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2. Introduction

Our *Eyes High* vision is aspirational and identifies several goals:

- “The University of Calgary **will** be a global intellectual hub...”;
- “Students **will** thrive in programs made rich by research and hands-on experience...”; and
- “By our fiftieth anniversary in 2016, we **will** be one of Canada’s top 5 research universities, fully engaging the communities we both serve and lead.”

To achieve this vision, we have made three fundamental commitments:

1. Sharpen focus on research and scholarship through focus, collaboration, support, translation, and attention to results;
2. Enrich the quality and breadth of learning through quality instruction, programs with defined and measurable outcomes, and engaging students in research and broader experiences; and
3. Fully integrate the university with the community by showing our pride and showing leadership, involving local communities and alumni.

Our *Academic Plan* identifies seven major academic priorities to guide our actions and thus it helps to define the nature of our discoveries, creative endeavors, and innovations. It is a roadmap for achieving our *Eyes High* vision.
Our Research Plan considers these academic priorities along with provincial, national, and global demands for new discoveries, to identify strategies for our research that will fulfill our fundamental commitments and achieve our Eyes High goals.

The University of Calgary is a comprehensive academic and research institution. We are an academy of students and faculty supported by staff, with a mission to discover new knowledge and translate our discoveries into applications that provide benefits to our society and global communities. To fulfill our mandate we require a diverse academy of scholars of the highest caliber.

It is the creation of new knowledge in all forms that distinguishes us as a research university, and our ability to engage students in discovery and innovation further distinguishes us among competing research universities. We are a comprehensive research institution that celebrates and rewards contributions from all disciplines and promotes interdisciplinary research to solve important problems.

Contributions from individual scholars are paramount for our success. We will support excellence in scholarship across the academy, and champion research priorities established by faculties. However, through the vision set out by Eyes High in 2011 and the lens of our Academic Plan, we have committed to increase our research impact in priority areas where we have recognized strength and leadership, where we can highly integrate teaching and research, where research outcomes and translation promote sustainability, where interdisciplinary contributions can lead to major advances, and where we can have the biggest impact on the communities we serve.

Our objective is not only to compete with the best universities ‘scholar-by-scholar’ or ‘program-by-program’, but also to differentiate our institution in the upper echelon of universities. Therefore, we seek the “strategic sweet spot” that aligns our areas of strength with areas of need locally, provincially, nationally and internationally where the University of Calgary can make a unique contribution.

To make that happen, we can no longer simply look internally to make decisions regarding our priorities. Paying attention to the needs of society and signals from governments in defining our priorities for discovery, creativity, and innovation positions us for success by “fully engaging the communities we both serve and lead.”

3. Process

To construct our new Research Plan, we followed a similar process to the development of our Academic Plan by synthesizing feedback from all faculties and student groups to a comprehensive set of questions (Appendix 1). These questions identified crosscutting research strengths and prominent research themes (Part 1 of the questionnaire), as well as strategies and tactics for advancing our research mission (Part 2 of the questionnaire).
4. Results from Questionnaires

Based on the responses from faculties and student groups, our Research Plan identifies three major priorities:

1. Match our Strengths with Opportunities;
2. Increase our Research Capacity; and
3. Create a Dynamic Research Environment to Promote Research Excellence.

In the following sections, we describe these priorities, along with goals, strategies, and tactics to illustrate how our Research Plan will help to achieve our Eyes High vision.

Before describing these priorities, we need additional clarity around the ultimate goal in our Eyes High vision. The final statement in Eyes High identifies the goal of being “one of Canada’s top 5 research universities....” It does not mean that we should become top 5 in research, without thought to teaching. Rather it means that our goal is to be a ‘top 5 university’ among those universities that are research intensive.

Therefore, we should not distill our goal into a small set of metrics around income for research, number of patents, graduate students sponsored, etc. If we attained these metrics, we will certainly be counted as one of Canada’s top 5 research universities but we may not have achieved our goal by fully engaging the communities we both serve and lead, nor will we have lived up to our three foundational commitments.
‘Sharpening focus on research and scholarship’ includes the commitment that our research will have impact and will change the world. In establishing our institutional priorities, we must take into account the tremendous needs of the societies we serve and lead. Similarly, we will not achieve our goal by simply “trading off teaching and research”.

Sharpening our focus on research and scholarship does not mean that we will reduce the quality and breadth of learning, because our second foundational commitment dictates that our students realize the benefits obtained from learning in a research environment that can only be achieved at a research-intensive institution. In short, we must benchmark ourselves not only against simple metrics, but also the entire set of aspirational goals in our Eyes High strategy.

In the final section entitled “Create a Dynamic Research Environment to Promote Excellence”, we highlight some tactics that could help to inform Institutional level metrics for gauging the research contribution to our Eyes High goals.

When we present the priorities, goals, strategies, and tactics in the following sections, we do not repeat those already identified in our Academic Plan. Recall that the Academic Plan is a major lens through which we view all of our missions. For example, the strategies and tactics identified in the priority area of ‘Talent Attraction, Development and Retention’ have direct implications for advancing our research mission. Similarly, ‘Sustainability’, ‘Interdisciplinarity’, ‘Leadership’, or ‘Internationalization’ identify major goals that directly impact our research—both research topics and research approaches. Thus, our focus here is on those new strategies and tactics that supplement those in the Academic Plan and are directed at our research mission.
5. Research Priorities

5.1. RESEARCH PRIORITY 1: MATCH OUR STRENGTHS WITH OPPORTUNITIES

5.1.1. Goal: Sharpen focus on research and scholarship

Our campus population of scholars and support staff surpasses 34,000 individuals, each with their own priorities for areas of inquiry and expression. As an institution, how can we identify strategic research themes to achieve our goal of being a global intellectual hub and fully engaging the communities we serve and lead? What does it mean to a scholar if the priority area of research does not touch on her/his research expertise or, equally important, what if it does?

5.1.1.1. Strategy: Use Current Societal Needs and our Capacity to Inform the Needs for new Discoveries, Innovations and Creative Endeavors to sharpen our Research Focus

Our strategy for identifying priority research themes is to match our areas of strength (“push”) with areas of unmet need in society for new knowledge, creative expression, and innovation (“pull”). Respondents from faculties and student groups were unanimous in recommending that the university focus research efforts based on the needs of the communities we serve. The tremendous breadth, depth, and excellence of scholarly expertise resident at our active and vibrant comprehensive research university have tremendous ‘push’ into society.

The interplay is very important—new knowledge and innovation can influence future societal needs, and this creates opportunities for growth and evolution of the academy. Great universities do not simply respond to needs, they also anticipate and act on local and global potential opportunities. For this reason, we must establish and foster mechanisms that allow us to engage our communities, track trends and be ahead of the pack.

The priority research themes chosen also resonate with features of our seven academic priorities: leadership, interdisciplinarity, integration of teaching and research, sustainability, connection with community, internationalization, and attraction and retention of talent.

The PULL: Opportunities Created by Societal Demands and Needs

The Environmental Scan section of our Comprehensive Institutional Plan provides an overview of some of the opportunities and challenges. Here we focus that scan on a few highlights or opportunities that shape our Research Plan. A key concept in our plan is that we should pay attention to our natural assets based on our unique location in the city and region, as well as the current needs of our society. Location, location, location!
1. **Local**

- Calgary is the “energy capital” of Canada, which provides unparalleled access to corporations, decision-makers and technology receptors comprising most of the country’s $80B energy sector. This access gives rise to a unique opportunity for our university to be the leader in Canada—and one of the few leaders in the world.

- Calgary is one of the Top 3 “emerging powerhouses and best urban prospects in North America,” in its analysis of the world’s fastest growing cities (Forbes Magazine, 2010). Calgary is #1 for Metro Areas in its Canadian Competitiveness Rankings (Brookings List) and the top in Canada on the recent CMA rankings.

- Calgary is diverse and one of the fastest growing metropolitan cities in Canada. This provides tremendous opportunities to understand sustainability of cities, economic growth and prosperity, along with promotion of cultural diversity. The *Make Calgary Initiative* and the *Urban Alliance* position Calgary as a ‘living laboratory’ to improve quality of life and export best practices to other rapidly growing metropolitan areas.

- Calgary shares the title for *Cultural Capital of Canada for 2012*.

- Calgary bests Toronto, Vancouver and Montreal in a new study ranking the top 12 information and communications technology clusters in North America.

- Alberta’s ‘One Provincial Health System’ provides unprecedented collaborative research opportunities and access to research facilities and data for ~3.2 million phenotypes, with the goal of improving health care and health care delivery.

- Alberta is a largely rural province and is a Canadian leader not just in natural resources but also in agriculture (grain and animals; nearly 70 per cent of Canada's cattle are fed out in Alberta), food related industries and bio-industries. Therefore, Alberta’s major economic drivers are strongly dependent on maintaining our environment and managing the human-animal-environment interface in the face of industrial pressures on the environment, pending and real climate change, and a growing urban population that puts pressure on and changes to the animal-human-environment interface.

- The Alberta Research and Innovation Plan encourages Campus Alberta Institutions to:

  1. Focus on Targeted Areas: strategically build a strong base of research and invest in strategic research areas that add value, and increase our knowledge translation capacity;
  2. Build Research Capacity by maintaining a strong base of research strengths in Alberta; and
  3. Contribute to an Integrated Research and Innovation System by enhancing Pan-Albertan collaboration, optimizing resources, and creating a culture of entrepreneurialism.

- The Alberta Ministry of Enterprise and Advanced Education has proposed three key outcomes that reflect the Government of Alberta Strategic Plan: effective resource and environmental management, broadened economic base, and resilient, healthy communities.
2. **National**

There is a strong emphasis throughout the Federal Budget 2012 to maintain support for fundamental and applied research funded by the Tri-Councils plus a commitment to continue supporting the Canada Foundation for Innovation through to 2015.

Federal Budget 2012 emphasizes enhancing the collaborative nature between industry and research—across portfolios—with an aim to foster commercialization, job creation, and other economic drivers. Research support will focus on:

1. Environment: Cleaner methods of extracting, processing and utilizing hydrocarbon fuels, including reduced consumption of these fuels;
2. Natural Resources and Energy;
3. Health and Life Sciences;
4. Information and Communications Technologies; and
5. Developing the Digital Economy

3. **Global**

Two major global trends, both driven by demographic observations, influence our consideration of research priorities. First, total energy consumption on the planet continues to rise at rates higher than increases in population density. Our population surpassed 7B in March 2012 and is projected to be 9B by 2050. Despite the economic downturn of 2008, per capita energy consumption continues to rise and per capita rates are expected to increase to alarming levels as undeveloped economies transform. Second, for the first time in human history, more than one-half of the human population now lives in urban as opposed to rural areas. These two trends foreshadow major conflicts for energy, food security, and human health.

**Our PUSH: Breadth, Depth, and Excellence**

The University of Calgary prizes every individual scholar and her/his contribution. As an institution, we are investing in individuals and are providing the infrastructure and support for each individual to excel in his or her chosen field of inquiry or expression. Each individual is “pushing” ahead frontiers of knowledge and applications by scholarly output, technology transfer, and creative expression.

Society expects university-based research to serve both as a key influence on public perception, in addition to leading progress towards solutions. Because the societal demands and needs of the future are not necessarily recognized or articulated today, we must ensure general infrastructure support to enable all areas of research and lay the foundation for the future. Explicit strategies to strengthen this capacity are described in Research Priorities 2 and 3 below.

5.1.2. **Goal: Identify our Research Themes**

Based on the surveys from all faculties and student groups, six strategic research themes emerge from matching the results of broad consultation with the opportunities presented by unmet needs and challenges of our society.
Our research themes are characterized by several important features:

1. We are leaders in the area, as demonstrated by a local critical mass of expertise, and we have attained national or international prominence, as measured by relevant output metrics;
2. We are an essential hub in provincial, national, or global research networks for the area;
3. We have built strong industrial or community (philanthropic) partnerships in the area; and
4. Our advances benefit from enabling research platforms and improve these platforms.

It is important to note, that while the strategic research themes may be led by strengths in particular faculties, our achievements require contributions from all pertinent scholars resident in many faculties. These are institutional strategic research themes that require excellent contributions from across the entire academy.

5.1.2.1. Strategic Research Theme: Brain and Mental Health

One in 3 Canadians will be affected by a brain or nervous system disorder or injury in their lifetimes. Some of these conditions occur early in life—for example, 75 per cent of major mental illnesses such as depression and addiction begin before the age of 25. Others, however, are diseases of aging—1 in 4 Canadians will have a stroke in their lifetime with the risk increasing with age and age-related dementia remains a major unresolved health challenge that threatens to overwhelm our health care system. This is of concern since recent census data indicate that the Canadian population is aging.

Solutions to these complex issues will require both engagement and intellectual exchange across the breadth of expertise in all faculties across our university. Fortunately, the university has already created a rich environment for research in child education and development, brain and mental health and we have developed strong partnerships with the external community to translate and integrate the knowledge we generate into meaningful outcomes for society.

This strategic theme builds on our past investments that have elevated the University of Calgary to international recognition in the neurosciences, mental health and sports related brain injury. From these foundations we will move forward, championing scholarly programs that balance prevention and early intervention across the life trajectory with innovative strategies for improved brain and mental health. Our Strategic Themes are themselves integrated. For example, this theme benefits from advances made by our Engineering Solutions for Health theme. Novel imaging methods developed by biomedical engineers advance our ability to visualize the inner workings of the brain.
5.1.2.2. Strategic Research Theme: Human Dynamics in a Changing World: Smart and Secure Cities, Societies, and Cultures

Calgary enjoys a booming economy in a bustling urban environment set in tremendous natural beauty that supports a vibrant tourism industry. In Canada’s most rapidly growing city, people have come from many different parts of the world to live and work, providing a living laboratory to researchers interested in urban growth, multiculturalism, transportation challenges, sustainable resource use and the desire for a rich social environment. Translation of this research is achieved through many partnerships with municipal governments (e.g., the Urban Alliance), non-profit organizations and foundations. Smart cities include livable cityscapes, high performance buildings, efficient transportation systems, culture and creativity, and fair opportunities for citizens.

Research contributions from across many disciplines improve the quality of life for citizens of growing metropolises, and significantly influence development and policies of our built environments and surrounding ecosystems. Secure societies are in touch with global developments in politics that have local, provincial, federal and international impacts. The University of Calgary is home to the Centre for Military and Strategic Studies, the leading centre of its kind in North America, and the Arctic Institute of North America that serves as a hub for studies of the impact of resource exploitation, climate change, militarization and Canadian sovereignty in the Arctic.

Our scholars lead in the study of cyber-intelligence, human rights, equality, and ethical governance—topics that are crucial to ensure safe and secure cities, societies, and cultures. Immigration enriches the cultural fabric of Calgary and increases the need to promote cultural awareness and understanding. Local businesses engaged in commerce in other countries look to experts in international business as well as scholars with expertise in social and political issues in regions of interest such as Latin America and Asia.

The university’s architects and designers are creating a new generation of urban spaces, while its writers, musicians, playwrights, and choreographers provide creative expressions of important social issues and contribute significantly to Calgary’s reputation as a cultural hub.
5.1.2.3. Strategic Research Theme: New Earth-Space Technologies

The University of Calgary is a world leader in the development and application of Earth-Space Technologies. This theme cuts across faculties and disciplines, integrating research strengths to create new technologies for improving global communication networks and environmental monitoring.

Near-earth-space research both builds on and underlies technology development for global positioning, telecommunication, and environmental monitoring. Development of geospatial technologies like GPS, GIS, and LIDAR feed a new industry in support of resource stewardship and agriculture—fields particularly relevant for Alberta and Canada. Environmental monitoring is critical for continued oil sands development. The vast agricultural industry will benefit from precision farming technologies that are based, in part, on satellite imagery and sophisticated spatial positioning systems, as well as for livestock operations.

Investments in space research including radio astrophysics, planetary science, and near-earth-space science are pushing the boundaries of sensor, sensor web, and antenna technologies, and are also motivating the development of stream computing and research into “big data”. These technological advancements will find application in improved wireless networks, personalized medicine (making sense of ‘…omic’ data in support of improved healthcare), oil sands and other environmental monitoring (integrating a wide variety of data sources and sensor network data), and navigation.

The overall theme will inform the development of environmental policy and contribute to Canadian arctic sovereignty. The theme of earth-space technologies builds on decades of national leadership that includes more than 20 space missions, a record unmatched by any other Canadian university, and brings significant reputational advantage to the University of Calgary.
5.1.2.4. Strategic Research Theme: Engineering Solutions for Health: Biomedical Engineering

Biomedical engineering is the application of engineering principles to solve problems in the health field. It is one of the fastest growing disciplines and industries for health innovation and product development globally; medical devices and technologies are a US$140-180B industry that is growing at over 10% annually.

Within the university, biomedical engineering has a long history and is rooted in interdisciplinary work across faculties. We host an NSERC CREATE initiative called 21st Century Biomedical Engineers, a unique training program giving graduate students the opportunity to gain advanced skills for careers in industry, government or academia. As a result of this focus and investment, the University of Calgary biomedical engineering group ranks the best in Western Canada based on research publications and impact.

To complete the research development pipeline, the university has several initiatives focusing on commercialization activities, including the Biovantage Alberta Ingenuity Centre, BOSE Biomaterials and Tissue Engineering Development Centre, the Hotchkiss Brain Institute’s partnership with Integra Life Sciences Corporation, Ward of the 21st Century, and Clinexus (funded by AET to accelerate existing small/medium enterprises in health technology areas). These centres focus on developing technologies and better treatment methods in many areas such as stroke, Alzheimer’s, arthritis, bone and joint conditions, heart disease, and neurological injury.

5.1.2.5. Strategic Research Theme: Infections, Inflammation and Chronic Diseases in the Changing Environment

Chronic diseases, infections, inflammatory states, and pain combine to create the greatest burden on health on a global basis. They are influenced by genetic predispositions and stress, but we now also know that the health of humans is closely intertwined with that of domestic animals, wildlife and the environment, including their respective microbiomes. Changes in one sector affect the other sectors. We now recognize that inflammation and as yet unidentified infections may be at the core of many chronic diseases, including cancer.
While significant improvements have been made in the treatment of acute symptoms of chronic diseases, chronic diseases that burden people over the course of decades pose huge novel challenges. For example, diabetes, asthma, arthritis, inflammatory bowel diseases, hepatitis, nephritis, chronic skin problems and cardiovascular disorders are managed over a lifetime leading to enormous costs and therapeutic challenges related to drug effectiveness and side effects.

The management of chronic diseases has been identified as a key priority by the WHO and our federal and provincial governments. Understanding the complex interactions among the diverse factors that predispose individuals to and cause inflammation and/or chronic infections is a major challenge and requires a rigorous multidisciplinary approach ranging from environmental sciences, biological and nutritional sciences, animal sciences, medical sciences, epidemiology, law, population and community health, and public policy.

The University of Calgary has internationally recognized expertise in all these areas and therefore the theme of infection, inflammation and chronic diseases in a changing environment is a natural research priority at the University of Calgary.

5.1.2.6. Strategic Research Theme: Energy Innovations for Today and Tomorrow

The University of Calgary is located in the energy capital of Canada, which provides unparalleled access to corporations, decision-makers and technology receptors comprising most of the country’s $80B energy sector. This access gives rise to a unique opportunity for our university to be the leader in Canada—and one of the few leaders in the world—in energy research. Significant research contributions are derived from every single Faculty at the University of Calgary and are organized around a variety of alternative approaches that address key issues facing the energy sector and societal demands: discover the supplies and new sources; extract efficiently with minimal environmental impacts; export to new markets; and plan for the future.
Sustainability is one of the priorities in our Academic Plan, so that this feature will influence our energy research. Environmental components are extremely important and also enter each theme where appropriate, as does our understanding of resource law. For example, new approaches for extraction will minimize environmental impacts through reduced water use or carbon emissions, new approaches for environmental assessment will inform planning efforts, and environmental considerations will influence the design of new pipelines for energy transport or the economic analysis of alternative export strategies.

We have significant disciplinary and interdisciplinary strength in each of the Energy theme areas. The themes provide the advantage of organizing our research questions, and we can consider different sectors (e.g., oil, gas, electricity). Even though the sub-themes reflect processes, the discoveries and innovations in each will influence how we plan for the future to meet the pressing demand for energy from our global population and manage risks. For example, the field of Energy Systems Analysis draws on the natural, applied, and social sciences to generate insight that can be used to inform policies and investment decisions.

Energy Systems Analysis does not create new scientific approaches or develop new technologies for discovering, extracting, or exporting energy but does provide critical insight into achieving sustainable energy supplies.

5.1.3. Goal: Support our Six Strategic Research Themes and Provide Return to Community

5.1.3.1. Strategy: Promote an institutional environment that enables our scholars to easily recognize their contributions to priority research themes

We will promote mechanisms that encourage engagement across disciplines through “self-organization” as a confederation of scholars—“forced” or “artificial” collaborations among scholars will not yield high impact results. We will investigate alternative institutional structures that will enable collaborative work on discovery, creativity, and innovation. For some themes, groups could form high-level organizations (e.g., schools or institutes), while others may find that there is no need to create over-arching central structures—the effective operation and collaboration among our faculties, centres, institutes, and schools are the key components for success.
Central support will be used to promote impact:

- Priority themes will have a strategic research council composed of thought leaders from the field to identify challenges and opportunities.
- Support will be provided for each strategic research theme to host a one day symposium that will be a “Report to the Community” featuring student presentations, presentations from thought-leaders, highlighting successes in the area of discovery, creativity, and innovation, the day-long event should include a session on “looking to the future” and international leadership.
- Support will be provided for each strategic research theme to target the hosting of one national or one international conference biannually.
- Support will be provided for each strategic research theme to host a meeting with scholars who are leading relevant research platforms that will promote exchange of accomplishments and will identify new areas for collaborative research.
- Support will be provided for each strategic research theme to undergo an independent international review at least every 5 years to ensure that the university is continuing to foster excellence in this area.

5.2. RESEARCH PRIORITY 2: INCREASE OUR RESEARCH CAPACITY THROUGH PEOPLE AND PLATFORMS

5.2.1. Goal: Increase research capacity by engaging all in activities of discovery, creativity, and innovation

Every single person on campus at the University of Calgary is on a scholarly journey, characterized by continuous learning of existing knowledge and learning how to create and evaluate new ideas, forms of expression, and applications of these ideas. The distinguishing feature among undergraduate students, graduate students, post-doctoral researchers and faculty is the duration of their journey.

A ‘top 5 research’ university recognizes that the capacity to create ideas or forms of expression does not reside in the hands of a few, but in the combined abilities of all scholars and staff, and creates the environment to ensure maximum participation. Our goal is to enable our students to transform themselves from being ‘consumers of knowledge’ to discoverers, creators, and innovators, as early as possible in their undergraduate and graduate careers. The Academic Plan identified a priority of integrating teaching and research; here we identify further strategies that emphasize the transformation of learning through discovery, creativity, and innovation.

Both the Government of Alberta and the Government of Canada recognize the contributions made by universities to the creation of new knowledge via the promotion and support of discovery and creativity. Both governments also recognize, however, that our quality of life and economic prosperity depend on our ability to innovate and to translate our new knowledge into significant benefits for society, but that Canada lags behind other developed nations in producing these societal benefits. Given that the University of Calgary is located in one of Canada’s most enterprising city and the tremendous
opportunities for application of our new knowledge that exist, we must provide the environment that will enable our scholars to achieve their full potential as innovators.

We will maximize our research capacity when all of our students, faculty, and staff are provided with the opportunity and skills to participate in discovery, creativity, and innovation. Some may excel, or be driven by success, in one area or another; but all should be provided with the ability to develop complimentary research skills in each facet of discovery, creativity, and innovation.

5.2.1.1. Strategy: Enhance research opportunities for Undergraduate Students

- Create courses that are research focused and that feature the benefits of undergraduate research as part of learning
- Create courses on innovation and entrepreneurship using case studies, grand challenges, or experiential learning
- Promote existing and increase the number of new opportunities for engagement in non-curricular experiential learning and community research and innovation projects (e.g., iGEM and Solar Decathlon)
- Increase the number and review the value of Undergraduate Research Experience Awards
- Improve the research portal initiative that links students to research opportunities
- Promote undergraduate research successes: integrate the annual Students’ Union Undergraduate Research Symposium into faculty and university communications; create YouTube videos or vignettes of undergraduate researchers explaining their projects and results.

5.2.1.2. Strategy: Enhance research opportunities for Graduate Students

- Create courses and other initiatives that raise student awareness about the benefits of translational and applied research
- Create more opportunities and provide funding for research projects/initiatives with a multidisciplinary or translational research focus
- Create courses on Commercialization of Intellectual Property.
- Create Reverse Internships for promoting innovation—invite experts (members of industrial research labs, local industry leaders etc.) for 2-4 months to immerse them in research teams—provides students with internship-like experience while on-campus.
- Create new project class where students from different faculties come together to work on a general problem that spans disciplines.

5.2.1.3. Strategy: Enhance research opportunities for Academic Staff and Post-doctoral Researchers

- Create professional development opportunities for commercialization, technology transfer, knowledge translation, and train scholars on how to engage partner organizations and how to manage partnerships.
- Create professional development opportunities for using social media as research tools—a recent example (Nature 466: 756-760) created an online, completely open access game called “Foldit” to build new proteins. Using “citizen science” and social media, gamers from around the world solved a major problem involving a key HIV Protein in less than three weeks that has bedeviled scientists for more than a decade.
- Create more opportunities for basic and translational researchers to collaborate via campus networks

**5.2.1.4. Strategy: Create research opportunities for Staff**

- Create staff awards for supporting discovery, creativity, and innovation
- Create training courses for common (and new) research techniques—Inference, web-based approaches, etc.

**5.2.2. Goal: Increase research capacity by supporting and creating platforms of international prominence**

Research Platforms represent organized scholarly activities, sometimes linked via infrastructure or critical mass of expertise, that are truly crosscutting and are catalysts in the creation or application of new knowledge. Platforms are not simply widgets, facilities, or specialized pieces of equipment; they represent “ways” of discovering or facilitating new knowledge and applications. As such, they are active areas of research in themselves; they continuously evolve as new knowledge is created thereby opening new paths to inquiry or changing the way we govern ourselves.

We have identified seven major research platforms:

![Diagram of research platforms](image)

Our research platforms are typically created, or supported, by highly accomplished interdisciplinary teams, involving cutting-edge facilities or networks in which the University of Calgary is providing provincial, national, or international leadership. They are platforms that enable great accomplishments for many of our strategic areas of research, and also contribute to other emerging areas of strength across our university. They also contribute strategically and/or provide unique components of Campus Alberta initiatives. By identifying our research platforms of international prominence, we avoid
unnecessary duplication in core facilities across the province and provide cutting-edge contributions to provincial initiatives.

The seven research platforms are described as follows:

**Synthesis and Visualization**

Our society is overwhelmed by data and information. Advances in many disciplines, using both qualitative and quantitative data, are limited by our abilities to synthesize these data and visualize them to aid our understanding. Images transport meaning and are essential in a wide variety of research areas. Data need to be captured, synthesized, and visualized to create images that help problem-solving.

The University of Calgary supports a comprehensive, cross-discipline *Synthesis and Visualization* platform and arguably leads nationally in this area of research. The platform integrates the efforts of researchers from different domains including arts, natural sciences, computer sciences, medicine, engineering, architecture, nursing and kinesiology that work in areas with a high potential for cross-pollination.

Researchers in the platform area work on a wide variety of topics ranging from inventing and improving data capture technologies (e.g., MRI, CT, optical, LIDAR), extracting data from narrative for analysis in humanities and social sciences, high-performance computing for synthesis (e.g. bioinformatics, geo-informatics, astro-informatics) to visualization (e.g., scientific visualization, information visualization, anytime/anywhere computing). The Taylor Family Digital Library provides a test-bed for the advancement of these approaches.

**Analytics and Simulation**

Once we have pulled the data together, our related platform of *Analytics and Simulation* ‘makes sense’ of the vast amounts of these data and applies this insight to solving important problems. Examples include simulating behavioural models for designing new health units (e.g., W21C), constructing transportation pathways in urban environments, or understanding the flow of hydrocarbons in deep reservoirs experiencing influx of steam or chemical catalysts. Our university supports the leaders in the Deep Analytics and Simulation, as well as the leading edge infrastructure to fuel their discoveries. Some disciplines are pushing existing technological barriers and we are national leaders in confronting these challenges.

Projects like the data analysis for the Square Kilometre Array or our contributions to international collaborations around sensor technologies for the study of the Aurora Borealis demand new approaches in analysis and data handling. Several groups are pioneering new approaches for computation and secure network communications that will meet the incredible computational demand from the emerging areas of precision or personalized medicine, and the "omics" revolution, including computational chemistry. Our scholars have made award-winning advances in the analysis and simulation of biological, chemical, and physical processes that have major impacts on quality of life and support mechanisms for society.
Research Stations

Our research stations draw scholars from around the world to conduct disciplinary and interdisciplinary research of the highest caliber, and to educate students from all levels. For example, the Kluane Lake Research Station operated by our Arctic Institute of North America, is one of Canada’s most valued, celebrated, and well-used facilities that provides a major gateway for researchers from across the globe to access research sites. The BioGeoSciences Institute (Barrier Lake Station and R.B. Miller Station) provides unique access and support for research in the Front Ranges of the Rockies—each year ~1700 User Days are logged by researchers from within the university and ~2.3 times that from across Canada and beyond.

Such stations are also paragons for the integration of experiential learning for undergraduates, graduates, and K-12 students. Our own BioGeoSciences Institute at Barrier Lake, hosts K-12 students from across the Province to learn about environmental sciences and field research (>2156 User Days per year), and conducts more than 3200 user days in university courses. We also support the Bamfield Marine Station, through our institutional partnership with the University of Victoria, UBC, UAlberta and SFU.

By supporting international class research stations, we also obtain reciprocal arrangements at stations in Canada and beyond, which provide opportunities for our students and scholars to test their ideas in different settings and participate in courses across a wide range of disciplines.

The University of Calgary is also investing in novel research stations that are partnerships in industrial settings. ACWA (Advancing Canada’s Wastewater Assets) embeds unique full-scale experimental facilities in a fully-operational large municipal wastewater treatment facility that enables researchers to investigate new treatment technologies and approaches for assessing environmental impacts of emerging pollutants, such as personal care pharmaceuticals, biological active compounds and industrial wastewater. We will continue to explore ideas for novel research stations, and we encourage the engagement of all disciplines to explore new partnerships (e.g., Urban Planning, Humanities, Social Work, Cultural Research).

Research Enablers

A top university should not only maintain facilities and have systems that adhere to federal and provincial regulations, but should also provide leadership in animal care, ethics in human subject research, financial and conflict of interest compliance, and governance. We will invest to improve our systems and facilities, but also engage our academy to advance research in these areas and provide advanced training for the next generation of scholars and ethical leaders. We will also lead approaches for provincial harmonization of core activities, by providing new electronic processes that enable research organizations to meet compliance requirements.

Research Enablers include our ‘state-of-the-art’ animal care facilities (e.g., the new Clara Christie Centre for Mouse Genomics) that promote research in Health Sciences and Environmental Sciences, and also test new animal models or protocols that meet the highest ethical standards. Research Enablers also include new avenues for supporting interdisciplinary research of high relevance to our community. The Urban Alliance, for example, is a partnership between the University of Calgary and the City of Calgary to use
our communities as a “collaboratory” to investigate vital topics such as addressing poverty, urban
development, housing and public building design, transportation networks, economic growth, and social
supports. The Urban Alliance enables data sharing and shared access to facilities by students and staff
from the University of Calgary and the City of Calgary. Other Research Enablers include the new Centre
for Advanced Leadership in Business, supported by the Haskayne School of Business and our research
libraries.

**Commercialization**

Several major recent reports and the 2012 Federal Budget, highlight the need for Canadian researchers to
bridge the gap between discovery and innovation. Our university has tremendous capacity to fill this gap,
and our Commercialization Platforms can support these initiatives. *Innovate Calgary* is emerging as one
of our commercialization platforms that could assist our scholars in technology transfer, licensing, and
company creation. Innovate Calgary is a new partnership between our *Universities Technologies
International* (UTI) and *Calgary Technologies Inc.* (CTI). Together with Alberta Innovates, we aim to create
a regional hub for commercialization that serves Southern Alberta.

Bridging the gap is a challenge. Some of our recent endeavors are quite successful (e.g., TECTERRA), and
we continue to explore alternative models for commercialization platforms in partnership with investors
and Alberta Innovates in specific areas (e.g., Biovantage). One size may not fit all, so we need to
experiment with different approaches that may be more productive for specific areas or could extend to
broader areas.

**Knowledge Translation**

Knowledge translation addresses the gap between research results and the practical application of the
resulting knowledge. It is a systematic way to ensure that knowledge ‘users’ are aware of and use
research evidence to inform their work, AND to ensure that research is informed by the most current
evidence available, and the experiences and knowledge needs of the ‘users’.

Knowledge translation involves an array of activities—for example, the application of research knowledge
in professional practice, the exchange of knowledge between researchers and knowledge ‘users’, the
synthesis of existing knowledge, the production of knowledge tools/products for applied use and
commercialization, and research on their implementation, among other activities. The knowledge
translation platform provides linkages to community partners or industrial collaborators.

In medicine, knowledge translation informs clinical practice, treatments, diagnostic procedures, public
health measures and pharmaceuticals. In science and engineering, knowledge translation may result in
industry partnerships and commercialization. In the Social Sciences, Management, and Humanities,
knowledge translation refers to connecting researchers in different areas and bringing their research
results to society through the development of policies, programs and information. In urban planning and
architecture, knowledge translation means developing best practise models that assist government
agencies and the construction industry to create more vibrant and liveable cities. In Law, knowledge
translation occurs through clinical courses and work on law reform.
**Policy Creation**

Championed by our School of Public Policy, this research platform draws together synthesis and analysis of information from many disciplines to advance public discussions of policy and to promote critical evaluation of policy alternatives. This integration is truly crosscutting, involving legal scholars, economists, political scientists, environmental scientists, engineers, health and resource economists, health practitioners, business and financial scholars, and social scientists. It considers an ever-evolving list of pressing demands from society for critical analysis and conclusions on the impacts of alternative policies.

Our research platforms interact closely with our strategic research themes—stimulating new advances and approaches for tackling key problems.
5.3. RESEARCH PRIORITY 3: CREATE A DYNAMIC RESEARCH ENVIRONMENT TO PROMOTE RESEARCH EXCELLENCE

For the University of Calgary to deliver on its promise of becoming one of Canada’s top 5 research universities, along with living up to our foundational commitments, we need to strengthen and improve our current research environment. To that end, we will build research strengths, build new initiatives, and engage our communities.

5.3.1. Goal: Build research strength

5.3.1.1. Strategy: Provide and maintain efficient services throughout the research enterprise, from inspiration through to return to community

- Research administrative systems should be easy, efficient and effective
- Faculty time is best spent on, and should be protected for, scholarly activities, such as teaching and research, by providing delegated research services whenever possible.
- Increase professional pool of research enablers—grant writers, editors, data analysts for grant support metrics.
- Use social media to promote collaboration among scholars at the University of Calgary on emerging issues
- Research support systems must ensure compliance and accountability to our external stakeholders through attention to regulations, timely reporting, and productive engagement of researchers.

5.3.1.2. Strategy: Continue to build/enhance research infrastructure

The university has a huge investment in research infrastructure including research stations, laboratories and information storage. In a dynamic research environment, new infrastructure that supports cutting-edge research is acquired through successful funding initiatives while existing investments in infrastructure are maintained through adequate technical and administrative support.

5.3.1.3. Strategy: Support people: Striving for research excellence (following upon Goal 11 in Academic Plan).

Innovation may come from within established disciplines and frequently it emerges from cross-disciplinary collaborations. We must support and reward discovery and innovation by recognizing both disciplinary and cross-disciplinary research initiatives. Cross-disciplinary teams should be free to focus on their research and training without concerns about administrative boundaries.

- Effective institutes and centres can provide such an environment, creating hubs of research synergy. Reward and recognition must go to all team members of successful institutes.
- Highly productive researchers in teaching-intensive units could be provided with sufficient release time to insure the successful completion and dissemination of their funded research.
5.3.2. Goal: Build new initiatives

5.3.2.1. Strategy: Identify areas of emerging research strength and invest in them to attain international prominence

- Research area will have prominent researcher(s) to provide administrative and intellectual leadership.
- Research area reflects provincial and federal government priorities and has considerable benefit to Canadians.
- Research area has already demonstrated strength and will benefit from focused investment. Such investments could include:
  - Strategic support for larger funding applications and fund development assistance.
  - Priority ranking for institutional cap competitions such as CFI.
  - Capacity to build national and international networks.
  - Differential allocation of support for a limited time.

5.3.2.2. Strategy: Create Opportunities for Researchers (as described in the Academic Plan)

A dynamic research environment attracts top scholars, who in turn attract other top scholars among faculty, technical staff, post-doctoral fellows, graduate students and undergraduates. We will invest in faculty retention through professional development which includes mentoring, collaboration and cross-disciplinary engagement.

- Chairs, including Canada Research Chairs and Industry Chairs are used strategically to bolster priority areas.
- Succession plans for renewal of scholarly activity in faculties is expected.
- We need to increase our investment in post-doctoral fellows and to insure that they receive mentorship, support and opportunities to fully participate in the academy as professionals.
- We need to recruit top graduate students from Canada and internationally. To effectively train the next generation of researchers, graduate students must receive proper supervision and training in all aspects of research and professional practice that is appropriate to their discipline, including professional skills courses or workshops.
- A dynamic research environment is one in which undergraduates at all levels are also engaged in the research enterprise. Through the development office, donors can be made aware of opportunities to support undergraduate research through assistance with costs of research and mentorship (i.e. graduate student mentorship of undergraduates).
- (Strategy 17.6 in Academic Plan is specific to faculty and staff). International exchanges and international experiences enrich learning and lead to opportunities for innovation among all members of the academy. Students and faculty should be encouraged to pursue international opportunities. Industry-academic exchanges similarly serve to enhance creativity. These may involve providing opportunities for industry personnel to become visiting faculty members for a term.
5.3.3. Goal: Engage our communities

5.3.3.1. Strategy: Ensure effective communication about our successes

- Better collection, organization, and dissemination of information about university research activities and researchers.
- The primary portal into research at the University of Calgary is the web site. The “Research” web site will be redesigned to serve both the internal and external communities.
- Continue and enhance support for community-academy initiatives, such as the Urban Alliance. Develop incentives, support, and rewards for community-engaged scholarship.
- Development office encourages donors to support such initiatives.
- The university will enhance engagement opportunities for community, government and industrial partners and create networking opportunities for faculty to help identify collaboration opportunities.
- Through the creation of industry partnerships and fellowships, University of Calgary research and student training will become better known in industry, resulting in future partnerships and employment for our graduates.
- Emphasize knowledge mobilization—dissemination beyond traditional academic outlets. Sponsor workshops to help faculty learn how to explain the relevance of their work to the broader community.
- The downtown campus provides a venue for community engagement through speakers, symposia (for example, the annual Community Forum sponsored by the Calgary Institute for the Humanities), workshops (Urban Alliance and the annual ‘make Calgary Design Workshop’) as well as courses.

5.3.3.2. Strategy: Develop a government relations strategy for our research enterprise

The Government of Canada is sharpening its focus on the need to translate the results of basic research to generating benefits to industry and society.

- The university will enhance support for commercialization, technology transfer, community-engagement and partnerships with industry, community and government through recognition of the effort required to move beyond basic research.
- To increase its impact on society and industry, the university, in collaboration with appropriate stakeholders, will create reward and incentive structures for community-engaged research and technology transfer activities to increase its impact on society and industry.
6. Appendix 1: The Questions

Research Priorities
1. Name up to four areas in your unit that represent your research strengths, as defined by critical mass/greatest activity as a group or by virtue of leading individuals.
2. Which of the areas above are in the top 3 of comparable groups in Canada, if not world-leading? Briefly provide evidence to support the claim.
3. Considering our natural advantages for the University of Calgary, our diverse expertise across campuses, and national research agendas, describe briefly up to four major research initiatives that could represent signature initiatives for our university, which could differentiate us on the world stage.
4. Reflecting on our natural advantages for the University of Calgary and the national and international research landscape, suggest up to four areas that the university can build into future areas of natural prominence. How do they fit into our strategic sweet spot?
5. Are there collaborations/partnerships on, or off, campus that could promote the national or world-class research areas identified in responses to questions 2, 3 and 4?

Mechanisms for Building Research Strength
1. What will you do within your unit that will differentiate research activity (discovery, creativity, and innovation) at the University of Calgary in the provincial, national, and international landscape?
2. What barriers or limitations currently exist in the university that prevent your unit from reaching its potential? Provide suggestions on what we need to do to get by these barriers.
3. In the next decade, what talent (broadly defined), infrastructure, or core facilities will be required to vault your unit to the top 5 in the country?
4. What are some distinct mechanisms to encourage cross-cutting faculty collaboration on institutional priorities?
5. How can we encourage the linkage between discovery and innovation in our priority research areas?
6. How can we more fully engage our community in our research—through discovery, creativity, and/or innovation—and enhance our ‘return to the community’?

NOTE: ONE page maximum for each question; 11 pt font; point form is encouraged. PLEASE PREFACE YOUR OVERALL RESPONSES BY TELLING US THE CONSULTATIVE PROCESS YOU USED TO ARRIVE AT YOUR RESPONSE.
For more information about the content of this plan, or to share your comments about it, please contact:

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