 10 - 30 percent. Some exhibits were also found to contain O6-monoacetylmorphine and noscapine; however, when present these compounds were at low levels - less than 1 percent. No adulterants or diluents were found in any of the exhibits.

All 100 exhibits were also subjected to detailed heroin signature analysis for determination of processing origin. All gave a final classification category of "Unknown" - that is, the signatures did not match any of the standard heroin profiles maintained by the Special Testing and Research Laboratory (those being: Southeast Asian (SEA), Southwest Asian (SWA), South American (SA), and Mexican (MEX)). Over 90 percent of all heroin exhibits submitted to the laboratory are classified as one of these four processing origins. The collective results indicate that the seized samples were not processed by any of the classic (known) methodologies.

Selected Intelligence Brief

Selected References (1992 - 2003) for Forensic Analysis of *gamma*-Hydroxybutyric Acid, *gamma*-Hydroxybutyrate, *gamma*-Butyrolactone, and Related Compounds

Analysis of *gamma*-hydroxybutyric acid (GHB) or *gamma*-hydroxybutyrate (GHB^-): Review (1), overview (2,3), comprehensive analyses (4,5,6), by dual mode ion trap mobility spectrometry (7), by free zone CE with direct UV detection of GHB (8), by color testing (9,10), by FTIR and color testing (11), by GC/MS after extraction on a SPME fiber and derivatization with BSTFA (12), by ICP-atomic emission and MS (13), by IR (14), by IR using a 3-bounce diamond ATR element (15,16), by microcrystal testing with cupric nitrate/silver nitrate solution (17), by NMR (18,19), by SPME - HPLC/UV and SPME/HPLC/MS (20), and by SPME - GC/quadrupole ion trap spectrometry (21).

Analysis of *gamma*-hydroxybutyric acid (GHB) and *gamma*-butyrolactone (GBL): Interconversion studies (22,23,24,25,26), by CE and HPLC (27), by GC/MS with BSTFA derivatization (28), by GC/MS and H1-NMR (29), by HPLC (30), by HPLC/UV-Vis and HPLC/Thermospray MS (31), by IR (32), and *gamma*-butyrolactone in wine by GC/MS (33).

Analysis of *gamma*-hydroxybutyric acid (GHB), *gamma*-butyrolactone (GBL), 1,4-butanediol (BD), tetrahydrofuran (THF), and/or GHB/GBL analogs: Comprehensive analysis of BD (34), Overview and comprehensive analyses (35), overview of analysis of GHB, GBL, and BD (36), overview of GHB, GABA, and various analogs (37), by capillary electrochromatography (38), by CE (39), by HPLC using paired ion chromatography (40), detection in liquids by osmolality (41), and of various 2-alkyl-2-keto-*gamma*-butyrolactone derivatives by GC after chiral derivatization (42).

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* Note: The *Journal of the Clandestine Laboratory Investigating Chemists Association* is a law enforcement restricted journal.

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SELECTED REFERENCES

[Note: Selected references are a compilation of recent publications of presumed interest to forensic chemists. Unless otherwise stated, all listed citations are published in English. If available, the email address for the primary author is provided as the contact information. Listed mailing address information (which is sometimes cryptic or incomplete) exactly duplicates that provided by the abstracting services.]

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3. Kim HK, Choi YH, Chang WT, Verpoorte R. **Quantitative analysis of ephedrine analogues from ephedra species using H1-NMR.** Chemical and Pharmaceutical Bulletin 2003;51(12):1382. [Editor's Notes: Presents the title study. Contact: R Verpoorte, Leiden Univ, Inst Biol, Div Pharmacognosy, POB 9502, NL-2300 RA Leiden, Netherlands.]

4. Cottingham K. **ICPMS: It's elemental.** Analytical Chemistry 2004;76(1):35A. [Editor's Notes: Presents an overview of the title topic. Contact: No contact information was provided.]

5. Nakashima K. **Determination of stimulants by HPLC.** Japanese Journal of Forensic Toxicology 2003;21(3):197. [Editor's Notes: A review of the use of HPLC and common detection systems. This article is written in Japanese. Contact: Division of Analytical Research for Pharmacoinformatics, Department of Clinical Pharmacy, Course of Pharmaceutical Sciences, Graduate School of Biomedical Sciences, Nagasaki University, Nagasaki 852-8521, Japan.]

6. Tanaka E, Terada M, Shinozuka T, Honda K. **gamma-Hydroxybutyric acid (GHB); its pharmacology and toxicology.** Japanese Journal of Forensic Toxicology 2003;21(3):210. [Editor's Notes: An overview and brief review. This article is written in Japanese. Contact: Department of Legal Medicine, Institute of Community Medicine, University of Tsukuba, Ibaraki 305-8575, Japan.]

7. Litman MA. **Rapid-acting drug analysis system.** U.S. Pat. Appl. Publ. US 2003 224,474 (Cl. 435-28; C12Q1/28), 4 Dec US Appl. PV 383,840, 30 May 2002. [Editor's Notes: Abstract unclear - Appears to be another methodology for detecting date-rape type drugs in liquids. Contact: USA (no further addressing information was provided).]

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NEW EMAIL ADDRESSES NEEDED

The email addresses for the following organizations have returned rejection notices to the Microgram Editor for the past three issues of *Microgram Bulletin*, and will therefore be dropped from the subscription list unless a corrected email address is provided by the end of March 2004. Note that the errors include anti-spamming comments, mailbox full messages, and user not found or user unknown messages. The Editor requests your assistance in contacting these organizations, determining if they wish to remain on the *Microgram* subscription e-net, and if so asking them to provide a valid email address to the microgram_editor@mailsnare.net address.

Maine State Police Crime Laboratory - Augusta, Maine

National Institute of Toxicology - Sevilla, Spain

Oakland County Sheriff's Department, Pontiac, Michigan

Orange County Sheriff Coroner's Office - Santa Ana, California

South Bank University London - United Kingdom

The following organizations (listed last month) were dropped on 2/29/04:

Israeli Police - Office of the Chief Superintendent - Israel

U.S. Food and Drug Administration - Northeast Regional Laboratory (Jamaica, New York)

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THE DEA FY - 2004 STATE AND LOCAL FORENSIC CHEMISTS SEMINAR SCHEDULE

The remaining FY - 2004 schedule for the DEA's State and Local Forensic Chemists Seminar is as follows (see next page):

April 19 - 23, 2004
June 14 - 18, 2004
September 20 - 24, 2004

Note that the school is open only to forensic chemists working for law enforcement agencies, and is intended for chemists who have completed their agency's internal training program and have also been working on the bench for at least one year. There is no tuition charge for this course. The course is held at the AmeriSuites Hotel in Sterling, Virginia (near the Washington/Dulles International Airport). A copy of the application form is appended onto the October 2003 issue of *Microgram Bulletin*, and should be mailed to the Special Testing and Research Laboratory (Attention: Pam Smith or Jennifer Kerlavage) at: 22624 Dulles Summit Court, Dulles, VA 20166. For additional information, call 703 668-3337.

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EMPLOYMENT OPPORTUNITIES

1. Broward County Sheriff's Office (BSO) (Second Posting)
Position: Crime Laboratory Manager
Location: Ft. Lauderdale, Florida
Salary Range: To Be Determined.
Application Deadline: Open Until Filled

Duties: This position directs, administers and manages all forensic services functions for the BSO (a 6,100 member department located in Ft. Lauderdale). Critical functions under charge include the Crime Laboratory, Automated Fingerprint Identification System (AFIS), and Latent Identification. Employees in this classification maintain responsibility for the direction, and management of personnel engaged in latent and ten-print identification, audio/video enhancements, quality control/quality assurance, DNA analysis, firearms and tool mark identification, forensic chemistry, questioned documents examination, and trace evidence analysis.

Qualifications: A Master's degree in chemistry, biology, or another physical science is required; a Ph.D. is preferred. The position also requires ten years experience that includes advanced forensic chemistry, biology or criminalistics preferably in a large national, state or regional laboratory. Thorough knowledge of DNA processing and American Society of Crime Laboratory Directors (ASCLD) certification required; certification by the American Board of Criminalistics (ABC) preferred. Experience in a managerial capacity with responsibility for administrative aspects of the work strongly desired.

Application Procedures: You may view a detailed job description, download an application or apply on-line at: www.sheriff.org. A completed application and accompanying resume will also be accepted by mail: Broward Sheriff's Office, Human Resources Bureau, 2601 W. Broward Blvd., Fort Lauderdale, FL 33312. EOE M/F/D/V DFWP

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2. Virginia Department of Criminal Justice Services (First Posting)
Position: Forensic Scientist II
Location: Roanoke, VA
Salary Range: $39,901 - $65,540
Application Deadline: Open Until Filled

Duties: Incumbent will: 1) Use current state-of-the-art methodologies and instrumentation to analyze controlled substances; 2) Prepare Certificates of Analyses on findings for use by the criminal justice system; and 3) Testify in court as a qualified expert for the Commonwealth at criminal proceedings as to the results of laboratory findings. Position requires occasional overnight travel. Employee will provide own transportation as required.

Qualifications: Knowledge, skills and abilities: Knowledge of basic theoretical principles and applications of the instrumentation and methodologies used to analyze controlled substances required. Knowledge of laboratory safety procedures; quality assurance/quality control and laboratory practices; instrumental analysis (GC, GC/MS, FTIR, UV) and experience in forensic drug analysis required. Successful completion of a documented training program and/or demonstration of competency is required. Experience presenting testimony in a court of law, as an expert witness is preferred. Must be able to analyze data,

develop sound conclusions, maintain accurate records, and analyze, and solve technical problems. Ability to communicate effectively orally and in writing required. A baccalaureate degree in chemistry or other related science with sufficient chemistry courses is required; graduate degree is preferred. Valid driver's license and/or other means of reliable transportation required.

Application Procedures: Applicants must submit a state application (#10-012). Applications may be mailed to the Department of Criminal Justice Services, 805 East Broad Street, 10th Floor, Richmond, VA 23219, ATTN: Human Resource Office; emailed to: gcolburn@dcjs.state.va.us or faxed to 804-786-6484. State application forms may be obtained by calling (804) 786-4246 or by downloading the form from the employment section of the DCJS web page at www.dcjs.org For assistance, call Gene Colburn at (804) 786-6925. AN EQUAL OPPORTUNITY EMPLOYER

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3. DEA Special Testing and Research Laboratory (First Posting)
Position: Mass Spectrometrist
Location: Dulles, VA
Salary Range: $85,210 - $110,775 [Note that this salary range will increase by approximately two percent if the pending (additional) Federal pay raise is enacted.]
Application Deadline: Open Until Filled

Duties: See: jobsearch.usajobs.opm.gov (Vacancy #03-34-HPRF-01S)

Qualifications: Comprehensive knowledge, skills, and abilities in the theory and practice of high-res, tandem, LC/MS, and IRMS is required. Knowledge of organic synthesis and structural elucidation preferred. A Ph.D. in chemistry or related field is preferred. See the vacancy announcement for additional details.

Application Procedures: See the vacancy announcement and/or call 703/668-3300 if you have questions or need clarifications.

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SCIENTIFIC MEETINGS

1. Title: MAAFS 2004 Annual Meeting (First Posting)
Sponsoring Organization: Mid-Atlantic Association of Forensic Scientists
Inclusive Dates: April 20 - 24, 2004
Location: Wilmington, DE
Contact Information: Dan Katz, 302/577-3420 [Also see website]
Website: [www.maafs.org/annualmeeting.htm]

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2. Title: SWAFS Fall Conference (First Bimonthly Posting)
Sponsoring Organization: Southwestern Association of Forensic Scientists
Inclusive Dates: October 11 - 15, 2004
Location: Oklahoma City, OK
Contact Information: Brandy Reese, 405/425-3857, brandyr@osbi.state.ok.us
Website: [www.swafs.us]

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3. Title: Joint Meeting of the Southern Association of Forensic Scientists, the Midwestern Association of Forensic Scientists, the Mid-Atlantic Association of Forensic Scientists, and the Canadian Society of Forensic Science (First Bimonthly Posting)
Sponsoring Organization: Southern Association of Forensic Scientists
Inclusive Dates: September 19 - 24, 2004
Location: Lake Buena Vista, FL
Contact Information: David Baer, 407/650-5152, davidb7818@aol.com; Mike Healy 941/747-3011, Ext. 2280, mike.healy@co.manatee.fl.us
Website: [www.southernforensic.org]

Computer Corner #180

Data Farms

by Michael J. Phelan
DEA Digital Evidence Laboratory

The continuous evolution of digital technologies and their increasing acceptance by individuals and businesses places an enormous burden on law enforcement to maintain the capability to collect and analyze digital evidence. One major trend in particular that is pushing the current limits of law enforcement technology is the rapid growth of data farms (data warehouses). Data farms have arisen as a result of individuals and businesses needing or desiring to outsource their information storage needs to specialized companies.

Individual Applications

Individuals can have data storage accounts either through their Internet service providers or through many major computer/software companies such as Apple Computer or Microsoft Corporation. A major advantage of storing data at data farms is that the information is retrievable at any time from any location in the world, so long the individual has Internet access.

Business Applications

Data farms are similarly popular in the business world because they provide specialized Internet connectivity for e-commerce, and also provide very large on-line data storage and service. Data farms can contain multiple "front-end" servers that act as a portal to a company's web site and serve as the first step in an e-commerce transaction. Front-end servers can support multiple Internet addresses. "Back-end" servers contain the e-commerce transactional databases and other critical information that need to be forwarded to other integral business entities such as the credit card companies that handle the financial transactions or the warehouses that actually ship the orders.

Data farms can be internal to a company, but as implied above they are more commonly provided by a disinterested provider for a fee. Commercial data farms can have hundreds or even thousands of customers, and a single account can easily store "terabytes" (1,000 billions or 1 x 1012 bytes) of information for a customer. Of concern to law enforcement, they are often located in a different state from the subject or business under investigation. Of even greater concern, many data farm companies are expected to move "off-shore" in the near future in an effort to reduce operating costs and provide greatly increased customer privacy and anonymity.

Legal Jurisdiction

The challenges for law enforcement personnel involved in the investigation of an individual or business that has information stored at a data farm are significant. First, the physical location of the data farm and the business must be determined, so that an appropriate search warrant can be issued within the proper judicial district. In the case of off-shore data farms, obtaining warrants will be problematic and in some cases impossible.

Volume of Data

Second, the collection of the needed investigative data needs to be carefully delineated in order to avoid a massive data overload for both the forensic examiner(s) and the case agent. It is very helpful to know in advance what is required. For example, the scope of the investigation may require only e-mail, financial information, or e-commerce transactions. Such "targeted" searches reduce the data recovery problem to a reasonable volume.

Digital evidence laboratories must have standard operating procedures that can handle an on-site backup at a data farm. Such backups are nothing like the copying of a hard drive from a home computer. Complete sector-by-sector copies of hard drives are often highly desirable in small computer cases. However, collecting (for example) just the e-mail for a large multi-national organization

from a data farm (potentially a huge amount of information) requires a different approach.

Technology Considerations

Third, the technologies used to collect on-site at a data farm require storage media with very large capacities, and also often require the examiner to use more sophisticated hardware and forensic collection procedures. For example, most data farm data collections involve interfacing with higher performance SCSI (Small Computer System Interface) hard drives. These SCSI drives can in turn be associated with highly sophisticated data redundancy storage protocols such as RAID (Redundant Array of Inexpensive Disks). RAID technology is a common multilevel hard drive redundant storage strategy that is found on many business network servers. Basic RAID technology can consist of hard drive mirroring. Other, even more advanced RAID concepts can consist of a technique called data striping, where information is spread over several hard drives; this makes recovery of any one failed hard drive a matter of evaluating the data on the other hard drives and determining if the missing data bit should be a one or a zero to satisfy a data check bit, commonly referred to as a parity bit.

Another redundancy technology utilized at some data farms is PERC (Power Edge RAID Controller). PERC utilizes unique chip sets installed on the motherboard or SCSI controllers of the computer/server. PERC chips or equivalent technologies can complicate data export to non-PERC environments.

Obviously, an examiner who is trying to collect copies or "image files" on-site at a data farm needs to know what type data storage technologies are being used, in order to know how to acquire the evidence.

Investigative Understanding

Fourth, computer forensic examiners must have a solid understanding of both networking and data warehousing technologies. Examiner personnel must also be able to determine the scope of the information network both forward in the information flow and retroactively. For example, DEA regularly encounters rogue Internet-based pharmacy operations. In many such cases, the data farm is located in a remote jurisdiction and is being operated by an unwitting data warehouse operator. The data farm may contain important e-commerce information and also log files of the communications with the actual (physical) pharmacy that fills and mails the prescription. Looking retroactively at the business, the data farm will have communication logs showing that a doctor with practically no patient interaction is approving customer requests. The doctor and the business can be located anywhere on the Internet, and can also be separate from each other. The web page design firm and the credit card/debit card billing can also be controlled from afar. Investigations of this type or of other types of Internet based fraud are some of the most complex encountered in digital evidence forensics. Knowledge of what information is needed can assist the digital forensic collection team develop a proper scope of effort. This ensures that the investigation is not overwhelmed by voluminous data of marginal interest or value, that could easily take months to process.

New Sub-Specialization

Digital evidence forensics is rapidly developing a series of sub-specializations as a result of the diversification of technology. Computer forensics, network forensics, volatile memory forensics, and data farm forensics are currently in high demand by law enforcement. However, these sub-disciplines require specialized knowledge, training, and equipment. The evolution of digital evidence forensics will span a new generation of technical training, improved hardware, and forensic software to address the unique data collection and data mining requirements associated with data farms. Similarly, a parallel evolution within the legal communities will need to occur, in order to standardize data recovery requests for law enforcement - which in turn will minimize disruption and cost for data farm businesses, and simplify the technical burden on digital evidence forensic data recovery specialists.

Questions or comments?
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