

[A Curmudgeonly View of the Liberal Arts]

By Tim Wedge, Associate Professor of Practice of Digital Forensic Science

Your unit has captured a couple members of a terrorist cell. You know that the other members, still at large, are going to try to kill U.S. soldiers or innocent civilians, and soon. Do you use torture to get the information that you need to stop them? Or . . . OR, do you whip out your liberal arts education? I argue, based in part on my experiences in Iraq, that forensics works better than beatings, and that one of our best tools against terrorism and other social ills is knowledge augmented with a liberal arts education.

The liberal arts degree is not merely lofty and intellectual; the broader base of knowledge and approaches to problem-solving that it provides is a practical solution to both known, and as yet unknown problems. There is the old adage that “when your only tool is a hammer, all your problems look like nails.” An effective education must not only provide the graduate with something more than a tool chest full of hammers; the graduate should have the skills to figure out previously unused tools, and even devise and build new tools to accomplish tasks that may not yet have been conceived.

Digital Forensic Science (DFS), for example, requires an extremely in-depth understanding of a large variety of hardware and software that store and manipulate data. Moreover, because the computer isn’t going to jail, data must always be put in the context of human interaction; the examiner must always verify the cause and effect assumptions about recovered data. The examiner must show not only that a digital artifact was the result of a human action, but that it could have been accomplished by only one specific human.

The value of a liberal arts degree is strongly influenced by the perceived value of potential employers. It must provide a value added in comparison to a purely technical or vocational degree or certification. In considering the typical management dilemmas of a 21st century police agency, or litigation support entity, the appeal of quickly-trained examiners is easy to understand. Today, it is not unreasonable to suggest that most crimes or actionable grievances have a digital evidence component; whatever role technology plays, it is far more likely that any given criminal act will have digital evidence associated with it than not. In my experience, the need for competent digital forensic examiners often exceeds their availability.

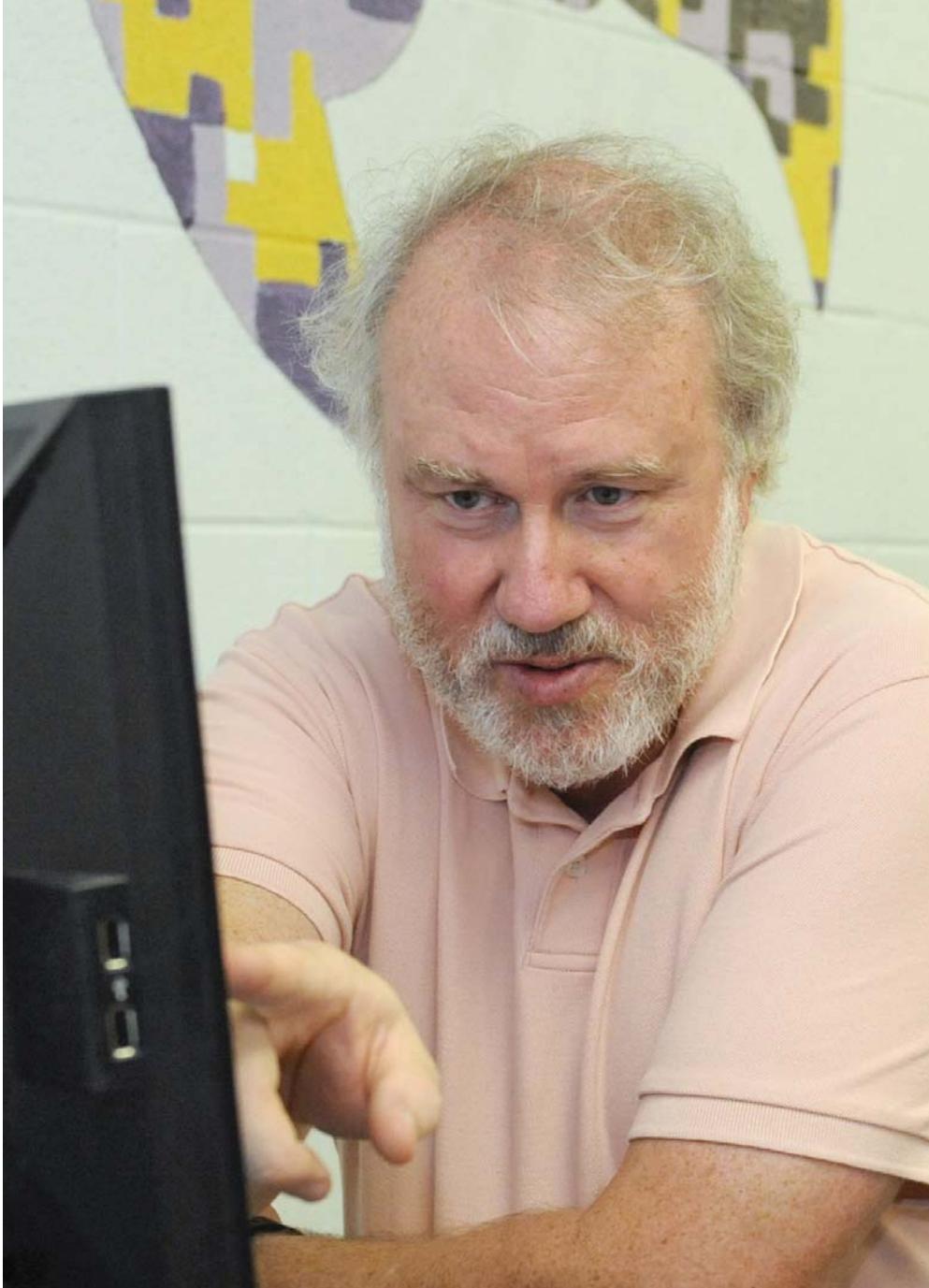
How do we define “competence”? A reasonably intelligent law enforcement officer could become reasonably proficient at minimal data recovery techniques with specific tools with less than 40 hours of training. When compared to a four-year degree, particularly one full of what may, on the surface, appear to contain material irrelevant to the task, this 40-hour investment becomes an extremely appealing solution; all the more so because personnel so trained will produce what appear to be useful, tangible results.

The insidious problem, though, is that these results are being produced without an understanding of the cause and effect relationship between human actions and the creation of the recovered artifacts. When an examiner can’t explain the relationship between the recovered artifact and the human

activity that created it, the results arguably fall short of due diligence. In fact, such examiners may, in good faith, draw conclusions that are not supported by the facts, and put them in their reports. To produce valid results, a truly competent examiner must not only recover digital artifacts, he or she must be able to conduct verifiable contextual analysis of those artifacts to draw verifiable conclusions about the artifacts and their explicit ties to human activity. Moreover, the tools, due to constantly changing technology in filesystems, operating systems, and individual applications, are inherently less than perfect in the recovery and presentation of the data they analyze. People who know nothing more than how to use a tool are manifestly incapable of detecting a tool’s limitations, or taking steps to correct or account for them. Moreover, they are often unaware of important information that the tool omits. A four-year undergraduate degree with a purely technological focus may be better equipped to address these issues, but still fall short in an important regard.

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The need for a broader based education becomes more apparent when we consider the sheer volume of information that must be examined, and the nuanced judgment necessary to correctly include or exclude digital artifacts as evidence. To understand the enormity of the task let’s consider a one terabyte hard drive, a standard component of a moderately priced PC. If we were to print the entire content of the drive as text, the resulting stack of paper would be a little over 17 miles high. In reality, the content of the drive will



consist of many things other than text, but the description serves to illustrate the size of the task.

This matters because the DFS examiner, then, is the only human being who will ever lay eyes on the vast majority of the data he or she recovers from electronic media. In addition to converting often indecipherable data into human readable form, the examiner must also determine the relevance of every document, video, html object, graphic, etc. to the specifics of the investigation in progress. Those items that are excluded by the examiner will never get a second look, will not be re-evaluated or reconsidered by another party for context; they are forever lost from human view. Digital forensic science is not a matter of recovering a file that proves somebody's guilt; it is about wading through possibly millions of a wide variety of digital artifacts and making very pointed critical judgments about which provide some sort of inculpatory or exculpatory evidence relevant to the case. This requires the examiner to have knowledge beyond mere data recovery.

Let us suppose, for example, that I am a DFS examiner working with intelligence analysts and investigators dealing with a violent insurgent group in a foreign country.

Tool use alone might allow me to recover thousands of images. With technical knowledge, I might piece together even more fragments of images and Web page artifacts out of unallocated space that were missed by the tools. Absent any other insight or education, I will likely discount dozens or hundreds of pieces of critical information. A liberal arts education might tell me (or give me the research skills and the habit to find out) that the bearded man with the green robes whose image keeps showing up on the subject's hard drive is Ali, suggesting that my subject is Shi'a. I might further recognize that my subject lives in a Sunni neighborhood. If my subject is a murder victim, this may provide an insight as to motive. If I am conducting an intelligence analysis, this may be an anomaly that is worth noting in my report or consultation with an analyst. These subtle observations may help me identify which of the quarter million images on the drive are photos of my subject's associates, bent on killing people in a coordinated attack.

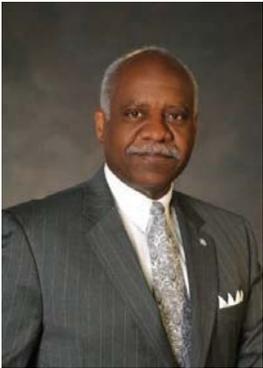
The ability to make this kind of contextual observation must reside with the digital forensic examiner to be of any value. Otherwise, the artifacts will simply be discarded, and the connections never made. This kind of contextual analysis does not come from tool proficiency or technical knowledge. For the examiner to make these connections; it requires a greater awareness of the world around us, as well as practice at making these kinds of connections, and the intent to do so. Moreover, having made these connections, the DFS examiner must present his or her findings in a manner that is decipherable to others.

Though I have focused on the benefits of a liberal arts education as it applies to DFS, the arguments could easily be applied to any discipline. The advantage of a liberal arts education is not that the student is better trained, or given a greater depth of technical knowledge. Where a technical education might teach the correct set of steps to solve a known problem, the liberal arts education guides a student to learn to recognize problems, to test for problems, and to develop new solutions for new problems.

DEFIANCE COLLEGE WELCOMES **THREE** NEW BOARD OF TRUSTEES MEMBERS

The Defiance College Board of Trustees welcomed three new members in 2016. They include Dr. Robert Head, Donald Hileman and Jonathan Gathman.

DR. ROBERT HEAD



Dr. Robert Head was President of Rockford University from June 2008 until June 30, 2016, when he retired and was named President Emeritus. He was previously President of Urbana University and a vice president at Benedictine University. Dr. Head acquired many years of experience in the banking industry, serving as vice president for trust services in Northern Trust Company in Chicago in the 1980s and 1990s.

During his tenure at Rockford, undergraduate and MBA enrollments reached their highest in school history. He led a robust strategic planning process geared to create distinction, increase enrollment, and bring an international flavor to campus. The endowment grew by more than 50 percent with more than \$15 million in capital improvements to roads, residence halls, classrooms, student facilities and technology.

Dr. Head has served on the boards of SwedishAmerican Health System, and David C. Cook, the Rockford Chamber of Commerce, Golden Apple Foundation, Rockford Rotary Club, Kobe College Corporation, Alignment Rockford, the Federation of Independent Colleges and Universities, and the Associated Colleges of Illinois. He also served as Scoutmaster for Boy Scout Troop 9 and was a member of the Steering Committee for Transform Rockford.

He earned a B.S. from Defiance College in 1976 and an M.B.A. from the University of Toledo in 1980. He received a master's in organization behavior from Benedictine University in 1996 and a Ph.D. in organization development from Benedictine in 1999.

He and his wife, Sheryl, reside in Ponte Vedra, Fla. They have three adult children.

DONALD HILEMAN



Donald Hileman is president and CEO of First Federal Bank and First Defiance Financial. A graduate of Heidelberg University, he has worked in the financial services industry for more than 40 years.

Prior to joining First Defiance in 2007, he served as a corporate controller with Sky Financial Group, Inc., a \$19 billion financial services holding company. He previously served as a community bank chief financial officer.

Hileman's wife, Betsy, is the daughter of the late Dr. Robert and Jane Boehm. Dr. Boehm was a revered member of the history faculty at Defiance College for many years.

JONATHAN GATHMAN



Jon Gathman is executive vice president and senior lending office at The State Bank and Trust Company.

He graduated from Defiance College in 1996 with a B.S. degree in finance, then went on to earn an MBA from Bowling Green State University in 2002. He is also a graduate of the Graduate School of Banking.

Gathman is past president of the Defiance College Alumni Executive Board. He is a board member and past president of the Defiance Community Improvement Corporation, Defiance County United Way, and Junior Achievement of Defiance. He is also a member of Sigma Phi Epsilon fraternity and current treasure of the alumni group. He enjoys water sports, OSU football, and coaching junior sports.

Gathman and his wife, Angie, are the parents of Brooke and Ryan.

DEFIANCE COLLEGE STUDENTS SHARE THEIR SUCCESS STORIES



As a member of a national student advisory committee to create change on college campuses to fight sexual assault, Defiance College junior Denique Dennis had the opportunity last fall to attend a reception hosted by Vice President Joe Biden in his residence at the Naval Observatory in Washington, D.C.

Dennis, a social work major, was selected in June as one of 28 students from across the country to serve on the advisory committee for *It's on Us*, a movement created in 2014 by President Obama and Vice President Biden to challenge students to take the lead on their campuses

and mobilize peers to create cultural and systemic changes against sexual violence. In 2015, the *It's On Us* Student Advisory Committee was created to further empower young people to step up and to be a part of the solution.

The reception at the Vice President's residence included lawmakers as well as three individuals recognized with Bystander Courage Awards for actively preventing an assault from occurring.

Prior to the reception, Dennis attended a meeting at the White House where she met the *It's On Us* council, and the group discussed various awareness events taking place on campuses across the country.

Dennis became interested in the *It's on Us* campaign during her freshman year. This summer, she received word that she was selected to serve on the national student advisory committee. "Our job is to mobilize students, to host events, and bring awareness on campus. My job includes a lot of calling and offering resources to host events," she says. Much of the committee's work is accomplished via conference calls.

She says changing the culture of sexual violence on campuses involves changing a mindset. She sees her life going forward as one of advocacy enhanced by her studies in social work. "I have an agenda of female empowerment and to help children of broken homes."

Her trip to Washington, D.C. and visits to the White House and Vice President's residence gave Dennis the chance to meet with like-minded students. "I felt empowered listening to student leaders speak," she says.

At Biden's reception, Dennis was able to speak with a wide variety of individuals including leaders of shelters, survivors of assault, advocates, and "people who are speaking out and trying to change the culture."

Biden addressed the group, thanking them for their efforts. "I was just really proud to hear someone in a place of power, who isn't a woman, give such a speech," Dennis says.

Biden spoke with her one-on-one and thanked her for her efforts. Dennis, a native of Jamaica, is the only student from an Ohio college or university serving on the *It's on Us* committee.



Will Selhorst, Columbus Grove, a sophomore in Defiance College's nursing program, joined a team of 12 Mercy Health and St. Rita's Medical Center employees on a medical mission trip to Haiti earlier this year. The group operated a medical clinic under the auspices of Haiti Outreach Ministries. A total of 551 patients were treated during the week, with more than 1,000 prescriptions written and filled, and 65 minor surgical procedures completed.

Will said that the team would arrive at the clinic around 7 o'clock each morning, and there would already be nearly 100 people waiting to be seen. He worked with the nurses in triage to assess each patient, acquire vital signs, and listen to their concerns. They would then decide which patients needed to be seen immediately by a doctor.

"The experience was amazing, and I plan on hopefully going again next year," Will said. "The trip made me greatly appreciate everything I have."

His plans after graduation are to work in an emergency room and later become a travel nurse, working at various hospitals around the country. He hopes to eventually become a nurse practitioner or CRNA.