EARTH

Fourth Symposium of the Humboldt Association of Canada

Banff, 9 – 11 May 2014

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Welcome

I want to welcome you to Banff and our fourth Kolleg! The focus of this meeting is simply EARTH—and follows our series of successful national symposia with the elemental themes of Water (Banff, 2005), Fire (Ottawa, 2009) and Air (Vancouver, 2011).

It is an incredibly eclectic symposium which includes academics, leading scientists, researchers, and scholars from almost every discipline. We have a great program in store for you featuring various prominent keynote speakers, as well as brief presentations and discussions about numerous aspects of the theme earth in probably one of the most spectacular settings in Canada. Although many of the delegates are more established Humboldt alumni, you will also see some newer faces in the crowd. We are taking the opportunity to promote the programmes of the Alexander von Humboldt Foundation (Bonn) to Canadian scholars in the early part of their career, while allowing them to network with alumni of those programmes.

So, while you contemplate all things earth, remember that it is also a wonderful chance to share stories and ideas with colleagues who have had a German-Canadian research experience or are just thinking about having one in the near future.

Once again welcome and I wish you all a great symposium. Enjoy!

Dietmar Kennepohl, President
Humboldt Association of Canada (HAC)

The Humboldt Association of Canada wishes to express its special thanks to

The Helmholtz-Alberta Initiative

The Humboldt Foundation Liaison Office in Canada (HFLOC)

The University of Alberta

and the

Alexander-von-Humboldt Stiftung

for their financial support of the Earth Symposium 2014

EARTH 2014: Program

Friday, May 9 Arrival of Delegates

16:00-18:00 Registration
Kinnear Centre (Room KC 301)

18:00 *Welcome to Delegates and Opening Reception*

Saturday, May 10

07:00-08:15 *Breakfast*
Sally Borden Building (Vistas Dining Room)

Opening Ceremonies
Kinnear Centre (Room KC 301)

08:30 Introductions and greetings

09:00 Keynote: **Prof. Dr. Helmut Echtler (**Universität Potsdam)
Chair: Dietmar Kennepohl

"The Neogene and Active Tectonics of the Central Anatolian Plateau, Turkey"

10:00 *Refreshments*

10:30 Concurrent academic presentations: **Humanities 1**
Chair: Gernot Wieland
Kinnear Centre (Room KC 301)

Michael Herren, "Did the Dark Ages Really Believe the Earth was Flat?"
Dennis Danielson, "Imagining a Planetary Earth and Why it was so Hard"
James White, "Healthy Earth, Sick Earth: The Use of Earth as Etiology and Treatment for Women's Illnesses in the *Trotula*"

10:30 Concurrent academic presentations: **Engineering 1**
Chair: Sigi Stiemer
Kinnear Centre (Room KC 306)

U. Sundararaj, "Polymer Nanocomposites Containing Material from Earth: Carbon Nanotubes, Clay and Block Copolymer for Dielectric and EMI Shielding Applications"
Milana Trifkovic, "Sustainable Energy Systems: Process Systems Engineering Perspective"
J.M. Floryan, "Induced Polarization Effects in Liquid Droplets"

12:00 *Lunch break*
Sally Borden Building (Vistas Dining Room)

13:15 Concurrent academic presentations: **Humanities 2**
Chair: Michael Herren
Kinnear Centre (Room KC 301)

Iain Provan, "Religion and the Care of the Earth: Two Common Beliefs Critically Appraised"
Steve Lofts, "Cassirer and Heidegger on Earth, Dwelling and World"
Gernot Wieland, "Earth to Earth: Plowing through the Etymologies of 'Earth'-related Words"

13:15 Concurrent academic presentations: **Science 1**
Chair: Rolf Mathewes
Kinnear Centre (Room KC 306)

S.R. Valluri, "Thermoelectric Energy Sources for Environmentally Benign Power Generation and Reduction of Air Pollution"
Thomas Baumgartner, "From Earth to Advanced Functional Materials: Organophosphorus Avenues toward Sustainable Energy Applications"
Michael J. Serpe, "New Opportunities for Integrating Nanotechnology and Environmental Monitoring"

14:45 *Refreshments*

15:15 Keynote: **Prof. Dr. Inga Moeck** (University of Alberta)
Chair: Anshuman Khare
Kinnear Centre (Room KC 301)

"Tap the heat: Research in Geothermal Technologies"

16:15 Excursion to Sulphur Mountain Hot Springs (Hot Baths or walking).

19:00 *Symposium Dinner (Reception at 19:00; dinner at 20:00)*
Kinnear Centre (KC 101 Husky Great Hall)

Sunday, May 11

07:00-08:15 *Breakfast*
Sally Borden Building (Vistas Dining Room)

08:30 HAC Business Meeting
Kinnear Centre (Room KC 301)

09:30 Latest news from the Humboldt Foundation

10:00 *Refreshments*

10:30 Concurrent academic presentations: **Science 2**
Chair: Len Wiebe
Kinnear Centre (Room KC 301)

David Begun, "The Changing Earth and the Origin of Earthlings"
Rolf Mathewes, "Fossils Illuminate Earth's Past, Present, and Future"
Jan Veizer, "Planetary Temperature and Climate across Geological Time Scales"

10:30 Concurrent academic presentations: **Medicine/Business 1**
Chair: Dennis Danielson
Kinnear Centre (Room KC 306)

Eric Pinnington, "The Story of Rare Earths from their Academic Interest in the 20th Century to their Current Economical Importance"
Frank W. Stahnisch, "On the Geographical Perspective in Medicine: Preventive Medicine and Climate Change between 1200 and 1900"
Anshuman Khare, "Smart Cities, Smarter Society"

12:00 **ALL** Final Assembly and Closing Remarks
Kinnear Centre (Room KC 301)

12:30 *Lunch and Departure of Delegates*
Sally Borden Building (Vistas Dining Room)

A B S T R A C T S

Keynote 1

Helmut Echtler (Helmholtz Zentrum, Potsdam)

The Neogene and Active Tectonics of the Central Anatolian Plateau, Turkey

Orogenic plateaus are among the largest, but most enigmatic topographic features on Earth. The presented research targets natural hazards and their tectonic and climatic boundary conditions in the regions straddling the densely populated margins of the Central Anatolian Plateau (CAP). Our approach aims at bridging the gap between basic and applied geological research, innovative methods in data acquisition and field investigations. Fault activity, deformation and uplift along the plateau flanks are analyzed through methods of tectonic geomorphology, surface dating with rates and processes of fluvial erosion and incision, 87Sr/86Sr stratigraphy, and structural mapping in order to understand how landforms and landscapes evolve in diverse tectonic and climatic settings. Our research applies GIS and remote sensing, structural field geology, low-temperature thermochronology, numerical modeling, and cosmogenic nuclides.

The Late Cenozoic uplift history of the Anatolian Plateau exhibits a changeover from shortening to extension along the southern margin that is coeval with the start of uplift and can most easily be associated with oceanic slab break-off and tearing. Based on the timing of the uplift, geophysical and geochemical observations, and model predictions, slab break-off likely occurred first beneath Eastern Anatolia in the middle to late Miocene, and propagated westward toward Cyprus by the end of the Miocene. The northern margin of the Central Anatolian Plateau has been interpreted as an actively deforming orogenic wedge between the North Anatolian Fault and the Black Sea that results from crustal shortening starting in the late Miocene or early Pliocene. Intermontane sedimentary basins provide a sink here for mass to accumulate within the orogen, and to store easily eroded material when climatic/tectonic conditions change. At the southern margin of the Anatolian plateau, Neogene carbonates record fault movement, while younger fluvial strata provide datable reference horizons that have been elevated during plateau-flank uplift. With new observations of the most recent uplift and deformation history, we will integrate an understanding of processes that have occurred over the past 10^3 to 10^5 years with the long-term geodynamic setting of the plateau margin.

Humanities 1

Michael Herren (York University and University of Toronto)

Did the Dark Ages really Believe the Earth was Flat?

This paper will contrast some flat-earth exegetical treatments of Genesis, the Christian Topography of Cosmas Indicopleustes and the Cosmography of Aethicus Ister with the views of

Isidore, Bede, and other writers of the early Middle Ages who espoused the Ptolemaic position or took a neutral stance. I expect at this point that the results will show that the most influential and widely read authors were not flat-earthers.

Dennis Danielson (University of British Columbia)

Imagining a Planetary Earth and Why it was so Hard

Partly thanks to Galileo, we tend to imagine the triumph of heliocentrism—the claim that the Earth circles the Sun, rather than vice versa—as a simple struggle between "two chief world systems, the Ptolemaic and the Copernican," the former being rather dogmatic and hidebound, the latter admirably scientific. By revisiting actual cosmological controversies of the late sixteenth and seventeenth centuries, however, we experience a much more intriguing and diversified taste of how real scientific struggle takes place, and indeed a bracing shakeup of persistent platitudes concerning the place and function of Earth within the Cosmos. This talk will reintroduce *scientific* debates for and against the movement of the Earth—and thus for and against the conception of Earth as a planet. On the outcome of those debates hinged humanity's capacity to imagine not only space travel but also of our home sphere's participation (as Galileo put it) in "the dance of the stars."

James White (University of Alberta)

Healthy Earth, Sick Earth: The Use of Earth as Etiology and Treatment for Women's Illnesses in the *Trotula*

Along with air, fire, and water, earth was one of the four elements that, in the medieval worldview, constituted the human body. Understood and cold and dry, earth combined with the cold and wet properties of water to form women. Men, on the other hand, were composed of the warmer elements of fire and air. All were important, however, for maintaining a healthy body. Medieval medicine, drawing on ancient sources, found it imperative to keep these cold, wet, dry, and warm qualities in balance. According to medieval views, earth-deficient women could experience a wandering womb (known as female hysteria in the early modern period), genital ulcers, and even nasal cancers. The direct application of earth to the body, however, could remedy the imbalance and cure the disease. This paper will utilize the *Trotula*, a well known twelfth-century Salernitan women's medical text, to explore the use of the earth as both the etiology and the cure for diseases in women.

Engineering 1

U. Sundararaj (University of Calgary)

Polymer Nanocomposites Containing Materials from Earth: Carbon Nanotubes, Clay and Block Copolymer for Dielectric and EMI Shielding Applications

The earth is a "material" world and we derive many materials from the earth for Man's uses today such as clay, carbon materials and metals. Conductive filler/polymer composites (CPCs) have gained increasing popularity in the field of polymer science and industry mainly because of their numerous applications: electromagnetic shielding material, dielectric materials, antistatic packaging applications as well as in highly specialized components in the electronics, automotive and aerospace sectors. Different conductive fillers such as Carbon nanotubes (CNT), graphene, Copper nanowires (CuNW) etc. have been mixed with polymer matrices in order to obtain CPCs with desirable EMI shielding properties. CNTs and CuNW are suitable fillers for EMI shielding applications. In this work, multiphase polymer blends including polystyrene (PS)/polypropylene (PP)/ styrene butadiene styrene (SBS) with different morphologies have been studied. Blends with higher polystyrene content show better EMI shielding and electrical properties than blends with higher content of polypropylene. Adding a third phase, e.g. SBS copolymer as compatibilizer to the blend modifies the structure and the electrical properties. In the compatibilized samples, an increase in electrical conductivity is observed, and a small increase in EMI shielding is also obtained. This is due to the change in the structure due to the processing and addition of the third compatibilizer phase.

It has been shown that introducing clay to the PVDF/CNT composite system is beneficial to attain higher amount of β phase crystal, which is favored for piezoelectric properties. Moreover, addition of clay to MWCNT/PVDF composites leads to a smoother transition from insulative to conductive region as a consequence of the barrier formed in between the MWCNTs by clays in the matrix. This smooth transition is considerably important for dielectric applications of the composites.

This work gives exciting evidence that the processing and blend formulation can be used to create low percolation polymer composites, high EMI shielding and excellent dielectric properties.

Milana Trifkovic (University of Calgary)

Sustainable Energy Systems: Process Systems Engineering Perspective

Energy has emerged as a dominant theme of research innovation in the past few years; the goal is to improve the efficiency and lower the cost of current energy systems and to develop and optimize economically attractive clean energy technologies that minimize the dependence on

fossil fuels (e.g. renewable energy). According to the International Energy Agency, CO2 emissions have to be cut by a factor 2 if one wants to mitigate the effect on the climate change to an acceptable limit. The role of process systems engineering in achieving the mitigation effort through successful utilization of renewable energy sources is demonstrated. The talk will also discuss future research opportunities in this area, including optimal integration and the development of power management tool for multiple hybrid energy clusters (i.e. sustainable neighborhoods).

J.M.Floryan (The University of Western Ontario)

Induced Polarization Effects in Liquid Droplets

It is desired in the formation of sprays to find the ways to control the size and distribution of liquid droplets. It is also of interest to provide means for directing the spray towards the target of interest. Both these goals can be addressed using electric fields, e.g., electrostatic spraying/painting. Similar processes occur in nature, i.e., formation of rain droplets in clouds during electric storms. The proper design and efficiency of the spray control techniques as well as the prediction of the form of rain droplets depend on the understanding of the fundamental aspects of droplet dynamics when exposed to external electric fields, and especially on the understanding of the processes associated with droplet break up. In order to study this down to earth problem, we had to go away from the earth and use microgravity flight experiments. The droplets and the camera were in a state of free fall towards the earth but, since they were moving with the same speed, the camera was able to capture undisturbed droplet dynamics. Because of the cost of the experiment, we had to develop simulations techniques and verify them against the experiment. The project was successful as we able to gather the desired information and the camera was able to reach earth in a controlled manner. The droplet evolution can be divided into rapid distortion followed by a combination of capillary instability, formation of Taylor cones and mass removal from the cones. This information helps in understanding rain formation in storm clouds, fuel injection into internal combustion engines, electrostatic painting and in many other down the earth processes.

Humanities 2

Iain Provan (Regent College, Vancouver)

Religion and the Care of the Earth: Two Common Beliefs Critically Appraised

A currently popular view in Canada of the relationship between religion and the care of the earth, which has also gained a significant foothold in the world of the academy, runs as follows.

Our hunter-gatherer ancestors, living in societies that were based around natural and cosmological cycles, were deeply connected with the earth; so too was their spirituality, which taught them how to live well "in place," displaying as they did so ecological wisdom, peaceableness, and equality. With the rise of civilization, however, and its attendant "world religions," the human connection with the earth was broken, since these religions, unconnected with particular places, inevitably reduced the importance of place, unless it was in a spiritual afterlife. Much of what is wrong with contemporary human life results from this embrace of civilization and its religions. In particular, our spiritual alienation from the earth lies at the heart of our current ecological crisis. The main culprit is often identified as the Western Christian tradition, described in a highly influential 1967 essay by Lynn White (*Science* 155) as "the most anthropocentric religion the world has seen."

Developing some material in my just-published book *Convenient Myths: The Axial Age, Dark Green Religion, And The World That Never Was* (Waco: Baylor University Press, 2013), I shall argue in this paper that 1) there is no reason to believe that the spirituality of ancient hunter-gatherer peoples led them to live ecologically wise lives, and 2) that even if some adherents of the Christian tradition have themselves not grasped this fact, the foundational biblical literature of that tradition does require of them the committed care of the earth.

Steve G. Lofts (King's University College at the University of Western Ontario)

Cassirer and Heidegger on Earth, Dwelling and World

In this paper, I will develop Ernst Cassirer's and Martin Heidegger's concept of the "world" and explore what it means to "dwell in the world." This dwelling in the world has a transcendental fourfold structure: namely, earth, sky, gods, and mortals. Connected to this fourfold structure is their respective theories of the difference between techné and technology: techné opens up the earth and brings it forth, whereas technology enframes the earth and closes it off.
In architecture and art, the earth is allowed to jet into the world opening the world in which human beings dwell in the sacred before the gods as mortals. One of the effects of the technological closing off of earth is the destruction of the sacred, the withdrawal of the gods, and the subsequent commodification of the world and human beings alike into standing reserve. The paper will end by some reflections on the technological dominance of our world and the need to recover a more original relationship with the earth and how this can be achieved through a new relation to the technologies that dominate our daily lives.

Gernot Wieland (University of British Columbia)

Earth to Earth: Plowing through the Etymology of "Earth"-related Words

Earth, Gaia, Soil, Terra (as in terra firma), and Humus are just some of the English words expressing various aspects of the ground we stand and walk on. As is to be expected, the modern English terms have their roots in Germanic (earth), in Latin (terrain, terrestrial, humus, soil), and in Greek (gaia, for instance, in geology, geography). While most modern English speakers will easily be able to define the word fields of "earth" as opposed to "soil" or "humus," they are less likely to know the base meanings of these words in their original languages. What is it that e.g. "humus" meant in Latin? Is it related to "humid" and hence signifies "wet soil," or is it related to "human" and hence signifies the material of which humans are made? Does "earth" have anything to do with "arid" and hence signifies "dry soil"? Or is it a metathesized form of "terra" with Grimm's Law applied to the "t" and hence signifies whatever "terra" signifies in Latin, which in turn could be derived from "terere – to grind" or from "torrere – to roast, bake, scorch"? – The proposed paper examines these terms and hopes to create a firmer understanding of the soil/earth/ground we stand on.

Science 1

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Thermoelectric Energy Sources for Environmentally Benign Power Generation and Reduction of Air Pollution

A world wide over-dependence on non-renewable fossil fuel sources for energy needs has motivated a strong search for alternative energy and novel energy conversion technologies. Our efforts to reduce the undue reliance on fossil fuels along with their environmental impact on our Planet Earth have led to important studies including that of direct thermal-electrical energy conversion via thermoelectricity. Thermoelectric (TE) processes convert wasted heat into electrical energy for efficient power generation devices through the Seebeck effect. Devices such as the Thermoelectric Generator have unique features, like their all-solid state assembly with no moving parts and ease of coupling to other energy conversion devices. Thermoelectric materials provide an alternative to photovoltaic solar cells. Low grade waste heat that is released to the environment could be converted into useful thermoelectric power. A large enhancement in conversion efficiency is desired in order to effectively utilize TE materials.

We briefly present our theoretical and experimental studies focusing on improving the efficiency of TE materials from our international research collaboration between Western

University, Canada, Sri Sathya Sai Institute of Higher Learning, Prashantinilayam and the Indian Institute of Technology, Chennai. We give an overview of Thermoelectrics as playing a dominant role in reducing air pollution besides having a benign environmental impact.

Thomas Baumgartner (University of Calgary)

From Earth to Advanced Functional Materials: Organophosphorus Avenues Toward Sustainable Energy Applications

The development of functional organic, 'plastic electronic' materials is an active field of research. Recent research has shown that the incorporation of heteroelements - main group elements such as boron, silicon, and phosphorus - can also be used to efficiently tailor the properties of these materials. Phosphorus chemistry, in particular, offers great opportunities toward unique electronic features, endowing such systems with distinct properties that include reactivity, photophysics, redox behavior, and molecular organization. My research group and others have recently established a variety of organophosphorus-based systems as an intriguing new class of electronic materials with unique and versatile properties. These properties make the materials promising candidates for practical real-world applications, such as low-power Organic Light-Emitting Diodes, or Organic Photovoltaics, as well as high-density Energy Storage Media (i.e. batteries).

Michael J. Serpe (University of Alberta)

New Opportunities for Integrating Nanotechnology and Environmental Monitoring

Research in the Serpe Group involves the development of novel nanomaterial-based approaches to solve environmental problems. In one case, the group is utilizing poly (*N*-isopropylacrylamide) (pNIPAm)-based hydrogel particles (microgels) to fabricate visually colored materials. These materials, referred to as etalons, are constructed by depositing a monolithic pNIPAm-based microgel layer between two planar mirrors. Light is able to enter the microgel-based cavity, and resonate, which leads to constructive/destructive interference and hence visual color. The specific color they reflect/transmit depends on the cavity thickness and refractive index. Because pNIPAm-based microgels are fully water soluble (and swollen, large diameter) below 32° C, but deswell and decrease in diameter above this temperature, the thickness of the etalon's microgel-based cavity can be tuned with temperature. Therefore, these devices exhibit visual color in water, which changes with water temperature. Recently, the etalon's response to solution and soil pH, solvent composition and metal ion concentration has been evaluated. This talk will highlight our efforts in these areas.

Keynote 2

Inga Moeck (University of Alberta)

Tap the heat: Research in geothermal technologies

Geothermal energy is the natural heat from the earth, slowly but constantly escaping from the ground. This heat can be efficiently tapped by modern technologies to be subsequently utilized as clean and sustainable energy to heat homes, to generate electricity or to grow food in greenhouses all year around. However, much effort in research is still necessary to develop this seminal energy source in Alberta and worldwide. Research efforts at the U of A have recently begun in order to perform advanced assessment and exploration methods of geothermal energy. These methods are designed to accelerate geothermal field development in geological environments similar to those found in Alberta where the geothermal gradient is average or low. For example, heat recovery can be enhanced by creating a man-made geothermal reservoir where there is hot rock but little natural permeability or fluid saturation. This technology referred to as Enhanced Geothermal Systems (EGS) significantly increases the geothermal potential of Canada. Recent research results from evaluation and integration of the vast geoscientific data sets available from Alberta's hydrocarbon industry can now be used to identify best candidates for EGS and hot sedimentary developments. Discover how exciting research at the U of A in the field of geothermal energy could transform the way we utilize sustainable energy and join us in envisioning our future energy diversification.

Science 2

David Begun (University of Toronto)

The Changing Earth and the Origin of Earthlings

The Earth is many things to many researchers. To paleontologists, the Earth's "earth" is the blanket that protects but also hides the fossil record of life on our planet. The changing Earth is also the driving force of evolution. In paleontology, the movement of the Earth's crustal plates (tectonics) and its impact on oceans, ice caps, climate, monsoons and corridors for the dispersal of land mammals are fundamental to understanding the evolutionary history of the great apes and humans. The earliest fossil apes appear in Africa before there was any terrestrial connection with Eurasia. As the African continent moved north in the counter-clock wise rotating motion, land bridges formed with Eurasia, permitting a flood of land mammal to move between both continents, in both directions. Among these migrants were our ancestors. Born in Africa, our ancestors spent their formative years in then seasonal subtropical forests of Eurasia. Quickly, our small family split into two, with a branch moving east into Asia and another going west, to Europe. It was in Europe that the ecological conditions on the Earth's

ever changing surface converged to favor the development of more modern-looking apes. With bigger brains and a new way of moving around, a precursor to bipedalism, these apes thrived, but the fickle Earth had other plans. Widespread cooling and drying in Eurasia compelled our ancestors to move south, returning to our ancestral homeland, Africa, where the earliest members of our tribe, the hominins, evolved. Without the time passed in Europe, we would not be the beings that we are today.

Rolf Mathewes (Simon Fraser University)

Fossils Illuminate Earth's Past, Present, and Future

Modern biologists often do not consider the long prehistories of organisms and ecosystems leading to the present, and thereby may end up with erroneous interpretations of past, present and future patterns of extinction, migration, and adaptation of life forms. Fossils provide the only direct evidence of the morphologies and adaptations of past animals and plants, and should be taken into account when reconstructing past life forms and their paleoenvironments. Understanding how past ecosystems have responded to perturbations such as climate change, volcanism, fire, and other disturbances provides important clues to how the future may unravel. Examples from the ancient “Greenhouse world” of the Earth during the Eocene (Dawn of the Recent), using fossil plants and insects, to the end of the last ice age in Canada will illustrate some scenarios. During the most recent geological time period on Earth, now called the Anthropocene , we will need the information provided by fossils to properly plan and manage our future.

Jan Veizer (University of Ottawa)

Planetary Temperature and Climate across Geological Time Scales

Based on the present understanding of stellar evolution, our planet should have been a frozen ice ball up to about 1 billion years ago. Yet, presence of running water as far back as about 4.2 billion years ago limits the surface temperature to 0-100 C range. The proposition that the early faint sun was counteracted by massive greenhouse is contradicted by carbon isotope data suggesting that the fundamentals of the planetary carbon cycle - and life - may have been established as far back as 3.5 billion years ago. For the Phanerozoic, the last 500 million years where we have proxies (e.g. soils, stomata in leaves) for atmospheric carbon dioxide levels, the latter are mostly much in excess of the present day values, often even at times of massive glaciations.

For the last million years, we have also direct measurements of carbon dioxide levels in archives such as ice cores, with changes in temperature preceding the changes in greenhouse gas concentrations. Finally, for the last 100 000 years we also have a record of solar activity in the time series of the so called cosmogenic nuclides that correlate well with the record of planetary climate. Based on these empirical observations, for geological time scales, the solar and celestial phenomena appear to have been the principal climate driver.

Medicine/Business 1

Eric Pinnington (University of Alberta)

The Story of the Rare Earths from their Academic Interest in the 20th Century to their Current Economical Importance

In 1787 an army lieutenant came across a strange black rock in the remote Swedish village of Ytterby. Thus began our study of thus fascinating family of 15 chemical elements, 4 of which are named after that village. In the mid-20th Century, the Rare Earths were of some academic interest as their electronic structure was very complicated and the analysis of their spectra was a real challenge of our understanding of atomic structure. In more recent years, the properties of these elements have been used in variety of important industrial applications, some of which will be discussed in this presentation.

Frank W. Stahnisch (University of Calgary)

On the Geographical Perspective in Medicine: Preventive Medicine and Climate Change between 1200 and 1900

The subject of "Climate Change" has become one of the most central scientific problems and highly debated topics at the end of the 20th and beginning of the 21st Century. Modern-day scientists and medical researchers, as well as societal groups and lobbyists, have collected plentiful information that has been used to both support the thesis of massive climate change processes since the height of the Medieval Period and also as a criticism that these past changes had really occurred. In general, the discussion about the future development of the Earth and the well-being of human societies has until now become strongly embedded in historical information and sociological arguments based on the history of climate change.

This talk offers to review the work of – the rather few – historians of medicine and science, such as Vladimir Janković, in: *Confronting the Climate: British Airs and the Making of Environmental Medicine* (2010) or Naomi Oreskes and Erik Conway, in: *Merchants of Doubt. How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (2010), who have investigated particular historical processes and events that

contributed to the current debates. Also, historians, researchers and social critics came to strongly diverge in their views on the precise beginning and quality of historical climate change phenomena, especially when focusing on the centuries between 1200 and 1900 across Europe and North-America. Ensuing academic debates thus centered on questions such as: When had the warming and cooling of environmental temperatures, droughts and flooding phenomena been perceived as major threats for human life? And how did it become possible that narratives of climate change entered so centrally the discussions of modern social and political arenas?

Anshuman Khare & Terry Beckman (Athabasca University)

Smart Cities, Smarter Society

According to UN-HABITAT (2008), by the year 2050 cities will house as much as 70% of the Earth's population. If resource efficiency is to be addressed it has to start from our cities.

The "smart" term has also come to be associated with responding to global climate change. The Climate Group's Smart2020 (2008) report claimed that global CO2 emissions could be cut by 15% by 2020 through smarter use of ICT in electricity grids, buildings, logistics and transportation, dematerialization, and in the ICT industry itself.

In this presentation we talk about information and communication technology and how it can help cities become more resource efficient.

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