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Annual Undergraduate Research Conference

Program

March 12 & 13, 2020

Qu Learning Commons Stauffer Library

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CONFERENCE AGENDA

Thursday, March 12, 2020

9:15-9:30 Coffee (Spea

ORAL PRESENTATIONS Session I: Seeing the Light Speaker'

Single Qubit Quantum Gates Implemented with Silicon Micro Ring Resonators Presenter: Matteo Pennacchietti, Physics, Engineering Physics and Astronomy Faculty Supporter: Dr. Bhavin Shastri

Quantum computers offer a new way of doing information processing by harnessing the unique properties of quantum mechanics, opening new possibilities for solving computationally difficult but useful problems more efficiently than a traditional classical computer (such as simulating molecular interactions). There are several ways of physically implementing a quantum computer, each with its own advantages and disadvantages. An approach which uses photons (i.e., particles of light), known as Linear Optical Quantum Computing (LOQC), has gained traction in the last decade. This approach uses integrated photonic technologies to design chips that can manipulate bits of quantum information known as qubits which are encoded in light. My undergraduate thesis research has focused on the investigation of new implementations of single qubit quantum gates the physical structures which manipulate single qubits to do computation. Using a nano-scale silicon photonic device known as a micro-ring resonator, I have developed a novel configuration which in theory, should be able to implement any single qubit operation. Realizing single qubit gates using micro ring resonators could prove to provide a large improvement in the scalability of an integrated photonic quantum computer. My research has shown an almost 200 times increase in the on-chip density of single qubit gates over the current state of the art in the literature can be achieved by using a ring resonator architecture. This research may lay the foundation for future work on a

problems.

Exploring the Phenomena of a Quantum Eraser in Young's Double Slit Experiment Presenters: Alexander Shaw, Trevor Vrckovnik, Billy Thorpe, and Christian Sprang, Engineering Physics

This experiment explores the quantum phenomenon known as the Quantum Eraser, using a variation of

Blitzkrieg – An Army Fueled by Drugs Presenter: Xavier Heckert, History

Pervitin is a drug developed in Nazi Germany by the pharmaceutical company Temmler, before the start

-apocalyptic world, and how this new environment allows for the transformation of social and gender structures of power. The theory of ecofeminism relies upon the belief that both women and nature are equally compromised and exploited by the patriarchy, constrained by the masculine forces of colonialization and capitalism. By situating her novel in a post-apocalyptic environment, Roanhorse implies that just as the earth has asserted its power over the effects of unrestricted capitalism through the consequences of global warming, Indigenous women have similarly taken back their powers of autonomy, liberating themselves from traditional gender roles. This paper shows how the connection between women

deviate from traditional gender norms and expectations due to the apocalypse. Through this complete reversal of common gender tropes in post-apocalyptic literature, Roanhorse demonstrates that the apocalypse has proven to be instrumental in freeing women from the constraints of gender roles, advocating the ecofeminist view that cooperation between women and nature is necessary for the liberation of both.

Sisterhood and Solidarity: An Exploration of the Role of Women in the Development of Chinese-Indigenous Relations in Disappearing Moon Cafe and "Yin Chin"

Presenter: Sarenna Lalani, English Literature

Faculty Supporter: Dr. Petra Fachinger

History class tells us a narrative of first contact between Indigenous people and colonizers that is very narrow in scope. The discussion is often limited to accounts of European colonizers; the brutal assimilation tactics that destroyed the culture of the first peoples of this land are often excluded. Also forgotten are the other stories of first contact that existed synchronously the stories that do not revolve around dominant provocatively spotlights the instances of connection between

Chinese and Indigenous communities both historically and in modern day. Lee cautiously manoeuvres around issues of love, miscegenation, intergenerational trauma and cultural norms, particularly focusing on the relationships that exist between both Chinese and Indigenous characters and communities. Lee Maracle focalizes these Chinese-

ance of women in bridging

together the two communities. Through the narratives they tell that surpass temporal boundaries and

mechanism of resistance to social barriers.

"Not just somebody's mother": University Campus Daycare Co-operatives in Ontario and British Columbia, 1960s to 1970s Presenter: Katherine Clare Simon, History Faculty Supporter: Dr. Lisa Pasolli

Daycare is now a common sight on university campuse

Medieval period, it proceeds to examine how the Grimm tales subvert the moralizing function of their Medieval precursors. It illustrates how the tales use absurd humour to humanize the devil, making him an object of mockery rather than terro

dealing with the devil does not place their souls in jeopardy, disrupting the orthodox potential of the devilnarrative by allowing the protagonists to attain earthly rewards without the supposedly requisite spiritual punishment. Moreover, it observes that almost every instance of reward without punishment is situated

structure. H

over moral virtue serves to both reflect and manage the existential uncertainty of a society which had rejected church authority but not religion itself. I

the human-devil relationship offer a fascinating addition to the Miltonic and Faustian traditions.

Session VI: Voice & Authenticity Spe

was, and of the type of person who participated in it, using Wilde as a representative for this identity. The way that his identity was forged allows us to see that while homosexuality as a way of being began to take shape th

to anxieties around child prostitution and trafficking of the 1800s. The development of this new identity and its portrayal betters the understanding of this.

Rooting Intergeneration Conflict in Racism: An Examination of and

Extending Vocal Pedagogy: Extended Vocal Techniques in North American Post-Secondary Music Education Presenter: Vanessa Romao, Dan School of Drama and Music Faculty Supporter: Dr. Colleen Renihan

In North America, post-secondary music education is heavily focused on (and limited to) the repertoire and techniques of the Western Art Music canon. Vocal training at these institutions is no exception: vocalists are trained in the bel canto technique whose lineage reaches back to seventeenth-century Italy. This conservatory-based curriculum supports a categorical vocal pedagogy, one that seeks to produce a particular type of singer with a very specific kind of sound. Instead of embracing what each individual singer is capable of, this model focuses on what singers should be capable of from the perspective of repertoire and technical mastery in the operatic tradition. In this paper I will argue that this model risks our losing sight of what the singer has to say in favour of what the composer has to say. Recently there has been discussion and research around a more inclusionary model of vocal pedagogy that would incorporate other techniques alongside bel canto. However, these discussions have been focused on inclusion of musical theatre and belt techniques, with very little discourse on the inclusion of extended vocal techniques. By drawing on the scholarly discourse on the limits and extensions of technical training in post-secondary vocal performance, as well as interviews with several women working in the performance and teaching of extended vocal techniques to contribute to a more inclusive model of vocal pedagogy.

Ein(Stein) on the Beach (in Egypt): 'Syncopated Time' and the Formation of a 'Continuous Present' in Philip Glass' Presenter: Lorenzo Sivilotti, Dan School of Drama and Music Faculty Supporter: Dr. Natalie Rewa

In her 1935 lecture , Gertrude Stein identifies a problem at the heart of the theatrical experience, that

asynchronicity between the

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trialectic relationship is largely responsible for their desyncing from the emotional time-sense of the work. As the theatrical medium involving perhaps the most complex interplay of reading, hearing, and seeing, opera is an excellent subject for the application of

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third opera (which recently received its Metropolitan Opera premiere), in order to explore how the work navigates the problems which Stein identifies. This compositional style creates allowing the audience to remain in emotive and cognitive synchronicity with the work, and thus preventing a offers novel approaches to the performative relationship between a work and its audience.

Works Cited

, edited by Patricia Meyerowitz, Peter Owen, 1967,

pp. 58-81.

Session VIII: Detection, Diagnosis, & Dodging Seminar Room, Stauffer Library, Room 121 Friday, March 13, 1:30 – 2:10 Moderator: Dr. Karalyn McRae, Centre for Teaching and Learning

The Effect of the Immunosuppressant Drug, Tacrolimus, on Nitric Oxide Production in the Immortalized First Trimester Extra-Villous Trophoblast Cells **Presenter: Kassandra Coyle, Life Science Faculty Supporter: Dr. Frederick W.K. Kan**

The remodeling of uterine spiral arteries and subsequent placental formation are crucial for normal growth and development of the fetus. These processes are heavily dependent on the functioning of the extra-villous trophoblast cells and their ability to invade into the maternal decidual blood vessels. Reduced trophoblast invasion and shallow spiral artery remodeling can lead to a number of gestational complications including intrauterine growth restriction (IUGR). Therapeutic intervention with low dose immunosuppressant tacrolimus was able to prevent implantation failure and IUGR in obese and diabetic mice. Treatment with tacrolimus successfully aided in spiral artery modification that was conducive to a successful pregnancy. Further, tacrolimus has shown promise in restoring trophoblast cell functioning in the immortalized first trimester HTR8/SVneo extra-villous trophoblast cells cultured under preeclampsia-like conditions in vitro. However, the mode of action of tacrolimus has yet to be elucidated. Here we attempt to uncover the mode of action of tacrolimus by examining its effects on eNOS activity within the trophoblast cells. Cells were treated with tacrolimus (10 ng/mL), L-

Session III: Poster Presentations

Queen's Learning Commons, Stauffer Library Presenters will be present at posters Thursday, March 12, 11:30-1:00 Posters will be on view March 12 & 13

1. Tyrosine-protein kinase Src regulates Kv1.5 channel activity and membrane expression through interaction with the N-terminus of the channel **Presenter: Taylore Dodd, Life Sciences Co-authors: Tingzhong Wang and Shetuan Zhang**

Kv1.5 is a voltage-gated potassium channel that generates the ultra-rapid delayed rectifier potassium current (I_{Kur}) important in the repolarization of the atrial action potential. Malfunction of the Kv1.5 channel often results in atrial fibrillation (AFib). A reduction in Kv1.5 current (Ikv1.5) occurs upon activation of the endogenous tyrosine-protein kinase Src. The Src SH3 domain binds to proline-rich motifs located within the N-terminus of Kv1.5. Disruption of these binding motifs has been involved in the development of familial AFib. The mechanism underlying the reduction of Ikv1.5 upon Src activation has not yet been established and the relationship between Kv1.5 and Src is poorly understood. Therefore, the present study aims to further elucidate the mechanism behind Ikv1.5 reduction. The hypothesis that Src regulates Kv1.5 activity by altering the density of mature membrane-localized channels was tested using whole-cell voltage clamp and Western blot analysis. We demonstrate that Srctonically inhibits Kv1.5 activity and decreases the density of mature membrane-localized channels. Kv1.5 channels possessing mutations within the Src binding motifs were also investigated and it was determined that each binding motif contributes to the Kv1.5-Src relationship, however, the binding of Srcto an individual motif is sufficiently effective. Our findings indicate that Src regulates Kv1.5 through an interaction with the N-terminal binding motifs and suggests that the inhibition of forward trafficking may be involved in the underlying mechanism. (Supported by the Heart and Stroke foundation of Canada and The Canadian Institutes of Health Research).

2. Prosody of Ojibwe Discourse Markers

Presenter: Sonja Frazier, Department of Languages, Literatures, and Cultures Faculty Supporter: Dr. Monique Dufresne, French Studies, and Dr. Rose-Marie Déchaine, UBC

Discourse markers (DMs) are optional, sequentially dependent sentence-initial items (Schiffrin, 1987) that are used to bracket units of talk (e.g.). This research aims to better understand Ojibwe DMs which typically occur as the first or second element of a sentence (Fairbanks, 2016). The proposed analy

Franks-Job, B. 2006. A dynamic-interactional approach to discourse markers. In K. Fischer (ed.) pp. 395–413. Amsterdam: Elsevier.
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Raso, Tommaso. 1996. Prosodic constraints for discourse markers. Spoken Corpora and Linguistic Studies. In
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3. Investigating the toxicity of naphthenic acid fraction components from oil sands process-affected water to developing fathead minnow () Presenter: Brianna Jackson, School of Environmental Studies Faculty Supporter: Dr. Diane Orihel

ates large volumes of oil sands process-

affected water (OSPW) that is stored in tailings ponds. Toxic constituents present in OSPW such as naphthenic acid fraction components (NAFCs) can cause adverse effects to aquatic life. Recent research has focused on the toxicity of NAFCs to highly vulnerable early life stages of fish. Here we examined the embryotoxicity of NAFCs (0-54 mg/tae

and when women are discouraged, it halves our pool of possibilities. We need leadership that is

5. The Future of Fracking: Zeolites **Presenter: Ambre Lambert, Shanwa Lee, and Rachel Miller, Biochemistry Faculty Supporter: Dr. Brown**

Hydraulic fracturing has become a very popular method of extracting natural gas. Even though there has been an increase in fracking activity, fugitive emissions like methane and hydrogen sulfide are escaping more frequently, creating health hazards. This application will focus on an effective method of reducing these fugitive emissions based on a very unique proposal: using molecular sieves or zeolites to capture methane and hydrogen sulfide molecules. We propose running laboratory trials with zeolites that have an affinity for methane and hydrogen sulfide molecules, to examine their effectiveness.

6.

The results showed that the automatic feature extraction outcompeted the manual rating system in explaining the difference in speech between participants with and without major depressive disorder through speech and language characteristics. While the extraction of audio features is not a substitute for the dinical interview, the ability to provide an unbiased prediction of vulnerability to depression from speech may assist clinicians in early diagnosis.

8. Association between physica00912 0 612 792 reWhBT/F2 12 Tf1 0 0 1 95.664 623.74 Tm0 gr0 g0 G[.)]

9. Physical activity in people living with rheumatoid arthritis compared to general population controls

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nutrients via tube feedings. ² However, infants who are in the NICU must have achieve independent oral feeds before being discharged from the hospital. The concept of NAS infants having longer feeding times compared to other NICU infants has been a common assumption, but no research has sought out to quantitively prove this. This study will be conducted by a retrospective chart review and the participants will be infants with NAS who are in the NICU and require pharmacological interventions. This study group will be matched with a control group of infants, with respiratory distress syndrome, for birth age (1-week -tests will be conducted to determine if

there is a statistically significant difference between the two groups in time to reach independent oral feeds and a Chi square test will be used to compare baseline demographics.

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12. It's a date! But why are men still expected to pick up the check? **Presenter: Ines Nannsen, Life Sciences**

After years of treacherous efforts to break out of traditional gender roles, one seems to remain across different ages, education levels, and income groups. 82% of men and 58% of women, agree that men should pay for common expenses. Additionally, two-fifth

he Royal Ontario Museum (ROM),

requested the items. Both Theolo

museum and transfer the materials to the ROM, where the items remain today. This project reveals how the Museum came in rounding the sudden and

tragic loss of such a culturally and educationally significant collection. The research collected has come from a variety of news sources, online publications, and archi

ROM Registration Department. As a result of this study, I and my professor (Dr. Barbara Reeves) are

of amending the past and providing the educational resources in

establishment. The story of this museum, and the journey its collections took, raises important questions in the field of Museum Studies such as the responsibility cultural institutions have to promote cultural heritage, and the importance of modernizing 21st century collections to include online databases.

16. "Not just somebody's mother": University Campus Daycare Co-operatives in Ontario and British Columbia, 1960s to 1970s
Presenter: Katherine Clare Simon, History
Faculty Supporter: Dr. Lisa Pasolli

Daycare is now a common sight on university campuses, but this was not always the case. Using the case studies of Simon Fraser University, the University of

the creation of daycare co-operatives on university campuses. The research makes clear that the formation of the co-

that the co-operatives took from these movements frequently caused friction and conflict with the liberal university and provincial administration. The co-operatives challenged and adapted to these pressures. They also challenged the nuclear family

18. Possible ore-controlling structures for the Woxi Au/Sb/W deposit in Tanghuping Mining Section, Hunan Province, South China
Presenter: Xi Wang, Geological Sciences and Geological Engineering
Co-authors: Laurent Godin, Jinjun Yang, Kai Zou
Faculty Supporter: Dr. Victoria Remenda

The Woxi Mining District in Hunan Province, South China, hosts numerous high tonnage gold, st

Pennacchietti, Matteo Pulver, Ben Richardson, J. Elyse Romao, Vanessa Shaw, Alexander* Simon, Katherine Clare Sivilotti, Lorenzo Sprang, Christian* Teale, Tanisse Thorpe, Billy* Vanderkooi, Sydney Vrckovnik, Trevor* Wang, Tingzhong* Wang, Xi Williams, Jack Xie, Anne Xie, Hui* Yang, Huilin (Galen) Yang, Jinjun* Zhang, Shetuan* Zheng, Yufei* Zou, Kai

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Acknowledgments

Inquiry@Queen acknowledges the Office of the Vice Provost and University Librarian for financial support.

Inquiry@Queen thanks all the staff and faculty in Queen's University Library who support the conference in many ways, and our faculty moderators who share their expertise, knowledge, and time to make the sessions a valuable learning experience for our undergraduate students.

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