

August 20, 2004: MicroPhage Moving to Longmont (The Boulder County Business Report)

GOLDEN – [MicroPhage, Inc.](#) has raised \$1.05 million financing through the sale of convertible notes and warrants, and will move its operation from Golden to Longmont starting in September.

[MicroPhage](#) has seven employees and is looking for additional research staff to complement its scientific team once it moves into 5,000 square feet of office and laboratory space at 2400 Trade Center it will lease from Pratt Properties.

The money will be used to accelerate the development of its [MicroPhage Amplification System](#). The system can identify multiple bacterial pathogens in a single test, such as bacterial pneumonia, foodborne pathogens such as salmonella, Listeria, and shigella, sexually transmitted infections, and biological warfare agents like anthrax.

Existing technology often takes two or more days to diagnose infection. [MicroPhage's](#) technology has proven the ability to identify low concentrations of these pathogens in less than four hours.

In addition to a set of independent investors, the round was joined by a group of Alpine Angels and CTEK Angel investors. As part of the funding, [Gary Mesch](#), managing director of the Alpine Angels, has joined the company's board of directors and [Scott Gaisford](#), former executive director of the CTEK Angels, has been elected chairman of the company.

August 13, 2004: MicroPhage Raises Funds, Eyes Longmont (The Daily Camera)

Technology – [MicroPhage, Inc.](#) a Denver [sic]-based developer of in-vitro diagnostics tools for clinical, food and beverage, environmental, and biodefense markets, recently closed on a \$1.05 million round of funding through the sale of convertible notes and warrants.

CTEK Angel and Alpine Angel investors, as well as individual investors, participated, the company said.

With the funding, the seven-employee company plans to ramp up development of its [MicroPhage Amplification System](#). It's currently negotiating a multi-year lease for a new home in Longmont, which it expects to move into next month.

April 21, 2004: Colorado School of Mines and MicroPhage, inc. awarded a Turner Biosystems Grant (Release)

April 21, 2004 – [MicroPhage, Inc.](#), Researchers at the Colorado School of Mines (CSM) and its new biotechnology start-up [MicroPhage, Inc](#) announce today that they have been awarded a [Turner Biosystems PicoFluor fluorometer](#) for its work in rapid biowarfare detection technologies. CSM and [MicroPhage](#) have been co-developing a rapid, sensitive, and specific means to identify bacteria, including principal bacterial biological warfare agents such as *Bacillus anthracis* (Anthrax), *Clostridium botulinum* (Botulism), and *Yersinia pestis* (Plague). Currently the pair is investigating detectors to be used with its technology that can be commercialized and applied to field use by physicians, soldiers, first responders, and environmental scientists. Included detector platforms under study are immunodiagnosics and fluorometry.

"With this grant, [MicroPhage](#) and the Colorado School of Mines can now work in earnest to test a field fluorometer for use by people in the field, rather than with laboratory instruments," said [MicroPhage](#) Chief Executive Officer [John H Wheeler](#). "We anticipate a substantial increase in sensitivity using this technology, resulting in almost absolute identification of a bacterial pathogen in less than three hours."

"We are excited about this technology and the work being done by [Dr Voorhees](#) at the [Colorado] School of Mines," said [Barbara Kyser](#), [Grants Program Coordinator at Turner Biosystems](#)."

The technology as applied here looks at small sections of DNA from bacteriophage that are amplified after infecting the presumably present bacteria. The DNA sections are unique to the bacteriophage and are used as a specific marker for the pathogen. The fluorometer detects the presence of what is known as a molecular beacon, a small section of DNA complementary to the section in the bacteriophage that fluoresces, or gives off light, when both sections bind to each other. The handheld fluorometer and the [MicroPhage](#) approach allow for a simple sample collection and rapid identification in the field, at a much greater advantage over the traditional method of collecting a sample, sending it to a laboratory, and running tests there, then waiting for results.

About the Colorado School of Mines.

The CSM Department of Chemistry and Geochemistry, under the direction of [Professor Kent J. Voorhees, Ph.D.](#), first described the use of bacteriophages (viruses that infect ONLY bacteria) for the rapid identification of bacteria by Matrix-Assisted Laser Desorption / Ionization, Time of Flight Mass Spectrometry (MALDI-TOF-MS). The Department (and CSM) has exclusively licensed the technology to [MicroPhage, Inc.](#) for commercialization. The University retains an equity position in the company, in addition to securing royalty payments.

About Turner Biosystems.

The Turner BioSystems (Sunnyvale, CA) is in place to help scientists learn about, evaluate, and use fluorometers and luminometers. They specialize in the life science applications of fluorescence and luminescence, especially the measurement of genetic reporters, ATP, and nucleic acids. The company focuses on making sensitive, reliable, and easy-to-use fluorometers and luminometers and on providing responsive technical service. The company has established its grant program to create goodwill in the community and cause these kinds of programs to be established by other companies and to do a better job serving our customers through the knowledge and the contacts we establish as they pursue this program. In

2004 it plans to grant 4 PicoFluor fluorometers, of which this is one award.

About Biological Warfare Agents.

Since the attacks of Fall 2001, a number of federal government agencies have prioritized the risk of biological warfare agents (BWAs) based on risk of use and potential level of harm. On these lists are more than fifty agents, many of which are more classically described as agricultural or animal pathogens, but in the wrong hands can pose a serious risk to the American public. These lists are composed of bacteria, viruses, protozoa, and toxins. Bacteria compose half of these lists and include (among others) *Bacillus anthracis* (Anthrax), *Clostridium botulinum* (Botulism), and *Yersinia pestis* (Plague). The Colorado School of Mines works on avirulent (strains of bacteria that pose no harm to humans) strains and is licensed with the Centers for Disease Control and Prevention (CDC) and the US Armed Forces Institute of Pathology (AFIP) for this work.

February 16, 2004: On the Move (Rocky Mountain News Bytes)

MicroPhage, Inc., a Colorado company developing high-speed bacteria-detection technologies, hired Breanna Smith as a Research Technician.

January 26, 2004: People on the Move (The Denver Post)

MicroPhage, Inc. appointed Scott Gaisford, Larry Gold, Stephen K. Onody, John H. Wheeler, and Kent J. Voorhees to its Board of Directors recently.

January 23, 2004: On the Move (Rocky Mountain News)

MicroPhage, inc. a high-speed bacteria detection technologies developer hired Ken R. Hance as production manager.

2003

December 17, 2003: MicroPhage, Inc. Announces Its Board of Directors

(Press Release)

GOLDEN, CO, December 16, 2003 – MicroPhage, Inc., a Colorado company developing high-speed bacteria detection technologies, proudly announces its newly appointed Board of Directors, made up of prominent local science and business leaders in Colorado. The Board is comprised of six members. The members are (alphabetically): Scott Gaisford, Dr. Larry Gold, Stephen K. Onody, Dr. Kent J. Voorhees, John H. Wheeler (Chairman), and a representative of the Colorado School of Mines (to be named).

"Each of these individuals brings a wealth of talent and diverse experience to our Board of Directors," said MicroPhage President and CEO, John H. Wheeler. "We wanted to be sure that the board overseeing MicroPhage's future was well-rounded and had a broad perspective. Creating the right board is critical to the company's future, and I am confident that with these individuals we have."

September 18, 2003: Local Company Wins State Honor (Katie Niekerk, Golden Transcript)

Golden-based MicroPhage Inc. recently won a regional competition recognizing the best technology business innovations in the Rocky Mountain area.

MicroPhage, based at the Colorado School of Mines, develops high-speed bacteria detection technologies that can potentially be utilized in commercial markets such as food and water safety. The technologies can also be used for clinical purposes to evaluate infectious agents in humans and animals.

MicroPhage is the first company to emerge from CSM's Technology Transfer Office, which helps promote the commercialization of promising technology.

The competition, called "The Next Great Idea: TIE-Rockies Search for Tomorrow's Technology Business" is sponsored by TIE-Rockies of Colorado. A panel of national judges, chaired by Secretary of technology for the State of Colorado John Hansen, selected MicroPhage over two other Colorado companies.

Each company gave a 15-minute live presentation at the Pepsi Center [Denver] in front of the panel and more than 120 Colorado business leaders. At the end of the event, Secretary Hansen named MicroPhage the winner.

"This is a great honor and validation of MicroPhage's vision," said MicroPhage's president, John H. Wheeler in a press statement. "The competition and the great companies identified demonstrate the wealth of business ideas and entrepreneurial spirit in Colorado. We are very pleased to serve as the inaugural winner of the TIE-Rockies competition."

September 17, 2003: New Colorado Biotechnology Firm Wins Region-Wide Competition (TiE-Rockies Press Release)

DENVER, CO, SEPTEMBER 17, 2003 – MicroPhage, Inc., a Golden-based company developing high-speed bacteria detection technologies, has been named the winner of “The Next Great Idea: TiE-Rockies’ Search for Tomorrow’s Technology Business,” an region-wide competition to identify and help develop the best new technology business concepts in the Rocky Mountains.

MicroPhage was selected by a panel of prominent national venture capitalist firms at an event at the Pepsi Center in downtown Denver Tuesday night chaired by John Hansen, Secretary of Technology for the State of Colorado and attended by over 120 business leaders from around the state. MicroPhage edged out two other Colorado companies after each company presented its business plan in a 15-minute presentation live to the panel and the audience. Secretary Hansen announced the winner at the conclusion of the event.

“We are very proud to have MicroPhage as the inaugural winner of the Next Great Idea Competition,” said Vipanaj Patel, president of TiE-Rockies. “The purpose of the competition was to identify and celebrate the great entrepreneurial efforts in Colorado and the quality of the finalists reflects that.”

MicroPhage, based in Golden CO at the Colorado School of Mines, develops high-speed bacteria detection technologies that it plans to commercialize in markets including food safety, environment contamination, water safety, evaluation of infectious agents in humans and animals, industrial pathogens, biological warfare threat agents, and other clinical applications. The company is the first out of the School of Mines Technology Transfer Office, which was established to help commercialize promising technology.

“This is a great honor and a validation of MicroPhage’s vision,” said John H. Wheeler, CEO of MicroPhage. “The competition and the great companies it identified demonstrate the wealth of business ideas and entrepreneurial spirit in Colorado. We are very pleased to serve as the inaugural winner of the TiE-Rockies’ competition.”

The other finalists in the competition were EncrypT Corporation, an Arvada-based company developing security infrastructure branded as “TrustedView” that allows corporations to control and manage access to and distribution of sensitive information; and StorePerform Technologies, Inc., a Denver company developing and marketing Intranet-based business intelligence software for retail operations.

The panel of venture capitalists included Basil Horangic, partner at Austin Ventures, Madhu Tadikonda, senior associate at Battery Ventures, and Ralph E. (Chris) Christoffersen, partner at Morgenthaler Ventures. Collectively, their firms manage over \$6.4 billion in assets and have funded some of the technology industry’s most successful ventures, including Akamai, NextTel and Vignette, among others. John J. Hansen, Secretary of Technology for the State of Colorado, served as an honorary judge, chaired the Next Great Idea competition.

About MicroPhage, Inc.

MicroPhage, Inc has been granted an exclusive worldwide license to proprietary and patented high-speed bacteria detection technologies for commercialization in worldwide markets. Pathogens that will be addressed with the Company’s technology include: *Bacillus anthracis* (Anthrax), *Yersinia pestis* (Plague), *Escherichia coli*, *Listeria monocytogenes*, *Mycobacterium tuberculosis*, and *Group B Strep*.

The technology, developed under Professor Kent J Voorhees at the Colorado School of Mines in Golden Colorado, permits the development of rapid, easy-to-use and low cost hand-held sample collection. This bacteria testing technology involves the multiplication of a specific component of the cell to effect production of a pathogen specific protein marker, and detection of that protein marker. This technology is more sensitive, more rapid, less costly, less laboratory-dependent, and retains high specificity to the species and/or strain level compared with detection and identification technology currently in the market.

About TiE-Rockies

TiE, a not-for-profit global network of entrepreneurs and professionals, was founded in 1992 in Silicon Valley, California. Although its birth name, The Indus Entrepreneurs, signifies the ethnic South Asian or Indian roots of the founders, TiE stands for Talent, Ideas and Enterprise. It is an open and inclusive organization that has rapidly grown to more than forty chapters in nine countries.

In July 2000, a group of successful entrepreneurs sculpted TiE-Rockies into a functional organization. Through their leadership and experience with entrepreneurship in the technology, the founders facilitated interaction among entrepreneurs; based on genuine mentorship, self-empowerment & active participation. The TiE-Rockies chapter has established an unrivaled track record of bringing some of the most successful entrepreneurs in the world to Colorado.

June 10, 2003: Businesses to Present Plans at Capital Meeting (Business Briefs, Rocky Mountain News)

Rockies Venture Club announced that eight companies seeking capital will present their business plans to a panel of leading venture capitalists and angel investors during the 15th annual Colorado Capital Conference on Thursday at the Marriott City Center.

The companies include Accera Inc., AirCover Network Solutions Inc., Colorado Altitude Training, Diabetech, The ManiaTV! Network, MicroPhage Inc., Uzed.com and WellDog Inc.

June 2, 2003: From Lab to Marketplace-Colorado School of Mines Helps Turn Ideas into Businesses (Jennifer Beauprez, Denver Post)

DENVER, CO, June 2, 2003 -- A Colorado School of Mines professor has developed a test that can identify anthrax cases in

just hours versus days and pinpoint E.coli in meat, salmonella in chicken and tuberculosis cases in Third World countries.

Professor Kent Voorhees has developed a faster way to detect dangerous pathogens. A Colorado School of Mines program is helping him transform his research into a commercial product. But as the first Mines faculty member in 26 years to take his research idea and turn it into a business, professor Kent Voorhees himself is being tested. Voorhees is the first graduate of Mines' nascent technology transfer program, which supports researchers' efforts to parlay heady concepts into solid business plans. The Golden school has licensed research to companies outside of Colorado. But in its history, 185 faculty members produced just 20 patents, and until now, none of those ideas spun off into a new Colorado business.

Voorhees' company, MicroPhage Inc., promises to create 100 local manufacturing jobs and change how the world detects dangerous pathogens before they spread or kill people. But the company first must get \$1 million from investors and await the results of outside studies by academics at top universities who could lend credibility to Voorhees' idea. He touts a method of introducing viruses in test tubes to various samples of bacteria. And instead of waiting hours or days for plaques to form - as with existing tests - MicroPhage's test will identify proteins in the virus. That difference could shorten the time it takes to identify bacteria to as little as 20 minutes. MicroPhage plans to sell \$25 test kits to food suppliers and environmental and biomedical laboratories. The gear those industries now use to test costs closer to \$125,000.

"There's enormous potential for this technology," said MicroPhage chief executive Jack Wheeler. "Quite honestly, there is a gold mine at the School of Mines that hasn't been accessed."

That is starting to change, thanks to Rahmat Shoureshi, a professor of engineering. After discovering two years ago that there was no support, no network and no defined legal documents to license his own research for a startup, Shoureshi agreed to become the one-man technology transfer office for the university. "We want to show the community the impact of research - the economic impact," said Shoureshi, who created a device to remotely identify and repair problems in telephone networks.

The initiative taken by Shoureshi and Voorhees delights Gov. Bill Owens' incoming secretary of technology, John Hansen. He has been working with Colorado's universities to boost technology transfer - or turn research into commercial products. Hansen said recruiting new companies to the state isn't enough to help Colorado's tech economy rebound. "The real spark of innovation comes from universities," Hansen said. "It creates an environment of startups and smart people coming in. These companies grow up to become big companies." To help faculty, Shoureshi created a board made up of other professors who review technologies for licensing and another committee made up of government officials, former CEOs and investors who can give advice and help.

Voorhees has been the School of Mines' guinea pig. He and partner Wheeler spent a year drawing up legal documents to transfer the technology and give a stake in the business to the School of Mines. In exchange for the school's ownership, MicroPhage will get access for a year to Voorhees' university laboratory stocked with \$2 million worth of equipment. "We are the first and we have gone through a lot of pain that future people probably will not," Voorhees said. "It's an exciting experience." So is the promise of Voorhees' technology.

In 2001, a Florida photographer died 3 days after he inhaled anthrax spores. It took two days to diagnose him with the illness. Voorhees' test could have identified that case in less than an hour, and the man could have been given antibiotics earlier, increasing his chances for survival.

Similarly, it now takes as long as a day to identify E.coli in ground beef - enough time for the contaminated meat to ship across the country. Voorhees said his test takes less than an hour. And tests to identify cholera and tuberculosis in developing nations can also take days; increasing the likelihood that the infected people may not be found once the results come in. Voorhees said his test, in addition to taking less time, would be as simple to administer as a home pregnancy kit. It wouldn't require costly laboratories or experienced workers.

Yet one expert cautioned that fast isn't always best. "I don't know of any laboratory test that is foolproof," said Burton Wilcke, a biomedical technology professor at the University of Vermont. Wilcke said companies using the test must make sure it is conducted by experienced people. Even the simplest things can change the results, such as holding the agents too long or at the wrong temperatures. A person who is colorblind might misread test results. "In this kind of setup, one cannot afford to have false negatives or false positives," he said.

Voorhees said MicroPhage would provide training to ensure accuracy. "We're keenly aware of the problem," he said.

How well Voorhees' company overcomes these challenges will be watched by a line of new companies poised to fledge from the School of Mines. One firm, Metafluidics, has developed microscopic pumps and valves that will deliver drugs and analyze blood inside a patient's body. The pumps are controlled by laser beams. Another firm is working to create a shoe insole for people with diabetes. The insole would create artificial stimulation to prevent ulcers that in some cases can lead to foot amputation.

May 7, 2003: Mines Leases Technology to Detect Pathogens

(Sabrina Henderson, Golden Transcript)

The Colorado School of Mines is leasing technology that provides a rapid, sensitive and accurate method of detecting pathogens associated with diseases such as anthrax and plague.

Mines signed the licensing deal with MicroPhage, Inc., a new Colorado company, on May 1. The partnership is expected to commercialize the technology, which was developed in the school's Department of Chemistry and Geology.

Drs. Angelo Madonna and Kent J. Voorhees invented technology that allows for identification of microorganisms in such applications as bioterrorism incidents, environmental monitoring, food safety, and emergency epidemics.

Voorhees has spent 18 years researching devices that can rapidly identify substances of both biological and chemical origin. He and his research team have worked on several military detectors, including the chemical and biological mass spectrometer (CBMS) Blocks I and II. The Coalition Forces in Operation Iraqi Freedom have employed the Block I instrument to protect troops and bases.

Voorhees explained that the technology was developed as part of Madonna's doctoral thesis. It makes possible to analyze very low concentrations of bacteria. Traditionally, samples are collected and then cultured in the laboratory for periods often exceeding 24 hours. Mines' methodology requires no culturing.

"Samples containing bacteria at concentrations too low to be detected are infected with a bacteriophage (bacterial virus) and allowed to incubate for a few minutes. During this time, the bacteriophage multiplies to a level where proteins associated with the phage are detectable by mass spectrometry," Voorhees said. "Because of the specificity of bacteriophages, detectable levels of bacteriophage proteins indicate the presence of a target bacterium. The goal of MicroPhage is to develop this technology to the point where less than 100 bacterial cells can be detected."

MicroPhage was recently founded to further develop, manufacture and market the detection and diagnostic applications of the technology licensed by the Colorado School of Mines. In return, Mines has received partial ownership of the company and will receive royalties on sales that result from the technology.

MicroPhage holds full worldwide rights for two pending patents and the right of first refusal for all additional intellectual property developed in Voorhees' laboratory. Mines will have access to technological improvements developed at MicroPhage for future research. Jack Wheeler, president and CEO of MicroPhage, believes the partnership with Mines offers great potential.

"The strong relationship that has been established between the School of Mines and MicroPhage represents an ideal model between one of our country's strongest engineering and applied science institutions and a new Colorado biotech start-up company," he said. "This further reinforces the governor's strategic initiative to develop biotechnology in the state of Colorado."

The new Mines Office of Technology Transfer, directed by Rahmat Shoureshi, seeks to expand the economic impact of CSM research outcomes and to facilitate the commercialization of ideas created by faculty, students and staff.

May 1, 2003: Mines Announces First Office of Technology Transfer Initiative: Technology Licensed to MicroPhage Inc.

GOLDEN, Colo.-- Intellectual property offering a novel, innovative and powerful approach to pathogen detection has been licensed by The Colorado School of Mines to MicroPhage Inc., an early-stage Colorado company. This platform technology provides a rapid, sensitive and accurate method for the detection of agents associated with diseases such as anthrax and plague. The Colorado School of Mines has partnered with MicroPhage, Inc. to commercialize the technology developed in the Department of Chemistry and Geochemistry.

Drs. Angelo Madonna and **Kent J. Voorhees** invented the technology that allows for identification of microorganisms in such applications as bioterrorism incidents, environmental monitoring, food safety, and emergency epidemics. Voorhees has spent 18 years researching devices that can rapidly identify substances of both biological and chemical origin. He and his research team have worked on several military detectors including the chemical and biological mass spectrometer (CBMS) Block I and II. The Coalition Forces in Operation Iraqi Freedom have employed the CBMS Block I instrument to protect troops and bases.

According to Voorhees, "The technology developed as part of Madonna's Ph.D. thesis offers an exciting new approach to the analysis of bacteria at very low concentrations. Traditionally, samples are collected and then cultured in the laboratory for periods often exceeding 24 hours. The CSM methodology requires no culturing. Samples containing bacteria at concentrations too low to be detected are infected with a bacteriophage (bacterial virus) and allowed to incubate for a few minutes. During this time, the bacteriophage multiplies to a level where proteins associated with the phage are detectable by mass spectrometry. Because of the specificity of bacteriophages, detectable levels of bacteriophage proteins indicate the presence of a target bacterium. The goal of MicroPhage is to develop this technology to the point where less than 100 bacterial cells can be detected. MicroPhage was recently founded to further develop, manufacture and market the detection and diagnostic applications of the technology licensed by the Colorado School of Mines. In return, CSM has received a percentage ownership of the company and will receive royalties on sales that result from the technology. MicroPhage holds full worldwide rights for two pending patents and the right of first refusal for all additional intellectual property developed in Dr. Voorhees' laboratory. CSM will have access to technological improvements developed at MicroPhage for future research.

Jack Wheeler, president and CEO of MicroPhage, believes the partnership with CSM offers great potential. "The strong relationship that has been established between the School of Mines and MicroPhage represents an ideal model between one of our country's strongest engineering and applied science institutions and a new Colorado biotech start-up company. This further reinforces the Governor's strategic initiative to develop biotechnology in the state of Colorado," he said.

The new CSM Office of Technology Transfer, directed by Dr. Rahmat Shoureshi, seeks to expand the economic impact of CSM research outcomes and to facilitate the commercialization of ideas created by faculty, students and staff.

March 28, 2003: Biotech Industry May Help in Twarting Bio-Terrorism (Amy Fletcher, Denver Business Journal)

Colorado universities and biotech companies could be on the front lines of a billion-dollar effort to protect the nation against bioterrorism. Some already have received federal funding since the Sept. 11, 2001, terrorist attacks, and others are hoping to win thousands, and in some cases millions, in new grants.

Gregory Milman, a director at the National Institute of Allergy and Infectious Diseases, was in Denver March 26 to tell them how. The institute is part of the National Institutes of Health, which under President Bush's budget proposal, would receive \$1.6 billion for biodefense efforts in fiscal year 2004. It is only the second year that funds have been earmarked for

biodefense, which includes everything from basic biology research to the development of new vaccines, treatments and diagnostic devices. "There really wasn't biodefense research until 2003. That was ... when people became concerned about it." Milman said. "Prior to that, we had research in emerging diseases." NIAID conducts and supports research of infectious diseases and the immune system, with an emphasis on such emerging and re-emerging diseases as HIV/ AIDS. The institute says studying the organisms that might be used as bioterror agents and those in emerging diseases require similar resources and expertise.

In fiscal year 2003, the president's budget allocated about \$4 billion for NIAID, with about one-third going to each of the following: AIDS, biodefense and non-AIDS, nonbiodefense research. "The biotech community is very interested," said Denise Brown, executive director of the Colorado Biotechnology Association. "Biotech companies right now are looking at every and all opportunities for funding." NIAID is interested in a range of biodefense research, from basic information about how bacteria cause certain diseases to the development of vaccines and drugs for prevention and treatment. "Our goal is the basic research, diagnostic research, research on vaccinations, treatments and clinical resources," Milman said. "We have various mechanisms to support that."

From small businesses to universities, there is a range of grants available. The institute is particularly interested in research related to anthrax, botulism, plague, smallpox, tularemia and Ebola. These agents have been targeted partly because they are difficult to diagnose early, could result in mass casualties and require better devices for detection and diagnosis. Mortality rates vary from more than 30 percent for smallpox to 100 percent for one form of anthrax. Medical researchers at Colorado State University and University of Colorado have collaborated to land in Fort Collins one of 10 biodefense research facilities the federal government plans to fund. The 874-page application was submitted in February, and the groups — which also include Denver Health, The Children's Hospital and Utah State University — should hear back in May. The groups requested \$60 million for new facilities, research and training. "It's an enormous effort and one that many of us in public health are pleased with," said CSU professor Barry Beatty, who spearheaded the effort. "There has been a loss of personnel in these fields and a lack of research. ... One just prays that there will never be a purposeful release of these things."

Several Colorado companies are conducting research or have developed technology that could be used for biodefense.

RxKinetix Inc. of Louisville announced in September it received a \$224,500 grant from NIAID to develop a delivery system for the anthrax vaccine. "This project is an extension of our ongoing vaccine research," former RxKinetix CEO John Lucas said in a press release. "It will help us to seek a tool against anthrax and to develop other company projects in which the goal is to improve immune responses." RxKinetix was formed in 1996 to develop products based on technology licensed by the University of Colorado. The company, which has 23 employees, develops products to improve the performance of existing drugs and also develops new treatments. Its lead product, which is still in clinical trials, is an oral rinse for the prevention and treatment of oral lesions, a common side effect of chemotherapy.

MicroPhage Inc. in Golden is a new company looking to market and manufacture products based on research by Colorado School of Mines professor Kent Voorhees, who has done work for the U.S. Department of Defense for more than 10 years. The company focuses on the detection of biological agents, including anthrax. MicroPhage plans to apply for three biodefense grants, President Jack Wheeler said.

Denver-based Globelmmune Inc. is also interested in the federal research funds. Globelmmune has developed a technology that could help create inexpensive vaccines for preventing and treating HIV, cancer and other diseases. At the heart of the company's research is the new application for ordinary baker's yeast in vaccine development. "We are working in a number of areas that have significant applications to biodefense," Globelmmune CEO Tim Rodell said. "We're interested, but it's not the backbone of our business plan."

March 27, 2003: Biotech Dollars Up For Grabs (Rachel Brand, Rocky Mountain News)

On the Starship Enterprise, Dr. McCoy used a handheld scanner to diagnose patients' diseases. Here on Earth, the Government would like similar gadgets to diagnose anthrax, plague, and smallpox. It's all part of President Bush's efforts to make sure domestic bioterrorism remains the stuff of science fiction.

The National Institutes of Health has received \$1.6 billion to spend on Biodefense research. And NIH representative Gregory Milman came to Colorado on Wednesday to tell local biotechnology and medical defense companies how to get their share. "In the diagnostic area, we'd actually like to invent the Star Trek tricorder," Milman said during his talk at Fitzsimmons Bioscience Park. "So you medical-device folks, get busy."

At least one Colorado biotech, MicroPhage, is well on its way to developing a kind of non-invasive test. Its product is a testing kit, much like a pregnancy test, to diagnose deadly diseases. For MicroPhage and others, Milman's office has earmarked \$100 million for basic research – enough to fund about 100 startups.

The funds are available through NIH Small Business Innovative Research grants of \$1 million to \$2 million. The money is targeted at attacking anthrax, botulism, plague, tularemia, ebola, and smallpox.

But companies developing cheap, easy-to-use diagnostics also can benefit and, in the long run, the basic research will spill over into the fight against other diseases. "We want to go from understanding how these agents work to understanding how we can stop them from causing any effect in humans," Milman said.

"It really does represent a wonderful opportunity for young companies," added Paul Ray, director of the Governor's Office of Life Sciences and Biotechnology. Unlike venture capital, the grants let founders keep 100 percent of their company ownership. They also provide a "seal of approval" on the research.

"These things can be very powerful in providing startup capital," said Brian Quinn, founder of year-old Aktiv-Dry, a local company that makes fine powders and coatings. He is hoping to receive an NIH grant, as is Jack Wheeler, head of Denver-based Microphage.

"The science is proven; it's already published," Wheeler said. He hopes to snare \$1 million from the NIH for his handheld test that detects the presence of disease causing microorganisms. Applications range from germ warfare to food poisoning. It's one example of how biodefense research could remedy other diseases.

"We're going to develop not only new antibiotics, but safer ones," Milman said. A better smallpox vaccine and a vaccine for the common cold may be on the way as firms delve into vaccines in general. A similar tidal wave of cash was thrown at AIDS ten years ago. Even though the deadly virus lives on, the research spawned new medicines for flu, herpes, and other viruses.

February 26+27, 2003: A Bridge to the Future: Colorado School of Mines techies Show Off the Future (Steven Graham, Rhythm of the West)

Can science make a home anthrax detection kit? How can hydrogen be separated from other liquids to power hydrogen cell cars? Can a concert violinist change sheet music without taking a hand off the bow? Students and professors at the Colorado School of Mines answered these questions and many more at the 2003 Technology Showcase, held on campus Feb. 22. The event was a rare chance for the public to glimpse the cutting edge technology under development at the engineering-focused school.

The most timely and high profile project is a hand-held scanner that can test for dangerous biological agents. MicroPhage Inc., a firm established at CSM, is developing the device. The firm is working with three federal government agencies to create specific scanners, and MicroPhage President Jack Wheeler expects to be building the devices in as little as nine months. The Navy is anxious to take the scanners on ships, where they could test for E. coli and other contaminants. The Army seeks a separate unit specifically designed to seek out anthrax and other bacterial warfare agents. The new Department of Homeland Security also is anxious to use a similar device to test for chemicals that could be used in a bioterrorist attack.

CSM graduate student John Oakley is working on his own detection system for more traditional health concerns, including viruses and cancers. He has developed the world's smallest tubes, which he is arranging on an ultra-thin chip to create tiny portable medical labs. He said the technology could be used to build portable home tests that use a drop of saliva or blood to quickly test for a variety of illnesses. He said it could help hospitals and medical labs run complex blood tests on a small device in hours rather than days. "Right now, the big issue is matching the technology with individual needs," said Oakley, who is receiving funding from the National Institutes of Health.

Also on the medical front, student Kim Anderson is helping develop "smart insoles" for diabetic patients. She said 15 percent of diabetics will develop foot ulcers in their lifetime, and accurately gauging temperature and other readings can alert diabetics to the risk.

A bridge to the future

Other technologies addressed less serious concerns. Undergraduate student Chris Aasted demonstrated his device that uses paper clips, a magnet and a foot lever to turn the pages of a musical score. Once the device hits the market, musicians will no longer need to take their hands off their instruments to switch pages.

Professor Tibor Rozgonyi, head of the mining engineering department, hopes to clear out landfills and strengthen bridges at the same time. He is hoping to mix used tires, which are a major environmental concern, with aggregate rock, a finite resource. The resulting composite rubberized concrete would be stronger and more able to absorb impacts. For example, he said bridge walls made with his concrete could absorb more of the impact of a car crash. He has been asked to show the idea to a concrete association meeting, and said he expects to have a product available in 18 months.

Fernando Roa is working on a tube that can cheaply separate hydrogen from hydrocarbon fuels to power cars and other applications. He is coating plastic tubing with a single-micron layer of palladium, an expensive metal that reacts with liquids to separate hydrogen. He said the device cannot be used with water because it is too corrosive, but he hopes to develop a cheap way to separate hydrogen from water. "I believe it's going to happen in the next 10 years," he said.

Finally, although not part of the fair, visitors enjoyed a glimpse at the high-powered lasers being built in a maze of basement rooms at the CSM technology center. Jeff Squier is helping build a five trillion watt laser that can virtually stop atoms for researchers to study. "No one really understands the physics of what's happening with these lasers," he admitted. To some laymen at the technology fair, the same could be said of all the projects.

February 13, 2003: Remarks of CO Governor Bill Owens (NIH Colorado Research Day)

It's not often that we get to say that we're present at a revolution. But, here in Colorado, and here at the Fitzsimons campus, that's exactly what's occurring. It's a revolution in medicine that is coupling the infinite capacity of human ingenuity with emerging technologies. It's a revolution in how we treat, and conquer, some of the most life-threatening diseases, and how we expand access to medicine into areas that are underserved. It's a revolution that is literally happening around us, here in Aurora, Colorado. It's no exaggeration to think about this campus, and the innovative private companies who have set up shop in Colorado because of it, as the home of a 21st century Thomas Edison, or Jonas Salk.

Think about the companies that have been drawn here by this economic development magnet. A company working on new drugs and treatments in the fight against cancer at Allos Therapeutics. Or new weapons against Alzheimer's disease at Accera. New devices that will revolutionize the way we receive medical care at CardioOptics. And MicroPhage is developing solutions to biological national security threats.

These are just a few. But each of these companies is producing real results. Which is why a recent media analysis pointed out, and I quote, that "Colorado is joining the top-tier of biotech savvy states."

Here in Colorado, we have over 200 biotech companies that employ 17,000 people. Colorado's biotech industry may be relatively young. But this industry is growing at break-neck speed. And showing very positive signs of life. In just the last four years, the number of Colorado biotech companies has grown 35 percent, outdistancing the national average of 29 percent.

In part, companies relocating to our state have fueled this growth, because they know of our commitment to creating a fertile climate for tech companies to grow. I'm proud of that. We welcome senior leaders here today from Amgen, Eli Lilly, IBM and Pfizer, who have located important facilities here in Colorado. And I thank you for that commitment to our state. We welcomed Ribozyme Pharmaceuticals, which relocated to Colorado from Cleveland. And, more recently, California-headquartered FeRx chose to place its entire R&D operations here at Fitzsimons.

And we expect that this is the leading edge of strong biotech development in Colorado. When Fitzsimons is completed, over 60,000 direct and indirect jobs will be created. At completion, the Fitzsimons project will also contribute about \$94 million annually in tax benefits to the state. So, obviously, the faster we build out this facility, the faster those benefits accrue to all of us. These companies have chosen Colorado and Fitzsimons for good reason. Colorado is emerging as America's newest technology hub. And Fitzsimons is just one more reason that Colorado is quickly becoming the envy of the technological community. This square mile research park is the first of its kind west of the Mississippi.

Biotech hubs are renowned for their first-rate academic and research institutions. Here in Colorado we have both. The CU system coupled with Fitzsimons is our competitive advantage. And don't just take my word for it. According to the U.S. News and World Report annual ranking of graduate schools, the University of Colorado Health Sciences Center consistently ranks among the best in the country. Best in the country for their programs in primary care, research and family medicine.

But the work does not end there. To develop Colorado as a biotech hub, steps are being taken today to ensure that growth continues well past tomorrow. After all, estimates show that it takes 10 to 20 years for a biotech industry to fully mature. Therefore, we are taking an inventory of our state resources and building a plan for the future.

We're already receiving some very interesting news. Each year Colorado's research institutions receive over \$300 million for research in the life sciences. That is half of the research funds that come to Colorado's institutions. And most of that money is provided by the National Institutes of Health. The NIH is the funding source for many important discoveries in biology and medicine- both in Colorado and the nation. We're very grateful to Dr. Zerhouni and his entire team at NIH for their commitment to Colorado.

It's the intersection of dynamic private companies, a state embracing the future and a world-class research university that makes Colorado a model for the nation. And I am so proud that Doctor Zerhouni is here today to see this facility. We all look forward to the completion of the Fitzsimons campus and the fulfillment of Colorado's biotechnology potential.

We're already well positioned. With 98 high-tech workers per 1,000, for the third year in a row Colorado has the highest concentration of high-tech employment in the nation. And these are solid, family-sustaining jobs. In 2000, the average wage

for biotech workers was almost double that of the private sector. These are the kinds of opportunities we want to increase for Coloradoans. Couple that with the fact that our business climate is rated among the very top by national surveys, and has been for four years in a row. We have business-friendly tax policies. We have a tradition of entrepreneurship. We have the best quality of life anywhere.

Now, we have the newest and most exciting health sciences center. A place to realize the promise of biomedical science and apply new discoveries to improving the health and the longevity of men and women here in Colorado and around the world.

And now I have the privilege of introducing a man at the forefront of this exciting industry, Dr. Elias Zerhouni, the Director of the National Institutes of Health. Please join me in giving a warm Colorado welcome to Dr. Zerhouni.
