

# DETECTING DANGER

NJIT alumnus Al Limaye MS '87 is in the business of detecting danger. He's the president of AC Birox, a company that manufactures a unique portable detector for biological and chemical warfare agents, explosives and narcotics.

From AC Birox headquarters at NJIT's Enterprise Development Center – the EDC – Limaye is coordinating work with NJIT faculty and students to enhance the detector's capabilities for industrial and medical applications. This includes the capacity for fast and accurate verification of pathogens such as E. coli and staph bacteria, mold, and even the H1N1 flu virus.





## MEETING IN MARYLAND

As Limaye explains, the fortuitous genesis of AC Birox was his getting to know researchers working for the U.S. Army's Edgewood Chemical Biological Center at the Aberdeen Proving Ground in Maryland. They had developed the first-generation technology at the heart of the detector that Limaye's company produces.

Although all concerned realized the market potential of this technology, the Army does not participate directly in commercialization. Limaye, in the right place at the right time, licensed and built on the Army's original patents. Manufacturing began in Maryland under the company name AC Birox. Asked about the name's origin, Limaye says that he and his associates, after some brainstorming, decided on one they feel evokes their goal – to detect a broad range of chemical and biological agents.



## A CAPABLE TOOL

The current version of the AC Birox detector – the ACB2000 – is a highly capable tool for military and civilian security applications. In addition to many types of explosives, chemical agents and narcotics, the unit can quickly warn of biological dangers such as anthrax spores, plague bacilli and the Ebola virus.

The ACB2000 works on the principle of “sniff and tell.” A sample is heated in a precisely controlled manner to generate a vapor containing the constituent compounds of the sample. The vapor is then deposited in a specially designed, lightweight gas-chromatography (GC) system. The GC column is thermally programmed to release the individual compounds in the vapor sequentially – the “sniff” phase. These compounds are then characterized by a differential mobility spectrometer that “tells” their identity. If a chemical agent is present in vapor form, the heating step is not needed.



Waleed Maswadeh, PhD (left), AC Birox chief scientist, and Al Limaye, company president



## BETTER, FASTER, LESS EXPENSIVE

Limaye aims to build even greater utility into the detector for use in industrial and medical settings. “We want to continue making our product better, to produce analytical results faster, and at lower cost.” For example, Limaye sees the potential for assuring that complex pharmaceutical manufacturing processes are proceeding smoothly, for replacing costly analytical tests in biomedical research, and for detecting and differentiating among pathogens in the hospital emergency room.

It's working toward this goal that has led to relocation at the EDC in New Jersey. “I knew

about the EDC from my connections to NJIT as a graduate,” Limaye says. “I also knew that there would be many advantages in moving there. Some are those needed by any new business, including affordable office and lab space, and being able to network with interested investors. But there are also the resources that you'll find only at a research university such as NJIT.”

Assistance in achieving the firm's objectives has come from Judith Sheft, NJIT associate vice president for technology development, and William Marshall, assistant vice president for government affairs and director of the New Jersey Homeland Security Systems Center at NJIT. Limaye credits Sheft and Marshall for introducing the ACB2000's technology to first responders in the New York/New Jersey region, including those with responsibilities for homeland security. They also helped to arrange a demonstration at the Public Health Research Institute Center headed by David Perlin, PhD, part of the International Center for Public Health at the University of Medicine and Dentistry of New Jersey. The demonstration focused on rapid identification of Gram-negative/Gram-positive bacteria and E. coli – an application of substantial significance in clinical medicine.



Parag Bargaonkar, AC Birox technical director, demonstrates how a sample is introduced into the ACB2000 for heating and vaporization prior to the gas chromatography stage.



## NEW JERSEY'S LARGEST HIGH-TECHNOLOGY BUSINESS INCUBATOR

The NJIT Enterprise Development Center – the EDC – is the state's oldest and largest incubator for technology-based and life-science companies. Part of the NJIT campus in Newark's Innovation Zone and University Heights Science Park, the EDC is convenient to New Jersey's largest transportation hub.

Since 1988, the EDC has helped entrepreneurs rapidly commercialize promising concepts and reduce start-up risks, while greatly increasing their chances of success. Participation is open to early-stage companies that have a proprietary technology as a significant source of revenue. The EDC provides office and lab space, financial assistance, business and technical services, and the shared business acumen of the Center's management staff.

The EDC has graduated more than 85 successful businesses. Nearly 95 companies now at the EDC employ over 300 people full-time, along with some 100 student interns. Among these are firms building marketplace success with breakthrough work in areas such as video e-learning, renewable energy, products in the life sciences for medical diagnosis and therapy, information technology, telecommunications, and advanced materials, including nanotechnology.

On the Web: [www.njit-edc.org](http://www.njit-edc.org)

“The mission of the EDC is to provide the best possible environment that allows early-stage startup companies to grow and accelerate commercialization of their technologies,” Sheft says. “Part of the interface role that NJIT's Office of Research and Development plays is to facilitate connections with the rich set of resources available. We help companies navigate what can at times be a daunting path, often by opening doors and making introductions to begin what, hopefully, will be very fruitful conversations.”

Limaye adds that Jerry Creighton, director of the EDC, has also helped to open important doors. “Jerry has been instrumental in aligning us with a number of manufacturers to consider as well as in setting up seminars with potential investors and others who can provide significant assistance for our company.”



### MARKET RESEARCH, MATH AND MORE

Contributions by NJIT faculty and students to further development of AC Birox's detector encompass market research, mathematical science, chemistry, software architecture and biomedical engineering. The School of Management's Distinguished Professor Bruce A. Kirchoff has provided the benefits of skillful student research into expanding the company's presence in their current markets and for entering new ones, such as medical diagnostics. Associate Professor Annaleena Parhankangas' MBA students provided valuable input with respect to strategies for competing in international markets.

Narain Gehani, dean of the College of Computing Sciences, and Fadi P. Deek, dean of the College of Science and Liberal Arts, suggested resources available in their respective schools. Students in the Capstone information-technology program directed by Senior University Lecturer Osama Eljabiri assisted with enhancing the detector's software, and Assistant Professor Chung Chang of the Department of Mathematical Sciences provided independent validation of the system's analytical accuracy.

Professor Somenath Mitra, chair of the Department of Chemistry and Environmental Science, has offered his thoughts on how

to prepare the broader range of samples that would be tested as the spectrum of applications for the detector increases. Graduate students recommended by Associate Professor of Biomedical Engineering Treena Livingston Arinzeh have worked with the company on developing the detector's capability to determine if stem-cell samples are viable. At present, the procedures for confirming viability are expensive and time-consuming. With the AC Birox detector, the time required could be cut from weeks to minutes, and be much less costly.

“All of these resources show what great synergy there is at the EDC and NJIT,” Limaye says. “Such resources are not widely available to smaller companies like AC Birox. When it comes to building the success of a technological product such as ours, they are invaluable.” ■

For more information: [www.acbirox.com](http://www.acbirox.com)

## BEFORE AC BIROX

**AC Birox is not the only successful company launched by Al Limaye. He is also the founder and current head of Logistic Solutions.**

**After coming to the U.S. from India to pursue a graduate degree at NJIT in computer and information science, Limaye went to work for AT&T Bell Laboratories as a contractor with a large consulting firm. “I realized that I could do this independently and decided to start my own consulting and software-development business,” he says.**

**Based in Piscataway, New Jersey, Logistic Solutions today offers services and products that range from credit-card fraud detection to leading-edge 3D animation. In the field of supply-chain security, they are among the few firms specializing in the use of radio frequency identification (RFID) tags with which retailers can track products as they travel from the manufacturer through warehousing and final sale. On the artistic side of the operation are the 3D animators on staff. They've worked with clients that include a TV production company in the United Kingdom, transforming political celebrities into subjects of animated satire.**