

IBM's Almaden Lab: A glimpse into the future

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To step inside IBM Research-Almaden is to get a peek into how the latest advances in technology are being applied to a crazy quilt of important issues from food safety and cancer to recycling.

Almaden lab, as it is known, celebrated its 30th anniversary earlier this month as an anomaly in a time when many profit-driven corporations have abandoned the uncertainties of pure research. Yet this lab appears to be going strong, decades after researchers first moved into offices on former ranch land at the fringes of San Jose to do battle with resident mice and rattlesnakes.

Big Blue's focus in the Bay Area has historically been about data, including some of the earliest work in disk drives and relational databases.

At Almaden, researchers were the first to position individual atoms for use in data storage and the first to create data mining algorithms. They invented the first ink jet printer prototype, which Hewlett-Packard made good use of. They developed the security for Blu-ray technology and created the world's smallest disk drive. One Almaden researcher went on to earn the Nobel Prize in chemistry and the lab's work regularly contributes to IBM's 23-year reign as the top U.S. company for patent awards.

Today, Almaden, where cows and the occasional coyote still dot the hillsides, has shifted its focus to cognitive computing and artificial

intelligence.

Researchers here are busy crunching vast amounts of data and looking for patterns using Watson, IBM's famous cognitive computing and [artificial intelligence](#) system. Beating human players at "Jeopardy," as it did in 2011, is not all Watson can do.

"Our mission is to augment human capability," said Jeff Welser, the director of Almaden Labs.

Corporate labs are mostly a thing of the past. Not long ago, the most powerful tech and communication firms maintained research centers, partly for prestige and partly to make sure cutting edge academic research was done in-house.

Outside of Google, which has its semi secret X research division, most internet firms are more likely to buy startups than set up labs. Or they follow Apple's model, in which "companies hop across industries without bothering to set up a central lab," said G. Pascal Zachary, a professor in the school of innovation at Arizona State University.

But IBM, which has long been under financial pressure, continues to support research, devoting about 6 percent of its annual revenue to finding breakthroughs. However, the company, which was founded more than 100 years ago, has shifted the model for its 12 labs, including Almaden.

In the past, Almaden was run like a mini university with specific subject silos. Researchers toiled away on projects in isolation before sharing with them with the world.

"Now we are engaged in research that will co-evolve with clients," said Laura Haas, an IBM fellow who has been at Almaden since it opened.

"The shift in style is a big change."

That shift makes sense for the times. The promise of big data is that it will provide new insights to help solve real problems. But those insights often need someone with a deep understanding of how the underlying technology - the chips, the databases - works, as well as subject matter expertise.

"The labs are viewed as the single greatest asset of the organization," said Bernie Meyerson, IBM's chief innovation officer. "The magic is the labs evolve ahead of the company. They are a vital part of defining the future."

The buzzword at Almaden is "multidisciplinary." An electrical engineer partners with a physicist. Together they crunch data using Watson to work on modeling cancer cells to help with cancer detection or study data on the movements of plankton to better understand algae blooms threatening some Florida beaches.

Meena Nagarajan, a machine learning expert, oversees a project that teaches Watson how to look for patterns in massive amounts of protein data found in all the world's academic research, something no human could easily digest. "If you can indeed feed the machine the language of protein and biology, you can accelerate the pace of discovery," she said.

Once a year, Almaden researchers gather in the auditorium for an open mic of sorts - the Grand Challenge - where they present some of their most far out ideas. The winner gets to work on the idea for two years.

One year's winner came up with an idea that ultimately led to TrueNorth, an energy efficient chip that mimics how the brain works. Lawrence Livermore National Laboratory will use the chip to explore new computing capabilities, and Samsung will demonstrate TrueNorth in

mobile devices.

Another year, someone suggested sequencing the DNA and RNA of food samples to find anomalies that might point to food-borne illnesses or food fraud. The first samples, sequenced by the University of California at Davis, were of fish meal, meat and bone meal, whole grain corn and poultry meal. Now IBM has a partnership with Mars Inc., the food company, and Bio-Rad, a biological testing company, for its Consortium for Sequencing the Food Supply Chain.

Sometimes, even accidents lead to new discoveries.

Jeannette Garcia, a polymer chemist, was doing a routine experiment when she accidentally made a new kind of plastic.

She had to break her flask to extract it. By deconstructing the accidental material, Garcia and others learned they had found a new class of plastics, nicknamed Titan, that is super strong and can be recycled an infinite number of times (unlike petroleum-based plastics).

"It's not a bad job," she quipped.

No, it's not. At Almaden, now at 30, such breakthroughs are still part of a day's work.

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