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DNA Testing Brings Them Home

*The Armed Forces DNA
Identification Laboratory
helps solve the riddle
of the missing*

VICTIMS OF TERROR

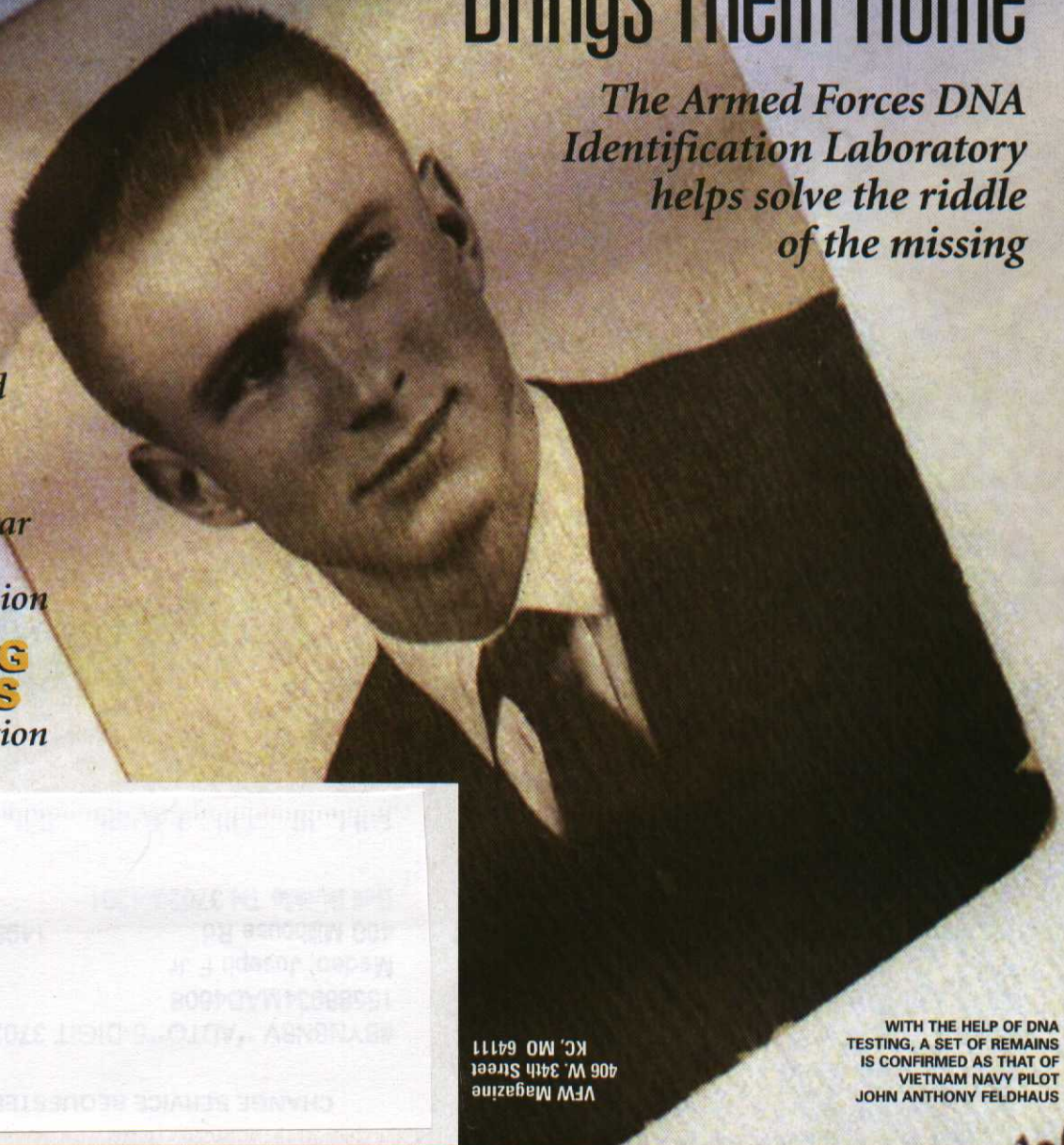
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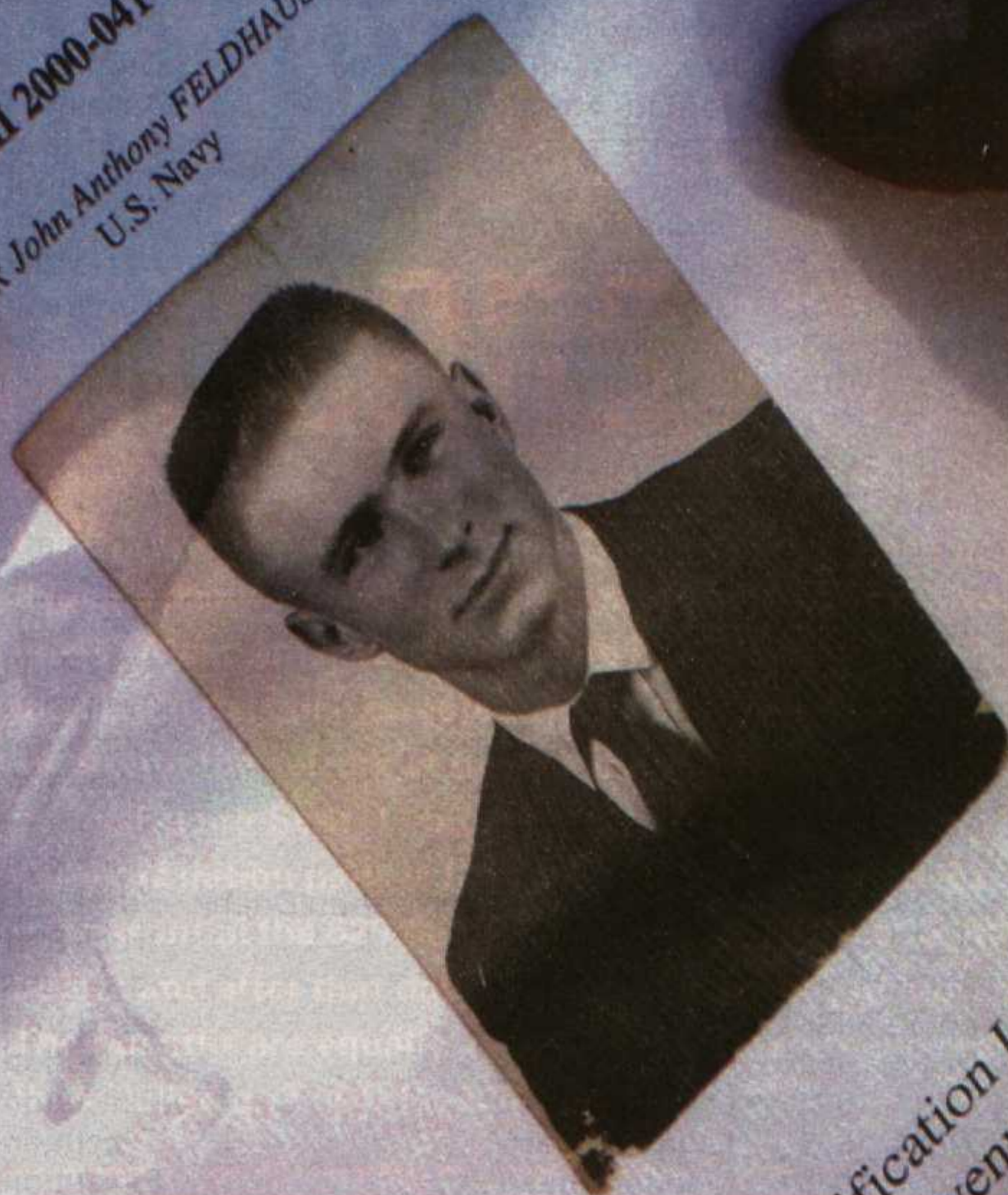
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WITH THE HELP OF DNA
TESTING, A SET OF REMAINS
IS CONFIRMED AS THAT OF
VIETNAM NAVY PILOT
JOHN ANTHONY FELDHAUS



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unknown no longer

DNA is the crucial key to identifying the remains of American MIAs from past wars. And the Armed Forces DNA Identification Laboratory is using that key to unlock the mystery of their fates.

by Gary Turbak

On Dec. 11, 1944, 1st Lt. Henry Lewis piloted a B-24 on a bombing run over Germany, then headed back to his squadron's base in England. Over France, the bomber collided with another plane and nose-dived into the woods, killing Lewis and his crew of eight. The government notified the families of the apparent deaths, but with the war raging and the crash area occupied by German

troops, no attempt was made to recover the bodies. Until recently.

In 1999, relic hunters discovered the wreckage, which contained multiple sets of human remains. Using DNA samples, U.S. investigators eventually identified eight of the nine airmen. On Aug. 25, 2001, Lt. Lewis was finally laid to rest in his hometown cemetery at Centreville, Md.—57 years after he gave his life for his country.

Above: Larry Feldhaus holds a report from the U.S. Army Central Identification Laboratory identifying the remains of his younger brother, Vietnam War Navy pilot John Anthony Feldhaus. DNA testing positively confirmed his identity.

It happens in every war—and even when there is no war: An American in uniform is killed, but the remains are lost or cannot be identified. The griev-

ing family gets no closure, and the deceased veteran has no proper burial. But thanks to new DNA technology, this great sadness may soon become a thing of the past. "Our ultimate goal is to never again have an unknown deceased American service member," says Jim Canik, deputy director of the Defense Department's DNA registry.

'Cellular Dog Tag'

Each human carries around a cellular dog tag called nuclear DNA, genetic material inherited in equal shares from a person's mother and father at the moment of conception. It is unique to each individual and a sure-fire identifier. Civilian authorities use nuclear DNA to convict criminals, and military investigators use it to identify current battlefield and accident victims. Usually, this is done by comparing a known sample of the victim's DNA to DNA taken from the bodily remains. But first there must be a sample on file.

In 1990, with war in the Persian Gulf imminent and U.S. forces expecting many casualties, American military leaders launched a major DNA collection project. Although the United States suffered relatively few casualties in the Gulf War, the Defense Department forged ahead with the creation of the Armed Forces DNA Identification Laboratory (AFDIL) and the Armed Forces Repository of Specimen Samples for the Identification of Remains (both located in Maryland).

The goal of these and affiliated organizations is to attach a name to every fallen soldier, sailor, airman and Marine. "Identification is extremely important to the families," Canik says. "We're here to help bring them closure."

The first step was to create a database containing the DNA of all members of the military, active and reserve. Vacuum-sealed with a drying agent, these 3.6 million blood samples are now stored at -20 C (-4 degrees Fahrenheit), ready to be matched to DNA from a soldier killed in battle, accident or terrorist attack.

An identification cannot be made, however, solely by comparing DNA from human remains to millions of stored samples. Instead, investigators must first use medical x-rays, dental records, personal effects and anthropo-

logical information to narrow the possibilities. With a short list of potential victims in hand, authorities then turn to DNA to confirm the identification.

AFDIL has used these stored DNA samples to identify casualties in Afghanistan as well as the uniformed victims of the Sept. 11 terrorist attack on the Pentagon. Thanks to DNA testing, all victims at the Pentagon and the Pennsylvania aircraft crash site were identified. Without DNA, perhaps only half might have been.

But giving names to current casualties is easy compared to the task of identifying the thousands of GIs who died

anonymously in past conflicts. Incredibly, more than 88,000 Americans who died in World War II, the Cold War, Korea and Vietnam have yet to be located and identified. But military sleuths are tackling this problem, too, albeit with a different DNA weapon.

Nuclear DNA is usually not much help in identifying older remains. For one thing, a sample of the MIA's own DNA is almost never available. In addition, no human cell contains more than two copies of its nuclear DNA, and this limited amount of genetic material often gets lost, especially if the remains are severely fragmented, very old or



David Boyer, operations director at the Defense Department's DNA repository, checks out a storage tray containing 400 stored DNA samples. The two-story walk-in freezer holds 4,000,000 DNA samples.

PHOTOS COURTESY ARMED FORCES DNA IDENTIFICATION LABORATORY



The Task of Identification

To positively identify the remains of casualties from past wars, investigators need mtDNA (in the form of a blood sample) from one or more of the MIA's maternal relatives. Here's the current status of the collection effort. *SOURCE: AFDIL*

WAR	APPROXIMATE NUMBER OF MIAS	NUMBER OF FAMILY SAMPLES COLLECTED	NUMBER OF FAMILIES REPRESENTED
Vietnam	1,946	1,417	985
Korea	8,100	4,170	2,660
World War II	78,000	286	234
Cold War	125	69	45

You Can Help

If you are a maternal relative of a missing service member, investigators might like to add your mtDNA to their repository. Depending on the MIA's branch of service, more information is available from:

Air Force:

USAF Missing Persons Branch
 HQ AFPC/DPWCM
 55 C Street West, Suite 15
 Randolph AFB, TX 78150-4716
 1-800-531-5501
<http://www.afpc.randolph.af.mil/powmia/>

Army:

Department of the Army
 Total Army Personnel Command
 TAPC-PER
 2461 Eisenhower Avenue
 Alexandria, VA 22331-0482
 1-800-892-2490
<https://www.perscom.army.mil/tagd/cmaoc/cmaoc.htm>

Marine Corps:

Headquarters US Marine Corps
 Manpower and Reserve Affairs (MRC)
 Personal and Family Readiness Division
 3280 Russell Road
 Quantico, VA 22134-5103
 1-800-847-1597

Navy:

Department of the Navy
 Navy Personnel Command
 POW/MIA Section (PERS-621P)
 5720 Integrity Drive
 Millington, TN 38055-6210
 1-800-443-9298
<http://www.persnet.navy.mil/pers62/pow-mia/62p.htm>

otherwise degraded—all common wartime conditions.

Mitochondrial DNA

Fortunately, another kind of DNA—called mitochondrial DNA (mtDNA)—is of great help in identifying older remains. This material is extremely abundant, with most bodily cells containing thousands of copies. With so much more mtDNA available, some of it almost always survives, no matter how old or degraded the remains (teeth and bones can be good sources). Scientists have even extracted mtDNA from a 100,000-year-old cave man.

Unlike nuclear DNA, mtDNA is not unique to the individual in question. For starters, only a few hundred thousand different variations of mtDNA exist among the world's billions of people. In addition, mtDNA comes solely from a person's mother, and it is shared by all

maternal relatives, which means that siblings as well as maternal aunts, uncles, and cousins have identical mtDNA. Consequently, mtDNA is not a precise identifier and would be worthless in a criminal case. But this apparent shortcoming also is mtDNA's greatest asset.

"For past conflicts, we don't have a nuclear DNA specimen from the lost service member, which makes mitochondrial DNA from family members very important," Canik says. Since 1992, investigators have been collecting mtDNA from the maternal relatives of MIAs and using these samples to identify remains. Thanks to the mtDNA repository, more than 600 families have experienced the bittersweet closure of MIA identification.

As with nuclear DNA, however, mtDNA comes into play only after other means have been used to narrow the identity possibilities. Perhaps inves-

tigators know which unit (and therefore which individuals) was in an area at the time of a battle. Or, in the case of a crashed plane, there may be a roster of crew members. Or dog tags or personal effects might be found near the remains. With the list of possibilities sufficiently narrowed, investigators can then use a relative's mtDNA to confirm (for all practical purposes) the identity of the remains.

In July 1950, Pfc. Nick Garza was captured by North Korean forces near Osan and interned at a POW camp. He died there and was buried with other POWs in a mass grave. Although the burial location remains a mystery, Garza's two sisters still hope their brother's remains might be located and—with the help of the mtDNA they have provided—identified. "If Nick's remains are ever discovered," says his sister Florence Garza

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Nieto, "we would very much like to bring him home for burial."

Home, like Michael Blassie. On May 14, 1998, workers at Arlington National Cemetery carefully set aside the marble cover on the tomb of Vietnam's unknown soldier, and respectfully removed the remains within.

By comparing that soldier's mtDNA with DNA from two families (each believing one of its members was the tomb's occupant), scientists were able to give the previously anonymous hero a name: Air Force 1st Lt. Michael Blassie, who had been shot down over Vietnam in 1972.

On July 11, 1998, Blassie went home for the last time, as his remains were returned to the earth with full military honors—and beneath a proper headstone—at Jefferson Barracks National Cemetery, near his hometown of Florissant, Mo.

CILHI

Much of the work of identifying remains from past conflicts falls to the 200 military and civilian personnel of the Central Identification Laboratory, Hawaii (CILHI). Not surprisingly, DNA technology has given CILHI a valuable new tool. "Thanks to DNA, we're able to go back and solve cases that have been in our files for decades," says CILHI's scientific director Tom Holland.

CILHI currently identifies about two sets of remains per week, many more than would be possible without DNA techniques.

Each past conflict presents investigators with a different mix of challenges and opportunities (see table for the number of service members unaccounted for from each era). "For Vietnam, we have the best medical and dental records—big keys to identification—but Southeast Asia is probably the worst place on the planet for the preservation of bones," Holland says.

Vietnam's acidic jungle soil and its warm, wet climate can completely destroy human remains in relatively short order. In addition, the high population density of this region virtually guarantees that any site (of a plane crash, for example) has been disturbed

by scavengers or the curious. "In Vietnam, we're really in a race against time," Holland says.

Identifying casualties from Korea presents different problems. Following Blassie's identification, authorities turned their attention to the hundreds of Korean War GIs buried at the National Memorial Cemetery of the Pacific in Hawaii. After the war, North Korea returned to American authorities the remains of 865 unidentified U.S. soldiers, who were respectfully interred at the Oahu cemetery (commonly called the Punchbowl because of its location inside an extinct volcano).

In 1999, with mtDNA now in their toolbox, authorities enthusiastically decided to start exhuming Korean War remains from the Punchbowl for possible identification. But the project quickly ran into a serious snag when the scientists failed to glean any useable DNA from the remains. "The bones are in excellent shape, but there seems to be something in them that either has destroyed the DNA or is binding it up and preventing us from chemically releasing it," says Holland.

One possibility is that the U.S. Army treated the remains with embalming powder containing formaldehyde before interring them. Research continues, but so far only four sets of Korean War Punchbowl remains have been exhumed, and none has been identified. Until this problem is solved, there will be no more exhumations.

But GIs buried at the Punchbowl are just the tip of the Korean War MIA iceberg. When that war ended, more than 8,000 American personnel were unaccounted for, which means that thousands more sets of remains are still somewhere on the Korean Peninsula—and thousands more American families wait to give proper burial to a loved one.

In some ways, the Korea situation is the flip side of Vietnam. In Korea, the physical conditions—a colder, drier climate with less acidic soil—are conducive to bone preservation. "The bones we recover from Korea are among the best that we see," Holland says. The bad news, however, is that a 1973 fire at the National Personnel Records Center in St. Louis destroyed many of the paper records that might aid in identification.

Numerically, the WWII situation—with about 78,000 American combatants still unaccounted for—is bleak. But some casualties from this long-ago conflict—like Lt. Lewis and his crew—are being identified, too. In August 1942, 19 Marines died in battle with Japanese soldiers on Butaritari Island in the Pacific and were buried in a mass grave.

Some 57 years later, in 1999, a CILHI team located this burial site and recovered the men's remains. Thanks to DNA testing, each of these Marines has been returned to his family for proper burial.

In general, paper records for WWII MIAs are good, and bone preservation is often adequate as well. The weak link here, however, may be the relatively few MIAs whose families have been able to provide a sample of mtDNA.

Painstaking Process

Successes notwithstanding, DNA identification is no cure-all. It can take weeks or months to complete an identification, which means it could be decades before all unidentified remains can be processed. And it's likely that no remains will ever be found for thousands of MIAs. Consequently, many deceased American military personnel will never be identified.

But for any given individual, there is always hope. "We never say never," Canik says. "We have the responsibility to those service members who gave their last full measure to this country to make as many identifications as we can—and to return their remains to their families with honor."

Going forward, the outlook is much brighter. Certainly, brave uniformed Americans will continue to die for their country. (In Afghanistan, all the Americans killed have been identified.)

But thanks to DNA identification techniques, it just may be that no future military veteran will ever again be buried beneath the inscription, "Here Rests In Honored Glory An American Soldier Known But To God." Henceforth, our nation may know the names of all its defenders killed in war. ★

GARY TURBAK is a free-lance writer living in Missoula, Mont., and an Air Force veteran of Vietnam.