

Cold War caper revisited

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Two Michigan State University researchers are the first to unlock the secrets of the invisible ink used by East Germany's secret police force, the Stasi, and in the process have mixed a batch of chemistry, history and mystery to teach students.

Kristie Macrakis, a historian of science, and Ryan Sweeder, a chemist, both of MSU's Lyman Briggs School of Science, teamed up to piece together the once-secret chemical formula behind the Stasi's invisible ink.

"Secret writing is a classic method of communication for spies," Macrakis said. "This is a high-level formula. It's not just lemon juice. It's much more sophisticated."

The Stasi's technique of transferring top-secret messages worked like a piece of carbon paper. An agent would place a piece of paper impregnated with the chemical cerium oxalate between two pieces of plain paper. As the agent pressed down to write, the chemical was transferred to the piece of paper beneath.

The person on the receiving end of the message then developed the note with a solution of manganese sulfate, hydrogen peroxide and other chemicals. The process activated the cerium oxalate to reveal the hidden text. A successful reaction yielded orange writing.

"From a chemical standpoint, this is very cool," Sweeder said.

The Stasi – the former East German Ministry for State Security – was created, in part, by Soviet KGB agents shortly after World War II. At that time, Germany was divided into two regions: the communist controlled East Germany and the democratic West. Stasi functioned as both internal security unit and foreign intelligence officers.

"It's like having the CIA and the FBI under one roof," Macrakis said.

After the fall of the Berlin Wall in 1989, the confidential archives of the Stasi were declassified. A few years later Macrakis discovered in those archives the incomplete formula for the secret ink and development process.

Macrakis approached Sweeder and another MSU chemist in hopes of determining the missing pieces to the ink formula.

"We wanted to decipher the question marks in the formula. We knew nothing about amounts and concentrations," Sweeder said.

With the help of undergraduate students Kevin Kalinowski and Elizabeth Bell, Macrakis and Sweeder solved a Stasi secret and created a chemistry lab dubbed the "Spy Lab."

In the Spy Lab, students become counter-intelligence agents trying to prevent a terrorist attack on a university building. Students are handed a torn piece of paper recovered from the crime scene with the location of the imaginary bomb written in Stasi invisible ink. It's up to the student counter- intelligence officers to determine the quantities of the chemicals needed to develop the message and thwart the operation.

The Spy Lab helps students learn about catalysis, redox reactions, kinetics and pH. Participants also learn the historical background of the Stasi and the politics that created the repressive ministry.

"This project braids history and science together and brings researchers together," Macrakis said. "The students find it intriguing."

Macrakis and her colleagues presented the work in early November at the 2006 Sigma Xi, a scientific research society, meeting in Detroit.

Source: Michigan State University

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