Canadian Artificial Intelligence
Intelligence Artificielle au Canada

Summer 1993 No. 32 été 1993

An official publication of CSCSI, the Canadian Society for Computational Studies of Intelligence
Une publication officielle de la SCEIO, la Société canadienne pour l'étude de l'intelligence par ordinateur

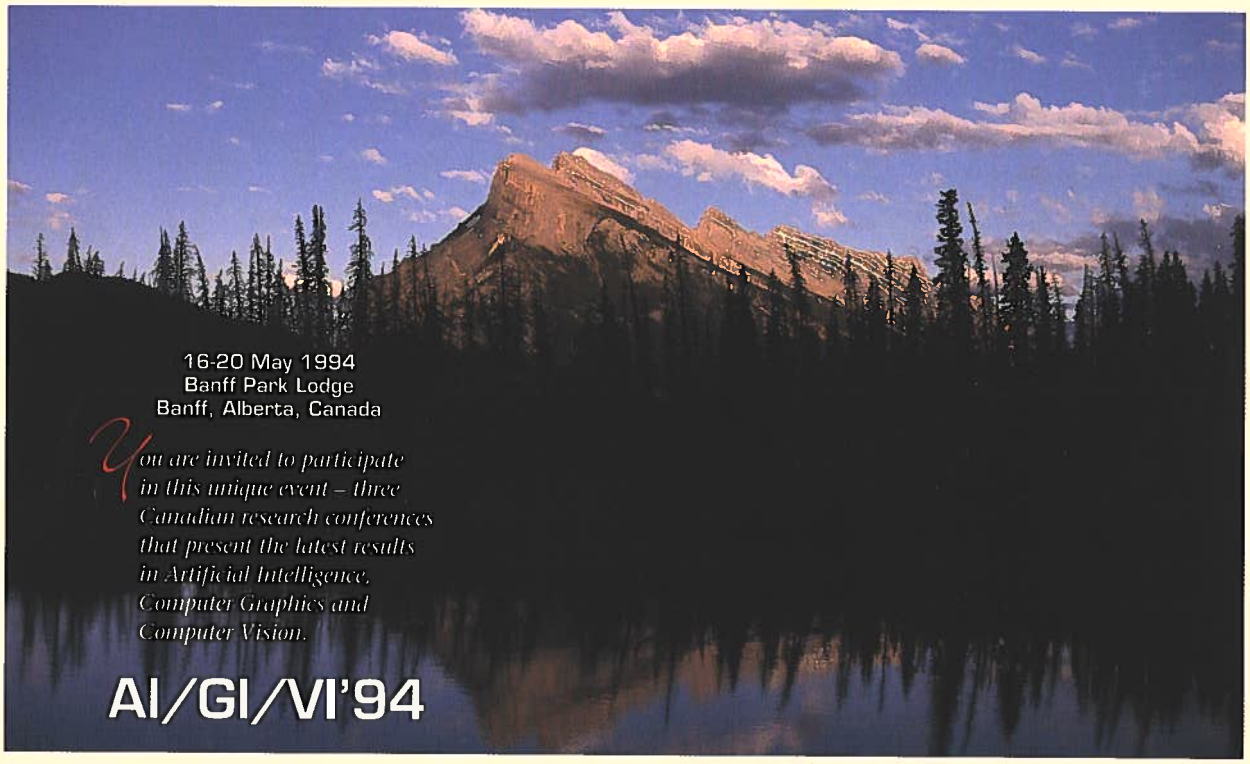


Photo credit: Greg Klymchuk

Mt. Rundle from Vermilion Lakes — Banff, Alberta, Canada

Retrospective

Contents

Cover graphic, contents from premiere issue of Canadian Artificial Intelligence magazine

Canadian Artificial Intelligence

Intelligence Artificielle au Canada

Summer 1993 | No. 32 | été 1993

Canadian Artificial Intelligence is published three times a year by the Canadian Society for Computational Studies of Intelligence (CSCSI). *Intelligence Artificielle au Canada* est publiée trimestriellement par la Société canadienne pour l'étude de l'intelligence par ordinateur (SCEIO). Second Class Mail Registration No. 7373

ISSN 0823-9339

Contents

Canadian Artificial Intelligence welcomes submissions on any matter related to artificial intelligence. Please send your contribution, electronic preferred, with an abstract, a photograph and a short bio to:

Canadian Artificial Intelligence
Alberta Research Council
3rd Floor, 6815, 8th St. N.E.,
Calgary, AB T2E 7H7
or — merling@skyler.arc.ab.ca

Advertising rates are available upon request from the address above.

Book reviews and candidate books to review should be sent to:

Graeme Hirst
Canadian Artificial Intelligence
Department of Computer Science,
University of Toronto
Toronto, ON M5S 1A4
or — gh@ai.toronto.edu

Profile: Nick Cercone

New Opportunities, New Challenges

Connie Bryson

Résume

Nick Cercone a résigné, au début de l'année, comme Directeur du centre pour les sciences de systèmes, prenant un congé de trois ans de l'Université de Simon Fraser, et a débuté comme Vice président adjoint aux recherches et Doyen aux Etudes supérieures à l'Université de Regina. Cette nouvelle a secouée beaucoup de gens. Cet article parle des ouvertures et des défis que Cercone a rencontré sur le chemin de sa carrière.

Summary

Earlier this year, Nick Cercone took a three-year leave of absence from Simon Fraser University, resigned as Director of the Centre for Systems Science, and started a new job as Associate Vice-President Research and Dean of Graduate Studies at the University of Regina. This shocked a lot of people. This article looks at some of the opportunities and challenges that have come Cercone's way in the span of his career.

Nick Cercone

When Nick Cercone took a three-year leave of absence from Simon Fraser University, resigned as Director of the Centre for Systems Science, and started a new job as Associate Vice-President Research and Dean of Graduate Studies at the University of Regina, a lot of people were shocked.

Cercone has been a mover and shaker in Canada's AI community since he arrived in the country in 1972. Given his broad responsibilities at Regina, it is unlikely that he will be able to maintain such a high profile in AI. SFU's Centre for Systems Science, which he developed, nurtured and turned into a success, was considered his "baby." For many, it seemed incredible that he would actually leave.

But leave he did. Of course he hasn't abandoned his interest in AI — he is building a research group at Regina, continues to co-edit *Computational Intelligence*, and is on the editorial boards of *IEEE Expert* and *IEEE Transactions of Knowledge and Data Engineering*. Neither has he abandoned Vancouver — he still has his research group at SFU and returns regularly to the city.

However things are different now, both professionally and personally, and the move to Regina represents a challenge on both those fronts. Fortunately, there doesn't seem to be much Nick Cercone likes better than a good challenge.

Getting started

While Cercone's name is associated with computing science, that's not how his academic career began. His undergraduate degree, from Pennsylvania's University of Steubenville, was in engineering science. As well as taking the required math, physics and engineering courses, he also took many arts courses and ended up with almost enough credits to graduate with a philosophy degree in 1968.

The computing connection came with Cercone's first job after graduating. "I was going to go to grad school and had been accepted at Notre Dame when I got a letter from my friendly draft board saying I was going to be drafted within the year. So I decided to go to work instead — for IBM."

As it turned out, Cercone didn't get drafted. Bad knees from years of skiing earned him an exemption. After a year at IBM, he applied for a two-year leave of absence to do a Master's degree at Ohio State. The degree took one year to complete, but Cercone stayed the extra year, teaching in the department and taking art courses.

Back at IBM in 1971, Cercone still felt his computing knowledge was lacking and he began looking at PhD

programs. "Whenever I tell this story, most people don't believe it but it's absolutely true. I went into the IBM library in Poughkeepsie and there was this book on fellowships put out by the Association for Computing Machinery. The first page I flipped to was the University of Alberta. I read the description and it sounded fine."

After checking with a few people who gave U of A a good recommendation, Cercone's mind was made up. He was off to Edmonton. It wasn't until he went to get his first paycheque for being a teaching assistant that he realized he should have done something about emigrating to Canada.

"In order to get the cheque, they said I needed a social insurance number. I pulled out my (U.S.) social security number, but that had the wrong number of digits. I guess I was one of those ignorant Americans. I just drove up to Edmonton without thinking that I was actually going to another country."

Cercone has many fond memories of his three years in Alberta. He still owns a farm west of Edmonton which he visits when he can. "I fell in love with the prairies. It's partly the geography — I hate hot and humid weather — and partly the people. The real friendly, easy-going attitude, the independent spirit. I'm independent myself. People don't tread on each other too much. They depend on each other but they give each other space. I think that's really important."

Going farther west

After finishing at U of A and completing a year as assistant professor at Old Dominion University in Virginia, in 1976 Cercone was offered a job in the computing science department at Simon Fraser. The department was small, about eight faculty, most of whom were jointly appointed from other departments.

It wasn't long before Cercone started to make his mark at SFU. He began the graduate program and, five years after joining the department, became its chairman. When he left the chair in 1984, the department was up to about 24 faculty. (In 1985, SFU achieved the third highest amount of external funding of all computing departments in Canada — an accomplishment that Cercone is especially proud of.)

"Hiring the right people is critical," he says. "We had a plan, we were aggressive and we created a good environment. I think that is one of the things I learned from working at IBM. You really have to treat people fairly. They must know where they stand all the time. When uncertainty creeps in, you get dissatisfied people.

"I also saw that in the early days, because we had so many needs, it really didn't matter what people were good at — we could use that skill. We just wanted them to do a whole lot of it, whatever it was. Later on, as we grew, we became more specialized and started to fill certain niches.

"I surrounded myself with people who were smarter than me. My job was to show everyone that they had a place, an important role to play."

Cercone on AI in Canada

Involved in both the research and administrative sides of AI in Canada, Nick Cercone has seen it all — the politics, the problems, the successes. And he admits to having mixed feelings about the future of AI in the country.

"I think Canada has a reputation for being, pound for pound, one of the best places for AI," he says. "There are terrific researchers here, a tremendous amount of capability.

"And yet we don't actually build things. We have all these raw materials, actualizing them is very problematic. I think the universities are getting very mixed messages. Various reports are stressing the need for better teaching. Conversely, NSERC, NRC and the networks program put more emphasis on the industry side. I worry about that mixed message. I hope I can use my new position to speak out more on this issue."

Cercone see solutions coming from efforts such as PRECARN. He credits PRECARN's former president Gordon MacNabb with having the vision to push the PRECARN model. Cercone believes that even if none of the current PRECARN projects succeed, the model itself will have made a valuable contribution in breaking down the barriers between industry and academia. He says it's already happening.

"Initially it was like two different worlds talking. But universities have moved a long way in the direction of finding interesting things for industry. However for the most part industry has not yet built themselves a receptor capacity.

"I believe you have to keep plugging away at this. It's going to take time but I think we eventually will succeed. We have to."

In 1987, Cercone took over as director of the Centre for Systems Science, created only a year earlier. Under his leadership the Centre grew and prospered, involving about 100 faculty, primarily from computing and engineering but also from disciplines like psychology and philosophy.

Funding came from the B.C. government, $2.5 million a year — half of which was committed to permanent positions. The rest of the money went to support the three major research areas of intelligent systems, microelectronics, and computers and communication. That money was used to establish a computer network and scholarships, and to support research.

"It all added up to quite a bit of leverage," Cercone says. "When I toted it up, on spending of $1.2 million (about half the $2.5 million from the provincial government), we had somewhere close to $24 million coming back to the university."

Ask anyone about the reasons for Cercone's successes with building the SFU computing science department and the Centre for Systems Science; the answer is always the same. It involves Cercone's way with people.

University of Alberta computing science professor Randy Goebel first met Cercone when they were both grad students at the U of A. (Their close friendship continues today.) Goebel remembers Cercone as **the** ringleader of the grad students.

"Nick gets loyalty from people because he brings out the best in them," Goebel says. "He can take someone who doesn't know they have a certain interest or desire, and can help them turn that into an ability. He is a stark contrast to some, especially those in research management, who immediately judge people on what they display as opposed to what their potential is.

"I once heard someone say that the problem with Nick is that he doesn't understand the difference between someone who is excellent and someone who is very good. I think that person will grow older and wiser someday and recognize it's impossible to distinguish between the two. What you want to do is get the best out of the people who are around. That's what Nick is good at."

Goebel also notes that Cercone's easy-going personality does have its limits. "Nick is benevolent to a fault. But when he gets pushed too far — and he rarely gets pushed too far — people expect him to still be flexible and giving and he's not any more. The boundaries are stainless steel, there's no changing his mind about something."

Stories abound about the reasons for Cercone's departure from the Centre and SFU. They invariably involve personality clashes and fights over budget cut-backs and changes in direction. While he admits there's an element of truth in all the stories, Cercone himself gives a more comprehensive explanation.

"I started the graduate program (in computing science) at SFU," he says. "When I became chairman, I grew the department from very small to very big. I developed the Centre for Systems Science — its infrastructure, programs and staff.

"But I realized that for the last year I just sat in my office, people dropped their problems off, and I tried to solve them. I was no longer part of any of the things I helped to create. Although I had a special rapport with each individual person, the sense of being a part of the whole wasn't there. I think that's what really underlies this change."

While it seems like a big switch, Cercone notes that he's always been interested in research administration. In fact, he was nominated for VP-Research at SFU, but turned the job down. ("It didn't mean anything there," he says. "There's no influence.") Regina offered the kind of challenge he was looking for.

Return to the prairies

Cercone began his job at the University of Regina early this year. As well as being Vice-President Research and Dean of Graduate Studies, he is also international liaison officer. His days are long, but luckily for Cercone his requirement for sleep is minimal (and legendary) — he only needs about three or four hours a night.

"It's definitely more of a challenge to build things here," Cercone says. "This university is relatively young, not that big (about two-thirds the size of SFU) and very, very impoverished.

"There's a missing layer of infrastructure here, like the kind of infrastructure we were able to build at SFU. I've been here long enough to identify the pockets of excellence and I intend to so something to help them.

"My budget for the faculty is about the same as the Centre's, but there are commitments on a lot of it. However there is an indomitable spirit of entrepreneurship here and quite a number of excellent new faculty. I also think the senior administrators have a good vision of where they want the University to be."

In October of last year, before the official start of his new job, Cercone read through — and made suggestions for changes to — all of the NSERC grant applications coming from the University. The review no doubt helped improve Regina's record at winning external grants and contracts. External funding increased by 39 per cent over the previous year.

"Of course it's still a very small base," adds Cercone. "The value of this year's external grants and contracts was $4.8 million, compared to SFU at $12- to 15 million So it's going to be a long haul. By the end of my term here I'd like to see 10 million in external funding."

Since coming to Regina, Cercone has put in place a new policy on centres and institutes, and two new institutes have been approved: the Institute for Northeast Asian Studies and the Development Institute of Saskatchewan. He thinks centres give universities the flexibility to change direction; he is working on ideas for other centres to be based at the University.

Cercone says the challenge for him at Regina is to build things; the job is definitely not a stepping stone on a career

path to a university presidency. In fact, he says the Regina job also brings with it a personal challenge to make life simpler, not more complicated.

"Control over time has become really important to me. I see that slipping away and I'm much more jealous of that now.

"To tell you the truth I haven't had much of a home life in the last 10 years. It just slipped by. I was feeling in the last few years that I never got out of my office. I want a home life."

But that will be difficult. Although he will soon have a post-doc and two PhD students at Regina, Cercone still supervises a large research group at SFU. His group is in the midst of commercializing two systems: SystemX, a natural language interface, and DBLearn, a learning and discovery program for relational databases.

On top of travelling back to SFU, his new job as already taken him on seven trips in the first three months and more are planned. Is he really going to be able to do things differently in Regina? Cercone's answer is succinct: "Either I will be able to or I won't continue. I don't want to sacrifice the rest of my life."

A look ahead

Cercone's close friends consider his move to Regina a good one, a much-needed change that brings with it the requisite challenge. One of those friends is Gord McCalla, head of the computational science department at the University of Saskatchewan.

"Nick needs to build something, to look forward," McCalla says. "The University of Regina hasn't yet taken off on the research end of things. Nick has a real chance to move into a vacuum where there's a lot that can be done, just like he did at SFU.

"Nick is innovative, he sees niches that can be explored. Then he says 'The time is right, maybe I can do it.' And he does it. He is good at follow-through.

"The only problem is that this is not the 1960s in academia or the 1980s in AI. It's the 1990s, the economy is on the rocks and Saskatchewan is in terrible shape. It's going to be a heck of a battle. But Nick can grow things in the desert, the ground needn't be that fertile. Nick just needs an opportunity."

Connie Bryson *is a free-lance technical writer based in Edmonton, Alberta.*

An Artificially Intelligent Music Composition Program from a Naturally Intelligent Teen

Penny Rokeby

Ce jeune compositeur de musique d'intelligence artificielle de Calgary gagne le prix de l'Alberta Research Council à l'Exposition des Sciences de Jeunes savants pour le meilleur project d'application d'ordinateurs.

An artificially intelligent music composer developed by a Calgary teen won the Alberta Research Council's prize for the best applied computer project at this year's Calgary Youth Science Fair.

The program was developed by 15 year old Ian Pekau, a grade ten student at Calgary's Western Canada High School, along with his friend and business partner Jason Gunthorpe. Taking input from Pekau's electronic keyboard, the program creates musical compositions based on rules extracted from the initial input.

Pekau, whose present ambition is to achieve success in his software business, IntelliSoft, says the project came about from two long-standing pursuits. "I've been interested in composing music for a long time, and I thought the computer could do the same thing," said Pekau. "I'm also interested in artificial intelligence," he adds, explaining that the current project started about a year ago. He wanted the computer to "learn" how to compose music based on styles that he played into it.

There are three basic elements to the hardware: an electronic keyboard, the MIDI (Musical Instrument Digital Interface) cables, and the computer. The program was initially written on an IBM 386, but Pekau now uses a 486, employing a Borland C++ compiler. "It uses C," explains Pekau," so it runs on anything." A simple Radio Shack radio acts as speaker for the musical sounds.

Pekau had the idea for the program about three or four years ago, then a summer job last year netted him enough cash to purchase the Roland JV80 synthesizer which looked after the problem of outputting the notes to the computer. "It's been a lot more fun since I got the keyboard," he says with a smile.

"There are three parts to the program," Pekau explains. "The MIDI I/O records and plays music. It gets the notes in and also plays them. The composition module takes the notes I've played and puts them in lists. It looks after the conversion of the notes to these lists. This is the module to change if I want to change the application. It also handles the reverse: conversation back from lists back into data for the keyboard." The lists include such musical features as timing - "the speed at which I play the notes," pitch, velocity on - "how quickly I strike the notes," velocity off - "how quickly I release the notes," and note length - "how long I hold the notes."

The third module of the program is the Knowledge Acquisition and Complete Numerical Simulation Module. It takes lists and analyses them using the patterns and links, and how the lists are laid out, and makes general rules. It also takes rules and generates new lists. "To generate new lists, the computer lays out random numbers then places patterns over top and checks to see if any of the rules have been broken, then changes the composition accordingly," says Pekau.

"Each of these modules is a different C file," Pekau explains. "Each one is separated as far as the actual source code is concerned, so you can take them apart and use them in different applications. The traditional example is the grasping of an egg without crushing it. But it could also be extended to, say, migratory patterns of birds."

The current program doesn't save input or output, but once it's further developed it will have a save feature. Currently, because of the capabilities of the keyboard for imitating various musical instruments, the user can play the input in pipe organ mode and hear the output in clarinet mode, for example. The variations are intriguing, since different instrument sounds give different results in the output.

As with all rule-based systems, in Pekau's program the computer sometimes makes false generalizations. This is particularly a problem if the piece played into the system is too short, but it also happens on longer pieces. "It will then use that false generalization and get dissonant notes," explains Pekau. During one demonstration, for example, the computer "learned" that Pekau played several sustained notes during a rendition of a Bach piece. The composition generated by the computer contained a number of exceptionally long sustains underlying a fairly melodic piece. On several other demonstrations, using the same

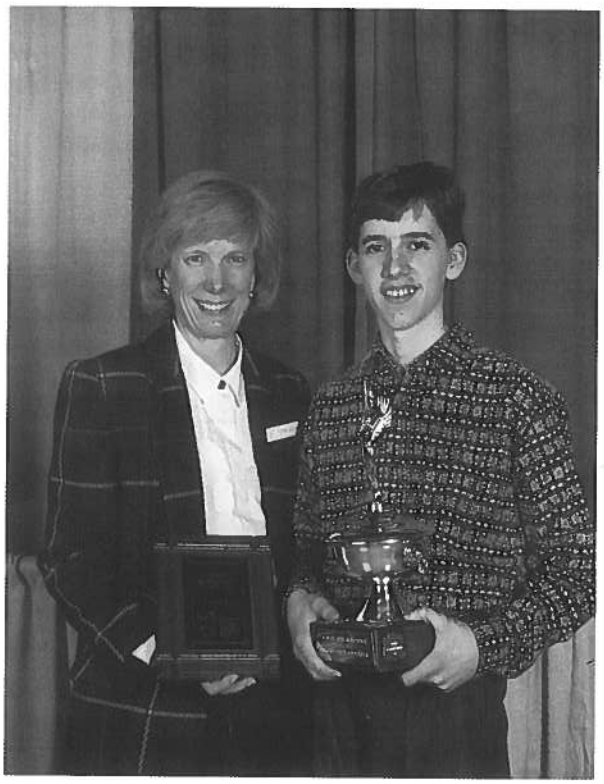
Bach example as input, the computer imitated the shorter sustained notes in a manner more similar to Pekau's original input, with only occasional discordant notes.

Pekau's interest in music has been long-standing. He has been playing the piano for about ten years and has been writing music "about that long, too." About a year ago he quit taking piano lessons, but continues to play trombone in the school band. "But I'm mostly interested in electronic music," he adds.

What makes his program different from commercially available programs? With commercial musical composition programs currently on the market, any would-be composer can do recording and basic editing, says Pekau, but a lot of the composition aids aren't there for the composer who wants help. "Maybe he's short for time, maybe he's just lazy, who knows? But the idea is to make it easier for the composer to compose," he explains.

Pekau's business interests have borne some fruit via widely used public bulletin boards. With partner Gunthorpe, he developed the IntelliTracker, which "just plays songs," and was distributed as freeware on the Genie system. Last year he won the Calgary Programming Society's programming competition, and his walls are decorated with several other awards as well.

Researching for his music project was not particularly productive. He began with the University of Calgary library where he borrowed ten books on artificial intelligence. "I found one thing on AI and music," he explains, "and that was recognizing simple rhythms. But I got an idea of what's been done in artificial intelligence and what might work best for music. There were a lot of very specific applications, like airline scheduling. I found I couldn't use a lot of what other people had done. And there was no terminology."



Ian Pekau accepts award from Joanne Johnson.

More hands-on research was the next step. "When I first began, the program ran making too many generalizations. I junked most of the third module, the knowledge acquisition and complete numerical simulation module. I researched more and saw a lot of people using neural networks to do problem-solving, in which the solution would be music. I decided to take the approach of strictly simulation."

Pekau says he wasn't working by any particular standard. "I went out on a limb," he says matter of factly. "I'm thinking of revising the program, but not totally redoing it. It's a tough thing to do with music, because computers aren't very musical," he shrugs.

This spring, Pekau was invited to speak at the Alberta Research Council, and Pekau sees other interesting possibilities down the road. Instead of complete numerical simulation, he could see using partial numerical simulation in something like weather forecasting. "Given this barometric pressure, tell me where the clouds will be."

Asked what he's most proud of, Pekau says, "I'm pretty proud of the results that I got considering the number of factors." And, he adds, "I don't really have too many work habits when it comes to school because I'm pretty involved outside of school, so I'm proud that I can still handle school."

As far as future plans, Pekau says he wants to continue along the lines of his current pursuits. "Running a business is a goal of mine, " he says. And there are a number of refinements to the program he's considering.

One of the awards on the wall above Pekau's computer is a plaque from an optometrists association. Pekau won this when he developed a program which dictates text for the blind. Somehow I think this bodes well for the future of AI in Canada.

Penny Rokeby *is a published poet and freelance writer whose works have appeared in such diverse publications as the United Church Observer, The Calgary Herald, Contemporary Verse 2, International Guide to Western Canada, and many other national and international publications. After spending a year as a newspaper journalist in Canada's Arctic, Ms. Rokeby is currently making her home in Calgary where she lives with three children and a pet mouse.*

On Raymond Reiter

David W. Etherington

AI Principles Research Department
AT&T Bell Laboratories
600 Mountain Ave., 2T-412
P.O. Box 636
Murray Hill, NJ 07974—0636

Résume

Professeur Ray Reiter recevra le prix d'Excellence dans la Recherche lors de la Conférence International sur l'Intelligence Artificielle (IJCAI-93). Cette récompense reconnaît le dévouement d'un scientiste dans le domaine de la recherce par l'excellence soutenue de son travail et par l'influence la philisophie qui se cache derrière les théorèmes sur la communauté internationale d'intelligence artificielle. Voici une idée sur la grandeur et l'étendue de sa carrière ainsi qu'un apercu de l'homme et sa philosophie derrière les théorèmes.

Summary

Professor Ray Reiter will receive the prestigious Research Excellence Award at the 1993 International Joint Conference on Artificial Intelligence (IJCAI—93). This award recognizes a scientist for a research career characterized by sustained excellence and influence on the international Artificial Intelligence community. Below is an idea of the depth and scope of his career as well as some insights into the man and the philosophy behind the theorems.

Introduction

Ray Reiter has been chosen as the fourth recipient of the prestigious International Joint Conference on Artificial Intelligence Research Excellence Award, placing him in the company of John McCarthy, Allan Newel, and Marvin Minsky. The award recognizes a scientist for a research career characterized by sustained excellence and influence on the international Artificial Intelligence (AI) community.

As a friend and former student of Ray's, I've been asked to capture something of the flavour of his career and personality. Describing his career is hard only because there is so much to say; his personality is much harder to capture. After knowing him for 12 years, I suspect that I only know a fraction of the complexity of his interests and ideas — I certainly keep being surprised.

In what follows, I will sketch what I know of Ray's research philosophy, then discuss some of the extensive achievements that have flowed from that philosophy (and brought him the recognition that led to this award), and finally touch on some of his extra-curricular interests, which are as interesting and as uncommon as his research style. In the process I will gratefully draw on comments from Alan Mackworth, Richard Rosenberg, Jack Minker, and John Seely Brown, all of whom have known Ray much longer than I.

On Research Philosophy

Trying to describe someone else's research philosophy seems like a dangerous task, and I'm sure that there will be, at best, a partial correspondence between my description and the true state of the world. But then, perhaps, as a logicist, Ray won't fault me for choosing a description that covers all my observations and has shown reasonable predictive power, even if I can't prove that the possible world it describes is the real one.

First of all, it seems that research really is *fun* for Ray. He pursues whatever question he is thinking about with a passion and excitement that doesn't seem explainable in any other way. As a PhD. student at Michigan in the sixties, Ray completed what would be his dissertation research fairly early on, but didn't tell his supervisor because he was having too much fun doing research. Instead, he put the work — foundational work on Petri nets that is still cited today in the Operations Research community — in a drawer and went to work on other problems for over a year before he was ready to hand it in and end his graduate student days.

Years later, when I was distressed about how long it was taking to bring my thesis research to closure, he told me, "Don't be in too much of a hurry to graduate; you'll never have as much freedom to work on what you want to work on, and to learn what you want to learn, as you do now."

In part, his sense of excitement seems directly connected to his deep interest in explanations — anyone who has spent any amount of time with Ray will surely find the phrase, "Yes, but what do these . . . *mean*?"[1] familiar. Over the years, he has instantiated ". . ." with "semantic networks," "negation-as-failure operators," "integrity constraints," "null values," "deductive databases," "sketch maps," "diagnoses," and so on. Richard Rosenberg, a friend of Ray's since grad school at Michigan, notes that Ray insists on understanding everything he reads before going on — arguing that otherwise nothing beyond that point will be understood. This desire to clarify and understand things underlies all his work, and

goes a long way toward explaining the clarity of writing and thinking that mark his papers and talks.

Applying this principle, Ray avoided teaching undergraduate AI courses during his many years at UBC — he felt that AI was too messy and incoherent — preferring instead to teach LISP or even PASCAL. The graduate AI classes he taught were aimed at providing a formal, logic-based framework on which to build, rather than surveying the state of the art. Despite this sense of its messiness, Ray's fascination with AI is readily apparent. As an undergraduate in his one-term LISP course, that enthusiasm infected me, eventually leading me to abandon operating systems and to enter the UBC graduate program in AI.

Another hallmark of Ray's career has been his insistence on doing things well. He jealously guards his reputation for doing careful, thoughtful work. On one occasion, when our study of circumscription led us to results that seemed to go against the general understanding of circumscription's capabilities, Ray spent the better part of a week looking for counterexamples that would show our proofs, which were quite rigorous, were somehow invalid. He has always regarded it as more important to publish high-quality work than to churn out lots of publications by sacrificing significance or careful development.

"Just because you can prove it, that doesn't mean it's interesting."

In a related vein, Ray has always held that it is important to have a wide view, to be aware of how one's work supports the advance of the field. As a student, my weekly meetings with Ray faced me with two challenges: I had to convince him both that the work I was presenting was formally bulletproof *and* that it was worthwhile. The first was no easy task, given his skeptical bent and his uncanny ability to poke holes in arguments, but the second was much harder. I vividly remember him telling me once, when I had presented an elegant proof that I was particularly proud of, "Just because you can prove it, that doesn't mean it's interesting."

This maxim has served Ray well. He has always claimed that better mathematicians and logicians are nosing about the same problem domains as he is, yet he has been able to make seminal contributions in a variety of areas by keeping the question, "Why should anyone care about this?" at the top of his stack. For him, the theorems are not the end, but the means to clear up vague, sloppy, or murky thinking. By keeping in mind, from the start, what could be *learned* from a line of investigation, not simply whether there were open problems, he has been able to make lasting contributions that have changed much of the AI landscape.

Ray's basic goal is to determine unifying reasoning patterns that cut across application domains. He believes that a science of AI is possible, and that one way to achieve it is by isolating these patterns and studying their formal properties. He has frequently pointed out the importance of discovering a way to look at the world and then applying that method to a variety of disparate problems.

His style has been to alternate between theory and practice. This has involved isolating problems and techniques that arise in different application areas, formalizing and, where possible, generalizing them, then exploring what these theories have to say about the applications that motivated them and about knowledge representation in general.

On Achievements and Contributions

It is hard to know where to begin in describing the impact of Ray's career to date. He has made significant research contributions to a half-dozen-odd areas, and yet he has also found time to be active in service to the community.

Perhaps his best-known contribution is that Ray can, together with McCarthy, McDermott and Doyle, be credited with (or blamed for) the birth of the formal study of nonmonotonic reasoning (NMR); the logic for default reasoning presented in his 1980 *Artificial Intelligence* paper continues to attract interest and spawn refinements more than a decade later — a rare feat of longevity in AI. His subsequent paper with Criscuolo set out many of the problems that still serve as benchmarks today.

His work on NMR characteristically sprang from observations of related phenomena in a variety of areas, including early AI programming languages (e.g., PLANNER), databases, frame systems, and natural language processing. In his 1978 paper, "On Reasoning by Default," he argued that the single notion of "in the absence of evidence to the contrary, assume . . ." was behind them all, and later formalized this idea with his logic for default reasoning.

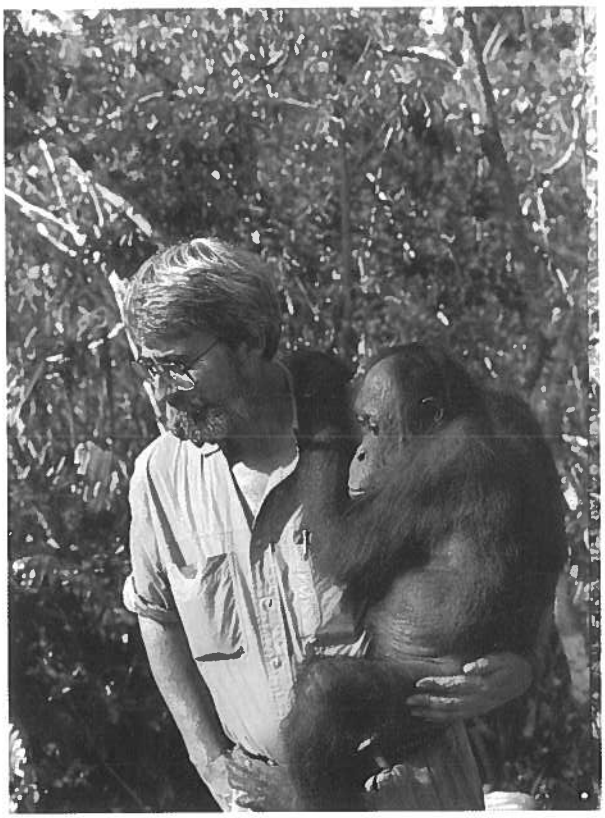
Similarly, his passion for nailing things down was aroused by the apparent difficulty of getting inheritance reasoning with exceptions right in NETL, resulting in our early attempt to provide a formal framework for studying inheritance that spawned another AI growth industry [2].

There are those who might argue the growth of NMR has not been an unalloyed boon to AI, lamenting that there has been a disproportionate amount of mathematics for the apparent amount of progress. This may be evidence that Reiter's Maxim, "Just because you can prove it, that doesn't mean it's interesting"[3] could stand to be more widely taken to heart in AI, but Ray's insights into the Closed-World Assumption (CWA), negation-as-failure, and nonmonotonicity in general have had tremendous impact on our understanding of logic programming, deductive databases, inheritance reasoning with exceptions, diagnosis, and truth maintenance.

Much of Ray's work has been concerned with generalizing databases to include reasoning capabilities, and with clarifying what had already been done in the area. This includes formalizing the CWA (which plays a key role for databases), the first proposal to compile deductive database rules, the first axiomatization of relational databases and

their deductive generalizations, and the first formal account of integrity constraints (and a later, more radical, autoepistemic interpretation of constraints). His axiomatization has become a standard specification for the deductive database research community. His recent research has been applying ideas from planning to the problem of understanding database updates — a very nice example of "classical" AI techniques having applications outside the field.

Logic programming, too, owes him several debts. In 1971, he independently formulated and proved the completeness of the SL resolution strategy that forms the procedural basis for logic programming interpreters. His 1978 analysis of the CWA long served as a provisional semantics for PROLOG's negation-as-failure operator. He also pointed out, as early as 1978, that the nonmonotonic nature of logic programming inference could make it suitable for implementing nonmonotonic reasoning systems; this is currently a hot research topic.



Ray holding orangutan in his arms while in Borneo oberving orangutans in their natural habitat.

Working with Johan de Kleer and with Alan Mackworth, he has developed formal characterizations of Assumption-based Truth Maintenance Systems, of depiction in high-level vision, and of certain aspects of diagnosis. This led to the realization that they are the same problem and that constraint satisfaction work could be seen as playing the same role in each theory: that of finding satisfying (logical) interpretations (models) of the evidence. This was quite a departure from the syntactic (theorem-proving) approach that has dominated much of formal knowledge representation, but it is typical of Ray's work: he's quite happy to abandon a theory in the face of a better view.

With 26 conference and 23 journal articles, and 7 book chapters to his credit at last count (not to mention 10 articles reprinted in various books, one 3 times), Ray shows no signs of slowing down. Seventeen of his publications are from the last 3 years, and he currently has 2 more under review and 4 others in preparation. Along the way, he has found time to co-found the International Conferences on Knowledge Representation and Reasoning, and the International Workshops on Nonmonotonic Reasoning, to be program co-chair of IJCAI—91, and to serve on numerous program committees. He has been a senior fellow of the Canadian Institute for Advanced Research's prestigious AI and Robotics program since its inception, was among the first to be elected as a Fellow of the American Association for Artificial Intelligence, in 1990, and is a charter member of the International Federation for Information Processing (IFIP) Working Group on Knowledge Representation.

His current research focus is on formal reasoning about change and action, using enrichments of the situation calculus, including a project with several colleagues at the University of Toronto on applying these ideas to controlling physical robotic devices, perhaps hedging against the fear he expresses as, "Oh God! What if Rod Brooks is *right*?!"

On The Personal Side

Perhaps Ray's most well-known personal characteristic is his nocturnalism. At UBC's semiannual graduate-course scheduling meetings, when the time came to schedule his classes, Ray would cross out everything before noon due to "prior constraints." Unless he was teaching, people never seriously looked for Ray before 2:00 p.m.; on the other hand, it was usually a safe bet that he would either be around the department or signed on from home until about 2:00 a.m..

When asked how he could consider leaving Vancouver's spectacular setting for Rutgers (to live in New York) and later for Toronto, his chief complaint was that "Vancouver rolls up the sidewalks at midnight—in New York/Toronto, you can get a coffee almost anywhere at 4 in the morning." It's easy to see why that would be important for him. If, as Alan Mackworth speculates, Ray is a machine for turning caffeine and nicotine into theorems, then it must have been distressing to be cut off from feedstock supplies during production hours!

Although Ray is a great conversationalist, he is not one of his own favourite topics; I do not recall ever hearing him volunteer anything about the non-academic side of his life. I had been his M.Sc./Ph.D. student for nearly 5 years when he took my wife and me out to dinner prior to his departure from UBC for the University of Toronto. Janine is very gregarious and in 3 hours had learned more about Ray than I had in 5 years!

Among other things, he told us that he is an avid lepidopterist, and spends much of his time in tropical places

hunting butterflies. (Of course, I have yet to see him with an actual butterfly, so there remains a possible world in which his expeditions are actually covers for plundering lost temples.)

Over the years since, we have heard a bit of his travels through the Indian subcontinent after graduation (before it became the thing to do in the later sixties), his trips to Borneo to spend time observing orang-utans in their natural habitat (we *have* seen photos of Ray with an orang-utan in his arms), and the trip upriver in Irian Jaya before IJCAI—91 into areas where civilization has only made slight inroads. On that trip, heavy rains and sodden landing strips forced the cancellation of the missionary flight that was to pick him up for the trip back down river and thence on to Australia (he was program co-chair) for the conference 3 days later. He ended up having to charter a helicopter for the half-hour flight, which probably cost more than the whole rest of his IJCAI trip. Even so, he described it as just part of the adventure of going off the beaten track.

Only recently I heard, from John Seely Brown, of late-night (of course) motorcycle jaunts in grad school. I suppose that the fact that the image of "Ray in a leather jacket in the wee hours of the night, zooming around on a big BMW cycle" doesn't fit my model of him shouldn't surprise me.

On Conclusions

Ray has been heard to say of John McCarthy that "no one has the right to be that smart!" As Mackworth points out, the same could be said of Ray, although in "typically Canadian" fashion, Ray tends to undervalue his achievements and talents. When Ron Brachman and I spoke of nominating him for this same award several years ago, he demurred, saying that there were many other people who are much more deserving. Jack Minker, who nominated Ray for the award reports that Ray also demurred when Jack told him he was nominating him, but Jack said that it was not his option — he was being told, not asked.

There seem to be two sides to Ray, one that his peers see and another that he reveals only to his friends. I've been privileged to see a bit of both sides. At first, they may seem incongruous — like the juxtaposition of the logician and the jungle trekker; reflection shows that his sense of adventure, his desire to explore ahead of the pack and to push on the frontiers, reconcile them. We should probably expect to continue to be surprised by where he goes next, in either realm.

Meanwhile, congratulations are in order.

Notes

[1] Distressingly familiar, at times!

[2] The fallacy, *Post hoc, ergo propter hoc,* notwithstanding.

[3] like the obvious corollary for system-builders, "Just because you built it, that doesn't mean anyone should care."

David W. Etherington *received his Ph.D. and M.Sc. in Computer Science (with an emphasis in Artificial Intelligence) from the University of British Columbia in 1986 and 1982, respectively. He studied with Prof. Ray Reiter, writing his theses on nonmonotonic (default) reasoning. Dr. Etherington is currently a Research Associate Professor at the Computational Intelligence Research Laboratory at the University of Oregon, in Eugene, and is on leave from the Artificial Intelligence Principles Research Department of AT&T Bell Laboratories, in Murray Hill, NJ. He also chairs the IFIP Working Group on Knowledge Representation. His current research interests include nonmonotonic reasoning and formal, tractable, theories of knowledge representation.*

CSCSI Réunion générale annuelle
CSCSI Annual General Meeting

La réunion générale annuelle de CSCSI se tiendra mercredi le 25 août 1993, de 12:45 - 1:30 pm en association avec la conférence IJCAI (IJCAI-93). Le lieu de la réunion sera indiqué dans le programme final de la conférence du IJCAI.

The CSCSI annual meeting will be held on Wednesday, August 25, 1993 in conjunction with the IJCAI conference. The time will be 12:45 - 1:30 p.m. The location will be listed in the final program for the IJCAI Conference.

Artificial stupidity

Creating machines that think like people is a great challenge, but a bad idea

In 1950 Alan Turing, a British mathematician of genius, challenged scientists to create a machine that could trick people into thinking it was one of them. By 2000, Turing predicted, computers would be able to trick most of the people most of the time at least in conversations where neither party could see or hear the other, but instead "talk" by typing at computer terminals. Thanks to 40 years of research into artificial intelligence - a field which has adopted Turing's test as its semi-official goal - Turing's prediction may well come true. But it will be a dreadful anti-climax.

The most obvious problem with Turing's challenge is that there is no practical reason to create machine intelligences indistinguishable from human ones. People are in plentiful supply. Should a shortage arise, there are proven and popular methods for making more of them; these require no public subsidy and little or no technology. The point of using machines ought to be that they perform differently from people, and preferably better. If that potential is to be exploited, machines will need to be given new forms of intelligence all their own.

Gradually, this is happening. Many human capabilities remain well beyond the reach of machines. No computer can understand a fairy tale, recognize faces or navigate across a crowded room. But machines have learnt a lot. Computer chess-players can beat all but the very best humans. Machines can solve logical puzzles, apply bureaucratic rules and perform passable translations from one language to another. Computers' new skills are winning them jobs alongside decision-makers in a variety of companies, complementing human weaknesses with computer strengths (see White Collar Computers, page 22).

To err is human

With skill and skulduggery, computer intelligence can already be disguised as human. Last year, in a "Turing contest" held at Boston's Computer Museum, a computer program tricked five of the ten judges into believing that it was man rather than machine. But to fit into a human mould, machines have to display human limitations as well as human skills. The judges at the Computer Museum, for example, were particularly impressed by the winning program's uncanny ability to imitate human typing errors. But who needs a computer that can't type?

Without such artificial stupidity, clever machines are not just people with the bugs worked out. They are different, and profoundly alien. Leave aside the things on which people and machines cannot yet be compared - bodies, sex, a social life or a childhood - and consider only reasoning. Already machines can match, or better, human performance on many problems, but by using utterly inhuman techniques.

Computer chess-players have no concept of strategy; instead, at each turn they scan through several billion possible sequences of moves to pick the one which seems best. Computer logicians make their deductions in ways that no human would or could. Computer bureaucrats apply the rules more tirelessly and consistently than any of their over-worked human brethren. Watching such machines at work, nobody could mistake them for humans - or deny their intelligence.

No wonder. People and machines bring quite different capabilities to the task of reasoning. Human reasoning is limited by the brains that nature evolved; machines are better engineered. Plug in enough memory and a computer can remember everything that ever happened to it, or to anyone else. Given a logical problem to work out or a theoretical model of how a complicated machine works, computers can deduce more consequences more quickly than humans.

Even on something as basic as assigning things to categories - tinker, tailor, soldier, sailor - people and machines do things differently. For a person, it is natural to conceive of something that is "sort of like" a fire engine, say; it is often hard to define precisely what a fire engine is. For a computer, the opposite is true. Precision comes naturally, and "sort of like" is difficult for machines to grasp.

One day researchers may use the precision and power of computers to re-create human reasoning. In the process they may unravel many mysteries - including, possibly, the roots of human intelligence. But to do so they will first create some truly artificial intelligences, unencumbered by forgetfulness, faulty logic, limited attention span and all the other characteristics of the merely human.

The real challenge, then, is not to recreate people but to recognise the uniqueness of machine intelligence, and learn to work with it. Surrendering the human monopoly on intelligence will be confusing and painful. But there will be large consolations. Working together, man and machine should be able to do things that neither can do separately. And as they share intelligence, humans may come to a deeper understanding of themselves. Perhaps nothing other than human intelligence - constantly struggling to recreate itself despite crumbling memories and helter-skelter reasoning- could even conceive of something as illogical and wonderful as machines that think, let alone build them and learn to live with them.

Reprinted with permission from The Economist, August 1st, 1992 issue .

KR'94 - CALL FOR PAPERS
FOURTH INTERNATIONAL CONFERENCE
ON PRINCIPLES OF KNOWLEDGE REPRESENTATION AND REASONING

Gustav Stresemann Institut, Bonn, Germany

May 24-27, 1994

with support from Gesellschaft fuer Informatik and CSCSI

The KR conferences emphasize the theoretical principles of knowledge representation and reasoning, the relationships between these principles and their embodiments in working systems, and the relationships between these approaches to problems and corresponding approaches in other parts of AI and in other fields. Submissions are encouraged in (but are not limited to) the following topic areas:

REPRESENTATIONAL FORMALISMS
- logics of knowledge and belief
- nonmonotonic logics
- temporal logics
- spatial logics
- taxonomic logics
- logics of uncertainty and evidence
- logics of preference and utility
- logics of intentions and actions
- deontic logics

GENERIC ONTOLOGIES FOR DESCRIBING
- time
- space
- causality
- resources
- constraints
- decisions
- activities
- mental states
- multi-agent organizations
- applications classes, e.g. medicine

REASONING METHODS AND TASKS
- deduction
- abduction
- induction
- deliberation and decision analysis
- planning and plan analysis
- learning
- diagnosis
- classification
- inheritance
- belief management and revision constraint solving
- analogical reasoning
- reasoning about reasoning

ISSUES IN IMPLEMENTED KR&R SYSTEMS
- comparative evaluation
- empirical results
- benchmarking and testing
- reasoning architectures
- efficiency/completeness tradeoffs
- complexity
- algorithms
- embedded systems
- knowledge sharing and reuse

SUBMISSION OF PAPERS

The Program Committee will review EXTENDED ABSTRACTS rather than complete papers. Abstracts must be at most 12 pages excluding title page and bibliography. Accepted papers will be allowed 12 conference pages. Detailed information about submission requirements and reviewing policy can be obtained by sending a message to KR94-cfp-request@medg.lcs.mit.edu or writing to one of the program chairs.

CONFERENCE CHAIR:

Erik Sandewall (Linkoeping University, Sweden)
Email: ejs@ida.liu.se

PROGRAM CO-CHAIRS

Jon Doyle (Laboratory for Computer Science)
545 Technology Square, Cambridge, MA 02139, USA
Phone: +1 (617) 253-3512
Email: doyle@lcs.mit.edu

Piero Torasso (Universita' di Torino, Dipartimento di Informatica)
Corso Svizzera 185, I-10149 Torino, ITALY
Phone: +39 11 7712002
Email: torasso@di.unito.it

PUBLICITY CHAIR

Werner Horn (Austrian Research Institute for AI)
Email: werner@ai.univie.ac.at

LOCAL ARRANGEMENT CHAIR

Gerhard Lakemeyer (University of Bonn, Germany)
Email: gerhard@cs.uni-bonn.de

IMPORTANT DATES

Submission receipt deadline:	**November 8, 1993**
Author notification date:	**January 24, 1994**
Camera-ready copy due to publisher:	**February 28, 1994**
Conference:	**May 24-27, 1994**

ICO'93 Conference Report

250 Scholars Take Stock of the Communication of Knowledge Organizations

Montreal, May 7,1993. More than 250 scholars from ten countries met in Montreal from May 4-7, during the ICO 93 Conference, to take stock of research in the application of computer science to communicating knowledge in organizations.

This scientific event was organized jointly by Télé-université and its Research Laboratory for Cognitive and Computer Sciences in Training Environments, LICEF and by GIRICO (the Inter-institutional Research Group in Cognitive and Computer Sciences for Organizations).

As was underscored at the opening session by Mr. Gilbert Paquette, the Conference Chair, "It becomes imperative, at a time when organizations are forced with the triple challenge of the internationalization of markets, production quality and the quest for knowledge, to establish a relationship between these challenges and research in cognitive and computer sciences.

The first phase of computer science development, from 1950 to the present day, saw the computerization of very simple and recurrent data. The second phase, which is the rallying point of knowledge-based systems, interactive multi-media and telematics, has already had and will still have much more far-reaching consequences on individuals and the society. Knowledge becomes at the same time the main input and the main product for organizations. It transforms work and culture and determines new competition criteria for individuals and for organizations.

Guest Speakers

ICO'93 was honoured by the presence of eight guest speakers of international repute:

Jean-Yves Babonneau, Director of Computer-aided Systems, INRIA (France). His area of interest is allocated, cooperative and interactive computer networks which, as regards software for the enterprise, is the focus of interest in the 90s.

André Boder, Université de Geoeve and Project Coordinator at NEUROPE LAB. He demonstrated the different components of the virtual organization where there is an interplay of cognitive and computer science, multimedia and telematic networks.

Derrick de Kerchhove of the McLuhan Program "Culture and Technology," University of Toronto. He studies the impact of computer science on culture.

Jean Gascon, Director of Research at Hewlett-Packard, Palo Alto, California, representing the enterprise. He presented his view on the growth of an organization under the influence of information technologies.

Douglas Lenat (AI Laboratory, MCC), one of the leaders of artificial intelligence in the United States. He gave an account of research that enables computer systems to be equipped with common sense, which particularly facilitates better Man-Machine communication.

Jacques Pitrat (LAFORIA, Université de Paris IV), pioneer of artificial intelligence in France. He made a synthesis of the metaknowledge of expression, which makes it possible for knowledge to be presented and communicated within a given domain.

Paul Romer, Economist at Berkeley University. He spoke on the communication of knowledge as an input of economic activity.

André Thompson, President and Head of the IST Group Inc., Montreal, representing the enterprise. He put forward the idea that our organizations have remained stagnant while the socio-economic realities they are supposed to manage have, for their part, abruptly changed.

Papers and Panel Discussions

Ten workshops featuring 42 scientific papers, selected by an international nodal committee of 68 institutional and industrial researchers, examined the subject of communicating knowledge in organizations from different angles:

- Applications to different forms of communicating knowledge in organizations: intelligent training, task performance support, analysis and management of documents, knowledge-based systems and systems integration.
- Means and computer science basic tools and techniques: knowledge modeling, natural language processing, intelligent interfaces and cognitive ergonomics, document structuring and media integration, telematic relationships creating virtual organizations.

Four panel discussions dealing with research in cognitive computer science for organizations, information retrieval (France-Quebec video-conference), multilateral exchange and with the integration of cognitive computer science and traditional computing within organizations concluded the scientific event.

An exhibition and demonstrations of systems in use or under development showed that cognitive computer science is making more and more in-roads into organizations.

Sponsorship

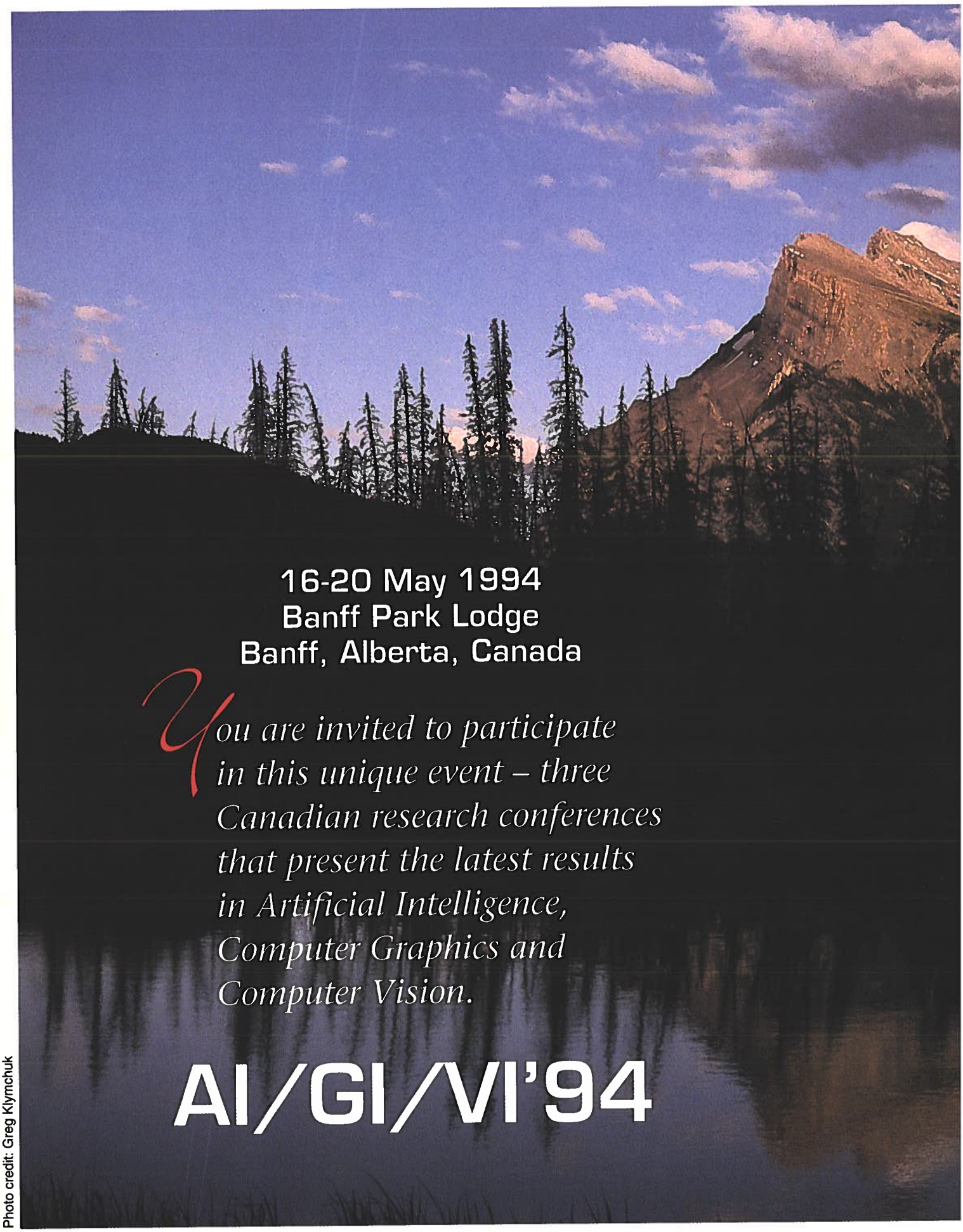
ICO'93 was co-sponsored by three U.S. computer science organizations (AAAI, ACM and IEEE Computer Society), a French association (AFCET), a British association (BCS), a Canadian association (SCEIO/CSCSI) and two Quebec associations: the Federation de l'informatique du Quebec (FIQ) and the Conseil de l'industrie électronique du Quebec (CIEQ).

The Conference received further support from Quebec's and Canada's main cognitive computer science research centres, namely the Centre de recherche informatique de Montreal (CRIM), the Centre canadien de recherche en informatique du travail (CCRIT), the Centre d'étude francophone de recherche en inforrnatisation des organisations (CEFRIO), the Centre d'analyse de textes par ordinateur, cognition et information (ATO-Cl) and the Alberta Research Council (ARC) as well as from the NEUROPE LAB and INRIA European research centres. The Proceedings of the Conference are available at the cost of CAN $ 60 at LICEF, Télé-université.

Université du Ouebec
Télé-université
2635, boulevard Hochelaga, 7e étage
Case postale 10700
Sainte-Foy, Quèbec, Canada
G1V 4V9
Telephone (418) 657-2262/1-800-463-4722

Source:
Francine Robert
Bureau d'information
et de relations publiques
Tel.: (514) 522-3540

Inquires:
Gilbert Paquette
Director of the LICEF
FAX: (514) 522-3608

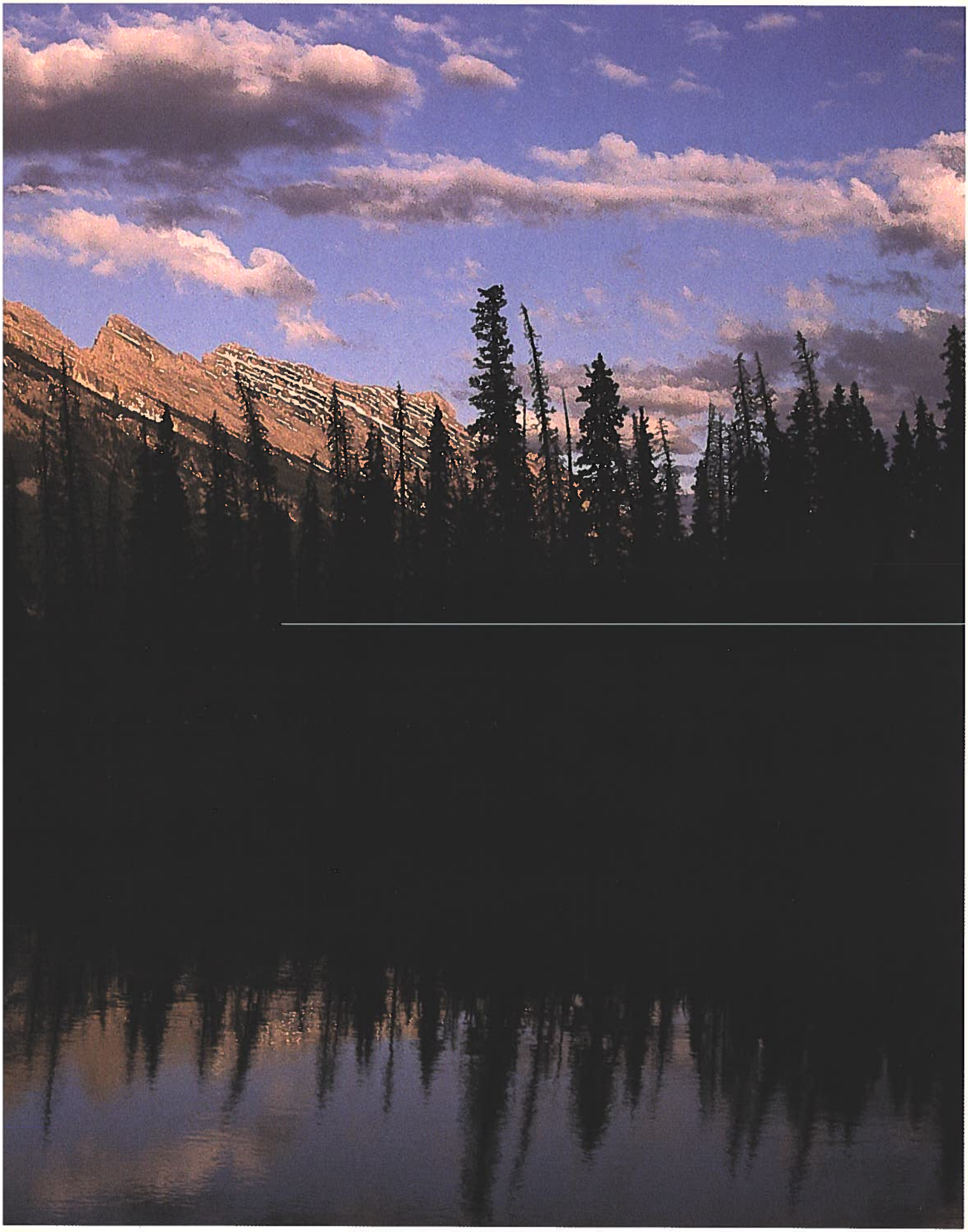


16-20 May 1994
Banff Park Lodge
Banff, Alberta, Canada

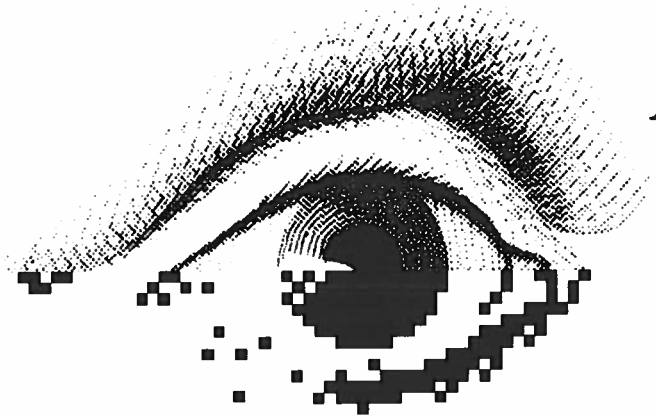
You are invited to participate in this unique event – three Canadian research conferences that present the latest results in Artificial Intelligence, Computer Graphics and Computer Vision.

AI/GI/VI'94

Photo credit: Greg Klymchuk



Mt. Rundle from Vermilion Lakes — Banff, Alberta, Canada



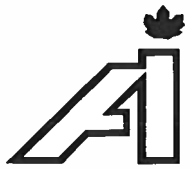
AI/GI/VI '94

16-20 May 1994

Banff Park Lodge

Banff, Alberta, Canada

CALL FOR PARTICIPATION




AI/GI/VI '94 is a unique event with three Canadian research conferences that present the latest results in artificial intelligence, computer graphics and computer vision. Each conference offers three concurrent days of invited and submitted papers. For a single registration fee, conference participants can attend presentations in any of the three, promoting the exchange of knowledge among these important disciplines. Two days have been set aside for workshops and other events. A banquet and electronic theatre provide additional opportunities to meet speakers and other attendees for informal discussion in a social setting.

The conference will be held at the Banff Park Lodge, Banff, Alberta. Banff is located in the spectacular Canadian Rockies, the beauty of which remains unsurpassed, and is just an hour and a half drive from Calgary. The Calgary International Airport can be reached from many North American cities via many different airlines. In addition, there is direct bus service from the Calgary International Airport to Banff, or alternatively one can arrange a limousine or rental car at the airport. The ski season usually ends around the 24th of May at Sunshine, so ski enthusiasts may enjoy spring skiing at its finest. For non-skiers there are many other activities to occupy their precious time.

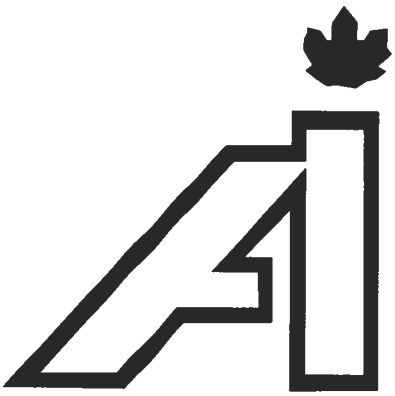
General Co-Chairs
Tony Marsland & Wayne Davis
Computing Science
University of Alberta
Edmonton, AB T6G 2H1
Ph: 403-492-3971
Fax: 403-492-1071
email: tony@cs.ualberta.ca
davis@cs.ualberta.ca

Treasurer
Peter van Beek
Computing Science
University of Alberta
Edmonton, AB T6G 2H1
Ph: 403-492-7741
Fax: 403-492-1071
vanbeek@cs.ualberta.ca

Local Arrangements
Jan Mulder
Alberta Research Council
6815 - 8th St NE
Calgary, AB T2E 7H7
Ph: 403-297-7570
Fax: 403-279-2339
mulder@skyler.arc.ab.ca

For Further Information Contact:

AI/GI/VI '94
Box 1098
Summerland, B.C. V0H 1Z0



AI '94

Canadian Artificial Intelligence Conference

AI '94 is the tenth biennial conference on artificial intelligence sponsored by the Canadian Society for the Computational Study of Intelligence. It will be held in conjunction with **Vision Interface and Graphics Interface**.

Contributions are invited that present original, unpublished results in all areas of artificial intelligence. They should be sent to the program chair, Renée Elio. Papers must be received by **15 November 1993**.

Submitted papers must not exceed 5000 words in length, including abstract and bibliography. Theoretical and position papers will be judged on their originality and contribution to the field of AI, and applied papers on the importance and originality of the application. To help in the review process, authors should list, in decreasing order of relevance, 1 to 3 of the following keywords:

applications	learning	reasoning (indicate subarea)
search	cognitive modelling	knowledge representation
planning	architectures	knowledge acquisition
perception	robotics	language understanding
problem solving	theorem proving	neural nets/connectionism

Authors should submit four (4) complete copies of the paper in hardcopy form, for review by members of the program committee. Acceptance depends on the overall merit and significance of the reported research, as well as the quality of the written presentation. Each copy of the paper must include a cover page, separate from the body of the paper, which includes, in order, (1) title of the paper, (2) full names, postal addresses, phone numbers, and email addresses of all authors, (3) an abstract of no more than 250 words, and (4) keywords to classify the paper for review purposes. As a condition of acceptance, the author or a co-author must present the paper at the conference. If the paper is being submitted to other conferences, either in verbatim or in essence, authors must clearly indicate this on the cover page.

Notification of acceptance or rejection will be mailed to the first author by **7 February 1994**. Camera ready copy of accepted papers is due **24 March 1994**. Each paper will be allotted up to eight (8) pages in the conference proceedings, formatted using 12pt LaTeX or equivalent. The journal Artificial Intelligence intends to publish the *"best paper"* of the conference, and provide a prize. Selection of the best paper will be done by the program committee.

For further information contact the Program Chair: Renée Elio

Program Chair

Renée Elio
Computing Science Dept.
University of Alberta
Edmonton, AB T6G 2H1
email: ai-94@cs.ualberta.ca
phone: 403-492-5444
fax : 403-492-1071

Program Committee

Fahiem Bacchus
University of Waterloo
Veronica Dahl
Simon Fraser University
Brian Gaines
University of Calgary
Russell Greiner
Siemens Research Lab
Lev Goldfarb
Univ. of New Brunswick
Scott Goodwin
University of Regina
Rainer von Konigslow
Cognex Corporation
Bruce MacDonald
University of Calgary
Gordon McCalla
University of Saskatchewan
Mary McLeish
University of Guelph
Robert Mercer
Univ. of Western Ontario
John Mylopoulos
University of Toronto
Monty Newborn
McGill University
Eric Neufeld
University of Saskatchewan
David Poole
Univ. of British Columbia

Graphics Interface '94

Program Chair

Barry Joe
Computing Science
University of Alberta
Edmonton, AB T6G 2H1

Tel: 403-492-5757
Fax: 403-492-1071
email: barry@cs.ualberta.ca

Graphics Interface '94 is the twentieth Canadian conference devoted to computer graphics and interactive techniques, and is the oldest regularly scheduled computer graphics conference in the world. Now an annual conference, film festival, and workshops, **Graphics Interface** has established a reputation for a high-quality technical program. The 1994 conference will be held in **Banff, Alberta** on **16-20 May 1994**. Graphics Interface '94 is sponsored by the Canadian Human Computer Communications Society, and will be held in conjunction with **Vision Interface** and **Artificial Intelligence**.

Conference Program

Contributions are solicited describing unpublished research results and applications experience in all areas of computer graphics, specifically including the following:

- Image Synthesis & Realism
- Shading & Rendering Algorithms
- Geometric Modeling
- Computer Animation
- Interactive Techniques
- Graphics for CAD/CAM
- Computer-Aided Building Design
- Industrial & Robotics Applications
- Graphics in Business
- User Interfaces
- Windowing Systems
- Computer Cartography
- Image Processing
- Medical Graphics
- Graphics in Education
- Graphics & the Arts
- Visualization
- Graphics in Simulation

Send five (5) copies of a full paper (20 double-spaced pages or less) to the Program Chair by **31 October 1993**. Include full names, addresses, phone numbers, fax numbers and email addresses for all authors. One author should be designated contact author for all subsequent correspondence regarding the paper. Accepted Papers will be published in the Conference Proceedings. Notification of acceptance or rejection will be mailed to the contact author by **1 February 1994**. Camera ready copy of accepted papers is due **28 March 1994**. Each paper will be allotted up to eight (8) pages in the proceedings. Extra charges will be made for papers exceeding the limit and for colored photos.

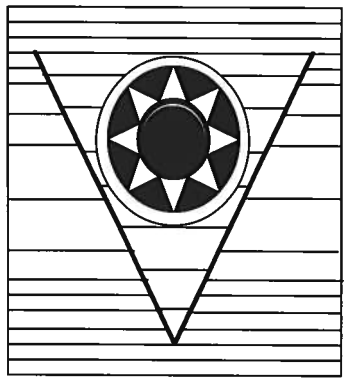
Electronic Theatre

Film and video tapes that illustrate the use of computer graphics and interactive techniques will be considered for presentation at the 1994 conference. This material could present new techniques, the artistic application of computer graphics, or a historical perspective of the field. All submitted material will be reviewed. Due to time constraints the entire film or video tape may not be shown. The committee reserves the right to edit all submitted material for presentation. Submissions must be received by **1 April 1994**.

For further information contact the Program Chair: Barry Joe

Program Co-chairs:
Colin Archibald
Autonomous Systems Lab
National Research Council
Ottawa, ON K1A 0R6
Ph: 613-993-6580
Fax: 613-952-0215
email: archibald@iit.nrc.ca
Paul Kwok
Dept. of Computer Science
University of Calgary
Calgary, AB T2N 1N4
Ph: 403-220-6316
Fax: 403-284-4707
email:
kwok@cpsc.ucalgary.ca

Vision Interface '94



Vision Interface '94 is the eighth Canadian conference devoted to computer vision, signal and image processing, and pattern recognition. This conference, held in various Canadian cities, is sponsored by the Canadian Image Processing and Pattern Recognition Society. The 1994 conference will be held at the **Banff Park Lodge**, Banff, Alberta on **16-20 May 1994**, in conjunction with **Artificial Intelligence** and **Graphics Interface**.

Contributions are solicited (English or French) describing unpublished research results and applications in any area of computer vision, signal and image processing, and pattern recognition. VI '94 will have a theme: ***"Perception in Robotics, and Process Automation"***. Submissions on this theme and on other areas of Image Processing and Pattern Recognition are welcome. Topics will include, but are not limited to:

Robot Perception	Biomedical Applications
3-D Vision	Modeling of Human Perception & Movement
Multi-sensor Perception	On-Line & Off-Line Document Processing
Active Perception	Industrial Applications
S/W & H/W Architecture	Intelligent Autonomous Systems
Remote Sensing	Knowledge Representation
Motion Representation	Neural Networks

Robust Methods for Signal & Image Processing

Four copies of full papers should be submitted to either of the Program Co-chairmen before **31 October 1993**. Include with the paper: full name, address, phone number, fax number and electronic mail address of the contact author.

Important Dates:
Four copies of full paper due:31 Oct 1993
Workshop proposals due: 15 Nov 1993
Authors Notified:1 Feb 1994

For Further Information Contact either of the Program Co-chairs.

Invited Speakers:

Judson P. Jones - Oak Ridge National Laboratory

R. Kasturi - Pennsylvania State University

William A. MacKay - University of Toronto

White-collar computers

SAN JOSE, CALIFORNIA

Businesses are seeking more help from intelligent machines. Ideally, machines and human beings should each do what they are good at.

Every customer has at least one horror story to tell of a company or a government department that is unable to stop sending wrong bills, or to correct an address, or to divulge a piece of information "because of the computer." The brainless obstinacy of some machines has made them great allies of bureaucratic solution-blockers. So the very thought of giving machines more responsibilities will send chills down many spines. Fear not. Companies are finding that the more intelligent machines are allowed to play to their strengths, the more they reduce human obstinacy.

Intelligent machines are increasingly being used to hide the brain-numbing complexity of modern business's products and processes, letting people concentrate on customers. In addition to providing better service, this redistribution of work should give new (and unsexist) meaning to the phrase "man's work."

One of the most ambitious efforts to employ intelligent machines is being undertaken in the credit-card operations of American Express. The firm is building a "knowledge highway" in which bright computers will help people with every step of the job of managing credit, from card applications to collecting overdue accounts. The business goal is to use the machines to shield both credit-card holders and employees from the bureaucracy needed to manage American Express's vast business - so leaving employees free to devote their efforts to building relationships with customers.

The machines help in several ways. The latest addition to the "knowledge highway" is designed to help with overdue accounts. It leaves humans in charge of collection, but protects them from error at every step. The system automatically pulls together all of the information needed to analyse an account. Previously analysts had to make 22 queries on average to computers spread across the whole of the company each time they looked at a problem account. Now they typically make only one. The computer keeps track of which state or national laws might affect the account. It helps to generate a dunning letter. It files all the paperwork. And it automatically reminds the analyst if the account needs to be looked at again.

Thanks to such automated assistance American Express is gradually changing the sorts of people it recruits to manage credit. Instead of hiring people good at number-crunching and applying complex rules, it is turning to people who know how to deal with people. And it is giving them more scope to use their skills. Previously the sheer complexity of the work meant that jobs had to be narrowly defined in order to be manageable. With that complexity largely hidden, American Express reckons it can define jobs more broadly - so giving generalists more freedom to make their customers happy.

American Express is not alone. At the recent Innovative Applications of Artificial Intelligence conference in San Jose, California, companies showed off the ways in which they use clever machines to make people's lives easier. Their experiences show that even a little machine intelligence can go a long way. Researchers are devising all sorts of new ideas and techniques to enable computers to solve problems that before only humans could handle. But it is the simplest of their creations that are proving most popular with business, in large part because they complement humans' own skills.

Expert systems, like automated bureaucrats, search a book of rules to decide what to do in any given situation. But because machines do not forget, they can manage more rules more consistently than people. Expert systems provide the intelligence for American Express's knowledge highway. Swiss Bank, like many other financial institutions, uses expert systems to help decide what sort of mortgage, if any, is best for would-be clients. Meanwhile, Whirlpool, a maker of washing machines and other appliances, has installed expert systems in its customer-service department to smooth the fixing of broken appliances by, among other things, ensuring that the repairman and the parts likely to be required arrive at the same place at the same time.

Brain boxes

Applying rules is not the only way to be clever. Compaq, a maker of personal computers, is trying to improve its customer service by installing automated assistants that work on the principle that reasoning is often just a matter of remembering the best precedent. Using "case-based reasoning" technology from Inference, one of the leading suppliers of artificial-intelligence software, Compaq is building a compendium of the problems that customers have had with its personal computers and the solutions which Compaq has come up with - a sort of corporate collective subconscious.

Computers can remember more precedents than any person, and Inference's software makes it easy to search even huge databases. By capitalising on corporate experience,

Compaq's customer-service representatives can answer a broader range of questions before they have to refer the call to a technical specialist. Eventually, Compaq may simply ship its database out to big customers so that they can use it to answer many of their own questions.

To apply precedents that are hard to express in either words or numbers, some companies are turning to "neural nets." Supposedly based on the circuitry of the brain, neural nets can be trained to recognise complex patterns. The nets are shown examples of things they are supposed to recognise and other things they are not. Because they have an uncanny ability to pick up subtle patterns, neural nets outperform other techniques for some problems. Some insurance companies are experimenting with neural nets to recognise fraudulent claims; financial institutions are trying them to sniff out problem loans. Fidelity, a big American investment firm, uses neural nets to screen shares for two of its mutual funds - though humans decide what to buy.

In every case, the key to making these intelligent technologies work is to build them into the structure of the organisation. That can be expensive. American Express reckons that the intelligent bits account for only 20% of the cost of its knowledge highway; the rest goes on networks and the integration of systems. But only with tight integration can companies redistribute work between people and machines.

That redistribution can bring dangers as well as benefits. By hiding unavoidable complexity from human view, machine intellect certainly enables people to do more work. But it can also make them more tolerant of needless complexity. Someday someone will inevitably go too far. Bankers, for example, are talking about using artificial intelligence to enable their people to sell financial products too varied and sophisticated for the salesmen to understand. Now that is an intelligent idea that could leave someone looking very stupid indeed.

Reprinted with permission from The Economist, August 1st, 1992 issue.

LIDO Bibliographic Mailserver for AI Literature:

Third Anniversary and Call for Technical Reports

The LIDO MAILSERVER for AI literature has now been in operation for three years at the University of Saarbruecken, Germany. The system allows for the retrieval of bibliographic information on AI-related publications via electronic mail. The references are returned in LaTex (Bibtex) format or in a refer-like format. As of January 1993, nearly 28,000 entries are contained in its database, with an increase of 20% annually. About 4500 bibliographic requests from 40 countries are currently handled each year. Since 1991, the LIDO bibliographic mailserver has been included in the NSF Internet Resource Guide.

Queries to the bibliographic database may refer to the authors' name(s), the title, and the year of publication. Substring search and regular expressions (egrep) are possible. Global keywords or classification hierarchies cannot be accessed. Users who already have a general knowledge of a field will therefore probably profit more from the LIDO MAILSERVER than novices familiarizing themselves with a new area.

For more information on this service, send the following e-mail message:

To: lido@cs.uni-sb.de
Subject: lidosearch info english

The body of the message should be empty.

During the next few years, increased emphasis will be put on entering the bibliographic data of technical reports and memoranda, in addition to books and articles from journals and proceedings. In order to become added into the LIDO database, one physical copy of each report should be sent free of charge to the following address:

LIDO Biblioware Systems
c/o Prof. Dr. Alfred Kobsa
University of Konstanz
D-7750
Konstanz, Germany

Please do not send e-mail material or report listings, but originals only. The organizers reserve the right to omit material that seems outdated or does not pertain to the field of AI and related areas.

Alfred Kobsa
University of Konstanz, Germany
Email: kobsa@inf-wiss.ivp.uni-konstanz.de

Cochairs:
Gerhard Brewka (GMD)
Matthew L. Ginsberg (Oregon)

Program Committee:
Jon Doyle (MIT)
doyle@zermatt.lcs.mit.edu
Michael Gelfond (Texas)
mgelfond@cs.ep.utexas.edu
Henry Kautz (AT&T Bell Labs)
kautz@research.att.com
Kurt Konolige (SRI)
konolige@ai.sri.com
David Makinson (Paris)
shmak@frunes21.bitnet
Judea Pearl (UCLA)
judea@cs.ucla.edu

Call for Participation

5TH INTERNATIONAL WORKSHOP ON NONMONOTONIC REASONING

May 29 - June 1, 1994
Castle Dagstuhl, near Saarbrucken
Germany

The Fifth International Workshop on Nonmonotonic Reasoning will be held May 29 - June 1, 1994, at Castle Dagstuhl near Saarbrucken. The aim of the workshop is to bring together active researchers interested in the area of nonmonotonic reasoning to discuss current research, results, and problems of both a theoretical and practical nature. The field of nonmonotonic reasoning includes work on circumscription, autoepistemic and default logic, truth maintenance, closed-world databases, logic programming, probabilistic reasoning, and related formal systems and application areas.

Because of the conference on knowledge representation and reasoning (KR-94) to be held the previous week in Bonn, the format of this workshop will be somewhat different from previous ones. There will be an increased focus on panel discussions; individual paper presentations will be restricted to position papers of the form not generally accepted at large conferences. Where possible, the panels will be organized around these position papers or around groups of related results presented at KR-94. By a "position paper," we mean a paper that discusses the significance of already known concepts or results, explains the interest and potential of current directions of research, or speculates on notions and questions that lie ahead.

Attendance will be limited and by invitation only. Space permitting, at least one author of each accepted KR-94 paper dealing with nonmonotonic reasoning will be invited. Others wishing to attend should submit a short description of their past accomplishments and current research interests. Position papers should be limited to 4000 words; papers of greater length or papers that are clearly more suitable for conference submission will be rejected without review. Panel suggestions are also welcome.

A limited number of spaces will be reserved for students, and student lodging and travel subsidies will hopefully be available. Students should indicate their university and year of study, and include letters of recommendation from their supervisors.

Please include your postal (and, if possible, electronic mail) addresses on all correspondence. Submissions may be either hardcopy (4 copies) or electronic (postscript files only) to either of the program chairs:

Gerhard Brewka
GMD, Postfach 1316
D-5205 Sankt Augustin
Germany
brewka@gmd.de
Phone: 49 (2241) 142 687

Matthew L. Ginsberg
Computer and Information Sciences
University of Oregon
Eugene, Oregon 97403
U.S.A
ginsberg@cs.uoregon.edu
Phone: (415) 723-1239

Electronic submissions are encouraged where possible and must be received by **December 7, 1993**. Hardcopy submissions must be postmarked by **December 6, 1993** and received by **December 13, 1993.** Notification of acceptance: **February 1, 1994.** Accepted authors will be expected to send a preprint for distribution prior to the workshop. No formal proceedings or collection of papers from the workshop will be published.

A quest for intelligent machines

by Grant Buckler

Roger Schank is hoping computers can turn us all into two-year-olds. Well, not exactly. But the founder of the Institute of Learning Sciences at Chicago's Northwestern University believes the "terrible twos" can teach the rest of us a thing or two about learning. And he thinks computers could help make the learning that goes on in the classroom more like the natural learning process of a small child.

Two-year-olds "have lots of interesting properties," Schank observed in a recent speech at Queen's University in Kingston, Ont., "one of which is that they're always getting into trouble."

What gets small children into trouble, Schank said, is "exploratory learning." They try things and make mistakes. "A two-year-old is a little learning device."

For instance, "a two-year-old learns to talk by saying stuff and getting corrected and using the correction in the very next sentence . . . It's really very simple - it's a learn-by-doing algorithm."

That contrasts with the structured approach to learning that takes place in a classroom. Trying to teach a set collection of facts doesn't work very well, Schank said, because not all knowledge can be put in the form of neatly defined facts and because this approach does not motivate students. School is boring because it doesn't have enough goals, Schank said.

Schank contended that what is needed is an approach more like the one the two-year-old takes, where students set out to accomplish goals and learn along the way. What the students do should be determined by their interests. "We put you in a situation where your goal seems interesting, and now we're trying to teach you in service of your goal."

But how do you let a classroom full of students pursue individual goals?

Schank's answer is computer programs that use a "simulation-based architecture" to let students tackle a particular project and gain knowledge along the way.

Example: a program simulates the experience of running a trucking company for a year. Along the way, it's designed to teach students about things like government regulations, economics and business.

This and other programs use multimedia techniques to give students access to snippets of information from many sources. Schank says his centre has "quite literally thousands of experts on video clips saying a little about what they know something about."

This lets the program provide instruction that is relevant to what the student is interested in at the time. Schank likened it to a flight simulator, which is a very effective teaching device in itself, but with the added capability of having a seasoned pilot appear on the screen after the student makes a mistake and explain what he or she did wrong and how to do it better next time.

The idea is to keep students interested by letting them pursue the goals that interest them, and then try to make sure they have every possible chance to learn in the process, Schank said. "The only trick is to stop stopping them from learning."

But he added that his approach requires lots of computers in the schools equipped with interactive software, so that students can have one-on-one instruction on demand

And he was critical of the uses to which computers are more frequently put in schools today, describing them as mostly "meaningless games - my favourite is "shoot the verb as it goes by."

Schank, who is known for his work on artificial intelligence in the 1980s, also had some sobering words about AI.

For one thing, he said, the need for goals applies to machine intelligence as well as that of humans. If artificial intelligence is possible, it will have to involve goal-seeking.

And he warned those interested in artificial intelligence to expect lots of drudgery. "Start doing the boring stuff. That's what's going to make it happen."

Intelligent programs need to have a lot of knowledge built in and that knowledge has to be well indexed so that it is easily accessible, he said. Eager students too often build a system that deals well with one example, Schank said, but they don't think about the fact that "the second example doesn't come any easier."

Reprinted with permission from ***Computing Canada,*** *December 21, 1992 issue.*

INTERNATIONAL WORKSHOP ON ROUGH SETS AND KNOWLEDGE DISCOVERY (RSKD-93)

INVITED SPEAKERS

Brian Gaines
University of Calgary
Gregory Piatetsky-Shapiro
GTE Laboratories
Ewa Orlowska
Polish Academy of Sciences
Andrzej Skowron
University of Warsaw
Roman Slowinski
Technical University of Poznan
Jan Zytkow
Wichita State University

ORGANIZATION

Co-Chairs:
Nick Cercone, Zdzislaw Pawlak

Program Chair:
Wojciech Ziarko

Publicity:
Howard J. Hamilton (Chair)
Jack D. Katzberg

LOCAL ARRANGEMENTS

Michael Wong

PROGRAM COMMITTEE

Tomasz Arciszewski
Wayne State University, U.S.A.
James Delgrande
York University, Canada
Nick Cercone
University of Regina, Canada
Didier Dubois
Universite Paul-Sabatier CNRS, France
Ken Ford
University of West Florida, U.S.A.
Brian Gaines
University of Calgary, Canada
Jerzy Grzymala-Busse
University of Kansas, U.S.A.
Howard J. Hamilton
University of Regina, Canada
Jiawei Han
Simon Fraser University, Canada
Waldemar Koczkodaj
Laurentian University, Canada
Adam Kowalczyk, TELECOM Australia Research Laboratories, Australia
Tsau Lin
San Jose State University, U.S.A.
Ryszard Michalski
George Mason University, U.S.A.
Akira Nakamura
Meiji University, Japan
Ewa Orlowska
Polish Academy of Sciences, Poland
Marian Orlowski
Queensland University of Technology, Australia
Zdzislaw Pawlak
Warsaw University of Technology, Poland
Henri Prade
Universite Paul-Sabatier CNRS, France
Zbigniew Ras
University of North Carolina, U.S.A.
Andrzej Rucinski
University of New Hampshire, U.S.A.
Andrzej Skowron
Warsaw University, Poland
Krzysztof Slowinski
F. Raszeja Memorial Hospital, Poland
Roman Slowinski
Technical University of Poznan, Poland
Jacques Teghem
Faculte Polytechnique de Mons, Belgium
Anita Wasilewska
State University of New York, U.S.A.
Michael Wong
University of Regina, Canada
Ramin Yasdi
Hochschule Bremerhaven, Germany
Jan Zytkow
Wichita State University, U.S.A

The purpose of this workshop is to exchange, compare and contrast research results in the areas of Rough Sets (RS) and Knowledge Discovery (KD). The theory of rough sets evolved during the last 14 years as an independent discipline concerned with mathematical modelling of imprecise or incomplete knowledge and approximate classification problems. Knowledge Discovery analyzed databases to uncover hidden relationships, regularities, etc. In this context, the theory of rough sets can be perceived as a mathematical methodology for discovering logical data patterns. The workshop will expose KD researchers to specific logical techniques used by RS researchers and it will enable RS researchers to familiarize themselves with KD problems and the approaches of KD researchers. This exchange will potentially lead to mutually beneficial co-operation.

The workshop has four specific objectives:

1. To discuss the state of the art in the theory of rough sets.
2. To discuss the applications of rough sets in knowledge discovery and machine learning.
3. To discuss practical applications of rough sets and knowledge discovery.
4. To determine the research directions and expected milestones in all three above listed areas.

Workshop Format

The workshop is planned as a three-day interdisciplinary conference focused on various theoretical, methodological, and practical aspects of rough sets and knowledge discovery. It will be conducted as a combination of invited talks, to be given by leading researchers, and a sequence of round-

Banff, Alberta, Canada
October 12-15, 1993

Sponsored by the American Association for Artificial Intelligence (AAAI), the Canadian Society for Computational Studies of Intelligence (CSCSI), the International Association for Mathematics and Computers in Simulation (IMACS), the Institute of Electrical and Electronic Engineers (IEEE) and the University of Regina.

table discussions, which will stimulate the development of an interdisciplinary understanding of both disciplines. This format will provide fundamentals of the theory of rough sets for researchers who would like to become involved in research related to rough sets and it will also provide ample time for discussions and exchanging ideas.

The following themes are planned for workshop sessions:

1. Theory and Extensions of the Rough Sets Model
2. Data-Driven Approaches to Knowledge Discovery
3. Rough Sets As a Methodology for Knowledge Discovery
4. Scientific Discovery
5. Discovery in Databases
6. Rough Sets and Machine Learning
7. Approximate Reasoning About Knowledge
8. Knowledge Acquisition
9. Applications of Rough Sets and Discovery Systems
10. Rough Sets and Fuzzy Sets

Tutorials and System Demonstrations

Tutorial sessions on rough sets fundamentals and the methodologies of knowledge discovery are planned for October 12, 1993. A special evening session devoted to demonstrations of rough sets or discovery systems is also planned. Participants willing to demonstrate software should contact Wojciech Ziarko at Ziarko@Max.cc.uregina.ca by September 1, 1993.

Banff

This scenic resort town is located in the Canadian Rockies about a one and a half hour drive from Calgary. The town of Banff is located in the middle of Banff National Park and surrounded by a variety of tourist attractions. The famous Lake Louise is 55km. from the Banff townsite. Both Banff and Lake Louise are wonderful tourist, shopping, dining and nightlife choices. Activities include downhill skiing, Nordic skiing, ice skating, gondola rides, hot springs and cultural events. The park itself is a wonderland: 6,641 sq. km. of mountains, lakes, rivers, canyons, forests and fresh air.

Submission Requirements

Submit a one or two page description of your current research interests and the type of work you are doing. To maximize the interaction among participants, the size of the workshop will be limited and the participants will be selected by invitation. Anyone wishing to make a formal presentation should submit four (4) copies of either a complete draft paper of at most ten (10) typed pages or an extended abstract of 3-5 pages to:

Wojciech Ziarko,
Department of Computer Science
University of Regina
Regina, Saskatchewan, Canada
S4S 0A2,

by **June 15, 1993**. Notification of receipt will be mailed to the first author (or designated author). Include on the first page the name, address, phone number, and (if possible) e-mail address of the author designated for contact. Accepted papers will be assigned to either on-stage or poster presentation.

Final Papers

Final papers are due at Workshop.

Publication

A collection of all draft papers and extended abstracts will be distributed to all registered participants at the workshop. Final workshop proceedings containing full papers will be mailed to participants after the workshop. All accepted papers will be presented at the Workshop and published in the proceedings.

Important Dates

June 15: Submission Deadline
July 15: Acceptance Letters mailed
October 12: Tutorial
October 13-15: Technical Sessions

Sponsoring Organizations

RSKD-93 is being sponsored by the American Association for Artificial Intelligence (AAAI), the Canadian Society for Computational Studies of Intelligence (CSCSI), the International Association for Mathematics and Computers in Simulation (IMACS), the Institute of Electrical and Electronic Engineers (IEEE) and the University of Regina.

Limited financial support is available for some student participants travelling to the workshop. To apply for this support, include proof of full-time student status.

Jean-Claude Gavrel

Moving Research Results to Industry

My last *Canadian Artificial Intelligence* article (Winter 1993) highlighted one of the major elements of technology transfer offered by the PRECARN model, that of technical workshops. These workshops, hosted by the project participants, are offered on a regular basis to all PRECARN member representatives and their technical staff. They are a major tool for transferring technology out of the laboratory into industry.

Three workshops have already taken place in 1993 and two more will be offered to Member organizations by year-end (October, Telerobotic Development Systems (TDS) project; December, Advanced Process Analysis and Control Systems (APACS) project). These workshops, specifically designed for a technical audience, provide full descriptions of the research objectives, methodologies and results of the project. They offer the Members a first look at the project and establish important contacts between the researchers and the broader industrial receptor community. Members are also encouraged to consult individually with PRECARN project researchers to obtain more details on specific technologies being developed. Those "one-on-one" sessions are often the vehicle for getting the research results transferred from the research project to individual organizations.

The challenge of delivering research results to industry remains a high priority for PRECARN, and, with its research program well underway, efforts continue to ensure that the most efficient mechanisms are used to encourage Canadian industry to benefit from the research undertaken by PRECARN project participants. In addition to technical workshops, PRECARN has initiated other steps to stay "ahead of the game" with regard to technology transfer. First, some history.

PRECARN's research program was launched in 1988 with a Request For Proposals (RFP) which resulted in the selection of seven feasibility studies from a total of twenty-eight proposals. At the time of the RFP, PRECARN was already concerned with the development of new technologies and their exploitation by industry: proposals had to include a university research component and had to have the support of at least two PRECARN Members.

The PRECARN program currently counts eight projects at various stages of completion, from early feasibility studies to halfway into the research phase (refer to earlier issues of *Canadian Artificial Intelligence* for an overview of the research program). Over twenty member organizations and six universities are currently participating in the industry-led research program. While numbers alone are not sufficient to ensure the successful development and exploitation of new technologies, the very significant investment of people, time and dollars by industry demonstrates their strong commitment to the program. Industry is accepting the long-term view of the PRECARN program, but is clearly expecting downstream economic benefits to justify its initial investment.

Each partner in a PRECARN project has a vested interest in seeing the results exploited: the "technology user" partner has a problem which needs solving, the "technology supplier" partner wishes to develop new products or services and the researcher or "technology developer" is interested in developing new technologies which will be broadly disseminated.

With the PRECARN model, research results are available to all Member organizations, not only to the project partners. The research program is precompetitive, i.e. beyond the fundamental research work typically done in universities, but before the final industrial product development. While the ownership of Intellectual Property may be vested with the developer, all PRECARN Members are entitled to a royalty-free license to use and commercialize the results. This policy was developed by the Members to encourage a broad dissemination of results in Canadian industry. For example, while the intelligent process control software developed in the APACS project directly relates to nuclear power plants, it is also available to other Members such as petrochemical companies, for application within their own environments. Experience has shown that as projects advance, and results begin to appear, new Members want to learn about technologies being developed and how to apply them.

In addition to the smaller workshop environments and the

"one-on-one" sessions, PRECARN holds a joint annual conference with the Institute for Robotics and Intelligent Systems (IRIS), one of the 15 federal Networks of Centres of Excellence. IRIS, managed by PRECARN, involves over 300 university researchers and graduate students.

The IRIS PRECARN Conference, held in June, is an event which brings together over 400 university researchers and their graduate students and Canadian industry representatives. Over the past three years, the Conference has evolved to reflect the maturing of the research and the emergence of tangible results. This past June has seen tremendous success with the Student Poster Session, displaying over 100 papers by students vying for three top prizes. Demonstrations of both IRIS and PRECARN project results were also featured and met with great success. Delegates who attended the three-day event saw first-hand the benefits of collaboration between the university and industry communities.

The efforts for technology transfer do not stop there. First, in recognition of interested non-PRECARN Member companies, steps have been taken to present opportunities to companies to attend both workshops and the annual Conference to gain insights into the PRECARN/IRIS world. The role of PRECARN is to encourage technology transfer, even to non-PRECARN Member companies. Individuals interested in participating in workshops or conferences are simply asked to sign a non-disclosure agreement, as some of the results being presented at these events are proprietary.

Second, PRECARN has recently hired an IRIS Technology Transfer Officer, whose role will be to promote the IRIS technologies within the PRECARN Membership, as well as to the broader Canadian industrial community. Ms. Jennifer Mills joined PRECARN in late March and is actively establishing a network of contacts within the University Technology Transfer Offices, the IRIS research communities and the PRECARN Membership. To assist in the rapid dissemination of results, while preserving the confidentiality of new Intellectual Property, our IRIS and PRECARN researchers fill out Technology Disclosure Forms which are communicated to PRECARN's Members. The Technology Transfer Officer will then be charged with circulating the Technology Disclosure forms, following-up with interested parties and seeking out potential clients for the results. Some challenging tasks, no doubt!

Those interested in obtaining additional information on the PRECARN/IRIS networks, on available technologies, or on upcoming workshops may contact Ms. Mills, or Mrs. Lise McCourt, Manager of Corporate and Public Relations at the following address:

PRECARN Associates Inc.
300-30 Colonnade Road, Nepean, Ontario, K2E 7J6
Tel:(613) 727-9576 Fax: (613) 727-5672
Email: Gavrel@a1.atott2.nrc.ca

Call for Papers

IEA/AIE-94

The Seventh International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems

The **Seventh International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems (IEA/AIE-94)**, will be held at the Hyatt Regency on Town Lake, Austin, Texas 78704 USA, May 31-June 3, 1994. Sponsored by the International Society of Applied Intelligence and cooperated with major international organizations, including ACM/SIGART, AAAI, IEE, IEEE Computer Society, INNS, ECCAI, CSCSAI, JSAI, and SWT. Submit four copies of long papers written in English (up to 10 pages) or short papers (up to 4 pages) by November 5, 1993, to:

Dr. Frank Anger, Program Chair
IEA/AIE-94
Department of Computer Science
University of West Florida
Pensacola, FL 32514, USA.
Telephone (904) 474-3022
Fax (904) 474-3129
E-Mail fa@cis.ufl.edu

Submission Deadline: November 5, 1993

BOOK REVIEWS

Genetic Programming: On the Programming of Computers by Means of Natural Selection *John R. Koza* (Stanford University) Cambridge, MA: The MIT Press, 1992, (Complex adaptive systems series, edited by *John H. Holland, Christopher Langton, and Stewart W. Wilson*), xiv+819 pp; hardbound, ISBN 0-262-11170-5, US$55.00

Genetic Programming: The Movie
John R. Koza & James P. Rice (Stanford University) 1 hour videotape, VHS NTSC format, 1992, ISBN 0-262-61084-1, US$34.95

Reviewed by
Peter Turney
National Research Council

If you are interested in genetic algorithms or genetic programming, then I highly recommend both this book and its accompanying video. If your interest is more casual, then I recommend the video by itself. The video and the book take the same approach. The core ideas of genetic programming are presented, and then the reader or viewer is deluged with sample applications of genetic programming. The book presents 81 examples and the video presents a subset of 22 examples. The range of applications is impressive: fitting curves by functions; backing up a truck and trailer; balancing a pole; programming a robot to follow a wall, collect simulated food, cooperate with other robots, move a box; compressing visual images; finding roots of equations; learning a boolean multiplexer; and generating random data. Many of these examples are suitable for visualization, and the video shows computer animations that make the examples easy to grasp at an intuitive level.

The sheer size of the book is intimidating — more than 800 pages. However, the book is not difficult to read. Since it is essentially a collection of sample applications, there is no complex argument that threads through the book. After reading the first seven, short, introductory chapters (190 pages), the reader can dip into the book at any point, in any sequence. Readers familiar with genetic algorithms or genetic programming may even choose to skip the introductory chapters.

Genetic programming builds on the ideas of genetic algorithms. A population of Lisp programs evolves from an initial random state to a more fit state. Fitness is defined by the user of the genetic programming software. The user provides a performance task and an evaluation measure for determining the fitness of the individual Lisp programs. For example, the performance task might be for a simulated robot to collect simulated food. The evaluation measure might be the amount of food collected in a certain time interval. The user defines a set of primitive Lisp functions — such as turn right, turn left, pick up food — which are used as the building blocks for the population of Lisp programs. The initial random Lisp programs perform poorly, but as the population evolves, the performance improves.

The simulated evolution of the Lisp programs involves reproduction, where the number of progeny of a program depends on its fitness. The population size is usually kept constant, by eliminating less fit individuals. A program may be reproduced exactly (cloning); with a mutation introduced; or two programs may mate. Mating, called genetic crossover, turns out to be a very important operation. Empirical results show that it is more important than mutation. Nature invented sex for a good reason.

Lisp was chosen for genetic programming because it simplifies genetic crossover. A Lisp program has a tree structure. Two Lisp programs produce a child by randomly selecting a branch from the tree of one program and splicing it into the other program. If the primitive Lisp functions are chosen carefully, it is possible to guarantee that the child program will be a syntactically valid Lisp program — although it may not be very fit.

It is difficult to believe that such a simple strategy can do anything useful. This is why Koza has chosen to write a book with 81 diverse sample applications of genetic programming. This mass of examples is Koza's argument that genetic programming does work.

Most of the computational effort in genetic programming is expended in the evaluation phase, where the individual programs are tested on a performance task. In all of Koza's 81 sample applications, the performance task takes place inside the computer. For example, all of the robot applications use a simulated robot in a simulated environment. As the complexity of the simulation increases, the time required for genetic programming to evolve a reasonably fit program increases substantially. This explains why none of Koza's examples involves a real robot working in a real environment. Even after seeing 81 examples, the reader may remain sceptical. All of the examples are "toy" examples. There is

no evidence that they scale up to real world applications. None of the examples is directly relevant for industrial, commercial applications.

Koza's book is clearly written and well organized. All assumptions and limitations are explicitly discussed in detail. The video is also excellent, although Koza speaks in a monotone and appears to be reading a teleprompter. The video explains the basics of genetic programming and the computer animations illustrate the ideas nicely.

Koza's work is very interesting and I will continue to watch his research. However, the absence of realistic applications is discouraging. I would trade one real-world application for 50 toy examples.

***Peter Turney** is a Research Associate at the Knowledge Systems Laboratory of the Institute for Information Technology of the National Research Council of Canada. His current research is in Machine Learning. He obtained his Ph.D. from the University of Toronto, in 1988.*

BOOKS RECEIVED

Reviewers are sought for books marked with a * in the list below. Readers who wish to review books for *Canadian Artificial Intelligence* should write, outlining their qualifications, to the book review editor, Graeme Hirst, Department of Computer Science, University of Toronto, Toronto, Canada M5S 1A4, or send electronic mail to gh@cs.toronto.edu or gh@cs.utoronto.ca. Obviously, we cannot promise the availability of books in anyone's exact area of interest.

Authors and publishers who wish their books to be considered for review in *Canadian Artificial Intelligence* should send a copy to the book review editor at the address above. All books received will be listed, but not all can be reviewed.

The language of first-order logic (Third edition, revised and expanded), including the IBM-compatible Windows version of Tarski's World 4.0 *Jon Barwise and John Etchemendy* (Indiana University and CSLI, Stanford University) Stanford: Center for the Study of Language and Information (CSLI lecture notes 34), 1992, xiv+319 pp and 3.5-inch diskette; distributed by the University of Chicago Press; paperbound, ISBN 0-937073-90-3, US$34.95

Statistically-driven computer grammars of English: The IBM/Lancaster approach *Ezra Black, Roger Garside, and Geoffrey Leech (editors)* (IBM T.J. Watson Research Center and Lancaster University) Amsterdam: Editions Rodopi (Language and computers: Studies in practical linguistics, edited by Jan Aarts and Willem Meijs, volume 8), 1993, ix+248 pp; paperbound, ISBN 90-5183-478-0, no price listed

***Foundations of knowledge acquisition: Cognitive models of complex learning** *Susan Chipman and Alan L. Meyrowitz* (editors) (Office of Naval Research and Naval Research Laboratory) Boston: Kluwer Academic Publishers (The Kluwer international series in engineering and computer science: Office of Naval Research advanced book series, edited by Andrè M. van Tilborg), 1993, x+339 pp; hardbound, ISBN 0-7923-9277-9, US$79.95

***Mechanisms of implicit learning: Connectionist models of sequence processing** *Axel Cleeremans* (National Fund for Scientific Research, Belgium) Cambridge, MA: The MIT Press (Neural network modelling and connectionism series, edited by Jeffrey L. Elman), 1993, xiv+227 pp; hardbound, ISBN 0-262-03205-8, US$30.00

Consciousness: Psychological and philosophical essays *Martin Davies and Glyn W. Humphreys* (editors) (University of Oxford and University of Birmingham) Oxford: Blackwell Publishers (Readings in mind and language 2), 1993, ix+311 pp; hardbound, ISBN 0-631-18563-1, US$49.95; paperbound, ISBN 0-631-18564-X, US$22.95

***Subsymbolic natural language processing: An integrated model of scripts, lexicon, and memory** *Risto Miikkulainen* (University of Texas, Austin) Cambridge, MA: The MIT Press (Neural network modeling and connectionism series, edited by Jeffrey L. Elman), 1993, xii+391 pp; hardbound, ISBN 0-262-13290-7, US$45.00

User modelling in text generation *Cécile L. Paris* (Information Sciences Institute, University of Southern California) London: Pinter Publishers (Communication in artificial intelligence series, edited by Robin P. Fawcett and Erich H. Steiner), 1993, xx+205 pp; distributed in North America by St Martin's Press; hardbound, ISBN 0-86187-809-4, US$79.00

The language complexity game *Eric Sven Ristad* (Princeton University) Cambridge, MA: The MIT Press, 1993, xvii+148 pp; hardbound, ISBN 0-262-18147-9, US$30.00

Computer supported collaborative writing *Mike Sharples* (editor) (University of Sussex) London: Springer-Verlag (Computer supported cooperative work series, edited by Dan Diaper and Colston Sanger), 1993, xv+222 pp; paperbound, ISBN 3-540-19782-6 and 0-387-19782-6, no price listed

Corpus-based computational linguistics *Clive Souter and Eric Atwell* (editors) (University of Leeds) Amsterdam: Editions Rodopi (Language and computers: Studies in practical linguistics, edited by Jan Aarts and Willem Meijs, volume 9), 1993, vii+260 pp; paperbound, ISBN 90-5183-485-3, no price listed

CSCSI/SCEIO Membership

☐ I wish to join CSCSI/SCEIO and receive Canadian Artificial Intelligence ($40.00 *Cdn./yr.)

☐ I am a student ($30.00* Cdn./yr.)
and/or

☐ I am a member of CIPS ($30.00* Cdn./yr.)

Name _____

Mailing Address _____

_____

_____

_____

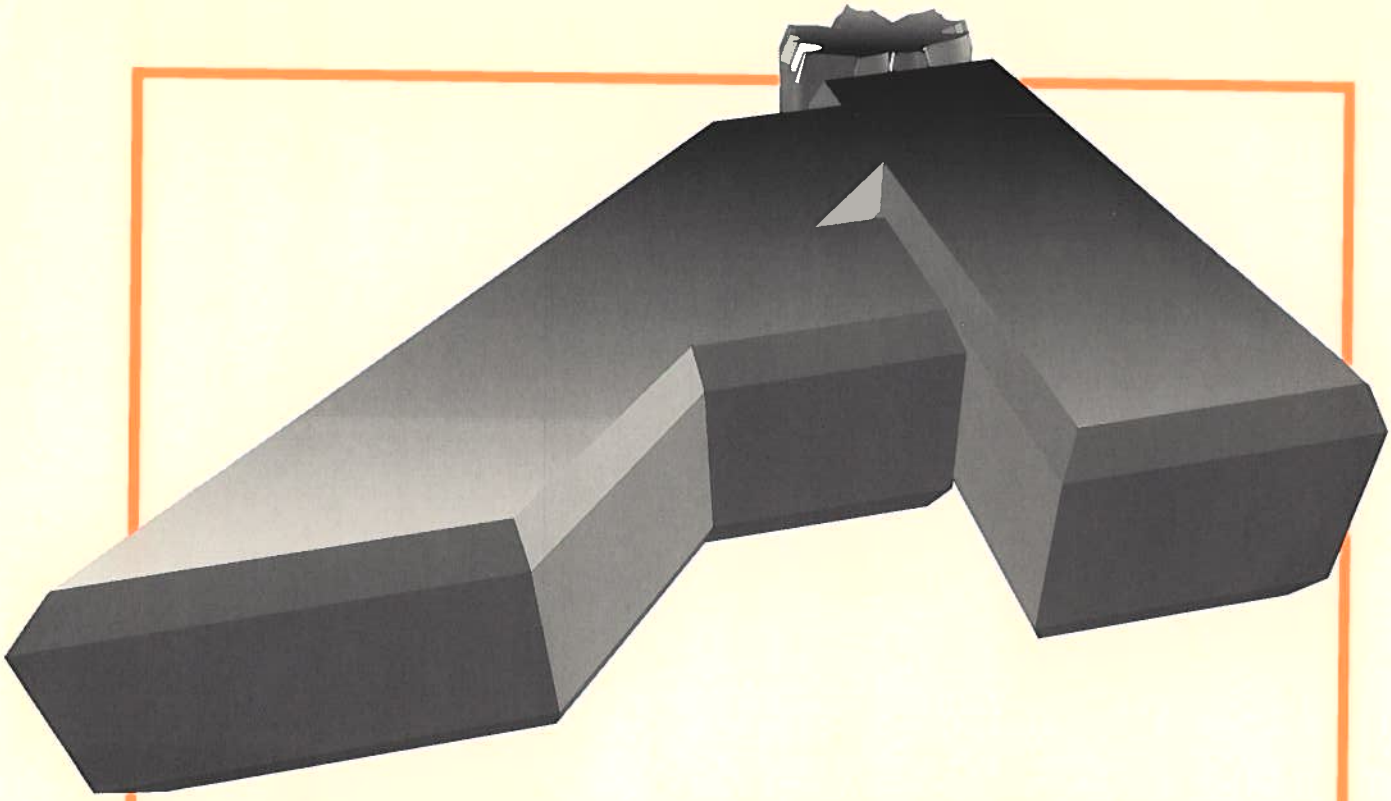
Please mail your membership to:

CIPS
430 King Street West, Suite 106
Toronto, Ontario
M5V 1L5
Phone: 416-593-4040
Fax: 416-593-5184

For more information contact **CIPS** or a member of the executive.
*Includes Applicable G.S.T.

Advertisers Index

Advertising Notes: Those interested in advertising in the magazine, please write us to obtain a Press Kit. Advertisers who reserve space for three consecutive issues are eligible for discounted rates.



BIG NEWS

DOES COME IN SMALL PACKAGES

Join CSCSI/SCEIO and receive
Canadian Artificial Intelligence Magazine

Canadian Artificial Intelligence

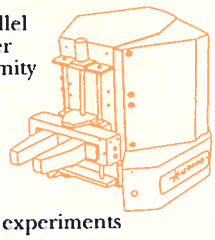
Intelligence Artificielle au Canada

Intelligent Micro-Robots

for Industrial Robot Prototyping and *ALife* Experiments

R-2

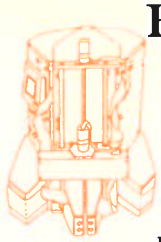
Compact, Integrated, Wheeled Micro-Robot



- Vertical direction parallel mechanical jaw gripper
- Ring of infrared proximity & bump sensors
- Cartesian manipulator for exploration
- Ideal for autonomous interaction, ALife, autonomous factory, and cooperative work experiments

R2E

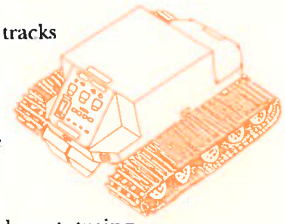
Extended R-2 System (all features of R2 apply)



- New 32-bit P2 processor, based on the Motorola 68332, configured on Vesta board.
- 1 Mbyte SRAM
- 32 Kbytes EPROM including R2 operating system.
- Graphic programming and monitoring environment.
- Ideal for prototyping advanced intelligent mobile robots for industrial applications and ALife experiments.

T-1

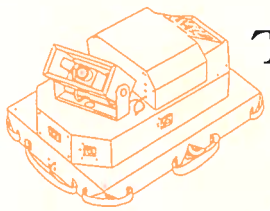
Highly Maneuverable Tracked Intelligent Micro-Robot Platform



- High power caterpillar tracks for rugged terrain
- Low or high gear ratio option
- Infrared sensors for collision avoidance
- Piezo-electric bump sensors
- Ideal for mixed terrain cooperative studies and prototyping autonomous civil engineering equipment

T-2

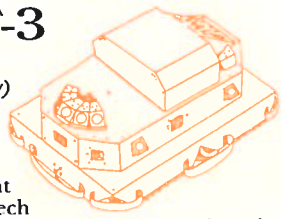
T-1 Based Tracked Exploration Robot (all features of T-1 apply)



- Color video camera and video transmitter (base receiving station included).
- Radio command/data link.
- Optional IR proximity sensors.
- Ideal for mixed terrain cooperative exploration.
- Adapted by NASA for lunar surface exploration.

T-3

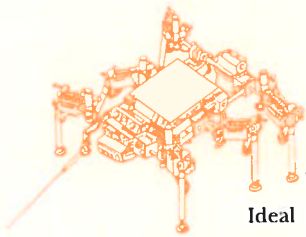
T-1 Based Tracked Human/Animal Interaction System (all features of T-1 apply)



- Pyro sensors for detecting human (animal) presence
- Light sensors to detect light intensity and gradient
- Optional microphones, speech recognition board, and digital speech output board
- Ideal for surveillance systems, entertainment systems, and intelligent toy

Attila-II

Highly Dexterous Six-Legged Micro-Robot



- Equipped with 150 high performance sensors.
- Gyro stabilized CCD camera and rangefinder.
- High performance multi-processor network.
- Capable of determining environmental lay, texture, hardness and color.
- Ideal for exploration, inspection and sample collection.
- Adapted by NASA for planetary exploration.

Pebbles

Sealed Tracked Robot for Hazardous Environments

- Large payload capacity and expandability in the chassis
- Sealed to dust and can be optionally sealed to water, oil, chemicals
- Can be hosed down and re-used if contaminated
- Black and white camera on front; video transmitter inside
- Ideal for exploration, inspection, and transportation in areas unsafe for humans

KAA

Pipe Inspection Robot

- Wraps around pipes and other vertical structures.
- 12 degrees of freedom.
- Snake-like movement on horizontal surface.
- Ideal for prototyping pipe inspection robots.

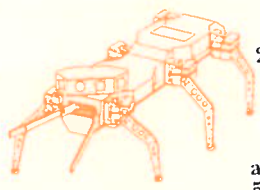
Genghis-II

Highly Dexterous Six-Legged Walking Robot

- Basic model detects forces, collisions, and people
- Extended package includes infrared proximity sensors, surface contact sensors, and pitch and roll inclinometers
- Expansion slots for future options
- Ideal for ALife behavior learning and evolution studies

Nero

Advanced Legged Robot



- Pan head carring a video camera and pyro sensors.
- 2 mandibles with an in/out & up/down drive motor.
- Motorola 68332 processor configured on Vesta board.
- 1 Mbyte SRAM and up to 1 Mbyte EPROM.
- 55 sensors, 16 actuators and 4 output devices available.
- Ideal for ALife experiments and prototyping advanced mobile robots for rough terrain.

IS Robotics — Exploring the Future →

Applied AI Machines & Software, Inc.
Suite 504, Gateway Business Park,
340 March Road, KANATA
Ontario, Canada K2K 2E4
Phone:+1 613 592 7729 Fax:+1 613 592 9762
E Mail: 73051.3521@compuserve.com

Applied AI Systems, Inc.
Suite 500, Gateway Business Park
340 March Road, KANATA
Ontario, Canada K2K 2E4
Phone: +1 613 592 3030 Fax: +1 613 592 2333
E Mail: 71021.2755@compuserve.com

Subsumption Architecture robots are conceived by Artificial Intelligence Laboratory of the Massachusetts Institute of Technology(MIT) and are built for AAI by IS Robotics. Robots are programmed in Behavior-Based Intelligence(SA).