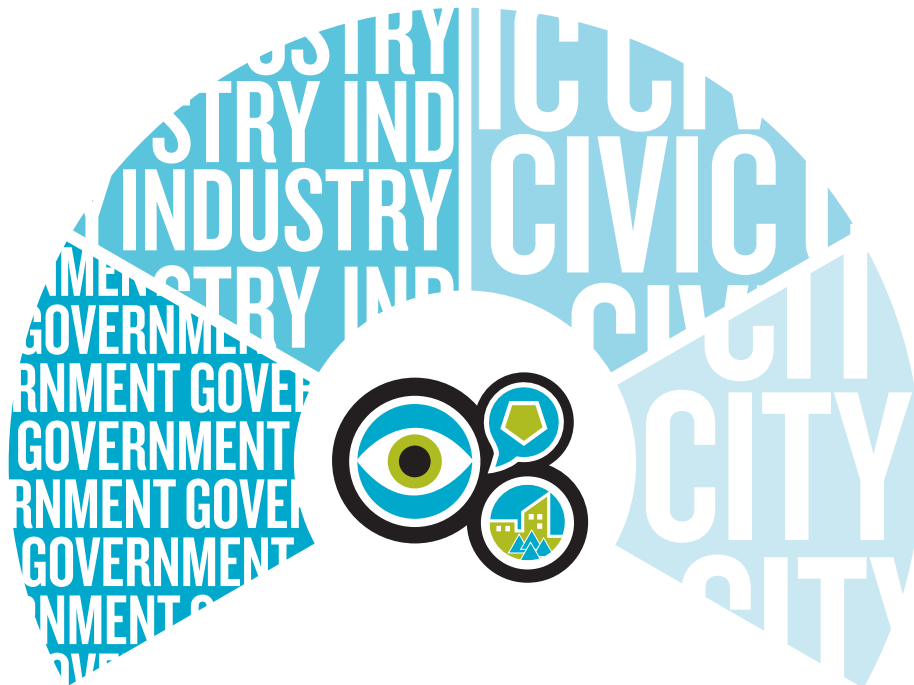# nano

CITY-REGION STUDIES CENTRE

A CITIZENS' SUMMIT

NANOTECHNOLOGY AND THE COMMUNITY

PROCESS SUMMARY

UNIVERSITY OF ALBERTA
FACULTY OF EXTENSION

INTRODUCTION

This brief report provides a summary account of a Citizens' Summit on 'Nanotechnology and the Community'[1]. The summit addressed the economic and social futures of the Alberta Capital Region[2] – its economies, politics, identities and physical infrastructure – as relate to recent strategic investments in nanotechnology research and associated commercial development. This engagement took place across two days in March 2013 and brought together a diverse group of regional participants cutting across academic, public sector, industry, and civic communities.

The primary aims of the Summit were to:

i. stimulate a locally-situated and relevant collective conversation about technological innovation and city-regional economic and planning development; and,

ii. provide a foundation for learning and thinking about innovative cities with which to encourage a wider local engagement with the Summit themes.

This report provides an account of the process and a summary presentation of the conversations that took place. It concludes by briefly identifying some key themes emerging from the summit. Further analytic and strategic conclusions will be presented in a separate report to be published during the Spring of 2014.

City-Regions, Edmonton and the Alberta Capital Region

Nanotechnology is imagined as a force of change and diversification; recasting Edmonton and the Alberta Capital Region as a globally competitive and innovative cityregion. Already a 'northern capital' serving as a gateway and service centre for a resource economy, and the substantial oil and gas industries of Northern Alberta in particular, nanotechnologies promised to attract a new class of high tech workers and entrepreneurs, and to bootstrap a world class livable northern city.

While the Alberta Capital Region has long been defined by its northerly location as a transportation and petrochemical support centre, as a provincial capital, and by the population's passion for hockey, less clear is its relationship with nanotechnology or with the large university on whose campus the National Institute for Nanotechnology (NINT) is situated. On first impression, nanotechnology and the Capital Region may seem like an unlikely pair.

Nanotechnology tends to be an ambiguous, specialist concept to the 'nonexpert' and is just as paradoxical to scientists. There are many uncertainties about what it is, what its capabilities are, its application, how it should be studied, and what its role in our lives can and should be.

Moreover, nanotechnology, and the senses of innovation and entrepreneurship the term often carries with it, exist in an ambiguous relationship to historic cultural identities. Such identities stereotypically emphasize the region's blue collar roots, its sporting accomplishments, and its frontier history. Currently, a nascent urban renaissance appears to underway which is more diverse, inclusive, and ambitious in conceiving the future of the cityregion. The role of nanoscience and nanotechnologies in cultural identities of Edmontonians, as well as in its economic future, remain tendentious.
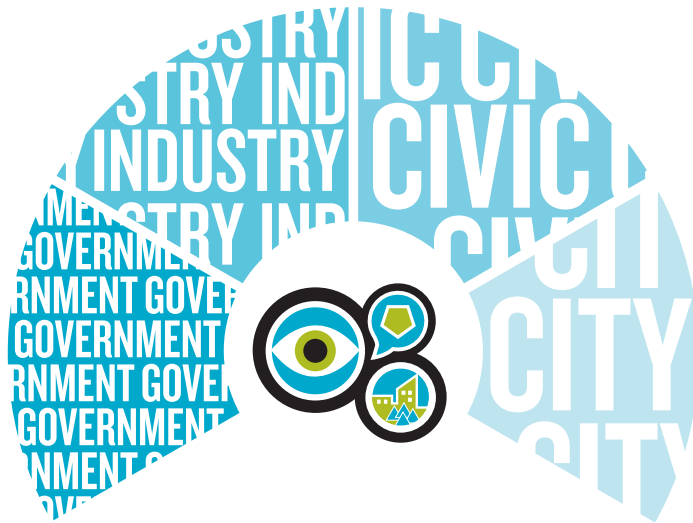
AT A GLANCE
Nanotechnology in Edmonton and the city-region

NINT (National Institute of Nanotechnology)

A partnership between the National Research Council Canada, the Province of Alberta and the University of Alberta. Situated at the U of A, NINT is home to a multi-disciplinary group of researchers supported by state of the art lab facilities, including advanced electron microscopes.

http://archive.nrc-cnrc.gc.ca/eng/ibp/nint.html

U of A nanoFAB

An open access lab facility which supports researchers from the academy and from industry to fabricate devices at the nanoscale.

http://www.nanofab.ualberta.ca/

ACAMP (Alberta Centre for Advanced Micro and Nano Technology Products)

A non-profit organization aiding the commercialization of nanotechnology by providing a range of services supporting product development, marketing and product assembly.

http://www.acamp.ca/

NAIT NanoCARTS

Providing prototyping and product development services to the Alberta nano-technology cluster, and assisting small and medium enterprises in particular.

http://www.nait.ca/44779_84834.htm

Industrial Development

The city-region is home to an emerging group of industries employing nano-technologies across a diverse range of sectors, including product develop-ments in micro-electronics, industrial coatings, sensory and diagnostic tools, and health technologies. For a good overview refer to Cool Companies' special report on Alberta's Nanotechnology and advanced materials industry:

http://coolcompanies.ca/bigfiles/CCNano2008CompleteBookWeb.pdf

Table 1: *From the Citizens' Summit Workbook*

Supporting a broader vision for the city, it is necessary to note that Edmonton is home to several worldclass postsecondary institutions, boasts an active science centre (Telus World of Science), wellrecognized commercial incubators, and an emerging collection of innovative technology firms (see Table 1). Moreover, innovative ambitions are supported by a vibrant economy, expanses in the oil and gas economy (though controversially), and a growing population. That Edmonton is strategically located near Alberta's oil sands may provide incentives towards innovation which benefit production, but also which may address the global and local environmental risks posed by this development.

Responding to a gap in social scientific research, the overarching aims of the 'Nanotechnology and the Community' project (see footnote 1) are to better understand the local growth or lack of 'embeddedness' of nanotechnology, and the strength of connection between this novel technoscience and the Capital Region. It seeks to provide the expertise with which to 'root' innovation as part of the planning and outlook of local communities and cultures, to integrate science and technology policy with municipal planning and development strategies, to support the growth of the social networks and partnerships necessary to support locally robust innovation strategies, and to foster a wider public engagement with innovation and nanotechnology. The research teams are thus seeking answers to the following empirical questions:

What cultures, urban forms, and places create positive conditions for innovation? What can cities and communities do to support and benefit from new technologies?

How can knowledgeintensive sectors develop in ways that account for local contexts and local needs?

How can benefits and prosperity be made to 'stick' to the communities in which new technologies are innovated?

Public Research Model

The methodology behind the Citizens' Summit is anchored in the CityRegion Study Centre's (CRSC) commitment to a *public research model* that emphasizes participative and integrative social research methods.

This model employs multiple methods. Qualitative research tools, such as interviews and focus groups are used in conjunction with digital tools used to examine the structure and dynamic of networks. In addition, through a program of partnership, engagement, and participatory research we promote opportunities for shared knowledge construction and the creation of governance scenarios that connect local communities with innovation and the future of the cityregion. By actively creating novel partnerships and community interactions our research model permits feedback and repatriation of new knowledge while we learn about current, local innovation activities. This model also allows us to document the types of interactions that emerge in these forums.

The Citizens' Summit was both an opportunity to connect with key regional stakeholders on an issue of key local importance, as well to learn about the ways in which innovation connects with communities.
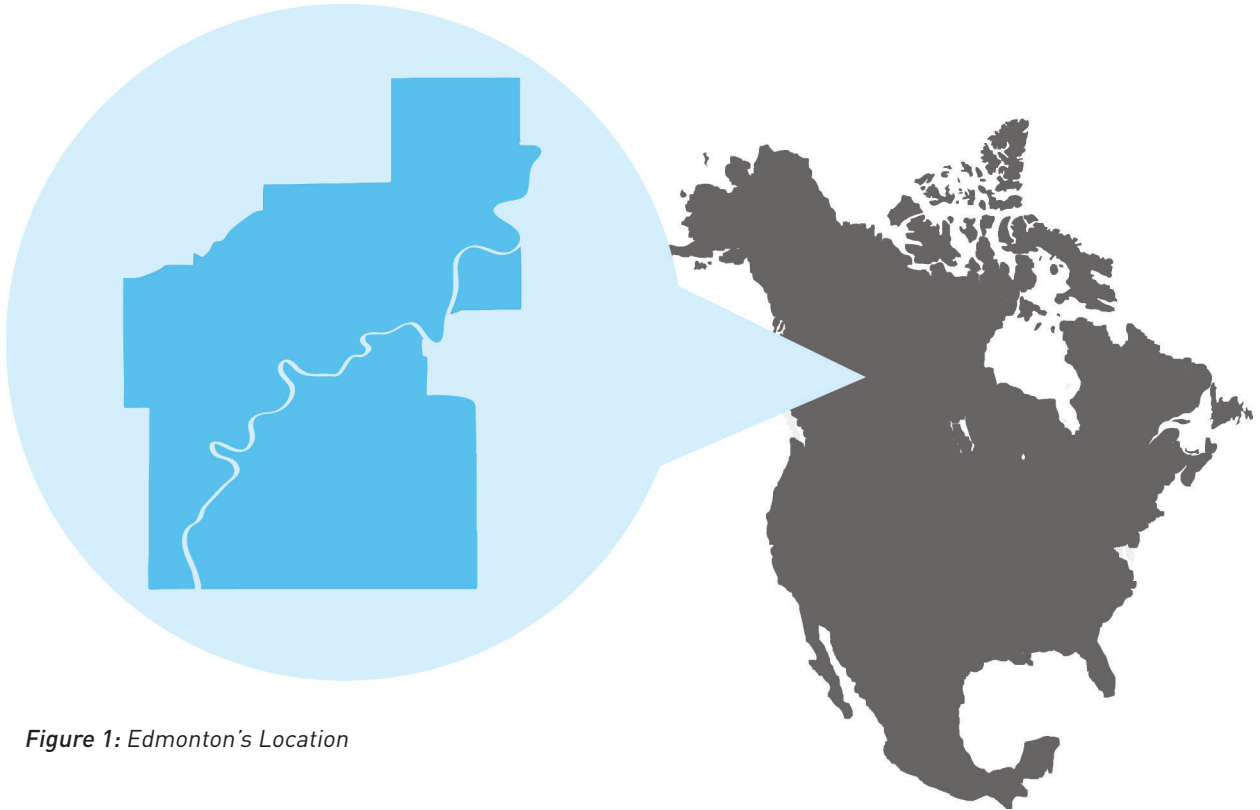
Figure 1: Edmonton's Location

Figure 2: NRC National Institute for Nanotechnology, Edmonton

Figure 3: Nanofab Facility

Figure 4: Northern Alberta Institute of Technology

As a means of engaging citizens the summit promoted:

• mutual learning about nanotechnology and ongoing developments in the nanotechnology
  sector within the cityregion;
• the exploration of challenges and opportunities for these innovations within the region;
• opportunities to build new relationships and widen partnerships amongst diverse
  communities in relation to nanotechnology development;
• citizen led conversations about nanotechnology and its potential role in the city-region.

In addition, the summit provided opportunities for researchers to investigate:

• local understandings and perceptions of nanotechnology;
• the ways in which communities discuss and situate nanotechnologies in relation to place;
• perceptions of the cityregion and its future in relation to innovation;
• the types of associations participants constructed in supporting future
  images of nanotechnology development in the region.

Figure 5: *Opening Session, Friday*

Background: The Why's

The Alberta Capital Region, or the Edmonton cityregion, is going through an important series
of transitions. It is seeking to evolve its economies to participate in fluid and global economic
futures, as well as to diversify the economic basis from which it competes. Innovation is firmly
on the agenda as a way to evolve cityregional economies and develop our municipalities
(see Figure 6). Meanwhile, the city region is home to a multitude of developments that are
shaping and revitalizing our communities and urban spaces. New places for expansion are
being considered, livable cities and urban lifestyles are moving to the fore of local development
agendas, and attempts to capture and represent Edmonton's identity are being pursued.
In the context of these significant changes there remains much uncertainty regarding the
best way to plan for innovation.

Figure 6: *Mosaic of Development Plans from the Capital Region 2011-13*

Why Nanotechnology and Edmonton?

Nanotechnology is the application of nanoscience, which in turn is the study of materials and objects on the scale from 1300 nanometres. This is a scale of one billionth (10^9); a scale at which object's properties are uniquely dependent on their size. Nanotechnology has arisen from the convergence of multiple disciplines – the physical and life sciences, and engineering. This union has led to new approaches to a range of scientific and engineering opportunities. It poses issues for how we understand matter and objects. Nanoscience challenges the future of these areas as separate disciplines.

It is becoming increasingly clear that nanotechnology will be a persistent, pervasive, and powerful driver of social and economic development. Edmonton has been the focus of significant investments supporting nanotechnology research and the development of nanoapplications. The Capital Region is home to the National Institute for Nanotechnology (NINT), which provides internationally competitive facilities to a multidisciplinary group of researchers and which supports a number of developing firms. NINT's labs and scanning electron microscopes are tools shared between scientific and engineering disciplines. An emerging community of nano-technology companies and startups also finds its home in Edmonton, and includes sectors such as microelectronics, health technologies, and energy.

Companies in the Alberta Capital Region have been active in smallscale commercial applica-tions of nanotechnology since the 1980s. But it was not until massive government investment to build NINT that Edmonton truly started thinking of its nanosector in global terms. The National Research Council established NINT in 2001 with an investment of $120 million Canadian, with the support of the Government of Canada, the Government of Alberta, and the University of Alberta.

Why a Focus on Innovation at the Scale of Cities?

Increasingly we understand cityregions as amongst key sites of future prosperity and as crucibles that leverage local innovation and initiative. Often described in economic or labourmarket terms, there is no single definition of a cityregion. These are regions that include downtowns, suburbs, and outlying areas such as natural amenities, airports, industrial parks and market gardening, and the commutetowork area.

Since the industrial revolution cities have been the locus of increased productivity through innovations in the organization and division of labour through mass production and special-ization. During this period, cities also became preeminent centres of wealth and information, economic decisionmaking, and the setting of cultural tastes. Urban and regional policy, as a consequence, is being placed at the heart of economic development strategies and is accompanied by a more general rescaling of governance to the urban level. A cursory glance at recent Capital Region development plans reveals an emphasis on innovation as crucial to local development strategies. In particular, Edmonton's recent economic development plan, The Way We Prosper, emphasizes the importance of innovation to Edmonton's economic future. However, while innovation is often desired, we are seldom sure what it will look like, or how to get to it. The term 'innovation' can be vague and nebulous, and most policies lack straightforward strategic meaning and direction. As a consequence innovation initiatives can easily be isolated from local development planning, from wider regional economies, and from the public.

NANO 101

NILS PETERSEN, PhD

WHAT IS 'NANOTECHNOLOGY'?

Nanotechnology is the application of nanoscience, which in turn is the study of materials and objects on the scale from 1-300 nm whose properties are uniquely dependent on their size.

THINK 'SCALE'...

A 1 nm gold nanoparticle scales to a grapefruit as the grapefruit scales to the earth.

| 1.2 nm | $1:1 \times 10^8$ | 12 cm | $1:1 \times 10^8$ | 12 000 km |

A 100 nm thick cell membranes scales to a pad of paper as the pad of paper scales to the peaks of the rocky mountains.

| 100 nm | $1:1 \times 10^5$ | 1 cm | $1:1 \times 10^5$ | 1000 m |

At the nano-scale, the dependence on size and shape arise from two primary phenomena:

1 "Surface effects"- the surface to volume ratio increases as the objects get smaller, so the surface properties of materials dominate.

2 "Quantum confinement"- as particles become very small, their internal energy can only exist in discrete levels dependent on their size.

In nanoscience we can now visualize and control individual molecules. Nanoscience and nanotechnology is expected to transition through multiple phases, it is here to stay and will be everywhere.

There is an estimated

1,000,000,000,000, 000,000,000,000 = 10^{24}

stars in the universe.

There is about 1,000,000,000,000,000,000,000000 = 10^{24} molecules of water in a sip of coffee.

The nanoscale is beyond the naked eye and is as fascinating as outer space.

LINKS & RESOURCES

'The Nano Project' -
www.nanoproject.org/inventories/consumer

The World Technology Evaluation Center -
www.wtec.org/nano2/Nanotechnology_Research_
Directions_to_2020

Why A Citizens' Summit?

The Citizens' Summit brought together a diverse group of individuals to explore the relationships between nanotechnology, innovation, and the future of Edmonton and the Alberta Capital Region. Guided by the research questions (see above), the summit fostered lively and critical discussions around the successful integration of science development within future visions of the city. These conversations potentially contribute to a broader and communitybased foundation for learning and thinking about innovative cities, and will be an important starting point in developing a placebased approach to innovation and development policy.
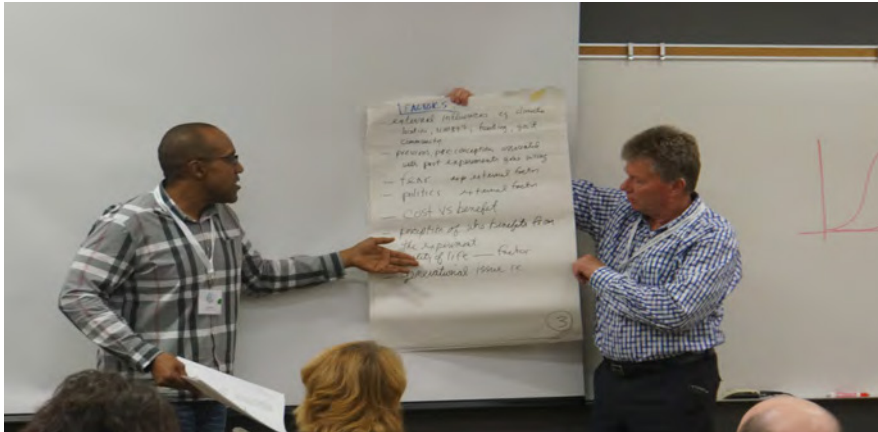

Figure 7: Presenting a Group Discussion

It is a crucial time to start conversations about innovation in nanotechnology and the development strategies of the cityregion. Success in each area requires community planning and the creation of new working relationships. Along with fostering critical conversations, the Citizens' Summit helped create the dialogues, social connections, and strategic networks that will take these conversations forward.

Overview of the Summit Process

The Summit took place on March 8th and 9th, 2013. The summit began with a welcome dinner and orientation session on the Friday evening. An overview of the research project was presented alongside an introduction to the summit and the topics for discussion. The primary engagement and interactive elements of the summit took place on the Saturday.

<u>Participants</u>

Thirtyfive participants from across the city and region joined the summit. Participants were specifically identified by the research team and invited individually to participate in the event. The identification and selection of participants was motivated by two primary factors:

Diversity - Participants were selected from across the community. This permitted bringing together participants from the nanotechnology community with a more inclusive subsection of the community. The summit was madeup up of citizens from science, industry (both nanotechnology and wider), government (provincial and municipal), the planning and development community, and key civic and community agencies.

Leadership - Each participant occupied a leadership role in the community. They were individuals involved in key aspects of the development and prosperity of the communities of the region, and influential in achieving change.

Format

The summit was comprised of a series of group discussions and plenary sessions (refer to Appendix A for an agenda). Participants were each assigned a group based on their areas of expertise or interest and worked together throughout the Saturday. Each group focussed their conversations upon a single theme, representing a perceived key issue pertaining to the relationship between nanotechnology and the community. These themes were established through prior consultation with participants and informed by a previous exploratory research engagement. Invitations to participate in the Citizens' Summit included nine examples of potential topics for the working group discussions, invited feedback on these themes, and canvassed for other topic areas to consider. Ultimately, the following six themes were agreed upon:

• Nanotechnology and the creation of an "experimental city" of new materials
• Capturing the benefits of innovation locally
• Placemaking and identity: what makes Edmonton an innovative city?
• Making space for new technologies and new business sectors – diversifying the regional economy
• Scalingup enterprise: from startup to local economic anchors
• Finding our nanoniche

Working with a worksheet (Appendix B) each group addressed their topic from the perspective of a series of questions. To assist with this process each group was asked to elect a rapporteur to chair the discussion, to act as a note taker, to communicate the group's discussions to the wider summit, and to act as a followup contact for the research participants.

During the first session, participants responded to the first two questions on their worksheets:

1) Identify what you feel are the key issues related to your topic. What factors shape these issues?
2) Choose either one or two of the above issues that you feel most urgently need discussion. Why are they the most significant? What benefits can be achieved by addressing them?

During the second session, participants responded to the following questions:

3) What current and future challenges, or opportunities, will impact change in the areas you have identified?
4) What can be done and who should be involved? How can CRSC help facilitate this process?
5) What is the one key message you would like to be taken forward from this discussion?

After each session, the main group reconvened to hear from each working group's rapporteur and to collectively attempt to pull together the conversation. While the summit did not seek to work towards consensus, through dialogue and in partnership with the researchers the aim was to provide direction in responding to the above questions and to begin to shape a strategic vision for communityinformed innovation and nanotechnology development.

Summary of Working Groups' Discussions.

Figure 8: *Facilitating and Recording the Group Discussion*

Working Group One

Nanotechnology and the creation of an "experimental city" of new materials.

Group members began their conversation by touching on the relationship between a "creative city" and an "experimental city." In thinking about key issues related to the development of an experimental city, participants emphasized factors associated with "risks and regulations associated with new materials." Discussants also identified a number of practical challenges related to developing an experimental city; these included formulating a clear hypothesis, defining the scope of the experiment, and identifying a desired outcome. The group went on to discuss the many factors that they felt impinge on the development of an experimental city. These ranged from perceptions of benefit to funding needs to NIMBYism to global climate change. The group classified these factors under the broader category of "risks and benefits." This category signified a fundamental question for the group: Who stands to benefit from an experimental city, and who bears the risks? Importantly, group members stressed that an experimental city is not only about economic benefit; it is also about the potential for a higher quality of life. Towards the end of the session, group members reflected on the conspicuous lack of focus on nanotechnology during their discussion. It was pointed out that it was necessary to learn about nanotechnology as a means of exploring these subsequent, but related issues.

Working Group Two

Capturing the benefits of innovation locally.

This group was assigned the theme of "capturing the benefits of innovation locally." Members began with a discussion of locality and the scope of the Alberta Capital Region, and felt that it might be preferable to focus on the latter with relation to capturing the benefits of innovation.

Along these lines, a need for increased graduate retention was mentioned, although it was recognized that graduates may need to be more openminded, especially when searching for nanotechnologyrelated employment. Indeed, nanotechnology was referred to as a "platform technology," in the sense that it is "going to impact every sector much in the same way that information technology has." However, it was noted that there is a gap between science and

the rest of the world, which is partly due to notions of intellectual property and broken communication between the two camps (this topic dominated Group 2's conversation). In particular, it was emphasized that the business sector, the public, and unlikely partners need to be involved in renewed, ongoing communication, and that relationships and trust between science and business are important. Some of the suggestions for fostering this communication included creating social media and video clips; facilitating outreach, engagement, and awareness; having an intermediary; and building an interdisciplinary team or network with the resources to ensure that collaboration is productive and ideas are implemented.

Working Group Three

Place-making and identity: what makes Edmonton an innovative city?

In the morning session, Group Three explored questions of placemaking and identity. The discussion began with the question "what does an innovative city look like?" Participants described an innovative city as one that is diverse, well designed, networked, youthful, energetic, tolerant, and adaptable. Group members negotiated the importance of the built environment for an innovative city. Placenarratives also emerged as a central theme in the discussion. Participants identified the negative narratives associated with Edmonton as barriers to its development as an innovative city. These negative narratives were balanced with a consideration of some of the more positive aspects of the city. For example, Edmonton is described as an entrepreneurial city that provides unique opportunities for young people. Edmonton is also considered as potentially innovative in its relative willingness to change and adapt (as opposed, for example, to Montreal). Towards the end of the discussion, participants negotiated the identity of Edmonton, emphasizing the need for the city to come to terms with its northerly location and extreme weather.

Working Group Four

Making space for new technologies and new business sectors–diversifying the regional economy

This group focussed their conversation on the relationship between nanotechnologies and dominant oil and gas economies in the region. They suggested the need to shift the conversation about diversification from being about a polarity between nanotechnology oil and gas, to a more nuanced conversation about the realistic nanotech opportunities in Alberta with oil and gas. Their discussion emphasized the value of entrepreneurs' risktaking and the private sector, but also acknowledged government's initial contribution to local infrastructure such as NINT. Other salient themes included the following: (1) lack of initial knowledge of nanotech and nanotech research and development in Edmonton, (2) difficulty in attracting skilled people (businesspeople and scientists) to Edmonton, and (3) the need for collaboration, solidarity, and organized action on the part of Alberta Capital Region businesspeople (and communities). Regarding the last point, there was mention of needing leadership that would foster cooperation.

Working Group Five

Scaling-up enterprise: from start-up to local economic anchors

This group on "scale up" began by discussing collaborative networks. If "entrepreneurs in their knighthood" really only speak their language and use their own jargon, is there a place for government and can government (and university researchers) help businesses become larger?

Group Five participants discussed how even nonprofit catalyst companies are motivated primarily to serve their own shareholders beyond the interest of the community. Public administration either funds without directives or may "innovative(ly) buy" outside its usual procurement chain and, while doing so, *protect* community industry strategically. However, certain questions remained such as "would external firms like Xerox work better (as customers) than local governments with startup companies here? What, if not all, little private businesses want to grow? Provided, suddenly when they get a big order, capacitylimited entrepreneurs meet people with very deep pockets but outsource manufacturing elsewhere."

Working Group Six

Finding our nano-niche

The sixth group, who were assigned the topic "finding our nanoniche," started by discussing communication and how to make nanotechnology sound interesting. Participants realized that we should engage with citizen scientists or the general public by solving our local problems, such as potholes, rather than problems others' value. Regional government, which has already invested in building NINT, will do more only if nanotech serves our community. For people to engage, meaningful results or impacts of nanotechnology (for example, those related to health) must be presented at intermediary nodes like Edmonton's TELUS World of Science, where even bluecollar adults visit for education on "burning issues" and interests. Canada, or at least its universities, should plan longterm, prevent braindrain while retaining talent, and not be afraid of risk during innovation.

Figure 9: Volunteer Recording Group Discussion

Working Groups One and Three (combined)[1]

In the afternoon session, Groups One and Three merged to discuss the links between placemaking, identity, and the experimental city. The theme of communication emerged early on as an important factor in the strategic development of an experimental/innovative city. Specifically, group members identified improved communication as a way to establish collaborative networks between organizations within the Capital Region. Much of the discussion explored the possibility of a pothole X Prize, a competition in which organizations and individuals attempt to solve the cityregion's pothole problems through technological innovation. The pothole X Prize was lauded by group members as a way of integrating local identity with the development of

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[1] During the first plenary the summit participants felt that there would be value in combining groups one and three. This group thus came together in the afternoon session. Throughout the summit process participants were invited to either switch between groups, or to redefine the groups so as to ensure useful and key conversations were supported.

experimental materials. There emerged, however, a tension between the competitive nature of the X Prize and the desire for collaboration. There was also some uncertainty about the best way to organize the pothole competition. While group members expressed the need to facilitate such a competition, this was coupled with an expressed wariness of bureaucracy and overmanagement. Participants went on to stress the need for strategic "matchmaking" between those with problems and those with solutions. The idea of "innovative procurement" was proposed as a way to encourage innovative solutions when none exist on the market.

Feedback on Methodology and Process:

The Citizens' Summit was in many ways an experiment in connecting conversations about nanotechnology with conversations about the future of the city and region. While loosely connected through rhetorics of innovation and development, the summit was designed as a methodology which would enable knowledge sharing, but also which would support novel ways of thinking and relating to technology and the city. There is value in briefly outlining some reflections on this process.

Talking about nanotechnology?

Nanotechnology, while a diverse and established area of scientific and engineering research remains a conversation which is often both new and somewhat distant for many publics. While some participants of the summit came from nanotechnology backgrounds, or were clear stakeholders in the nanotechnology development, for the majority of participants the summit was an introduction to the field. Introducing the science and technology behind nanotechnology in Edmonton was thus an important and necessary part of the process.

Yet, knowing how and when to talk about a new technology with a citizen audience is not a straightforward problem. Public discussions of science can easily be overwhelmed by the science itself. For instance, it is often observed that public conversations about science are led by conversations about scientific hype its novelty, its progressive future, and the need to support and accept new technologies. Talk about science can very readily translate into setting the parameters for how we talk about sciencesociety relationships; in the example above this includes the delineation of desired futures, what citizens and governments should do to support science, and generally a perception that sees public roles as responsive to science. As the summit aimed to foster wider, more inclusive and creative means of talking about nanotechnology in Edmonton and the Alberta Capital Region, these were important concerns.

The research team chose to host an introductory lecture on nanotechnology on the morning of the second day of the summit. This was presented by Prof. Nils Petersen, the former Executive Director of NINT, and a coinvestigator on this project[2]. The intent was that hosting this lecture after the orientation and welcome session would permit the wider summit and project goals to come to the foreground.

However, during the opening night, participants expressed much uncertainty and even frustration about the lack of an indepth opportunity to learn about nanotechnology from the outset of the orientation session. Many participants were interested to learn about the technology, and others voiced insecurities about the ability to participate in any conversation without first knowing what nanotechnology was all about. The moderator and research team thus fielded recurring questions about the technology and why it was not being presented upfront,

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[2] You can view Prof. Petersen's presentation on the CRSC website at this link: http://www.crsc.ualberta.ca/Research/Nanocommunity/LearnAboutNanotechnology.aspx

such as: what is nanotechnology? Why did you ask me to come when I don't know anything about nanotechnology? How do we know what's expected of us if we don't even know what nanotechnology is? While the research team and some participants offered brief explanations of nanotechnology, they necessarily relied on generalities due to the complexity of the technology and the time constraints of the session. Similarly, material circulated in advance of the engagement did not engage the concerns of the participants.

The lecture the following morning did much to allay uncertainties and address the participant's questions, however their initial response suggests some important methodological lessons:

• Not talking about science early in a public dialogue can lead to insecurity and uncertainty about citizen participation, and thus hamper wider engagement.
• It is good practice to be flexible and responsive to participants learning needs, and the summit benefited from eventually letting the participants set the terms with which they engaged the science.
• Presession learning could be a valuable tool for citizenscience engagement. This should extend beyond information sharing to support more active selflearning.

Relating Nanotechnology and the City

One significant uncertainty at the outset of this engagement related to the ability of participants to bring together two often divergent conversations those about technology development, and those about the city. As discussed in the introduction, while the future of novel technologies and the future of cities are often rhetorically connected, these intersections are rarely fully explored or critically addressed.

Conversations in the working groups (see above), as well as in the plenary sessions, demonstrated participant's ability to engage in nuanced and creative ways of linking nanotechnology and the city. These conversations effortlessly traversed boundaries between talk about technology, economy, culture, place, identity, sustainability, business development, and risk. In doing so, the participants made significant strides towards imagining what nanotechnology could look like within the context of the cityregion. The upstream nature of this conversation that participants were not constrained to talking only about the science, or about a specific application, but open to wider conversations about development directions and desired future outcomes of innovation for the city we take as one marker of the success of the process.

Partnership Building

A key aim of our project is to support novel conversations about nanotechnology and the community by fostering new relationships and networks of community stakeholders. As a single introductory and exploratory exercise, it is beyond the scope of the Citizen's Summit to fully satisfy these aims, but there is value in briefly reflecting on what was achieved.

Bringing together divergent groups of stakeholders and community leaders was valuable. It permitted knowledge sharing about the ways in which innovation and technologies were being imagined and developed in the city. It also, importantly, fostered conversations about the different values and needs that different stakeholders see as essential to making innovation stick to the city. As an exercise in mutual learning and understanding the Citizen's Summit was a useful means of creating a foundation for future partnership.

In addition, more tangible outcomes arose from the summit. Firstly, participants were drawn together to support a subsequent research event the Futurescape City Tours. Their continued

involvement helped define the focus of the tours, and was essential to developing further partnerships within the community to provide expert support to the process. Secondly, following the Summit, a group involving individuals from both the nanotechnology community and the urban development community began working together to explore interrelationships between material technologies and infrastructure challenges particularly as relate to potholes.

Well these initial steps are valuable, it is essential that we continue to support the relationships established during the Summit. This is challenging in any project as one activity tends to fall after another, and other priorities (for example, data analysis and dissemination) come to the fore. However, there is value in continuing to inform participants about the progress and activity of the project, as well as supporting further interactions in events, research exercises, and the production of results. The research team remains committed to doing so.

Figure 10: *Presenting Issues and Challenges*

CONCLUSION:

The Citizens' Summit simultaneously acted as a platform for consultation, building networks, and researching social interactions and discourses; it involved both an exploration and recognition of opportunities, challenges, and the context that is Edmonton. The outcomes of this Summit provide a foundation for learning and thinking about innovative cities. We hope this Summit was a key starting point that, in the long term, will lead to a robust community and placebased approach to innovation and development policy. We continue to strive to foster networks which integrate scientific innovation, community development, and urban planning in the development of local 'innovation clusters,' which recognize and engage people and place as key constituents of successful science policy and development strategies.

As mentioned at the outset, this draft report provides a descriptive summary of the Citizen's Summit process. Further analysis and reflections are being developed in both scholarly publications, and in a further report of the outcomes of our research.

Please visit our website for updates to this report, and for further information and analysis related to this project:

http://www.crsc.ualberta.ca/en/Research/Nano-community.aspx