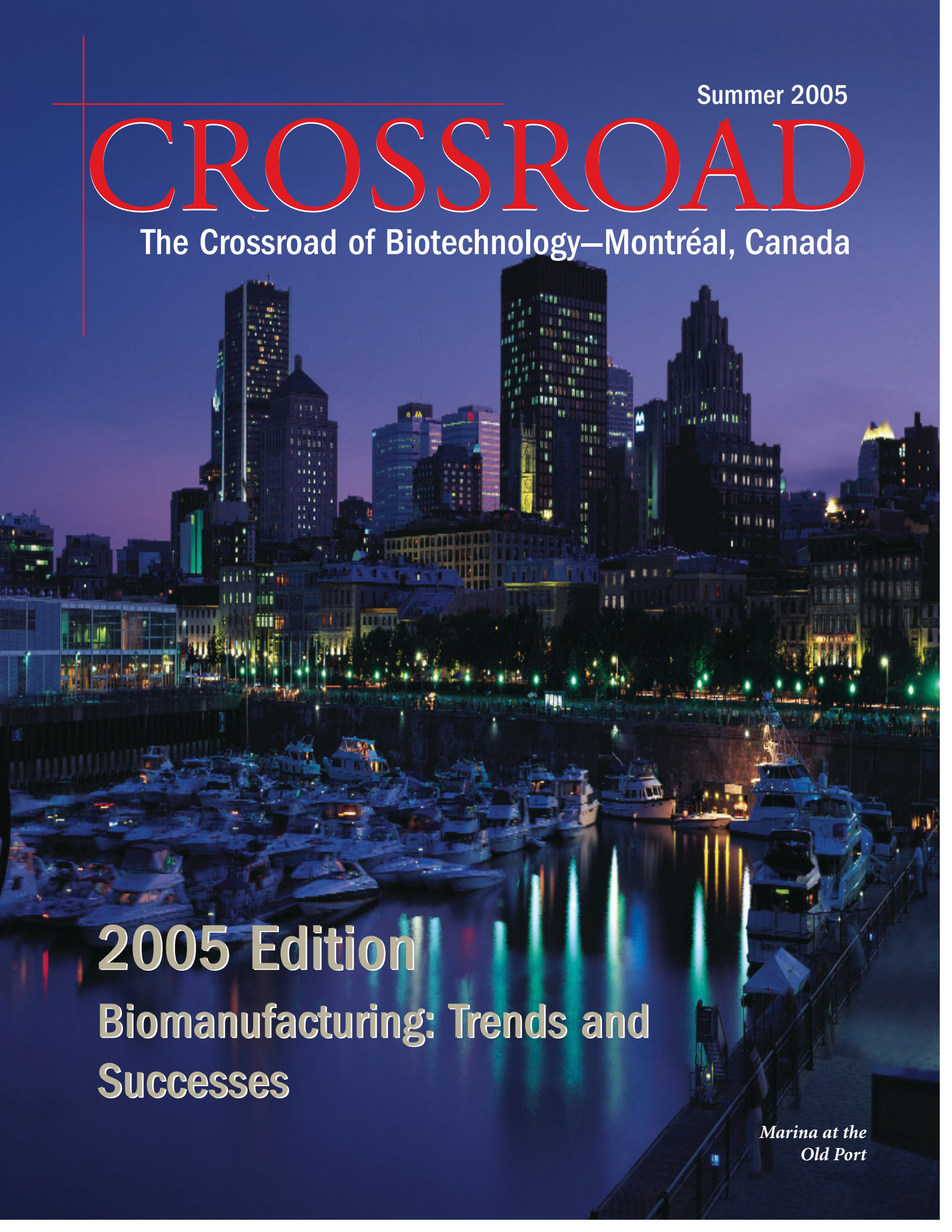
Summer 2005

CROSSROAD

The Crossroad of Biotechnology—Montréal, Canada



2005 Edition

Biomanufacturing: Trends and Successes

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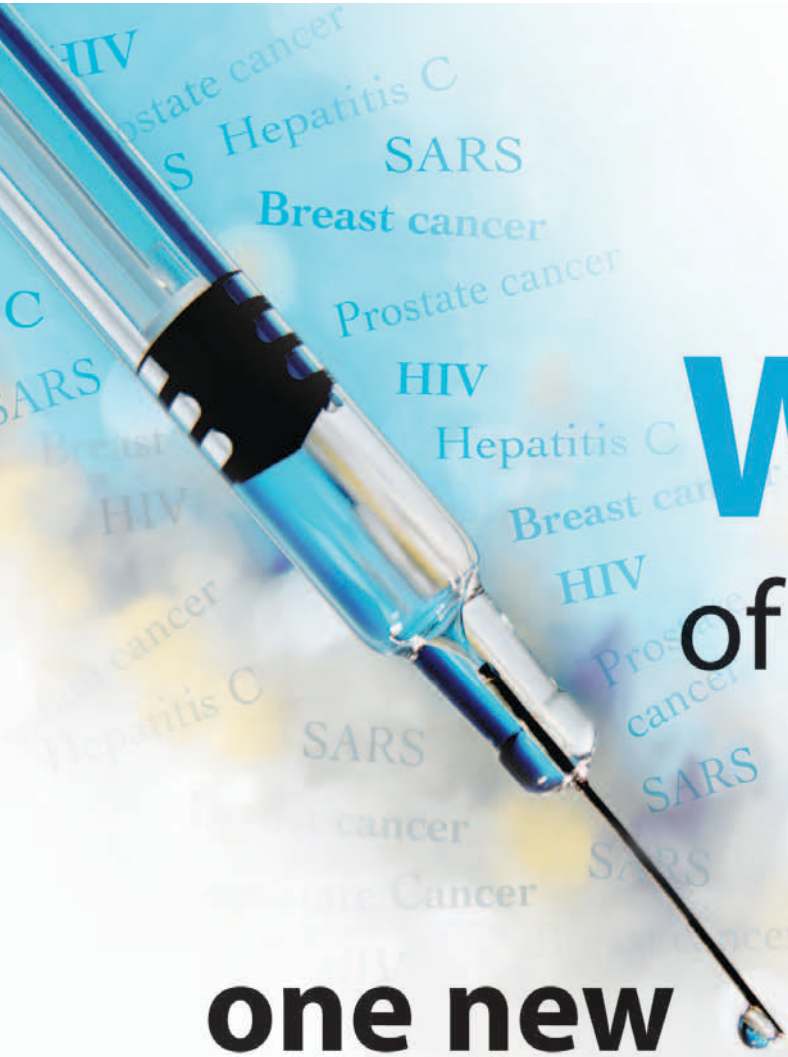

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CROSSROAD
BIOPROCESS SUMMER 2005

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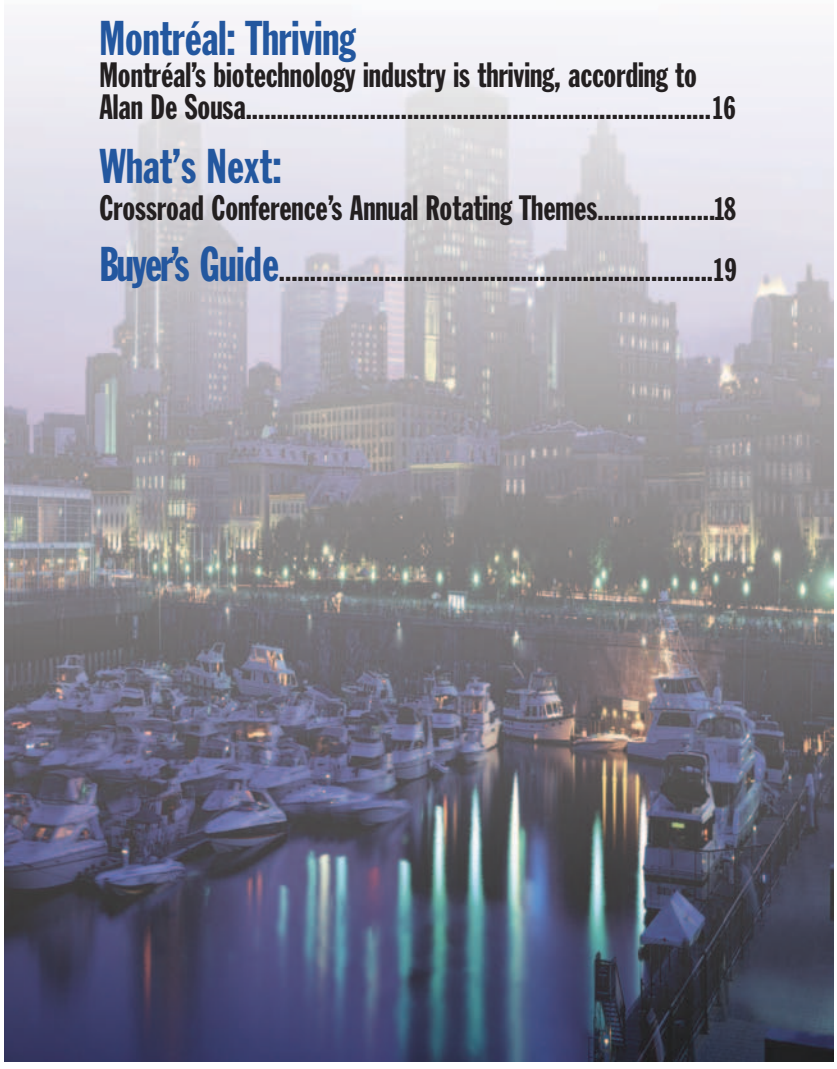

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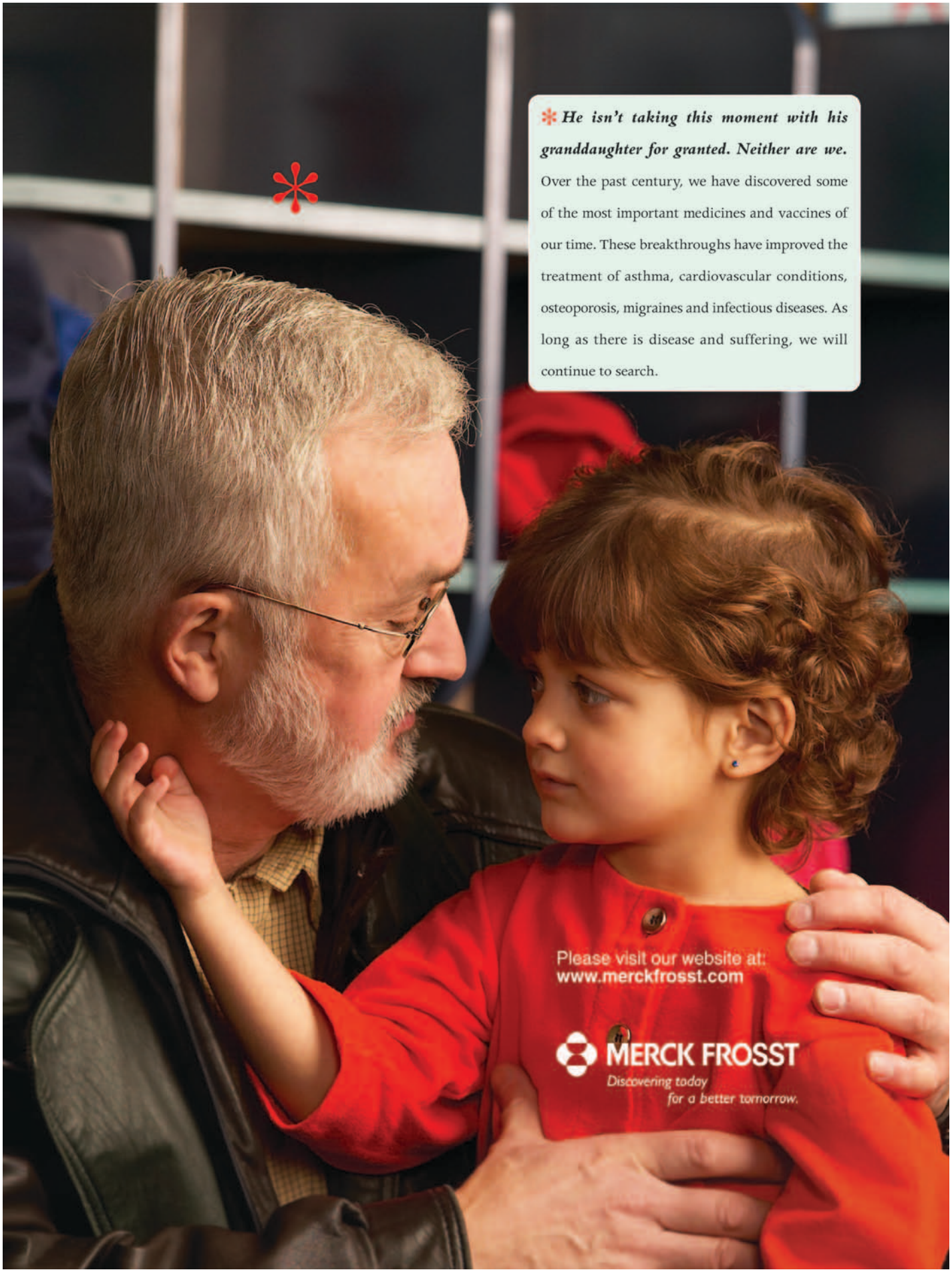
He isn't taking this moment with his granddaughter for granted. Neither are we.
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Dear Colleagues,

I have the great pleasure of presenting this third edition of the Crossroad magazine to you. It is a publication that promotes the Crossroad of Biotechnology, a conference of international scope that has long established its reputation as a major event dedicated to the field of biotechnology in North America.

An initiative of the National Research Council's Biotechnology Research Institute (NRC-BRI), the 10th edition of the Crossroad of Biotechnology that was held at the BRI on February 9 and 10, 2005, under the theme **BIOMANUFACTURING: INNOVATIVE BIOPROCESSING TECHNOLOGIES AND STRATEGIES** was a resounding success. Presided over by Mr. J. Mark Lievonen, President, Sanofi Pasteur Ltd., and bringing together more than 135 organizations, including some 100 private businesses from 10 countries, this conference enabled us to bring several trends in the biomanufacturing industry to light.

Whether it is the increase in the production of new compounds at lesser cost, the output of the production capacity of cellular systems or the growing requirements of regulatory agencies, the industry is faced with several challenges. Within these pages, you will find a summary of the results of this latest edition of Crossroad as well as a preview of the theme for our next conference that will have annual rotating topics. They will be environment-2006; health-2007; and the return of bioprocessing in 2008.

Without a doubt, this 10th edition of the Crossroad of Biotechnology fits perfectly into the strategy that aims at creating a true biomanufacturing cluster in Montréal around the NRC-BRI. It is quite reasonable to believe that the metropolitan Montréal region, that today has with its current 540 companies and a total of 37,000 jobs devoted to the life sciences, offers a major possibility for growth.

I am convinced that you will be pleased to read this issue of our magazine, and that many of you will participate in great numbers at the next edition of the Crossroad of Biotechnology conference, which will be held in Spring 2006. This 11th edition will be devoted to the environment and its theme will be **INDUSTRIAL BIOPROCESSING AND ENVIRONMENTAL BIOTECHNOLOGY FOR SUSTAINABLE DEVELOPMENT.**

You can count on the Crossroad team to organize a program that will reflect the reputation that has made the Crossroad conference an essential event in the area of life sciences and biotechnology.

Sincerely yours,

Michel J. Desrochers

Message from the Director General of the NRC Biotechnology Research Institute and Chair of the Organizing Committee for the 10th anniversary edition of the Crossroad of Biotechnology

Visit us on the web:
www.irb-bri.cnrc-nrc.gc.ca

Thank-you!
We would like to say a big THANK YOU to all the people who made the *Crossroad of Biotechnology conference*, February 9 and 10, 2005, a huge success.

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Bioprocessing: Reaching the Maturation Stage

Internationally recognized, NRC-BRI's Bioprocessing Sector is catching the eye of the global biotech community

It's cutting-edge. It's innovative. It's the NRC's Biotechnology Research Institute's Bioprocess Sector—a division that is internationally recognized as a centre of excellence. With a multidisciplinary research team that includes molecular biologists, cell biologists, microbiologists, chemical and biochemical researchers, and engineers, the Bioprocess Sector of NRC-BRI is leading the search for innovative technologies with their use of living cells.

In particular, it is the use of modern production methods employing living cells (bacteria, yeast, fungi, insect, mammalian and human cell systems), together with associated technologies, to develop and optimize processes that will enable the production of biological products. The Sector develops microbial and advanced cell-based processes from inception to industrial scale. These processes can then be used by industrial partners for the production of valued compounds, such as bio-therapeutics, enzymes, green products and other biological products.

"Our team consists of some of the best researchers in the world in this specialized area," confirms Amine Kamen, Ph.D., Director of NRC-BRI's Bioprocess Sector. After serving as Group Leader of the Animal Cell Technology Group from 1996-2004, he became Director of the Bioprocess Sector in 2004. His current research activities involve scale-up of production processes, rational media design based on metabolic flux analysis, feeding strategies to achieve high cell density, development of new Process Analytical Tools, and high yield production of recombinant proteins and gene delivery vectors.

Yet this is only a small glimpse into what Montréal's bioprocessing/biomanufacturing sector is capable of delivering. Attendees at the *10th Annual Crossroad of Biotechnology* conference were able to experience much more. The main focus of the event was bioprocessing, with well-respected international speakers in the biomanufacturing/bioprocessing field delivering fascinating speeches on everything from exploring new technologies to taking products to market.

"I believe everyone went home satisfied and contented," says Kamen about the conference. "The speakers covered many exciting topics that were really informative, cutting-edge and useful for everyone who participated. It was a huge success not only for NRC-BRI but for the bioprocessing/biomanufacturing community in Montréal."

NRC-BRI on the Job

The NRC-BRI has put a lot of time and effort into developing the infrastructure necessary to support the development of bioprocess as well as ensuring that it is able to grow and flourish. These infrastructures make it possible for the area to support the large-scale industrial development of biopharmaceuticals and biologics. At the centre of this development is the Pilot Plant, which includes computer-controlled fermentors of different sizes, ranging from 3.5L to 1500L. The largest of its kind in Canada, the Pilot Plant also includes a wide range of analytical equipment and instruments to support its fermentation and downstream processing activities.

The Sector also has a large-scale bio-safety level-2 compliant multi-suites area for extensive operation of animal cell cultures. Fully-equipped with bioreactors, with scales ranging from 10L to 180L, as well as with all ancillary devices and instrumentation necessary for fed-batch and perfusion cultures, primary separation and purification of recombinant proteins and viral vectors. Kamen confirms, "we have built up the Sector, ensuring that we have, at our fingertips, the best tools available. This means that researchers have access to the instruments that they need to perform their work efficiently and in the best manner possible."

For the Future

When it comes to modern pharmaceutical biomanufacturing, the industry did not even exist 25 years ago. It was born, in fact, in the early 1980's, the day Eli Lilly's recombinant human insulin (the first real biotech drug) was approved and on the market. But a lot has happened in the past few decades. "And there is a lot more to come," predicts Kamen. "Especially when we have brilliant researchers and state-of-the-art tools working towards the treatments and cures of tomorrow."

Since the beginning, bioprocessing has had its ups and downs. Yet, for the most part the industry has enjoyed tremendous growth around the world. In fact, worth over $32 billion in 2003, it has become the core of the human medical biotechnology industry. Moreover, it is generally believed that the recombinant therapeutic protein market alone will reach a global value of $50-70 billion by the year 2010, thanks to monoclonal antibodies.

Yet, says Kamen, "more discoveries are to come. Those that enable us to move forward in translating discoveries from the bench by process development to ultimately commercial applications, are the ongoing goal of researchers in this field."

With NRC-BRI's unique bioprocessing facilities at the wheel, chances are Montréal's bioprocessing/biomanufacturing sector will be at the forefront of many of these discoveries. After all, NRC-BRI's scientists, researchers and engineers are on the job, exploring and developing the tools for the future. ■

At a Glance

The experts at NRC-BRI's Bioprocess Sector work on a wide range of activities that encompass everything from gene expression to purified, characterized products ready for pre-clinical trials. Below is an overview of just what the NRC-BRI can do:

Products and Services:

- Research Reagents
- Pre-clinical Materials
- Bioprocess Development/Optimization
- Bioprocess Scale-up
- Product Purification and Characterization
- Cell Lines and Expression System Development
- Cell Sorting by FACS
- Cell Microscopy

Viral Vector Technology

- Development of Viral Libraries
- Viral Vector Technology: Adenovirus, Retrovirus, Adeno-associated Virus
- Development of Improved Adenoviral Vectors
- BSL-2 Viral Production Facility to Support Gene Therapy Research

Microbial and Enzyme Technology

- Development of New Expression Vectors
- Recombinant Strain Development/Selection
- Bioprocess Development, Optimization and Scale-up
- Handling of Methylotropic Micro-organisms
- Small-scale BSL-2 Laboratory
- Hydrolases in Condensation Reactions
- Enzyme Production, Purification and Characterization

Insect and Mammalian Cell Cultivation

- Development of Versatile and Commercially Viable Expression Vectors
- Baculovirus-based Bioprocesses for Recombinant Protein Production
- Large-scale Transfection Technology for Recombinant Protein Production
- High-Density Mammalian Cell Cultivation
- Suspension and Serum-free Cultivation
- Cell and Metabolic Engineering
- Process Monitoring and Control
- Development of Industrial Cell Lines

Downstream Processing

- Primary Recovery
- Chemical or Mechanical Cell Breakage
- Ultra-filtration to 1000L Scale
- Purification by Conventional and Expanded Bed Chromatography Technologies
- Analysis and Protein/Product Characterization
- Lyophilization

Looking Back

Crossroad of Biotechnology celebrated its 10th anniversary with success

J. Mark Lievonen speaks on market outlooks, compliance challenges and cost

By all accounts, the 10th annual Crossroad of Biotechnology conference held at the NRC's Biotechnology Research Institute (NRC-BRI) on February 9–10, 2005 was a complete success. This year's theme, *Biomanufacturing: Innovative BioProcessing Technologies and Strategies*, worked as a catalyst, bringing together more than 135 organizations, including approximately 100 private companies from 10 countries.

Presided by Mr. J. Mark Lievonen, President of Sanofi Pasteur Ltd., the event included speakers specializing in biomanufacturing. They hailed from right here in Canada, to the United States, France, the Netherlands, the United Kingdom, Sweden and Switzerland.

"The 10th edition of the Crossroad of Biotechnology went off without a hitch," says Amine Kamen, Director of the Bioprocess Sector at the NRC-BRI. "This year we focused exclusively on bioprocessing, whereas in past years the subjects were broader in scope. It was an experiment but it worked! Attendees walked away with a huge depth of knowledge on our Sector, which wouldn't have been possible had we organized the event as in previous years."

The Crossroad of Biotechnology is an annual conference that has established itself as a key event, bringing together business and science within Montréal. Bridging the biotechnology and pharmaceutical industries, the Crossroad of Biotechnology brings together European and North American markets in Montréal, one of the most dynamic biopharmaceutical clusters in North America. And, since its debut in 1995, the event has continued to evolve into the well-known conference it has become today, now exploring the increasingly specific topics of bioprocessing, environment and health care, sequentially.

Themes and Trends

This years' conference identified a number of important developments. For example, there is a definite move towards the manufacturing of biopharmaceuticals in Montréal. In fact, the industry seems to have reached a mature stage in its development, especially when it comes to upstream activities. This maturity reflected a great need for both qualified personnel and for more dedicated facilities.

Bridging the biotechnology and pharmaceutical industries, the Crossroad of Biotechnology brings together European and North American markets.

The event also identified a need for more investment in bioprocessing, especially in product/process development and preparing for product launching and commercialization. Process Analytical Technology (PAT) is also a new approach to speed up technology transfer into manufacturing. PAT calls for increased on-line monitoring and process control, which are both critical in order to define and prove process robustness.

When it comes to the regulatory aspect, the industry is slowly moving away from the concept that the process defines the product. On the other hand, with the advent of innovative analytical tools to characterize the product, the new trend is that the product is beginning to define the process. Thereby, a same product could be produced using slightly different processes as long as the various "versions" of the product are still "comparable". This also applies to the development of biogeneric products.

Other important trends include:

- An increase in productivity is expected in the biomanufacturing sector. In fact, new compounds should be produced at lower cost since, despite the existence of several high-revenue therapeutic firms (more than $1 billion/year), the revenues of most will be in the vicinity of $100–$200 million.
- Considering the large number of therapeutic products in the pipeline, the industry is heading toward a production capacity deficit. New biomanufacturing plants are being built to overcome this shortage and the increase in the production capacity for cellular systems should increase from 1g/L to 5g/L in a sustained manner.
- New processes should be more robust and possibly based on solid experimental testing at a small or micro-scale, which will serve to improve product characteristics in order to respond to increasing requirements on the part of regulatory agencies. New tools such as high-speed screening, online analytical tools and the optimization of multifactor processes at micro-scale should be implemented. ■

Speaker Highlights

The Crossroad of Biotechnology event introduced many notable speakers to attendees at the conference. Teasers of their speeches can be found below:

Mr. J. Mark Lievonen, Sanofi Pasteur Limited, Canada—Mr. Lievonen, Honorary President of the conference, focused his remarks on the market outlook for vaccines and biologics, the compliance challenges and the means to assure continued supply in the face of increasing costs.

Mr. Richard Francis, Protherics, United-Kingdom—Mr. Francis, the Keynote Speaker of the event, spoke of the role and challenges of biomanufacturing in releasing the potential of many of the therapeutics stemming from the $400 billion/year pharmaceutical industry. As new technologies are being developed and capacity expanded, the biomanufacturing sector is being asked to deliver novel products at lower prices, with greater safety and assured supply.

Dr. Klaus Joeris, Bayer Health Care-Biological Products, USA—Dr. Joeris highlighted several years of Factor VIII production in mammalian cells at constant yields, purity and cell densities using perfusion technology. The cultures were maintained at 20 million cells/mL for more than 3 months at 95 per cent viability. New technology platforms enabling these perfusion processes were developed in Dr. Konstantinov's group and include high productivity cell lines, metabolic flux analysis, cell retention systems, advanced process control and improved downstream processing.

Dr. Ron Taticek, Associate Director, Genentech Inc., USA—Dr. Taticek offered some background on Genentech. The company's CHO cell line boasts eight licensed products with fourteen indications on the market. The period from 1997 to 2004 was an active one, which saw one license per year on average, and the challenges of production at multiple sites including contract manufacturers.

Dr. Michel Chartrain, Merck Research Laboratories, USA—Dr. Chartrain described Merck's technology platform for the production of plasmids for DNA vaccines. Although plasmids are not the usual fermentation end product, the challenges are similar to those encountered when manufacturing proteins, including process characterization, control and cost.

Mr. Guus Scheefhals, Avantium Technologies BV, The Netherlands—Mr. Scheefhals provided a brief background of Avantium Technologies. Avantium's services to the pharmaceutical sector consist mainly of solid-state research and chemical process optimization. He described the company's rationally designed, high-throughput approach to optimization, which he defined as an exploration of the complete experimental space, while using rational strategies to keep the total number of experiments needed to a minimum.

Dr. Marco Boorsma, DSM Biologics, The Netherlands—Dr. Boorsma began by review-

ing the biomanufacturing trends that are driving generic manufacturing platforms, satisfying the twin demands of rapid progress from discovery to clinical studies, and lower cost of goods in Phase III and commercial manufacturing. He defined such a manufacturing platform as a robust, generic, scalable process that is highly productive, regulatory friendly, and adaptable.

Dr. Bernard Massie, NRC-Biotechnology Research Institute, Canada—Dr. Massie presented recent progress in the development of an inducible expression system in CHO and NS0 cells, the cells of choice for production of therapeutic proteins. He described the use of expression cassette optimization, first, to increase expression levels and, subsequently, to develop inducible regulation using the "cumate switch".

Dr. Jay D. Keasling, Professor, University of California at Berkeley, USA—Dr. Keasling explained how miniature bioreactors came about as a spin-off of metabolic pathway engineering. Optimizing complex metabolic pathways requires a large number of shake flask cultures, raising the question of whether a better bioprocess optimization tool could be designed along the lines of standard 96-well plates.

Dr. Govind Rao, University of Maryland, Baltimore County, USA—Dr. Rao described disposable optical sensors that overcome the limitations of electrochemical instrumentation. The sensing element is a patch of fluorescent material that can be interrogated non-invasively using a beam of light. The technique offers wireless sensing based on rapid fluorescence phenomena, and an entire array of wells or flasks can be interrogated using a single optoelectronic detector resembling a coaster or a pen.

Dr. Virginie Brenac, Pall Biosepra, France—Dr. Brenac began by describing the need to shorten development times and improve process characterization and monitoring, from recombinant protein expression to purification and QC of the final product. She identified the weaknesses of conventional purification development methods but also of monitoring assays.

Dr. Nadine M. Ritter, Biologics Consulting Group, USA—Dr. Ritter described the purpose of her talk as fourfold: to put the audience in the reviewer's shoes, to explain where to find documentation on the regulatory requirements, to give practical examples, and to provide resources for further reference.

Ms. Gail Sofer, GE Healthcare, USA—Ms. Sofer said that despite the lack of a specific timeline in ICH Q5D, cell line characterization is expected to begin prior to an IND to assure cGMP for clinical materials and should not be left until Phase III. Regulators expect to know the source and complete history of the cells. However, the lack of a history can be overcome by stringent testing.

Dr. Tim Hayes, American Red Cross, USA—Dr. Hayes provided an overview of comparability concepts, primarily during product development. He said that comparability is first and foremost a tool to manage change throughout the development cycle. Comparability links the characteristics of the product and parameters of the process to clinical outcomes, the principle of "know thy product, and know thy process".

Dr. Duu-Gong Wu, Senior Director, PharmaNet, USA—Dr. Wu provided insight into the history and contents of ICH Q5E and the regulatory perspective of the FDA when reviewing comparability data for manufacturing changes. He highlighted the fact that process changes could happen at any stage of the development and approval process, from pre-clinical to post-marketing.

Mr. John Curling, John Curling Consulting AB, Sweden—Mr. Curling spoke about the contradictions faced by the biologics industry and regulatory agencies, ranging from the fact that the process defines the product in the current regulatory framework, to the conflicting challenges of a "better-faster-cheaper" mindset.

Dr. Michael Kosinski, Merck Research Laboratory, USA—Dr. Kosinski said that the human Papillomavirus (HPV) is associated with 99 per cent of the lesions that lead to cervical cancer. He described the development of a vaccine based on L1 capsid proteins from four strains of HPV, which self-assemble into virus-like particles (VLPs). Each of the four L1 proteins is expressed in yeast using a tightly regulated promoter, and produced in a standardized fed-batch process, providing consistent process performance.

Mr. Thomas Smith, GlaxoSmithKline, USA—Mr. Smith explained that GSK has worked on 12 monoclonal antibodies (MAbs) over the last decade, and that the company's current product pipeline is divided equally between MAbs and other gene expression products. In his talk, he focused on achieving product consistency and stability through careful monitoring and downstream processing.

Dr. Duncan Low, Amgen, USA—Dr. Low discussed

the role of new technologies and increased institutional knowledge in lowering the cost of goods and reducing time to market. He talked about the potential returns from improving processes for products that are already marketed, which increases the revenue stream and can be generalized to other products.

Dr. Charles A. Haynes, University of British Columbia, Canada—Dr. Haynes said that, since upstream productivity has improved 10-fold, the next decade will see a focus on removing downstream processing bottlenecks and increasing cumulative yields. He touched on the challenges posed by integrated technologies that combine unit operations, and spoke in detail about chromatographic systems designed specifically for high-throughput development of preparative-scale separations.

Mr. Luc Dubois, Laborium Biopharma, Canada—Mr. Dubois presented plans for the inclusion of a new Laborium Biopharma facility in Montréal's biotechnology cluster, in order to fill the current gap in contract manufacturing of biologicals for clinical testing. He painted an overall picture of growth in clinical and commercial manufacturing worldwide, with over 450 new products in clinical trials.

Dr. Alain Bernard, Serono, Switzerland—Using the example of a recombinant, secreted human glycoprotein expressed in CHO cells, Dr. Bernard addressed the bottlenecks that arise while scaling up from 1kg/year quantities needed for pre-clinical work to 100kg/year production levels.

Dr. Christopher Bryant, ProMetic BioSciences, USA—Dr. Bryant defined what he called an expedited development paradigm for plasma proteins. He summarized the deliverables as: a process description, an understanding of the parameters, set-points and tolerances, validation of product consistency for clinical trials and manufacturing, and a data package for regulatory approval.

Mr. Scott Fulton, Consultant, Ardea Bio Consulting, USA—Mr. Fulton explained that transgenics are a reminder that biomanufacturing is a complex and risk-laden business. Some 15 years since its inception, the promise of transgenics to exploit humanity's vast farming and aseptic food processing infrastructures to produce valuable biologics has yet to yield any approved products. The challenges include regulatory risks such as applying GMPs to farming, virus and prion pathogens, and glycosylation-related antigenicity in plant-based materials.

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Canada

The ongoing support for biomanufacturing demonstrated by the City of Montréal was addressed by Alan DeSousa, guest speaker at the Honorary Dinner held during the 2005 Crossroad of Biotechnology conference. He spoke about how Montréal's biotechnology industry is thriving.

Montréal: THRIVING

Ville de Montréal

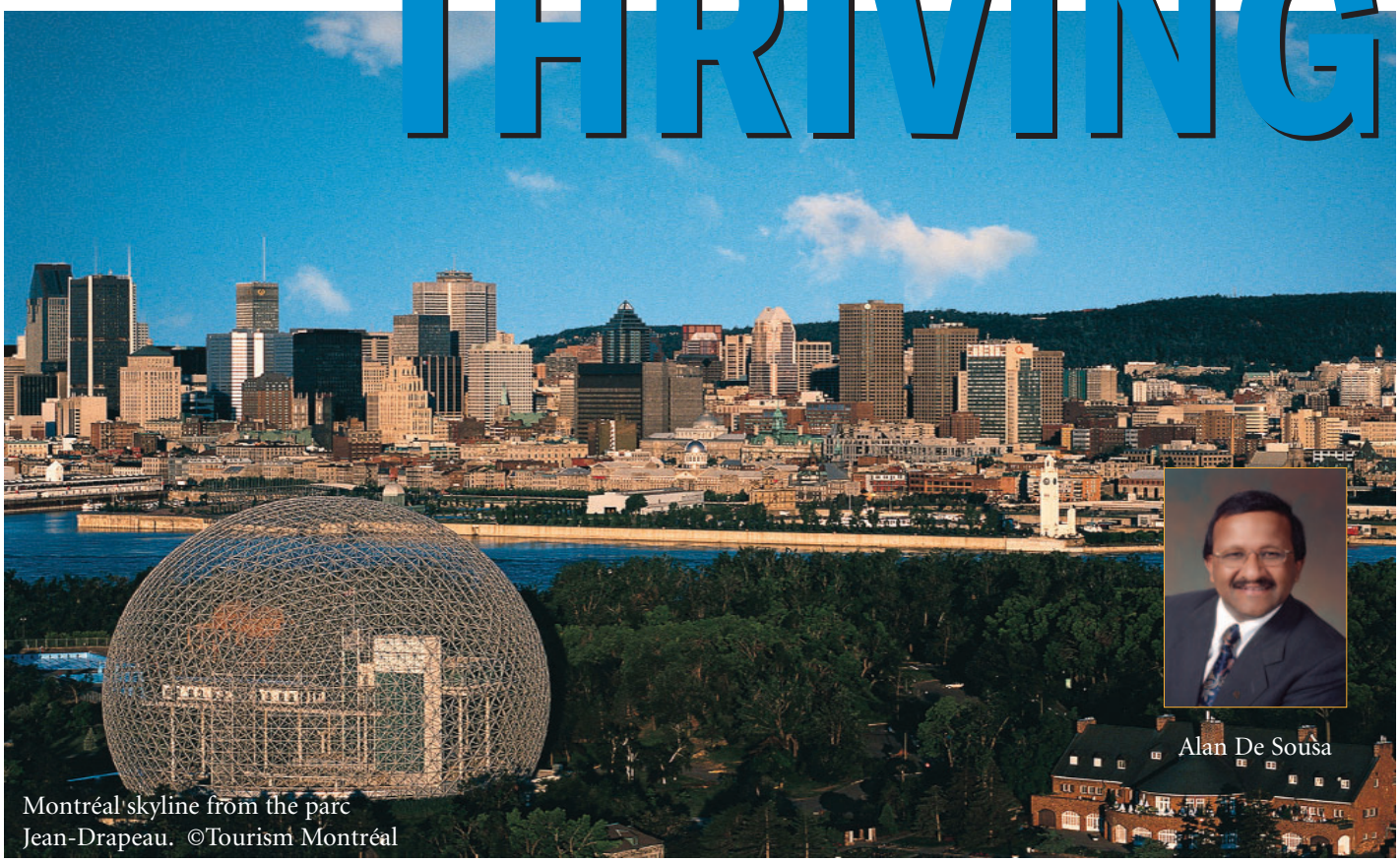
I for my part, can assure you that the City of Montréal will be proactive and that we will exercise the leadership required to support the planning and development of Montréal's integrated biomanufacturing hub. Alan DeSousa, February 2005

Alan DeSousa is quick to praise Montréal's biotechnology sector. "Thriving, dynamic, prosperous," are just a few of the descriptions he easily throws around. And it's no wonder. As the eighth most prosperous bio-city in North America, Montréal definitely stands out. Not to mention the fact that the sector employs more than 37,000 people (14,000+ in pharmaceuticals, 9,000+ in research and 3,000+ in clinical research), with more than 1,800 new jobs in 2004.

"We are major bio-crossroads," comments Alan DeSousa, member of the Executive Committee of the city of Montréal, responsible for Economic Development and Sustainable Development. "We have all of the major biotech components; research and delivery, manufacturing, distribution. And the clusters are also continuing to evolve and grow."

They have to. With intense international competition, Montréal will have to stay strong and competitive if the city wants to contend on a global level. So far, this is exactly what is happening. DeSousa explains that Montréal has a number of very important factors going for it. For starters, the city is incredibly hospitable to foreign researchers and companies. Next, explains DeSousa, is the fact that, "everyone is really getting on board; government, academia, the private and public sectors. It's really great to see everyone bring ideas to the table."

While it's DeSousa's job to proclaim the benefits of the Montréal Life Sciences Cluster, he isn't just paying lip service to this biomanufacturing hub. Examples of where the industry has made strides are:



Alan De Sousa

Montréal skyline from the parc Jean-Drapeau. ©Tourism Montréal

- A centre of excellence in research providing jobs for 9,000 people, including first-rate researchers, in 125 research establishments;
- A pool of 500 companies of different sizes and at various stages, employing 28,000 people; and
- The production of three billion dollars' worth of pharmaceuticals and drugs, in 2003.

Yet, says DeSousa, one of the biggest assets to Montréal's biotechnology industry is the fact that industry leaders are really looking towards the future. He explains, "everyone is planning and looking at ways to draw attention and people to Montréal." That, he adds, is key to ensuring the sector continues to thrive.

Leading the pack is the National Research Council's Biotechnology Research Institute (NRC-BRI), which has played a key role in the growth of the sector. Since 1987, DeSousa says the NRC-BRI has played a vital role in "attracting high-calibre companies here [to Montréal], largely owing to its exceptional expertise in biomanufacturing." Aside from the obvious, attracting major players from around the word and creating jobs, the NRC- BRI also plays a key role in bringing private-sector investment to the Montréal region. In fact, a study done in 2004 showed that public-sector investment in the NRC-BRI stimulated private-sector investment more than five times the amount. In other words, says DeSousa, "we're talking about a return of 560 per cent on each dollar of public money invested." Not to mention that foreign capital accounts for over 71 per cent of this private investment. Obviously, the growth of this sector is on-going.

> "We are a major bio-crossroad. We have all of the major biotech components; research and delivery, manufacturing, distribution. And the clusters are also continuing to evolve and grow."

Attesting to that fact is the success of leading Montréal biotech companies such as AstraZeneca, Caprion and DSM Biologics. These, as well as others in the area, define the success that companies can enjoy in Montréal. They also confirm the definite presence of public-private co-operation; of which they all take full advantage.

"Montréal biotech companies are flourishing locally, nationally and now, more than ever, abroad," confirms DeSousa. "This truly attests to the solid-base they benefit from at home."

However, says DeSousa, if Montréal is going to continue to compete on the world biotech stage, the city has to keep fighting for it. After all, cities around the world are trying to define themselves as biotechnology meccas. So, if Montréal wants to stand out, it has to continue to define itself as a biotech mecca itself.

There are three steps, explains DeSousa. Montréal, he says, must: 1) position itself on the world market; 2) consolidate its gains; and 3) make better use of its assets, including the NRC-BRI. In short, Montréal has to build an "integrated biomanufacturing hub" around the NRC-BRI. This core will combine research, training and industry and, adds DeSousa, will strengthen the Life Sciences Sector, not just in Metropolitan Montréal, but in Québec and Canada, too."

In Montréal, everyone is on board; from the city to the boroughs. Everyone is putting on their game face, ready to defend what has already been built and develop a plan to grow the industry even more. Teamwork is exactly what will ensure success. "We must act quickly," says DeSousa, "because we are not the only ones who want to position ourselves in this promising sector."

While that is very true, Montréal certainly has a head-start in the world wide biotech development race. Private and public institutions, academia and government are all on-board. What will happen? Only time can tell. But one can be sure that in the years to come, Montréal will have its place on the biotech map. ■

What's Next for the Crossroad of Biotechnology?

The 10th anniversary of the Crossroad conference in 2005 was the ideal occasion to revise the Crossroad format making it more specifically focused, says Michel Desrochers, Director General of NRC's Biotechnology Research Institute. This year's conference was dedicated to bioprocessing and manufacturing. Alternate topics are planned for the upcoming conferences, encom passing core research activities ongoing at NRC-BRI, as described below.

2006

Industrial Bioprocessing and Environmental Biotechnology for Sustainable Development

"The new trend is sustainability," says Adrien Pilon, Director of the Environment Sector of NRC-BRI. "Lowering green house gas emissions, finding alternatives for fossil energy, developing new enzymes and technologies that will help the environment–it's all part of a new bio-economy that is working to develop solutions for the future."

This will be the heart of the next Crossroad of Biotechnology. "We'll be talking to and hearing from key industrial leaders, users of the end-products, researchers who are developing new products and industry stakeholders," explains Pilon. "At the heart of the matter will be how we can design economically viable products and processes that won't hurt the environment and have a positive social value impact. We'll be showing success stories, talking about environmental testing, exploring alternative energy sources and looking at new products. We'll be covering all of these aspects using a practical approach."

The NRC's Biotechnology Research Institute's Environmental Sector focuses on the development of bioprocesses for the prevention, remediation and monitoring of pollution, as well as developing new processes for fighting climate change and achieving sustainable development.

2007

Healthcare

Using state-of-the-art technologies, the Health Sector focuses its expertise and resources on cancer and infectious diseases. However, the 2007 Crossroad event will focus on one very specific topic: the development of novel therapeutic strategies based on the disruption of protein-protein interactions.

"It's a bit of a hot topic," divulges Andy Storer, Director of the Health Sector of NRC- BRI. "But that means it will be of great interest to pharmaceutical and biotech companies across the country."

Storer explains that the event would bring people up to speed, as the area is an "unconquered frontier. Up until three or four years ago, this area was really felt to be a tough topic to tackle."

Even so, Storer and his team are ready to take on this controversial topic, as companies need more information. And, that, says Storer, is exactly what the 2007 Crossroad of Biotechnology event will do.

2008

Bioprocessing

For anyone who was at the 2005 event, bioprocessing will be a familiar topic. However, says Bernard Massie from NRC-BRI's Bioprocessing Sector, the 2008 event while still bioprocessing oriented, will build on futuristic approaches.

The event, says Massie, will focus on gene therapy. "It's hard to predict what will happen in three years," says Massie. "That's why we want to look at what's here now and what's coming for the future."

For example, explains Massie, while there are a number of blockbuster drugs available now, "it's not inconceivable that in a few years people will get treated by engineered cells."

After all, concludes Massie, "if you want to fix the problem it just makes sense that you have to go to the genetic level."

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Biophage Pharma Inc. GLP Laboratory Module

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