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ANCHORAGE ANKARA ATHENS AUCKLAND BAGHDAD BANGKOK
BEIJING BOLOGNA BARCELONA BELFAST BUCHAREST BRUSSELS
BUDAPEST BEIRUT BELGRADE BERLIN BERN BOGOTA
BOSTON BRISBANE BRUNEI CAPE TOWN COPENHAGEN
DALLAS DARWIN DENVER FARGO FLORENCE GIZA
HALIFAX HAVANA HONG KONG JERUSALEM JAKARTA
KARATCHI KIEV LA PAZ LIMA LONDON
LOS ANGELES MONTREAL MOSCOW
NAIROBI
NEW YORK
PANAMA
PHOENIX QUEBEC CITY REGINA
RIO DE JANEIRO RIYADH ROME SAN DIEGO SAN FRANCISCO SARAJEVO
SASKATOON SEATTLE SEOUL SPOKANE ST PAUL ST PETERSBURG
TAMPA TEL AVIV TEHRAN THUNDER BAY TOKYO
TORONTO TULSA TUNIS VANCOUVER VENICE VICTORIA
VIENNA WARSAW WASHINGTON WHITEHORSE WINNIPEG
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ANKARA ATHENS AUCKLAND BAGHDAD BANGKOK BEIJING
BOLOGNA BARCELONA BELFAST BUCHAREST BRUSSELS BUDAPEST
BEIRUT BELGRADE BERLIN BOGOTA BOSTON
BRISBANE BRUNEI CAPE TOWN CHICAGO COPENHAGEN DALLAS
DARWIN DENVER DUBLIN FLORENCE GIZA
HALIFAX HAVANA HOUSTON HONG KONG JERUSALEM JAKARTA
KARATCHI KIEV KUWAIT LAGOS LA PAZ LIMA LONDON
LOS ANGELES MADRID MEMPHIS MEXICO MONTREAL MOSCOW
NAIROBI NASSAU NEW DELHI NEW ORLEANS NORTH BAY
NEW YORK ODESSA OSAKA OSLO OTTAWA PANAMA PARIS
PHOENIX PITTSBURGH PRAGUE QATAR QUEBEC CITY
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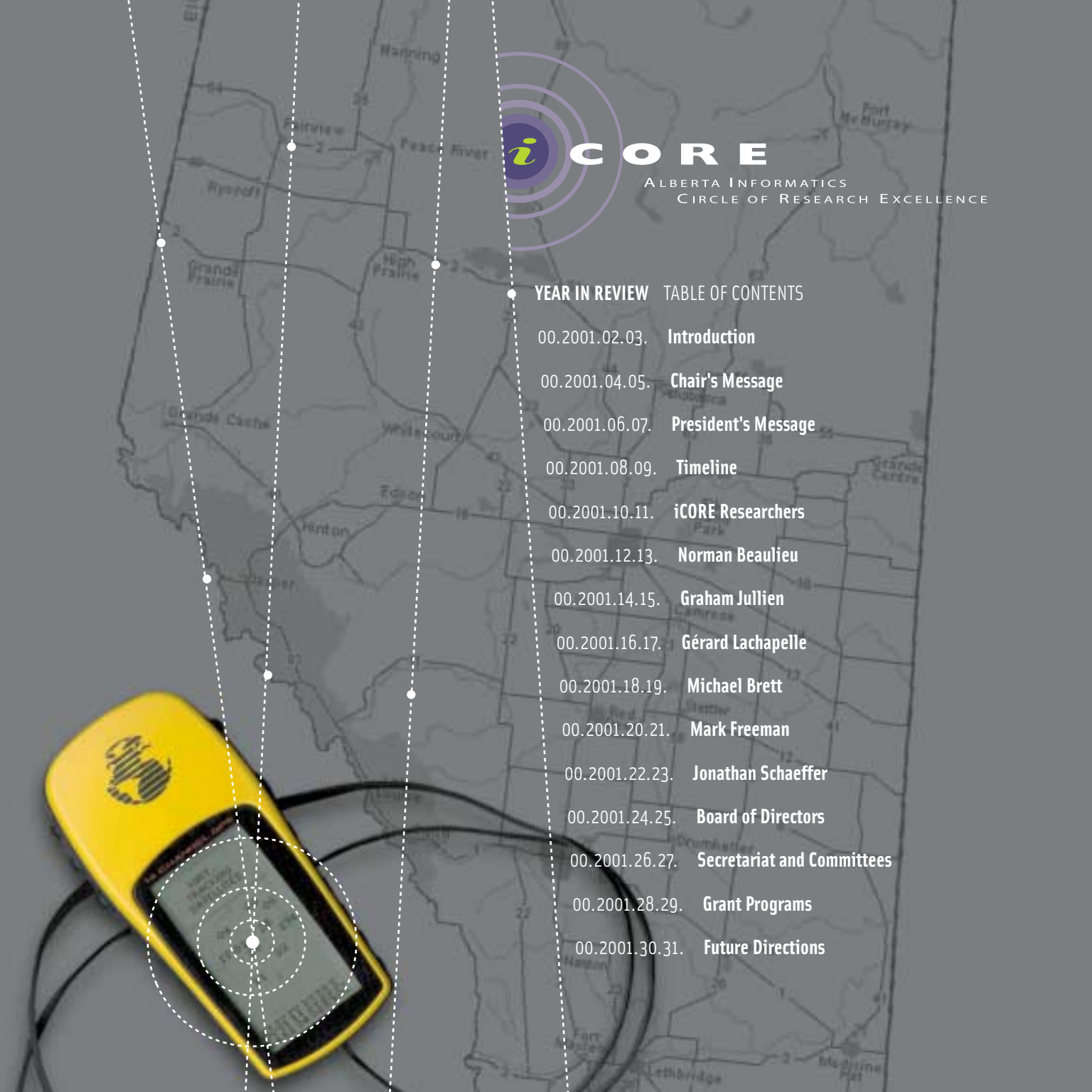
SARAJEVO SINGAPORE SAN SALVADORE STOCKHOLM TAHITI
TEHRAN TOKYO TRIPOLI VANCOUVER VIENNA WELLINGTON

iCORE Year in Review

YEAR 2000 - 2001

ALBERTA, CANADA


YOU ARE
HERE



iCORE
Alberta Informatics Circle of Research Excellence

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iCORE:

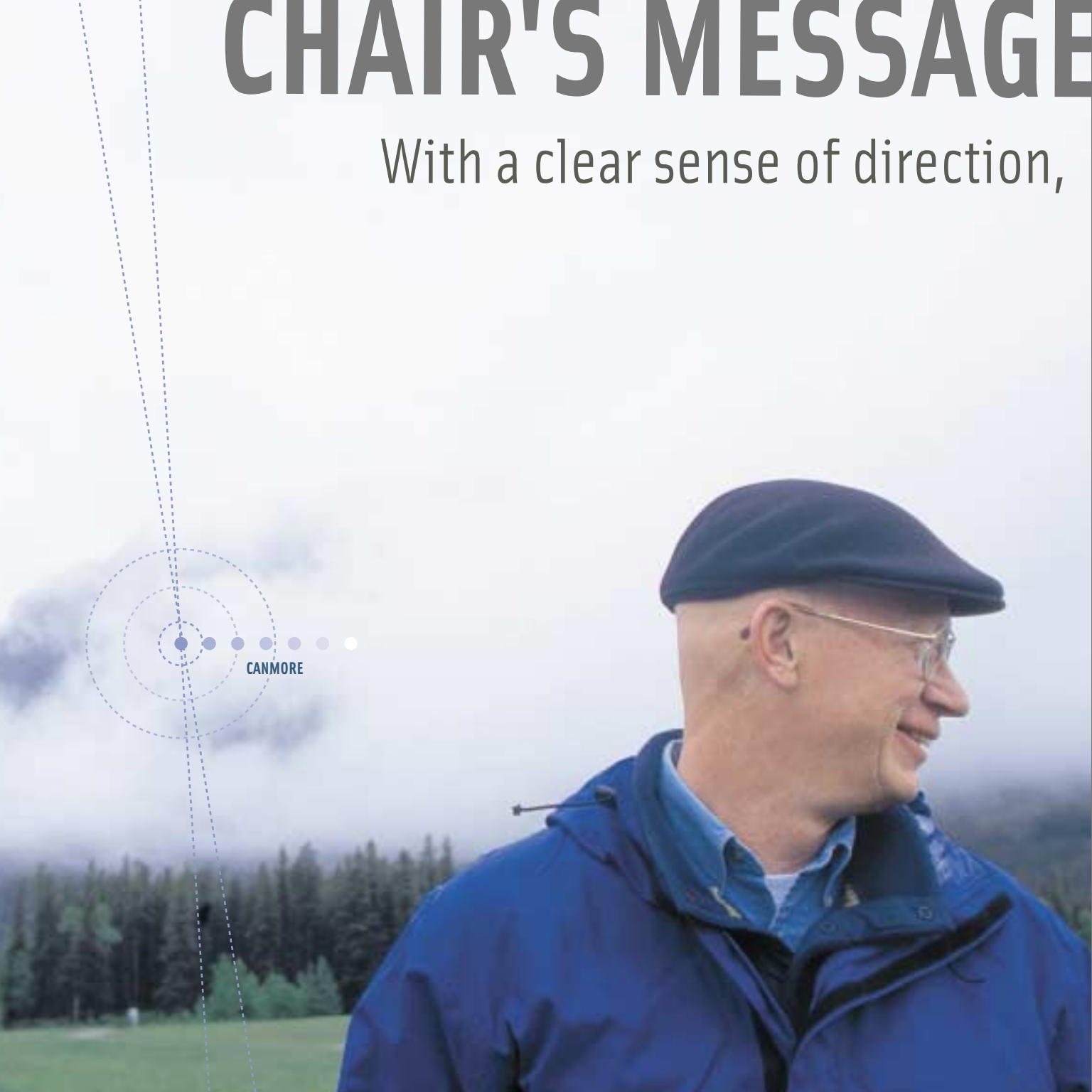
Positioning Alberta as an ideal place for ICT research is a long-term project. Fueled by its initial success of attracting top researchers, iCORE is evolving a strategic direction to increase the scope and strength of ICT research in Alberta. It will propel the development of well-rooted and visionary research clusters, ensuring a globally recognized ICT sector in the province.

GLOBALLY POSITIONING ALBERTA AT THE TOP

00.2001.02.03.

CHAIR'S MESSAGE

With a clear sense of direction,



we are investing in the potential of people

The ICT industry is a little like hockey – you need to skate to where the puck will be, not where it is. Wayne Gretzky's strategy summarizes the iCORE vision. We are focusing on where the ICT industry is going, not where it is right now.

We are fortunate to have a strong and committed team to support our efforts along the way. Our board of directors includes visionaries such as Dr Jim Gosling, VP and Fellow, Sun Microsystems; Dr David Jefferson, Senior Scientist, Compaq; Dr William Pulleyblank, Director, IBM Deep Computing Institute; and Nobel Laureate Dr Richard Taylor, Physicist, Stanford University. In addition, iCORE has recruited half a dozen acknowledged research leaders in areas including network and wireless communications, nanotechnology and software development.

iCORE's impact is being felt in academic circles across the country. Alberta is creating an attractive research environment with committed funding and support from the provincial government. We have sharply increased undergraduate and graduate enrolments and are building great strength in ICT-related disciplines.

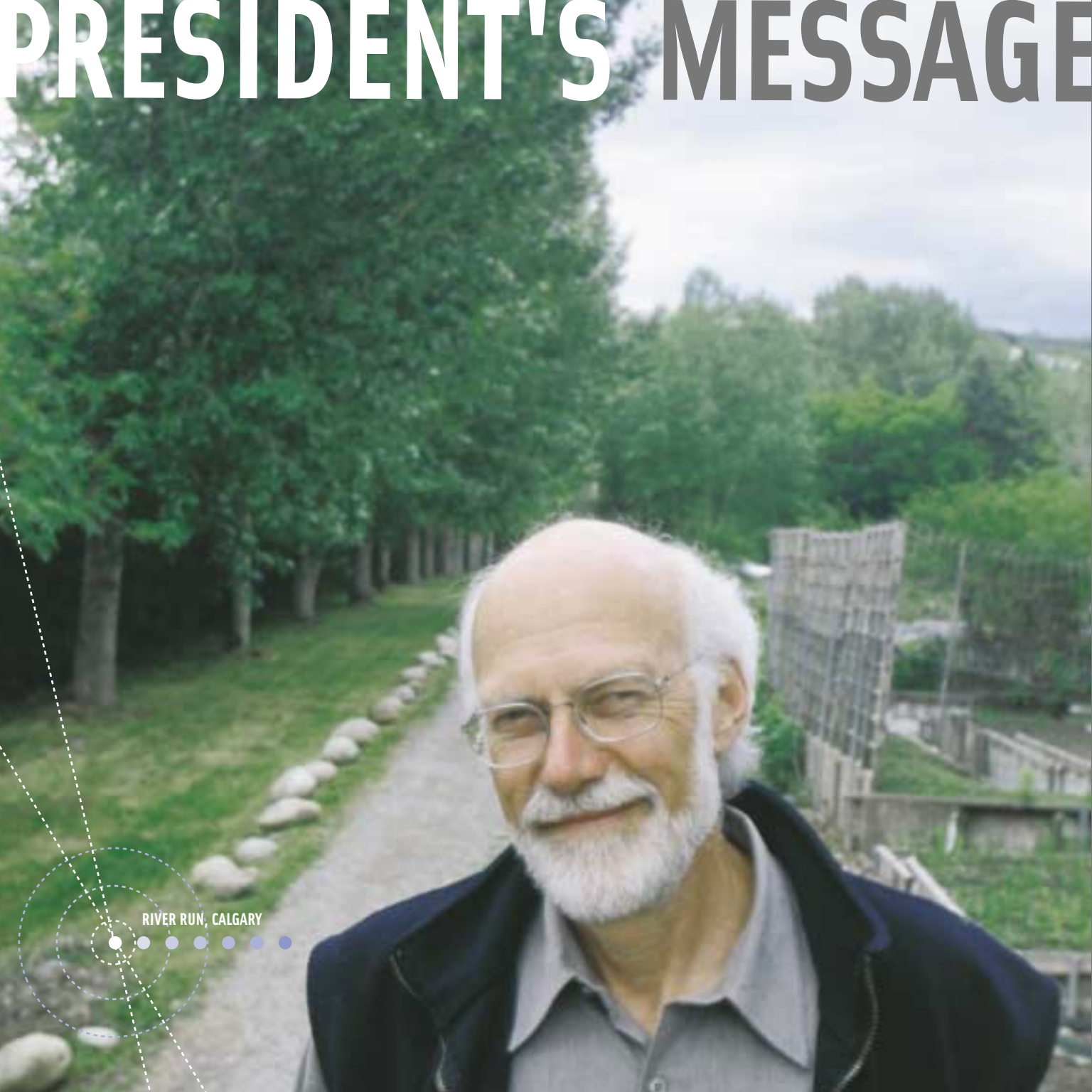
When you recruit truly outstanding individuals, they in turn attract other top faculty members, graduate students and undergraduates from across Canada and worldwide. The momentum continues to build as industry recognizes that it has access to some of the brightest minds in the ICT sector. As we move forward, iCORE is becoming a key leading component in the development of Alberta's knowledge-based sector, and in the overall diversification of the economy. Eventually, we may well see a Nobel Prize winner emerging from our efforts, a feat we believe is entirely possible.

iCORE's challenge over the next few years is threefold: to successfully attract research leaders from outside of Canada as well as from within, to build more industry relationships for commercialization of technological breakthroughs, and to establish greater linkages with federal government programs. There is no magic bullet for success. It will take a concerted effort and hard work to achieve our goals.

We have a lot to offer in Alberta. We have a quality of life that is second to none, and a commitment from the provincial government to provide the continuing support necessary for success. This province is an exciting place to be, and iCORE is contributing to building the excitement.

Roger Smith
Chair, iCORE Board of Directors
Vice-President (Research and External Affairs), University of Alberta

PRESIDENT'S MESSAGE



RIVER RUN, CALGARY

Locate the heart of any success story, and you will find amazing people

World class research needs world class leaders, ambitious teams, bright students and excellent infrastructure. iCORE is striving – with government, industry and university support – to create this environment. Our vision has remarkable people at its core.

In the information and communications technology (ICT) industry, one brilliant idea has the power to change how the world works. iCORE's strategy for the next five years is to recruit and fund brilliant thinkers who can develop new ICT applications that make a difference, and who are living magnets for rising stars from across Canada and around the world.

Alberta's instinct for innovation is a strong draw. In its first 15 months, iCORE has exceeded expectations by funding half a dozen top tier researchers at Alberta's universities and over 60 graduate students. We are extremely proud of the caliber of these individuals – very bright people rated in the top five per cent in their fields. Even with the current market contraction, attracting them was no small feat, given a highly competitive environment where universities, private and public companies throughout North America and Europe offer competitive opportunities, salaries and budgets.

Why is iCORE successful? In simple terms, the Government of Alberta is committed to the creation of a globally competitive knowledge-based economic sector. It is somewhat ironic that Alberta, through its bountiful oil and gas fields, has been given the means to compete for the top minds in the ICT fields. Alberta also has a wealth of natural beauty and recreational opportunities adding to the appeal for researchers, graduate students and industry.

The potential benefits of this program to Alberta are numerous and substantial. When we elevate the reputations of Alberta's research universities, we in turn attract high quality junior faculty members and graduate students. Industry wants to be located close to superior academic research facilities and highly qualified students, leading to a broad range of interesting and challenging job opportunities for young people.

Looking ahead, iCORE will continue to proactively recruit within and outside Canada. We will collaborate with the federal government and the ICT industry to create research environments at our universities that will generate a wealth of success stories.

We are encouraged by our progress so far, and look forward to acting as a catalyst with government and industry, building on today's momentum, and fostering growth of a critical mass of amazing ICT researchers in Alberta.

Brian Unger
President and CEO, iCORE

00.2001.06.07.

09.1994
Alberta Science and Research Authority (ASRA) established

11.1997
ASRA creates ICT Task Force

10.1998
ASRA releases *Information and Communications Technology: A Strategy for Alberta*

03.1999
Alberta government approves budget of $10 million per year for ASRA to fund an ICT research excellence program

10.1999
iCORE (Informatics Circle of Research Excellence) announced to the public

01.2000
iCORE grant programs rolled out

TIMELINE

09.2000

First Chair appointed –
Dr Norman Beaulieu appointed
iCORE Chair of Wireless
Communications Laboratory

01.2001

Dr Graham Jullien appointed
iCORE Chair of Advanced Technology
Information Processing Systems Laboratory

Dr Gérard Lachapelle appointed
iCORE Chair of
Wireless Location Research Group

Dr Jonathan Schaeffer appointed
iCORE Chair of High Performance
Artificial Intelligence Systems Laboratory

Dr Michael Brett appointed iCORE Senior Research
Fellow of Nanoscale Engineering Physics Initiative

Dr Mark Freeman appointed
iCORE Senior Research Fellow
of Nanoscale Engineering
Physics Initiative

Alberta, Canada. One of the most compelling places in the world to undertake information and communications technology research

WE ARE

It's not easy positioning yourself in a changing world. This was the challenge the Alberta government took on when it created iCORE in 1999. The goal: to foster excellent university-based research in the ICT sector that in turn creates social, cultural and economic advantages for Albertans.

The plan is ambitious, with a mandate to attract and retain the best talent in Alberta, and from around the globe, in information and communications technology.

Despite worldwide shortages and intense global competition for top people, iCORE exceeded its goal for the first year and already has six researchers and their teams in place at Alberta universities. Three more researchers and associated teams are poised to begin in mid-2001. It's an investment in people that is already paying dividends.

Just ask the following six iCORE research leaders who call Alberta home.

HERE.

00.2001.10.11.

Norman Beaulieu

UNIVERSITY OF ALBERTA

sees a future without wires

iCORE Chair, Wireless Communications Laboratory

"What do I think of Alberta? It's better than I ever imagined it could be. The university, the caliber of the people involved in the research programs here, the quality of life. People don't think of Alberta as a hotbed of wireless research. You expect that to come from Silicon Valley or maybe Ottawa. There's the perception and there's the reality. In Alberta, the air is clean, the housing is affordable, the quality of medical services is high and the food is great. Everything is better than you imagine."

"My philosophy is that great things happen when people are committed to thinking broadly, when they have positive attitudes, and when they are willing to work together to build something that is as big and as good as it can be," says Dr Norman Beaulieu. "That's what I see happening in Alberta today." It's a visionary approach that Beaulieu shares and brings to his role as chair of iCORE's new Wireless Communications Laboratory at the University of Alberta. It also speaks volumes about Beaulieu's determination to build the province's reputation as a key player in wireless research, and move it to the forefront of the ever-changing world stage.

Beaulieu is one of the top wireless communications researchers in the world. It's a field that continues to grow exponentially. He says more and more people want diverse wireless services. "The future is portable, low power devices," says Beaulieu. "These things have to be small, easy to carry, low power, high speed. People don't like waiting to download something. It doesn't matter how fast you make it, people always want it to go faster." His goal: to develop wireless techniques that allow the highest throughput in the smallest slice of spectrum.

Beaulieu says the industry is under intense pressure to expand services and improve the quality of service to a growing user base. But to do this requires a huge pool of highly skilled people.

Thanks in part to iCORE's funding, Beaulieu is planning to accomplish this goal. iCORE is contributing $700,000 of a $1.2 million-a-year budget to grow the Wireless Communications Laboratory. The new facility allows Beaulieu and his colleagues to focus on training more scientists and engineers who will stay in the province and contribute to the growing critical mass.

"We're fortunate in this province," says Beaulieu. "We have a government astute enough to realize that the telecommunications industry isn't going away. It's here to stay. It's also wise enough to recognize that if we can make Alberta a center, we're doing very good things socially and economically for the province and the country."

Graham Jullien

UNIVERSITY OF CALGARY

is processing billions of bits

iCORE Chair, Advanced Technology Information Processing Systems Laboratory

"We're doing things with microchips we would not have even dreamed about 20 years ago. Yesterday it was the industrial revolution; today it's the information revolution. Tomorrow, who knows? We're already crowding tens of millions of devices onto pieces of silicon the size of a fingernail. Soon it will be billions. Microchips fuel the stuff of everyday life – computers, televisions, cars, microwave ovens, even medical equipment such as hearing aids. Without microelectronics, there is no web, there is no IT industry, and there is no information revolution."

According to Sir Isaac Newton, objects in motion stay in motion. That's what is happening in Alberta where iCORE has set the wheels rolling to develop a world-class research laboratory that positions Alberta as a leader in the field of microchip design. It's the kind of synergy that internationally recognized researcher Dr Graham Jullien relishes. It's an energy and attitude he embraces, and something he's carried with him from the University of Windsor to his new role as chair of iCORE's Advanced Technology Information Processing Systems Laboratory. iCORE has committed $3.7 million over five years to establish the group.

Jullien admits that until a year ago, he was in no way considering a move to Alberta. Then a colleague told him what iCORE was doing to support information and communication technology in Alberta, and his curiosity was piqued. "Frankly, I was intrigued," he says. "Here is a province lucky enough to have surplus revenue and smart enough to use it to diversify the economy. I like the idea that the government is strong enough to say, 'Hey, we're fortunate, but we're not complacent. We're making a dedicated commitment to build Alberta's high-tech sector'."

Big ideas can yield big results, with the right environment, tools, and a shared vision.

"We're pushing the envelope of chip design technology," says Jullien. Using Very Large Scale Integration (VLSI) research, his team employs a broad approach that looks at microchips from the architecture and algorithm stages, then follows them through the arithmetic systems and circuit implementation right down to the transistor level design. The goal: to develop new potential products, better ways of doing things and a deepening pool of highly qualified technical talent to do so.

Synergy is how Jullien describes what he sees. "We're building a critical mass of industry knowledge in Alberta, and that will continue to grow," he says. "We're positioning ourselves for success today and for the next generation of high-tech leaders."

Gérard Lachapelle

CITY OF CALGARY

is putting Alberta on the map

iCORE Chair, Wireless Location Research Group

"It's always fun for me to come to work at the University of Calgary. I love what I do. I'm passionate about satellite-based navigation and the potential it holds. But at the same time, it's a challenge because there's never enough time to do everything that needs to be done. The professional demands and expectations are incredible. I work hard to keep family first. It is possible. It's a question of balance."

It's also about location and navigation. At least that is how Dr Gérard Lachapelle describes the work he does with global navigation satellite systems. "We live in a geospatial world. Everything – events, people, things – occurs in relation to a certain place. Humans have known this for thousands of years. That's why we have maps. Maps to chart land, to show where water is, to help us find our way," he says. But in fact, maps aren't perfect, and many of history's most incredible disasters, like the sinking in 1588 of the seemingly invincible Spanish Armada, resulted from poor location knowledge.

Since the Second World War, our map-making ability has become much more sophisticated. Dr Lachapelle is one of the pioneers who put Calgary on the map as a world leader in GPS research. Now with iCORE's $2.5 million commitment over five years, plus a Canada Research Chair, Lachapelle has additional resources to focus on developing the next generation of location technologies and applications. "In the past two decades, we've made unimaginable strides in GPS technology. Twenty years ago, GPS equipment cost $200,000 and weighed 500 kilograms – that's the combined weight of five vastly overweight men! Today, we're talking about devices the size of your thumbnail."

Lachapelle is quick to add that the GPS industry isn't prepared to rest on its laurels. There are many new applications waiting to be discovered.

Potential applications include incorporating GPS technology into wireless technologies such as cellular telephones and PDAs (personal digital assistants). "Ironically," says Lachapelle, "while the technology and knowledge continue to grow, the complexity and challenges increase exponentially."

Meanwhile, Lachapelle is on a mission to attract high caliber people to Alberta who will contribute to the high-tech wireless industry, and to encourage big companies to set up shop here. "My job is to sell Alberta, what we can do here and what we have," he says. "And so I push and pull and try to make things happen. It is exciting, not to mention fun."

Michael Brett

knows how to engineer a team game

iCORE Senior Research Fellow, Nanoscale Engineering Physics Initiative

"Our students are our future. With iCORE's help, we're building a superb training ground at the University of Alberta for tomorrow's nanoscientists and nanoengineers. There aren't many facilities that allow students to do hands-on nanoscience work in a state-of-the-art facility. We're creating an environment where novel ideas, the latest technology and willing mentors come together. The result? We're positioning ourselves as a world leader in the very young and growing field of nanotechnology."

Dr Michael Brett is a coach – on the basketball court encouraging young players to sink a hook shot or working with University of Alberta students and colleagues. It's a job that's been made easier, at least off the court, thanks to iCORE's $2.5 million commitment to develop the Nanoscale Engineering Physics Initiative.

Nanotechnology is a relatively new science, one that's been prompted by advancements in microfabrication. "The microchip industry continues to miniaturize things at a galloping pace," says Brett. "But one can argue current microchips have nearly reached their capacity." The search is on for new paradigms that can make the jump to the next level – nanotechnology, a measurement scale in the vicinity of 1/1000th of a micron.

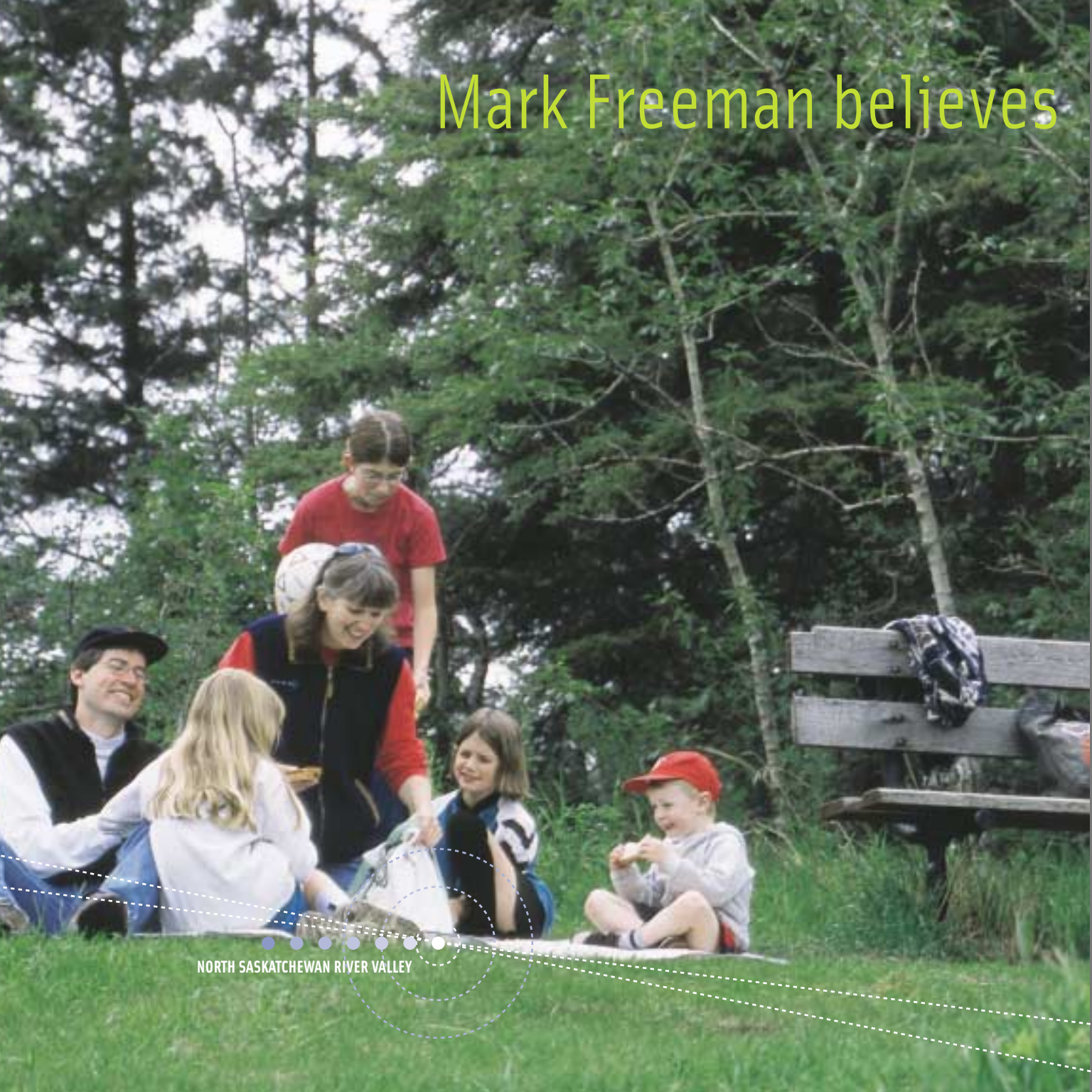
Brett and his 12 colleagues (eight of them students) at the University of Alberta are involved in nanoengineering specific structures with thin film coatings using unique fabrication procedures. The list of potential applications is endless.

"If we can develop, for example, a low cost nanofabrication way to produce photonic crystals, it will be a major step towards paving the way for developing faster optical computers of the future." Other research efforts focus on fabricating nanosprings or mechanical oscillators that can act as acoustical filters in communication devices such as cell phones.

The opening of the University of Alberta MicroFab lab nearly two years ago has helped cement Alberta's reputation as a nanotechnology leader. "We've built a facility that meets exacting standards in terms of equipment, processes and cleanliness," says Brett. "And we have an open door policy toward other university and industry researchers."

iCORE's forward thinking is doing a lot to position Alberta as a global leader in nanotechnology. Meanwhile, Brett continues to focus on mentoring the next generation of nanoscientists and nanoengineers from Canada and around the world.

Mark Freeman believes



NORTH SASKATCHEWAN RIVER VALLEY

big things come in small packages

iCORE Senior Research Fellow, Nanoscale Engineering Physics Initiative

"Why do I live in Edmonton? Call it the family factor. My wife and I are from here. I did most of my schooling here. Then I left and went to work in IBM's research division in New York. I was doing cutting edge research in a cutting edge lab. Our family made a conscious decision to return to Edmonton in 1994 because we wanted to raise our kids here, and I was very fortunate to have an opportunity to work at the U of A. Now thanks to iCORE's vision and funding, I am able to do research amongst the best in the world and I am living where I want to live. It's beyond my wildest dreams."

It takes a lot of dedication to be a 365-day-a-year bicycle commuter in Edmonton. But neither rain nor snow stand in Dr Mark Freeman's way. He's committed to what he does – both in and out of the laboratory.

Freeman is considered one of the top nanotechnology researchers in the world. What is nanotechnology? Think small. Think very very small. It takes one million nanos to make one millimeter. In fact, Freeman says a nanocentury lasts about as long as it takes to say the words. But Freeman's research is anything but small. In fact, the implications are global.

In broad strokes, Freeman and his nanoscience colleagues are interested in understanding what happens to individual properties of materials when they're broken down into very small pieces. Freeman says that once researchers understand these properties, they'll be able to put them to work in various new technologies and industrial applications. What kinds of technologies? He says that is the million-dollar question.

"The only thing we can be sure of are the current evolutionary improvements to technologies we already know about," says Freeman. In his case, this sort of information is useful in his research evolving data storage technologies to higher performance, higher speed and higher capacity.

iCORE's commitment to nanotechnology through the Nanoscale Engineering Physics Initiative is a huge step towards positioning Alberta as a key player on the world stage. "iCORE's interest and willingness to fund new nanoscience initiatives is transforming our research opportunities and capabilities," says Freeman. "iCORE has presented researchers with a golden opportunity."

He adds that through iCORE and his partnership with fellow researcher Dr Michael Brett, the University of Alberta has become a hotbed for the latest knowledge in fabricating nanostructures.

Jonathan Schaeffer

UNIVERSITY OF ALBERTA

is building intelligent agents

iCORE Chair, High Performance Artificial Intelligence Systems Laboratory

"It's hard for me to envision where our research in the field of artificial intelligence will go in the next five years. As far as I'm concerned, the sky's the limit. I have 20 researchers working with me. I hope to have 25 by year end. More staff power has freed me up from some of the more mundane everyday tasks so I can start looking for new opportunities with local companies. The plan is to take the ideas and technologies we're developing, and bring them out of the laboratory into real world applications."

Dr Jonathan Schaeffer is a master strategist. His game plan as iCORE Chair of the High Performance Artificial Intelligence Systems Laboratory is ambitious, but it's what you might expect from a man who is regarded as a world authority in artificial intelligence applied to computer games. Now, due in part to iCORE's $2.5 million funding over five years, Schaeffer can continue to position his research group as number one in the world.

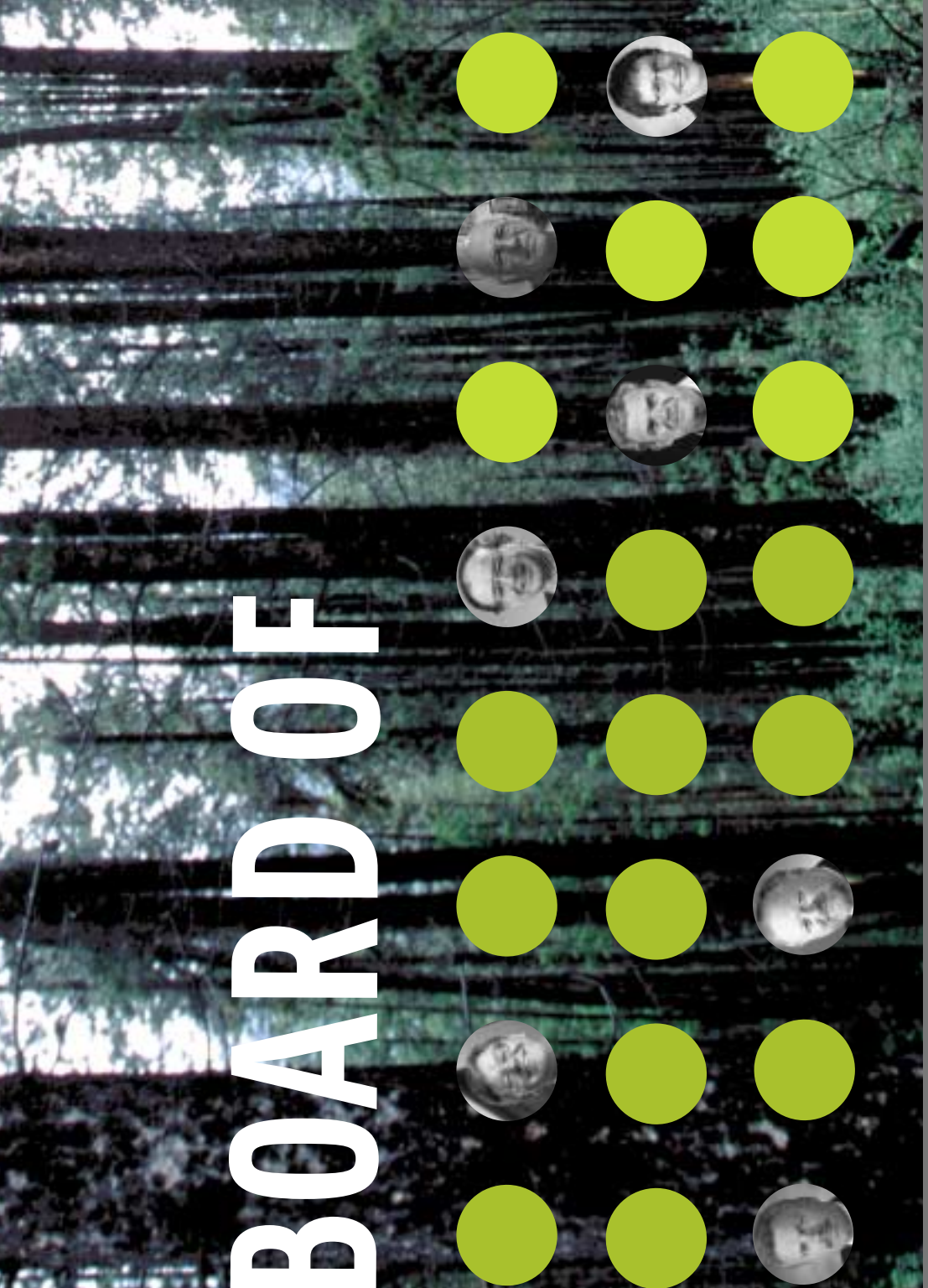
Schaeffer's work focuses on knowing what computers do best – things like memorizing lots of data, solving sophisticated mathematical problems accurately and quickly, and doing repetitious tasks without getting tired or bored. "What we do is try to solve problems using techniques that exploit the strengths of computers. The best example, because we do a lot of work on this, is computer games such as checkers, chess and even poker," he says. In fact, Schaeffer's program Chinook has been the World Human-Machine Checkers Champion since 1994, and in 1996 was recognized by the Guinness Book of World Records as the first computer program to win a human world championship in any game. It's a record that stands to this day.

Why games? Because the problems Schaeffer really wants to solve are too complex to analyze at present. "I'd really like to write a computer program that is the perfect medical doctor," he says. "I'd like to write a computer program that never makes a legal mistake – the perfect judge and jury. These are real jobs that we say require intelligence. But we're not there yet."

"Our goal is to develop new ideas in artificial intelligence, using game-playing programs to test the ideas, and then hopefully transfer that technology to some other non-game domain where the technology can be exploited."

Schaeffer says the iCORE money is allowing him to work with several Alberta companies and allowing him to keep and attract world-class researchers.

"We're already a well-respected group in our field," says Schaeffer. "I like to think we're the best in the world. The iCORE funding is going to allow us to be more ambitious with the research we're doing, particularly in terms of moving our ideas out of the laboratory and into the commercial marketplace."



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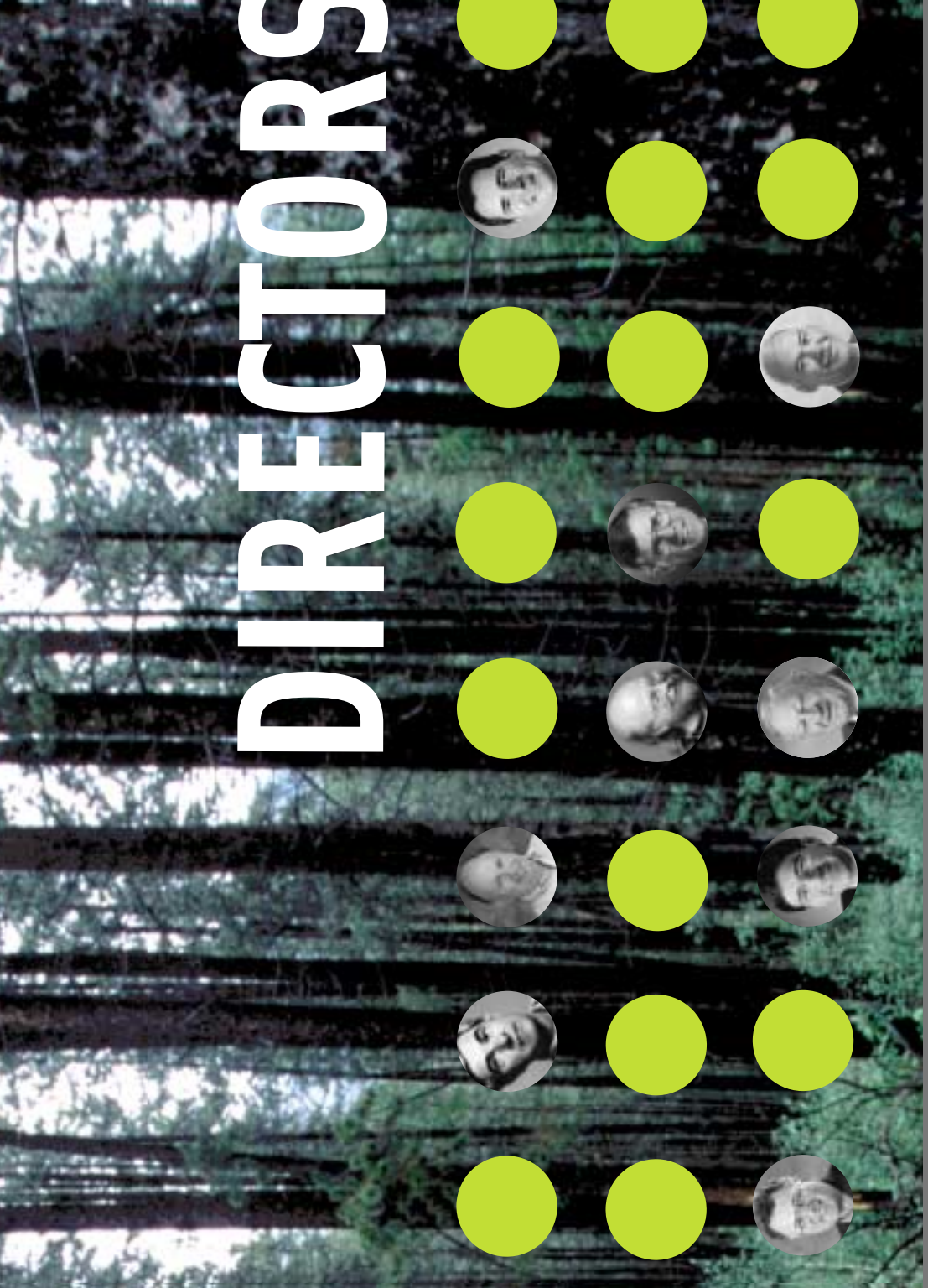

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GRANT

PROGRAMS

iCORE offers grant programs supporting the development of world-class research teams

Chair and Professorship Establishment Grants

Through Chair and Professorship Establishment (CPE) Grants, iCORE brings outstanding ICT researchers from around the world to Alberta.

The CPE Grants fund the salary of an iCORE chair or professor and the salaries of associate research team members, including professors, research fellows, postdoctoral fellows, and graduate students, and may also cover operating and equipment costs.

CPE Grants range from $200,000 to $1,000,000 per year for five years.

Graduate Student Fellowships

Designed to increase the number of high-quality graduate students working in ICT in Alberta, this program offers an iCORE award to all new computer science and electrical and computer engineering students who hold an NSERC Post-Graduate Scholarship (PGS-A or PGS-B) and choose to attend an Alberta university.

Industrial Chair Establishment Grants

Industrial Chair Establishment (ICE) Grants fund outstanding researchers who have world-class research records demonstrating industrial relevance and contribution.

iCORE joins with industry to support research in ICT at Alberta academic institutions through the creation of iCORE Industrial Chairs. These Chairs and associated research teams are appointed in collaboration with Alberta universities. Industry funding is required, and in most cases an NSERC Industrial Research Chair (IRC) provides a third source of funding.

ICE Grants are available for two to five years.

Recruiting Grants

Funds supporting recruiting efforts are available through ICT Strategy, Planning, and Recruiting (ISPR) Grants, providing up to $10,000 each. These are available to Alberta-based university and institute researchers to fund travel, accommodation, and other costs associated with recruiting or developing a proposal for an iCORE CPE or ICE Grant.

00.2001.28.29.


TIONS

iCORE's next steps are aimed at supporting the contributions of many players to Alberta's ICT sector. iCORE envisions strong working relationships with research universities, technology transfer organizations, major ICT research and funding groups, infrastructure organizations and, last but not least, industry.

FUTURE DIREC

We will continue to attract ICT researchers – from chairs to graduate students – and develop specialized recruiting efforts to shape a maturing sector. But we are also branching out to support multidisciplinary and industry supported research, to advance the technological infrastructure for researcher use, and create a community of Alberta's excellent ICT researchers and supporters.

All of what we will accomplish will be due to the people whose vision creates the Informatics Circle of Research Excellence. These individuals shape iCORE as a positioning system that puts Alberta on the global ICT map.

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