A Laser Quest

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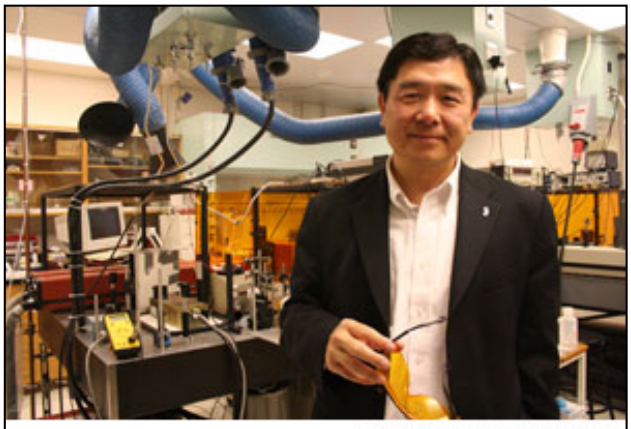

Credit: Jessica L. Horton

Bill Tong is passionate about lasers. The technique he has developed has enormous potential and could be used for a huge number of applications.

Bill Tong has a lab full of lasers. He's got big lasers, small lasers, expensive lasers and cheap lasers. He's got lasers that could burn a hole through a steel plate and others that are barely visible with the naked eye.

Touring his lab, Tong skips from worktop to worktop spewing facts and figures, frequencies and costs about his beloved lasers and their many, many uses.

And there are, evidently, a lot of uses for all those lasers.

Though he admitted, with a smile, that when most people think of lasers they think of light sabers or disco lights, Tong and his team of researchers at San Diego State University have developed a use for lasers that is far more sophisticated.

Tong said he has figured out a unique method of using lasers to scan material in search of specific molecules or compounds. By firing high-resolution lasers into and through any matter, Tong said he can pinpoint the location of certain rogue substances. He said he can locate even minute traces of such agents as explosives, radioactive material and even cancer-causing agents present in the human body.

Tong envisages creating hand-held scanners that soldiers can use to search either side of a street in a war zone for hidden explosives. Similar scanners

could also be used to detect explosives and dirty bombs contained in luggage at airports and train stations. Or a scanner could search people waiting in line at a checkpoint for explosive belts worn by suicide bombers.

"This ultra-sensitive method is applicable to just about anything you want to detect," said Tong. "… All we have to do is send in the right photons and have them interact with different types of chemicals that are present."

Essentially, what Tong does is shoot a couple of laser beams at a sample. When the beams hit the target, and run into each other, they generate patterns and produce a single beam that is fired away from the sample and which carries a chemical signature of the substance scanned. By analyzing the chemical signature, Tong can establish exactly what the substance is.

The possibilities for the technique, according to Tong and his colleagues, are extremely wide-ranging.

"It has the possibility of being portable, rugged, inexpensive to manufacture and operate, and has a sensitivity level and selectivity level that is unmatched," said Mike Rondelli, program manager at SDSU's Technology Transfer Office, who is working on taking Tong's research directly to high-tech manufacturers. "The application for it is taking a platform anywhere that you need a selective and highly sensitive sample."

It wasn't always Tong's dream to develop a technology that could be used by the military and by national security agents. For the best part of the last 20 years, he and a number of researchers at his impressive lab at SDSU have been developing the laser scanning technique for use in bio-medical applications.

The same lasers that can be used to detect explosives can equally be fine-tuned to search a part of a patient's body for disease-causing agents.

Whether he's searching for TNTs or STDs, however, Tong said the advantages of his technique over other methods already on the market should be clear to manufacturers and end users.

"What we're trying to develop," said Tong, "is something with better sensitivity, with better chemical specificity and is also portable. That's the challenge."

To give some idea of just how sensitive Tong's technique can be, Rondelli offered up an analogy.

"We're doing parts per quadrillion," said Rondelli. "It's like being able to isolate one second in five million years."

Tong and his team still work primarily in the field of bio-technology, fine-tuning the laser technique and building prototypes of scanners.

He stressed that what is important in his work is not what is being scanned, but how it is being scanned. Tong's laser scanning method is, therefore, being developed on more than one front. Scanning a human body for cancer, he said, is no different in theory than scanning a dusty side street in Iraq for hidden weapons.

The innovative scientist, who was named top researcher of the year at SDSU

last year, said he's more than happy to carry on his groundbreaking work at the university where he has studied for more than 20 years.

For his colleagues, the presence of Tong on the staff means more prestige, more funding and more publicity for **the work SDSU is doing as a research institution**. That Tong's work lends itself to the field of national security is, according to Tom Scott, president for research at SDSU, pretty good timing.

"We are under an unprecedented level of potential threat," said Scott. "There is probably no more propitious time to create a system in which you can detect impurities at unprecedently low levels."

And that's what keeps driving Tong. As he tinkers with his dozens of lasers, further and further developing his technique, he said he is safe in the knowledge that he's doing something that will ultimately make everybody safer.

*Please contact Will Carless directly at **will.carless@voiceofsandiego.org** with your thoughts, ideas, personal stories or tips.*

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