AAPS Advanced Applied Physics Solutions

ETPP Exploitation des Techniques de Pointe en Physique

Bridging the gap between innovation and commercialization

Advanced Applied Physics Solutions 2011 Annual Report

Our Mission

To commercialize advanced physics technologies for the social and economic well-being of Canadians and for the benefit of people around the world.

CONTENTS

About Us

Advanced Applied Physics Solutions (AAPS) is an independent, entrepreneurial organization that focuses on bridging the gap between innovation and commercialization.

AAPS was established in 2008 as a Centre of Excellence for Commercialization and Research (CECR) at TRIUMF. Initial financial support for AAPS to pursue its mandate has been provided by three of Canada's federal granting agencies:

- Natural Sciences and Engineering Research Council of Canada (NSERC),
- Social Sciences and Humanities Research Council of Canada (SSHRC), and
- Canadian Institute of Health Research (CIHR) via the Networks of Centres of Excellence (NCE).

Building on the strong foundation of TRIUMF's internationally recognized expertise in particle accelerators and advanced radiation detection systems, AAPS collaborates with academic, government and industry stakeholders to develop and commercialize technologies emerging from worldwide subatomic research.

AAPS' vision is to help position Canada at the forefront of knowledge and application in these twenty-first century technologies.

TRIUMF

AAPS is a commercialization partner of TRIUMF – Canada's national laboratory for particle and nuclear physics.

TRIUMF is one of the world's leading subatomic physics laboratories. It brings together dedicated physicists and interdisciplinary talent, sophisticated technical resources, and commercial partners in a way that has established the laboratory as a global model of success.

Canada

AAPS is one of 11 Centres of Excellence for Commericalization and Research established in February 2008 through the Federal Network of Centres of Excellence Program.

To have profound positive impacts on the lives of Canadians and successfully compete in the 21st century global economy, we must find ways to more effectively bridge the gap between academic R&D and the successful commercialization of breakthrough technologies.

Canada invests in excellent research, but it is obvious that this is not enough to address the challenges and opportunities in today's fast-paced world. To have profound positive impacts on the lives of Canadians and successfully compete in the 21st century global economy, we must find ways to more effectively bridge the gap between academic R&D and the successful commercialization of breakthrough technologies. We have started down this path at our Company.

Our Company and our project partners are working to successfully develop and demonstrate technologies that were conceived at TRIUMF. Our business model has also started to attract interest from the broader technology community as we have shown our ability to expedite innovation towards anticipated commercial success. We continue to develop links with industry partners and are collaborating with stakeholders in government agencies and the scientific community. Through these efforts, we are generating intellectual property and working towards the objective of commercializing new technology in private sector companies with private sector investors and managers.

Building for the Future: This year the Board of Directors focused its attention on sustainability beyond our initial 5-year mandate. The Board determined we should both continue to nurture our longer-term platform technologies and focus on selecting new projects with near-term commercial potential.

The Board is unanimous in its belief that because of our Company's experience and momentum generated by the development of our unique business model, we must find ways to continue its business operations after the expiry of our initial five-year funding. To this end, the Board and its Science and Technology Advisory Committee continuously review the scientific and technical merits of all proposals requesting AAPS support, in order to identify near-term opportunities and to maintain a list of projects in the pipeline. To ensure that projects are tracking towards both technical and commercial viability, our Project Review Panel, comprising board members, key management personnel and outside consultants, regularly analyzes key performance factors. These reviews, combined with board member expertise and the capability of our management team, enable us to successfully advance each project to the point where we are optimistic they will deliver economic and social benefit to Canada.

Access to Innovation: TRIUMF is one of Canada's premier scientific institutions and serves as an international flagship for Canadian scientific leadership. AAPS' partnership with TRIUMF allows us to leverage the infrastructure and innovation at TRIUMF and apply our business, financial and partnering expertise to develop and commercialize advanced technologies. We thank TRIUMF for its ongoing support.

On behalf of the Board of Directors, I thank our management team for their work and contributions this past year. We are fortunate to have a diverse, talented, and professional team. I also thank our Board of Directors for their time, effort and commitment to ensuring that our Company operates efficiently and in compliance with the Networks of Centres of Excellence mandate.

We look to the coming year with optimism under the capable leadership of Dr. Colin Jones, a senior member of the Board of Directors, former assistant vice-president of research at Simon Fraser University, and former Chair of TRIUMF's Board of Management. Colin was appointed CEO after our former CEO, Jack Scott, announced his departure to return to Eastern Canada. We are pleased to advise that Mr. Scott will re-join our Board as a director in September 2011.

For the coming year, we look forward to maximizing the valuable opportunity that the CECR program, through the Canadian Networks of Centres of Excellence, has afforded our Company.

Edward Odishaw
Chairman of the Board of Directors

AAPS recognizes the path to commercialization starts with a single great idea to apply science and technology in a new way to meet an industry need and thus realize social and economic benefits.

This fiscal year (2010-2011), AAPS continued to refine its model for bringing research ideas towards commercial readiness and success. We have built our team and partnerships and expanded our domestic and international relationships. Working with TRIUMF, its member universities and a broad network of global industry and research partners, we have added to our project pipeline, while moving current projects closer to market.

Partnerships and Collaboration in Action: AAPS recognizes the path to commercialization starts with a single great idea to apply science and technology in a new way to meet an industry need and thus realize social and economic benefits. To develop the idea into a successful commercial product, service or enterprise requires collaborating with the right partners, with the right expertise, at the right time. These crucial collaborations help validate and demonstrate the technology, while helping to build the business case—assessing commercial readiness, potential market value and industry acceptance.

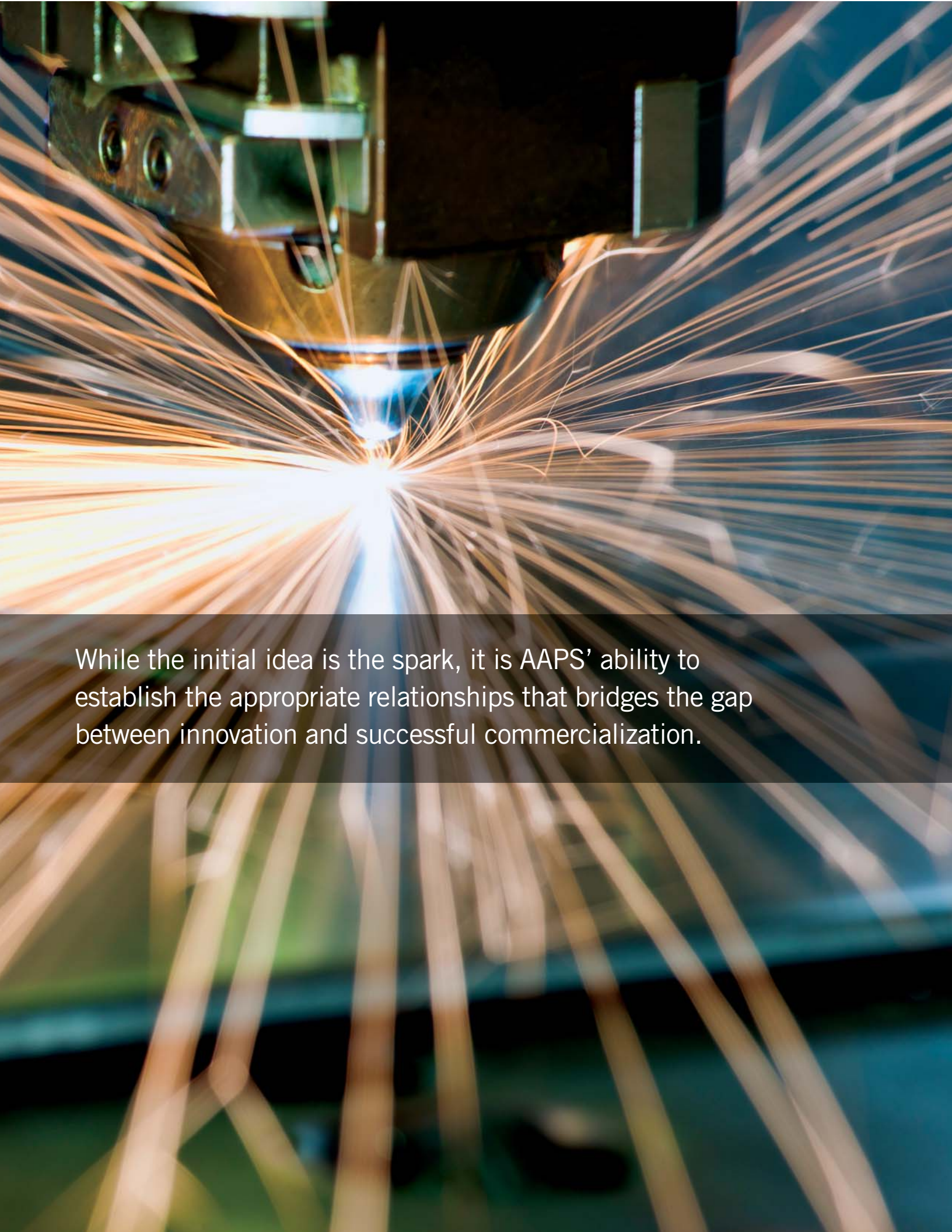
This year in particular, AAPS demonstrated its strength in building mutually beneficial collaborations between academic-research, government and industry partners. Nowhere was this more evident than the collaboration between AAPS, researchers at TRIUMF, the Geological Survey of Canada, BC Ministry of Energy and Mines and industry representative NVI Mining-Breakwater Resources, to accelerate our muon-based Geotomography Project. (See page 06 for story.) Another example of a strong collaboration is our MoRe (Molybdenum/Rhenium) Project, which involves Canadian and US industry and academic partners. This year, the team collaborated to complete and commission a dedicated Isotope Separator Test Facility. This unique facility opens the door to contract development and research opportunities geared towards new medical isotope processing methods. (See page 10)

Commercial Readiness: AAPS continued to create paths to earlier revenue and private sector investment by selecting projects with the best opportunity for commercial results. Toward the end of this year, AAPS helped lay the foundation for a fast-track, spin-off company dedicated to reducing X-ray exposure during fluoroscopy-guided medical procedures. The company's launch is expected to be announced in the coming months. (See page 09)

Commercial Success: Micromatter, a commercial operating division of AAPS, produces specialized foils, films and coatings for a number of industrial and scientific applications. 2010-2011 saw increased revenues and expanded production capacity. While still early days, Micromatter is building a solid revenue source for AAPS, with a customer base from around the world and the potential for a new regional distribution network.

I have appreciated the chance to work with the AAPS team and partners, and admire the commitment of all involved to achieving success this year and in the years to come. On a personal note, while I have resigned my post as President and CEO to return to the private sector, I have been offered the privilege of continuing to serve on AAPS' Board of Directors. This is a great opportunity for me to stay involved, and to contribute where I can add value. I see the ongoing AAPS leadership, model and team providing the approach and skills needed to translate Canada's physics-based research into industry applications that will build competitiveness for Canadian companies in an evolving world economy.

Jack Scott
President and CEO



While the initial idea is the spark, it is AAPS' ability to establish the appropriate relationships that bridges the gap between innovation and successful commercialization.

Innovation > **Collaboration** > Commercialization

There is a growing awareness that collaboration is one of the keys to achieving significant breakthroughs. The physics community has a long and proud tradition of large international collaborations and cooperation that is often held up as a model worthy of emulation.

AAPS identifies promising physics-based technologies and forms collaborations to drive successful development and commercialization. This process is crucial to reducing technology-related risks, as collaborators bring their unique expertise and capabilities to provide the technical and economic validation required for attracting private sector investment, and to bring innovations to market.

In 2010 - 2011, many partnerships and collaborations contributed pivotal elements in accelerating AAPS' projects along their unique paths to commercial viability.

DETECTOR AND IMAGING TECHNOLOGY

RADIATION DETECTOR TECHNOLOGY AND IMAGING SOLUTIONS HAVE APPLICABILITY IN MANY DIVERSE SECTORS, INCLUDING MINING, SECURITY AND HEALTHCARE.

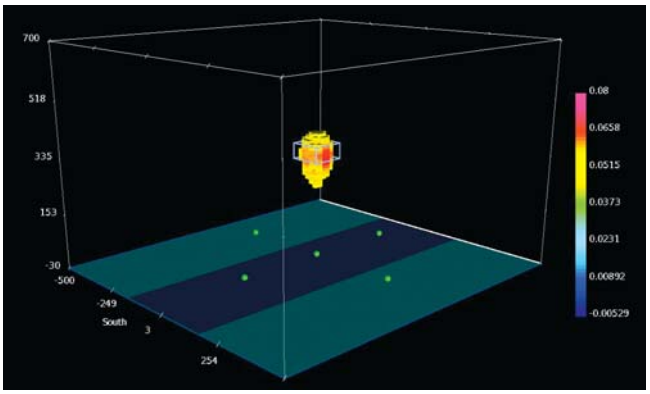
Developing a New Geophysical Exploration Technique for Mining Exploration

AAPS and its industry collaborator, Breakwater Resources, have demonstrated that muon tomography can successfully identify ore bodies underground. This has directly led to project co-funding of $1.8 million from Western Economic Diversification.

AAPS is pursuing a novel imaging technology for identifying mineral deposits. Muon geotomography uses naturally occurring cosmic ray muons—subatomic particles that penetrate through the atmosphere and deep into the earth. The penetrating power of muons depends on the amount of the material through which they pass. Detectors placed underground monitor the number of muons reaching them and advanced software algorithms create 3D images of dense mineral deposits. This technique results in images similar to those obtained from CAT scans in medical imaging.

Innovation

The innovation lies in the development of special sensors and software to produce images of density variations in the overlying rock. These dramatic 3D representations show the location of high-density mineral deposits deep within the earth.



Example of a 3D density map.

Commercial Applications

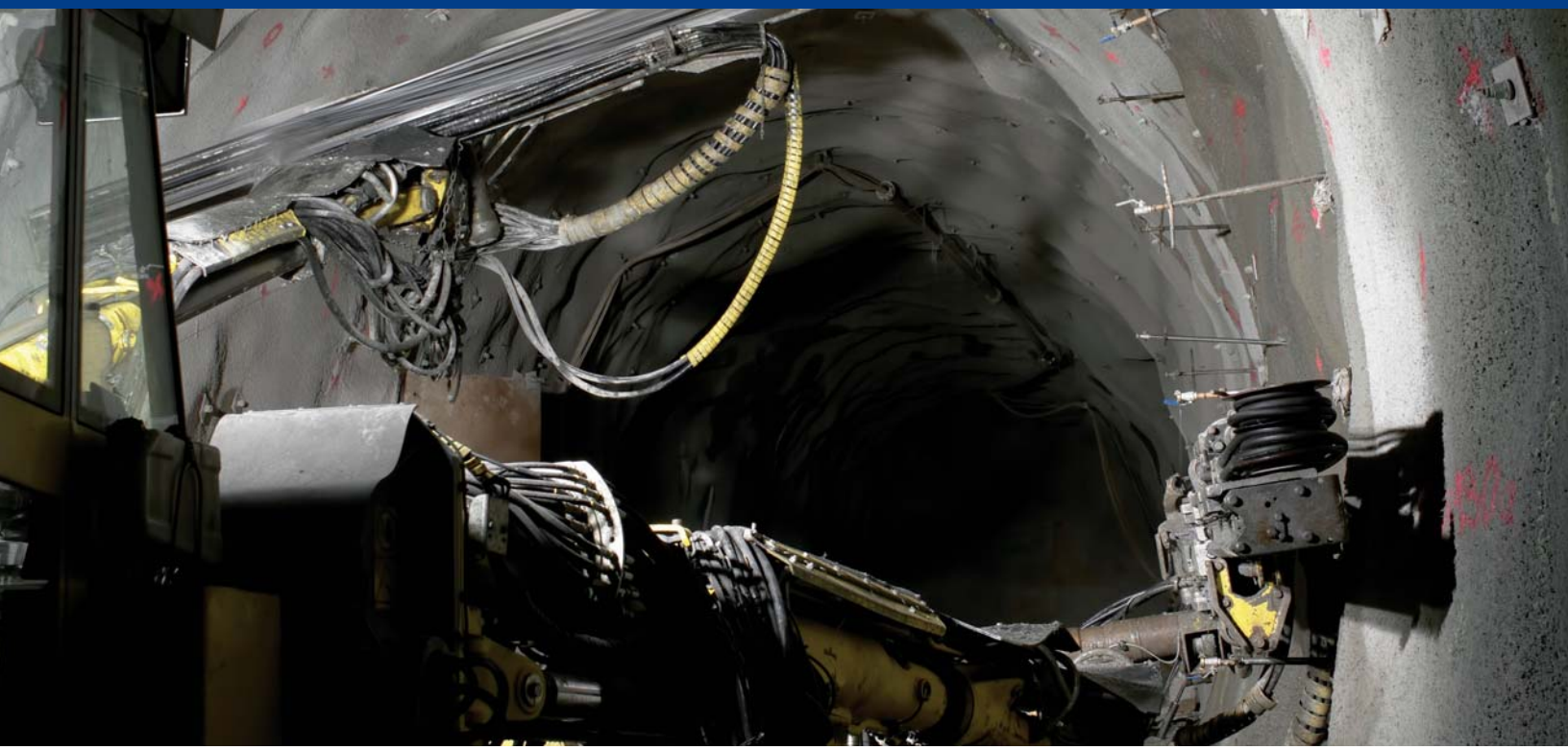
Mining is one of Canada's largest industries in terms of job creation and economic impact. Muon-based geotomography addresses many of the current challenges and limitations in mineral exploration. The technology could increase the success of exploration while at the same time making it less expensive and reducing its environmental impact.

Collaborators

This project is an excellent example of the collaborations required to successfully develop, demonstrate, and ultimately commercialize new breakthrough technologies. We gratefully acknowledge our collaborators: TRIUMF, UBC Geophysical Inversion Facility, Geological Survey of Canada, BC Ministry of Energy and Mines (British Columbia Geological Survey), Western Economic Diversification, NVI Mining / Breakwater Resources and Bern University.

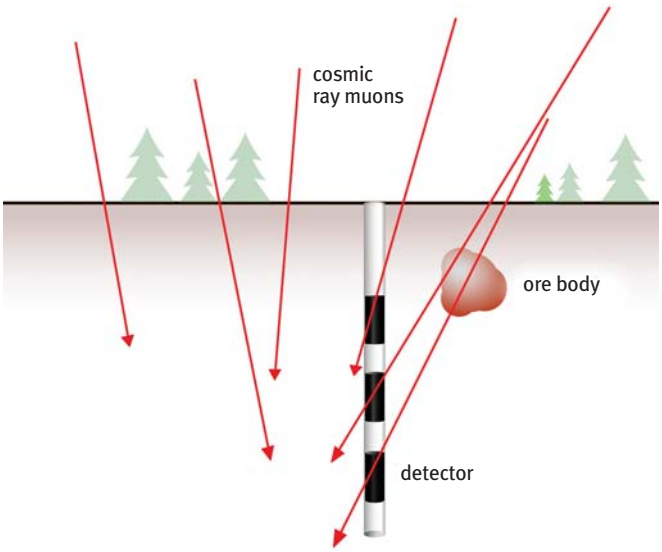
"Because this technology has the potential to detect and image deposits at depth, it will refine the exploration search area which will reduce the amount of expensive drilling required and further efforts to minimize environmental impact."

Rick Sawyer, NVI-Breakwater



Progress

During 2010 - 2011, the technical team built a prototype muon sensor system and designed the data acquisition and image reconstruction software in partnership with the Canadian Geological Survey. The prototype was deployed in field tests at Breakwater's Price Mine on Vancouver Island. Based in part on the successful field trials, and coupled with a strategy for commercialization, the team secured co-funding of $1.8 million dollars from Western Economic Diversification (WD) to further advance the technology.



Schematic representation of muon geotomography. Detectors underground sense the decrease in muon rate after passing thought the ore body.

Moving Forward

The WD project will allow the investigation of additional mine sites and will provide further insights into the types of mineral deposits that can be observed with this technique. The ultimate objective is to form an independent company to commercialize this technology.

" Mining is a major contributor to our resource-based economy. By investing in this project, government is ensuring that our key sectors develop the tools necessary to grow and provide highly-skilled jobs for Canadians. We will continue to help build a more globally competitive and productive mining sector."

Lynne Yelich, Minister, Minister of State for
Western Economic Diversification

Western Economic Diversification announcement. From left to right: David Keiver, Human Resources Superintendent, NVI-Breakwater; Dr. Douglas A. Bryman, UBC; The Honourable Lynne Yelich; and John E. (Jack) Scott, President and CEO, AAPS.

Improving Border Security and the Detection of Special Nuclear Materials

AAPS has successfully demonstrated the technical merits of its muon detector design for use in identifying smuggled nuclear materials at ports and borders.

The smuggling of Special Nuclear Materials (SNM) into or through Canada is a major concern as these materials could be used to produce improvised nuclear devices. To help address the situation, in 2009, the Government of Canada's Centre for Security Science awarded $2.55 million to a Canadian team to develop a novel technology to detect concealed SNM.

Innovation

This is another example of particle physics know-how being applied to solve real-world problems. The screening method relies on the measurement of naturally occurring cosmic ray muons —subatomic particles that continually shower down from the upper atmosphere. Deflection of muons by dense SNM or shielding materials is sensed by a detector system, and advanced software algorithms generate 3D images from the detector data, indicating the location of a potential threat.

Commercial Applications

The successful development of this approach would significantly improve the ability to discriminate SNM from less dense materials and could lead to an improved screening technology at container ports and border crossings.

Collaborators

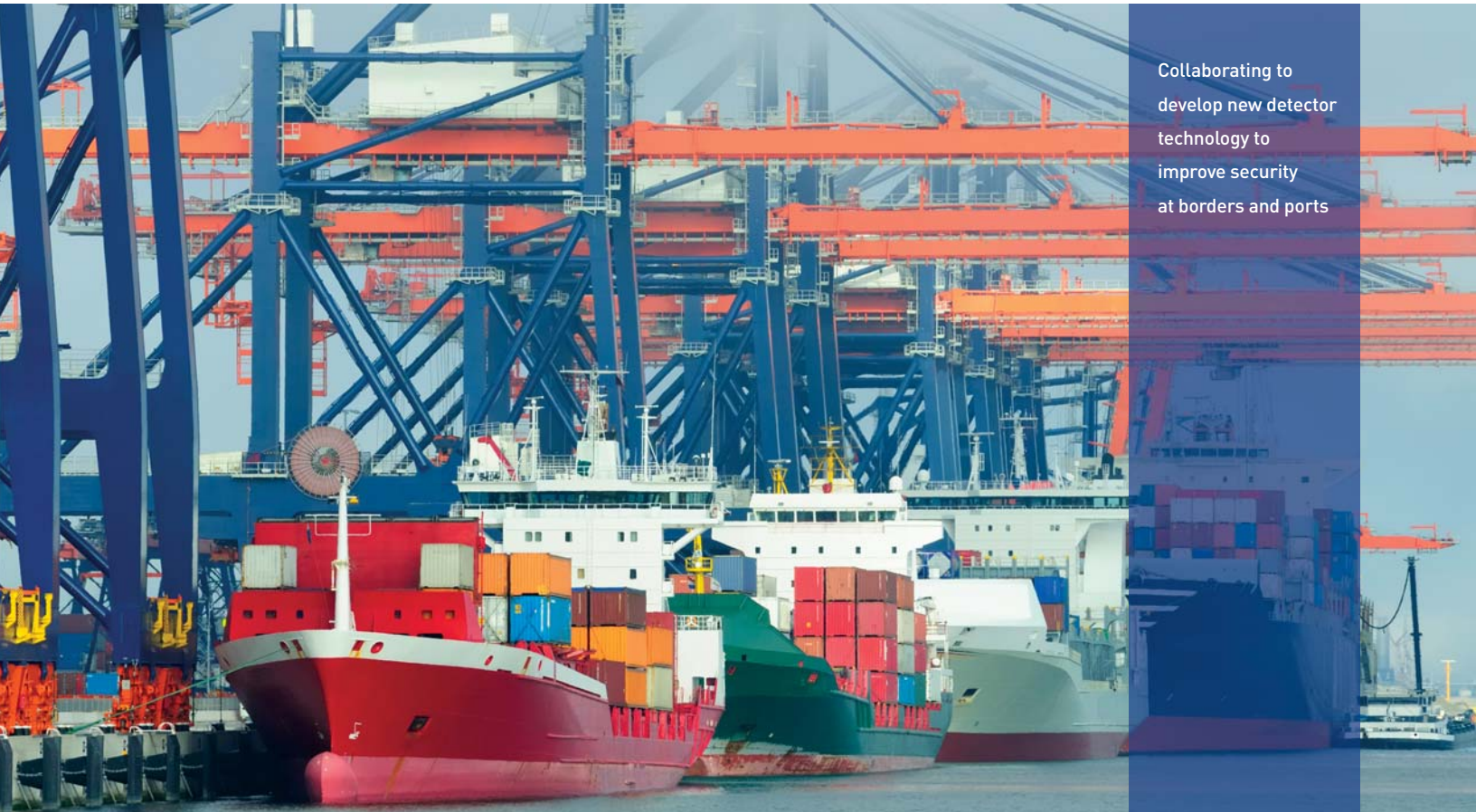
The exceptionally strong national team of collaborators includes, in addition to AAPS, members from Defence Research and Development Canada, Carleton University Physics Department, Atomic Energy of Canada Limited (AECL), Canada Border Services Agency, Health Canada's Radiation Protection Bureau, and International Safety Research.

Progress

During 2010 - 2011, successful test results from AAPS' muon detector system were used to design a full-scale prototype. Field testing by AECL and the Canada Border Services Agency is scheduled to take place next year.

Moving Forward

The technical team will conduct field trials to obtain the necessary information from which to calibrate the resolution and detection times required for commercial implementation of the detector system. AAPS will play the lead role in advancing and commercializing the technology by engaging industry and government partners to enable further funding for commercial demonstration leading to government and industry adoption.



Establishing a Commercial Venture to Reduce X-ray Exposure for Patients and Medical Staff

AAPS has provided business development services and management expertise to help form a new company dedicated to reducing X-ray exposure during fluoroscopic-guided medical procedures.

Image-guided, minimally invasive medical interventions provide an alternative to open surgery that is rapidly being adopted across the globe. However, the X-ray exposure to patients and medical staff during long fluoroscopy-guided procedures is a growing concern. The medical community, governmental regulators, healthcare labour organizations and even mainstream media are openly discussing concerns about exposure levels that can be equivalent to thousands of chest X-rays.

Innovation

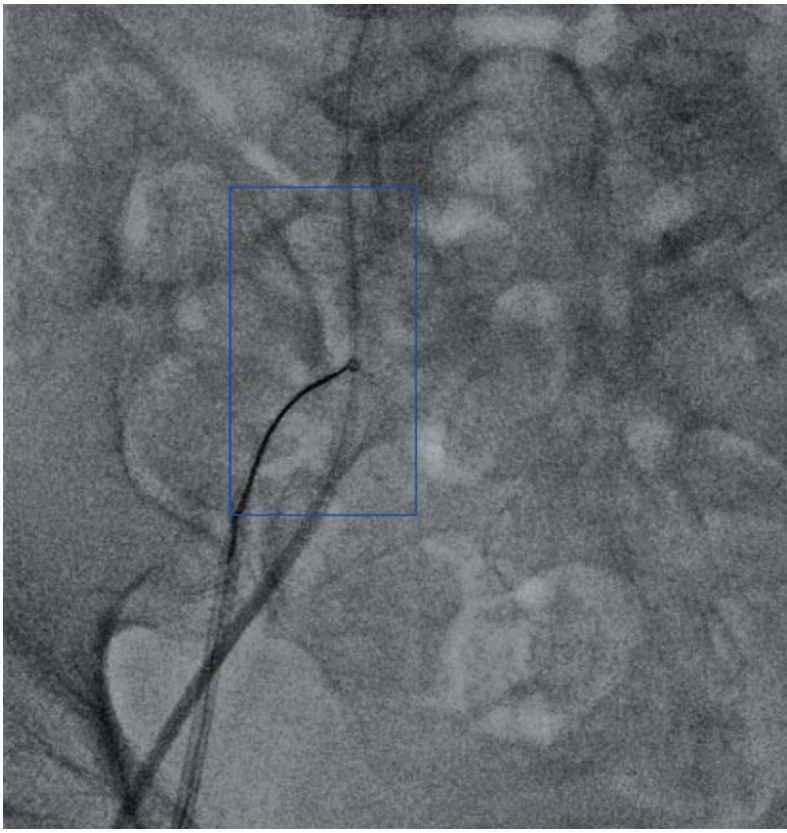
By introducing a fast-moving shutter system and integrated image processing software, X-ray exposure can be significantly reduced. The system is designed to maintain image quality in the region-of-interest to the physician, while reducing exposure in the broader field of view. The successful development of the technology will reduce X-ray exposure for both patients and medical staff by up to tenfold. In addition, it could also open the door to longer and more sophisticated procedures.

Commercial Applications

Manufacturers of fluoroscopy imaging equipment continually strive to improve their products and are expected to integrate this technology into their systems as part of their commitment to keeping X-ray exposure rates as low as reasonably achievable. Potential customers could include medical equipment giants General Electric, Siemens, Philips and Toshiba.

Collaborators

While many of AAPS' projects originate through TRIUMF, AAPS has been demonstrating its value to the broader technology community. This project was brought to AAPS by a group of Vancouver-based physicians and a well-known entrepreneur, Mr. Dan Gelbart. Discussions are underway with major research hospitals across Canada to help validate product potential and to further tailor the new technology to meet the needs of medical professionals using fluoroscopy-based imaging systems.



Progress

During 2010-2011, AAPS provided business development services to help fast-track a new company dedicated to bringing this technology to commercial fruition. At fiscal year end, the new company is nearing completion of its first round of financing and is poised for prototype development and new job creation within months.

Moving Forward

AAPS is committed to providing management expertise and business incubation services to support the new company. In addition, AAPS will work to facilitate access to TRIUMF's well-established expertise in radiation management and monitoring technologies.

"This technology is new and exciting and AAPS is proud to be financing and working with a team that spans from bench to bedside. This effort has the potential to make a significant difference for Canadian healthcare as well as deliver economic value to the Country."

Edward Odishaw, Chairman of the AAPS Board of Directors

ACCELERATOR-RELATED TECHNOLOGY DRIVING INNOVATION IN HEALTH AND LIFE SCIENCES

ACCELERATOR TECHNOLOGY AND ITS ROLE IN IMPROVING THE HEALTH OF CANADIANS

Building on Canada's Leading Role in Medical Isotopes

The commissioning of AAPS' Isotope Separator Test Facility signalled a major step towards developing a new method for producing high value isotopes for use in medical imaging and cancer therapies.

The MoRe (Molybdenum/Rhenium) Isotope project is another example of how AAPS leverages the leading, multi-disciplinary expertise at TRIUMF. The Nuclear Medicine Division at TRIUMF has focused on the diagnostic power of medical isotopes, but there has been a longstanding interest in matched pair isotopes—where an isotope suitable for imaging and diagnosis is first used, followed by a second isotope which delivers a highly targeted therapeutic radiation dose directly to cancer cells.

Radioimmunotherapy is a relatively new treatment that combines the cancer-killing power of radiation therapy with the precise delivery of immunotherapy. Essentially, a radioisotope is linked to a protein that selectively binds to cancer cells. This approach ensures that tumor cells receive a high dose of radiation, while minimizing unwanted damage to normal tissue. Unfortunately, adoption rates and new drug development have been slowed, in part, due to the limited selection of radioisotopes available in suitably high purity.

Innovation

AAPS is developing a novel approach to help fill this need for high purity medical isotopes. The electromagnetic isotope processing technology is designed to purify isotopes with properties that could increase the efficacy of radiopharmaceuticals, while reducing their side effects.

Commercial Applications

Drug developers have had their eye on several promising isotopes for years, but there has not been a way to produce them in sufficient isotopic purity. For example, Rhenium-186 is of great interest to radiopharmaceutical developers because its chemistry is almost identical to Tc-99m and its decay properties would make it ideal as a general-purpose isotope for many of the most promising targeted therapies being developed today. The successful development of the MoRe technology would allow Re-186 to be a therapeutic match for the most widely used diagnostic isotope, Tc-99m.

Collaborators

Initial scientific and technical work was supported by the Natural Sciences and Engineering Research Council 'Idea to Innovation Program'. AAPS gratefully acknowledges the support of our key project collaborators and their respective institutions: TRIUMF, Simon Fraser University, University of Missouri, BC Cancer Agency, IsoTherapeutics Group LLC, Washington University in St. Louis, and D-Pace.

Progress

A key technical milestone was reached this past year with the successful commissioning of the Isotope Separator Test Facility, which was purpose-built to develop and demonstrate ion sources capable of efficiently producing the high intensity metal ion beams required to make this new method of isotope processing commercially viable.

Moving Forward

Over the next year, AAPS and our collaborators will progressively validate key aspects of the MoRe Isotope production approach for several isotopes.

Isotope Selection for New Cancer Therapies

As the science of highly targeted therapeutic delivery advances, so too does the science concerning which radioactive isotopes are most effective for each medical application. To be suitable, the isotope must have the correct combination of chemical and physical decay properties, and must be commercially available in high purity form.

The MoRe approach is designed to take readily available, low purity compounds and strip away the unwanted atoms to yield products of unprecedented radiochemical purity.

WORLDWIDE DEMAND FOR COMMERCIAL ACCELERATOR-BASED TECHNOLOGY IS BEING DRIVEN BY MAJOR SOCIETAL CHALLENGES. IN THE HEALTHCARE SECTOR, THERE IS STRONG DEMAND FOR RADIOISOTOPES TO SUPPORT LIFE SCIENCE RESEARCH AND TO ENABLE DIAGNOSTIC AND THERAPEUTIC APPLICATIONS.

Working to Secure Canada's Supply of Isotopes Crucial for Medical Imaging

While the MoRe technology was originally conceived to produce high purity isotopes for therapeutic applications, the recent Technetium-99m (Tc-99m) supply crisis has driven urgent efforts towards assessing the viability of using the electromagnetic isotope separation approach to help solve the long-term supply issues.

Natural Resources Canada formulated the Non-reactor-based Isotope Supply Contribution Program (NISP) to help secure a more sustainable supply of medical isotopes. Providing business acumen and an understanding of the sophisticated supply chain for Canadian medical isotopes, AAPS worked with TRIUMF and its partners to prepare a successful proposal.

The TRIUMF-led NISP proposal was awarded $6 million to develop and demonstrate cyclotron-based production of Tc-99m. The project brings together physicists, nuclear chemists, radiochemists, pharmacologists, biologists, technicians, and clinicians from across the country to answer the critical questions that remain before this process can be deployed on a large scale.

Innovation

By enabling regional hospitals to produce and distribute this key isotope to local clinics, widespread disruptions of Tc-99m supply would be an issue of the past. The cyclotron-based production approach would also avoid the use of uranium target material and reduce reliance on the handful of aging research reactors that are responsible for current supply.

Commercial Application

The successful demonstration of this approach is expected to drive commercial demand for Canadian-made cyclotron hardware and dedicated Tc-99m production equipment. Each of the projects funded through the NISP program requires the use of enriched Mo-100. The MoRe technology could provide a secure domestic source of this key isotope.

Collaborators

The TRIUMF-led team is known as CycloTech99 and includes AAPS, the BC Cancer Agency, the Centre for Probe Development and Commercialization, and the Lawson Health Research Institute.

Moving Forward

AAPS will continue working to address the key technical issues that affect the economic feasibility of domestic Mo-100 production. In addition, AAPS stands ready to further develop and commercialize the technologies and know-how emerging from the CycloTech99 team.

The Honourable Gary Goodyear, Minister of State (Science and Technology), pictured middle, visits AAPS' Isotope Separator Test Facility.

AAPS Personnel, left to right: Jack Scott, CEO; John D'Auria, Technical Project Leader; Edward Odishaw, Board Chair; Christopher Campbell, Chief Operating Officer.

THE SUCCESS OF THESE PROJECTS WILL HELP TO MAINTAIN CANADA'S POSITION AS A WORLD LEADER IN MEDICAL ISOTOPE PRODUCTION TECHNIQUES. AAPS WILL CONTINUE TO WORK ON FINDING VIABLE WAYS TO DEVELOP, VALIDATE, AND COMMERCIALIZE INNOVATIVE ISOTOPE PRODUCTION TECHNOLOGIES IN ORDER TO SERVE DOMESTIC NEEDS AND WORLD MARKETS.

Surveying Positron Emission Tomography Adoption Rates across Canada

AAPS and TRIUMF joined forces to survey institutions about their procedures and uses of Positron Emission Tomography (PET). The goal was to learn whether there are ways to more effectively share best practices across the country and thereby improve healthcare outcomes for Canadian cancer patients.

Positron Emission Tomography (PET) allows physicians to non-invasively examine the bio-chemical functioning of organs. PET relies on advanced detector technology and radioisotopes produced through accelerator-based systems. The modality has proven valuable in early cancer detection, treatment planning and follow-up, which can result in improved patient outcomes and lower healthcare costs.

Current use of PET scanning as a standard tool in provincial health systems varies widely across Canada. As one of the founding developers of the technology, TRIUMF is interested in identifying how PET might further improve patient outcomes across the country.

Objective
The survey aims to examine the use of PET imaging within provincial health systems across Canada with a view toward understanding common conditions for increased effectiveness. The goal is to generate a set of comprehensive findings regarding procedures and uses, and to make recommendations about how to improve PET utilization in support of improved cancer-patient care.

Progress
Over 45 senior practitioners from major hospitals and cancer agencies and associations across Canada have been interviewed for this report. Over the next year, the team will report findings and implement a communications plan.

PET imaging is a national opportunity for Canadian leadership in healthcare. Improved utilization of PET scanning could improve patient care and reduce associated costs. The report will serve as the backbone of an education campaign that will focus on enhancing awareness about the role of PET in cancer care and how to improve its efficiency and effectiveness by aligning best practices across the country.

Leveraging Radiochemistry Know-how to Fight Malaria

The World Health Organization recently reported that an estimated 243 million cases of malaria resulted in nearly 863,000 deaths in 2008. Canadian scientists have recently demonstrated selective anti-parasitic activity of metal-carbohydrate compounds.

Currently, no commercially available vaccine for malaria exists and chloroquine resistant malarial strains are on the rise. Unfortunately, scant funding has led to insufficient research for novel drugs and treatments for malaria. Some alternative drugs are being investigated, but are either costly or have adverse side effects.

Innovation
Based on work originating in UBC's chemistry department and in collaboration with experts in radiochemistry at TRIUMF, AAPS has provided funding to secure expertise in metal-carbohydrate chemistry. The goal is to synthesize new inexpensive compounds that have activity in chloroquine-resistant strains and that increase efficacy.

Collaborators
University of British Columbia, McGill University, University of Cape Town in South Africa.

Progress
During 2010-2011, preliminary cell-culture based testing in laboratories at Cape Town University demonstrated that the new compounds show promising efficacy against the chloroquine-resistant strains of Malaria, although further testing and validation will be required.

MATERIALS SCIENCE

AAPS' MATERIALS SOLUTIONS INCLUDE THIN FILMS, FOILS AND SPECIAL COATINGS FOR USE IN SCIENTIFIC EQUIPMENT AND CYCLOTRONS AS WELL AS IN CALIBRATION STANDARDS FOR USE IN X-RAY FLUORESCENCE.

Commercializing Thin Films, Foils and Special Coatings: Micromatter™

An operating division of AAPS, Micromatter runs as a commercial business with two product lines:

- **Diamond-like carbon (DLC) foils and coatings and**
- **Thin film X-Ray Fluorescence (XRF) calibration standards**

The original foil lab was an extension of TRIUMF's expertise in and requirement for stripper foils used in extracting the ion beam from TRIUMF's commercial isotope production cyclotrons. These foils are now used worldwide in cyclotrons which produce radioisotopes for medical applications, as well as in research accelerators.

In 2009, AAPS purchased the assets of Micromatter Co., an established manufacturer of thin film–based X-Ray Fluorescence (XRF) standards. XRF is a non-destructive technique widely used for elemental analysis across a wide range of fields. It is critically dependent on accurate calibration standards and, today, Micromatter produces some of the world's highest quality standards, as evidenced by the demand for its products from such leading international institutions as the International Atomic Energy Agency (IAEA), the US Navy, the National Institutes for Standards and Technology (NIST) in the US, and the US Environmental Protection Agency (US EPA).

Innovation

Micromatter has developed a special type of highly flexible and extremely durable carbon foil. The novel process uses pulsed laser deposition and a new "doping" step to produce finely structured diamond-like carbon (DLC). These foils increase productivity through higher beam performance and reduced service intervals. At the same time, Micromatter XRF standards are unique in the accuracy with which standards at the microgram level can be prepared.

Commercial Aspects

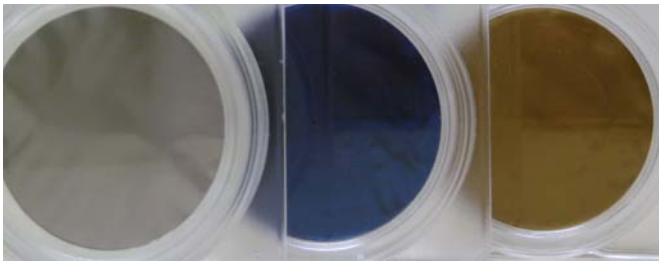
Micromatter's number one goal for 2010-2011 was to increase revenues from commercial product sales. This past year, sales of XRF calibration standards to customers around the world were close to tripling. AAPS reinvests its revenues to support new product development. In 2010-2011, AAPS invested in a custom Chemical Vapor Deposition system to produce new product lines and to allow Micromatter™ to explore applications in the semiconductor and micro-fabrication markets, as well as in the field of DLC-coated medical appliances.

Moving Forward

With technological advancement, there is an ever-increasing demand for new materials. Micromatter will continue to develop specialty materials to meet existing and new market demands. AAPS will continue to foster this growing business with the long-term view to making Micromatter a strong commercial venture in the frontier area of materials science.

Diamond-like Carbon (DLC) Foils

Custom Coatings



XRF Calibration Standards

www.micromatter.com

FINANCIAL HIGHLIGHTS

AAPS received start-up funding totaling $14,955,575 in April 2008 from the Government of Canada's Networks of Centres of Excellence Program. During 2010 – 2011 expenditures increased by 22% as AAPS and our collaborators accelerated technology development efforts in several projects. Commercial revenues from our Micromatter™ operating division increased again last year and ongoing investment in product development and production apparatus is expected to generate sales from new product lines starting late next fiscal year. In 2010-2011, AAPS excess of revenue over expenditures was $178K, a slight decrease from fiscal 2009-2010. Moving into fiscal year 2011-2012, management is planning for increased activity and investment, especially related to our muon-based mineral exploration project and at least one new venture.

Statement of Financial Position

	March 31, 2011	March 31, 2010
Assets		
Current assets	$ 8,234,117	$ 11,100,044
Capital asset	954,484	905,775
	$ 9,188,601	$ 12,005,819
Liabilities and Net Assets		
Current liabilities	$ 1,009,135	$ 781,697
Fund balance, end of period	7,663,857	10,887,007
Net assets	515,609	337,115
	$ 9,188,601	$ 12,005,819

Statement of Operations

Period from April 1, 2010 to March 31, 2011 with comparison figures for 2010

	Audited 2011	Audited 2010
Revenues		
Commercial Revenues, Interests, & Other Revenue	$ 441,962	$ 394,784
Amortization of Government Funds	3,156,755	2,506,991
Contributions in kind	1,140,811	1,037,625
	$ **4,739,528**	$ **3,939,400**
Expenditures		
Operating Costs	$ 1,370,049	$ 1,333,028
Salary Costs	1,717,986	1,090,217
Knowledge Dissemination/Sharing Costs	116,071	73,112
Commercialization Costs	172,705	191,790
Other Expenses	43,412	28,377
Expenditures in kind	1,140,811	1,037,625
	$ 4,561,034	$ 3,754,149
Excess of Revenue over Expenditures	$ **178,494**	$ **185,251**

LOOKING TO THE FUTURE

THE OVERARCHING VISION FOR AAPS IS TO BUILD A NATIONAL AND INTERNATIONAL REPUTATION FOR DEVELOPING PROVEN AND VIABLE MODELS FOR ACCELERATING TECHNOLOGY COMMERCIALIZATION.

AAPS' strategic plan is designed to enhance Canada's capacity to translate research breakthroughs into products, services, and businesses that drive innovation and benefits in key priority areas:

- Health and related life sciences and technologies
- Natural resources and energy
- Environmental science and technologies
- Information and communications technologies

As our projects move toward commercial viability, they stand to have significant social and economic impact for Canadians and people around the world. We will continue to seek ways to address the gap between R&D and the successful commercialization of cutting-edge technologies.

Goals for 2011-2012

Generating Funding to Support Future Research and Development Efforts

This year we focused efforts on laying a foundation to sustain AAPS beyond its initial 5-year mandate. The following outlines our priorities to achieve this goal in the coming years.

1. Our principal objectives will remain:
- Investment in and development of "close-to-commercial" ventures,
- Active pursuit of early, private sector investment in support of these ventures, and
- The generation of future revenue sources for AAPS from spin-off companies, licensing and royalty agreements, and equity positions.

2. We will scale-up and expand production capacity and develop new product lines for our Micromatter™ operating division in order to increase commercial revenue.
3. AAPS will continue to build on TRIUMF's world-class facilities, expertise and network to:
- Identify new projects to fill AAPS' pipeline and
- Provide increased opportunities for Canadian companies through contract work, product development and collaborative applied research.

4. Attract additional HQP with a significant number of new appointments planned for next fiscal year.

Collaborating to Strengthen Project Viability

This year we demonstrated our strength in building strong and mutually beneficial collaborations in order to advance promising projects. While nearer term projects are being pursued, we also need to continue building capacity, fostering increased industry involvement, and facilitating the development of longer-term opportunities.

Developing Highly Qualified Personnel

Attracting and developing Highly Qualified Personnel (HQP) is an important part of AAPS' mandate and business model. While there are time-honoured traditions for academic training, there is currently no clear formula for developing scientific entrepreneurs. To fulfill our objectives, it is important to identify and train individuals who can combine solid scientific knowledge with the business skills required to participate in the commercialization of new technologies, products, and services. This is vital to translating research into successful commercial applications with real social and economic impact.

AAPS continues to provide opportunities for HQP to further develop their technical skills in a range of scientific disciplines, including accelerator physics, engineering, materials science, radiochemistry, and computer science — all while gaining exposure to the business side of the commercialization spectrum.

To date, AAPS has engaged over 25 HQP from North America and overseas as employees, contractors, and consultants in fields such as advanced detector technology, medical isotopes, particle beams, thin film coatings, and metal-carbohydrate chemistry. Attracting, training, and retaining these highly qualified individuals is a key part of attracting investment and bringing breakthrough commercial solutions to world markets.

AAPS – PEOPLE MAKE THE DIFFERENCE

Developing HQP: The Best of Both Worlds

Equipped with a Bachelor's degree in Theoretical Physics from the University of Guelph and a Master's degree in Experimental Physics from the University of British Columbia, Keith Ladouceur was happy to be recruited to AAPS in April 2009 and looked forward to applying his technical skills. What he did not count on was the opportunity to gain valuable business skills. On joining AAPS, Ladouceur became part of the MoRe Isotopes project team that is working to develop a novel method of purifying medical isotopes.

"Because of AAPS' unique mandate, I found myself interacting with, and learning from, our C-level executives about the business side of science," Ladouceur explained.

Motivated by this exposure, and with the support of AAPS, Ladouceur enrolled in an intensive UBC Technology Entrepreneurship Program offered by the Sauder School of Business. This course focuses on how technology ventures are created and the decisions entrepreneurs face. It gives students hands on opportunities to evaluate new ventures and present an opportunity to real investors, while getting invaluable feedback each step of the way.

"The course made a big difference. I have the mindset now so that when I am working on the AAPS project I am looking at it in terms of both the commercial and technical side, and what aspects will most interest investors," Ladouceur concludes.

Contributing to the International Community

In September 2010, TRIUMF and AAPS sponsored the 25th World Conference of the International Nuclear Target Development Society. Hosted by TRIUMF, the conference attracted more than 40 participants from 13 countries.

International Visitors

On September 17, 2010, a group of Austrian policy makers, business leaders, and university administrators visited TRIUMF and AAPS, to better understand science, technology, and innovation in Canada.

On September 29, 2010, the Scientific Attaché from Italy, Dr. Emanuele Fiore, visited with TRIUMF and AAPS to discuss technology transfer and research relationships between Canada and Italy.

Management Team

John E. (Jack) Scott
President & CEO

Paul W. Schmor
Vice-President &
Chief Scientific Officer

Meir Deutsch
Vice-President &
Chief Technology
Officer

Konstantine Sarafis
Vice-President,
Business Development

Christopher J. Campbell
Chief Operating Officer

Pamela Mooney
Chief Financial Officer

Ann Y. Fong
Corporate Secretary

Cynthia Reis
Administrative Director

Board of Directors

Edward Odishaw
Barrister & Solicitor
Chairman and CEO
Austpro Energy Corp.

Michael Burns
Director
Naikun Wind
Energy Group

Poul Hansen
Chairman &
General Manager
Sperling Hansen
Associates

Dr. Colin H.W. Jones
Professor Emeritus
Simon Fraser
University

Howard Kellough
Barrister & Solicitor
Partner
Davis LLP

Dr. Nigel S. Lockyer
Director
TRIUMF

Dr. W. John McDonald
Professor Emeritus
University of Alberta

John E. (Jack) Scott
President & CEO
AAPS

Peter Scott
Partner
Stirling Mercantile
Corporation

Dr. David F. Torgerson
Senior Technology
Advisor
AECL

Arthur H. Willms
Retired/Independent

Fouad Elgindy
(Observer)
Networks of Centres
of Excellence

AAPS
Advanced Applied
Physics Solutions

ETPP
Exploitation des Techniques
de Pointe en Physique

Advanced Applied Physics Solutions
4004 Wesbrook Mall, Vancouver, BC V6T 2A3

t: 604.225.2277 e: info@aapsinc.com

www.aapsinc.com