RED RIVER COLLEGE | RESEARCH PARTNERSHIPS & INNOVATION

College Applied Research Development (CARD) Fund
General Guidelines

1. Purpose

The College Applied Research & Development Fund (formerly known as Research Innovation Fund) provides funding to encourage faculty and staff to engage in research activities. The intent of the fund is to develop and build internal research capacity by providing funding for release time for interested faculty and staff and associated project costs.

In general, the funding is intended to be used to:

- conduct short-term applied research projects;
- carry out demonstration and/or proof-of-concept applied research projects;
- prepare industry-focused applied research proposals;
- conduct and assess the commercial potential of projects;
- provide assistance in proposal preparation; and/or
- support research dissemination - including the preparation and presentation of publications, as well as organization of research workshops and symposiums.

Applied research is "research focused on the applications of existing knowledge and is addressed to clearly defined problems and leads to products or services that may be exploited in the near term." Proposals concerning Knowledge Translation (*applying the results of research by the applicant or others*) are also welcomed.

The value of each award (potentially repayable in the event of a commercial return) will normally be up to $7,500. Projects may exceed $7,500, but internal or external sources of funding will be required in such situations. Contributions would be repayable only in the event of a commercial return - the intent being to help perpetuate on-going operation of the Fund.

2. Eligibility

Eligible applicants: All RRC faculty and staff. It is expected that for each approved applied research project, RRC students will be engaged.

3. Project Categories

There are three application categories that an applicant can apply for funding; applied research project, applied research incentive and dissemination of research results.

A. Applied research or Knowledge translation
This project category is intended for short-term applied research and development projects or the application of the results of an initial research (knowledge translation) that does not require subsequent external funding. This means that the requested funding is enough to complete the applied research work which includes student salaries, materials and equipment cost and other miscellaneous expenses that are eligible.

B. Applied research incentive
This is intended to facilitate applied research projects by serving as a catalyst for larger and longer term projects. Applicants are expected to show the plan to transition and apply for funds from external agencies (e.g. Tri-Council, NRC, etc).

C. Dissemination of research results
This category is intended to facilitate publication of research results or organization of a research workshop, symposia or conference.

All categories requires the applicant to provide a clear project overview, the project objectives, a detailed work plan, the required resources (e.g. students, materials, equipment) and appropriate budget to complete the project.

4. Application Process

For a CARD application to be considered for evaluation, it has to be approved by the applicant's School Chair. For non-academic staff, the department manager must approve the application. The School Deans will be provided with the list of applications from their respective Schools for ranking and prioritization.

The previous form has been converted to an online form that will automatically send a notification to respective Chairs for approval. The online form can be found in the ROMEO's Researcher portal (https://rrc.researchservicesoffice.com/).

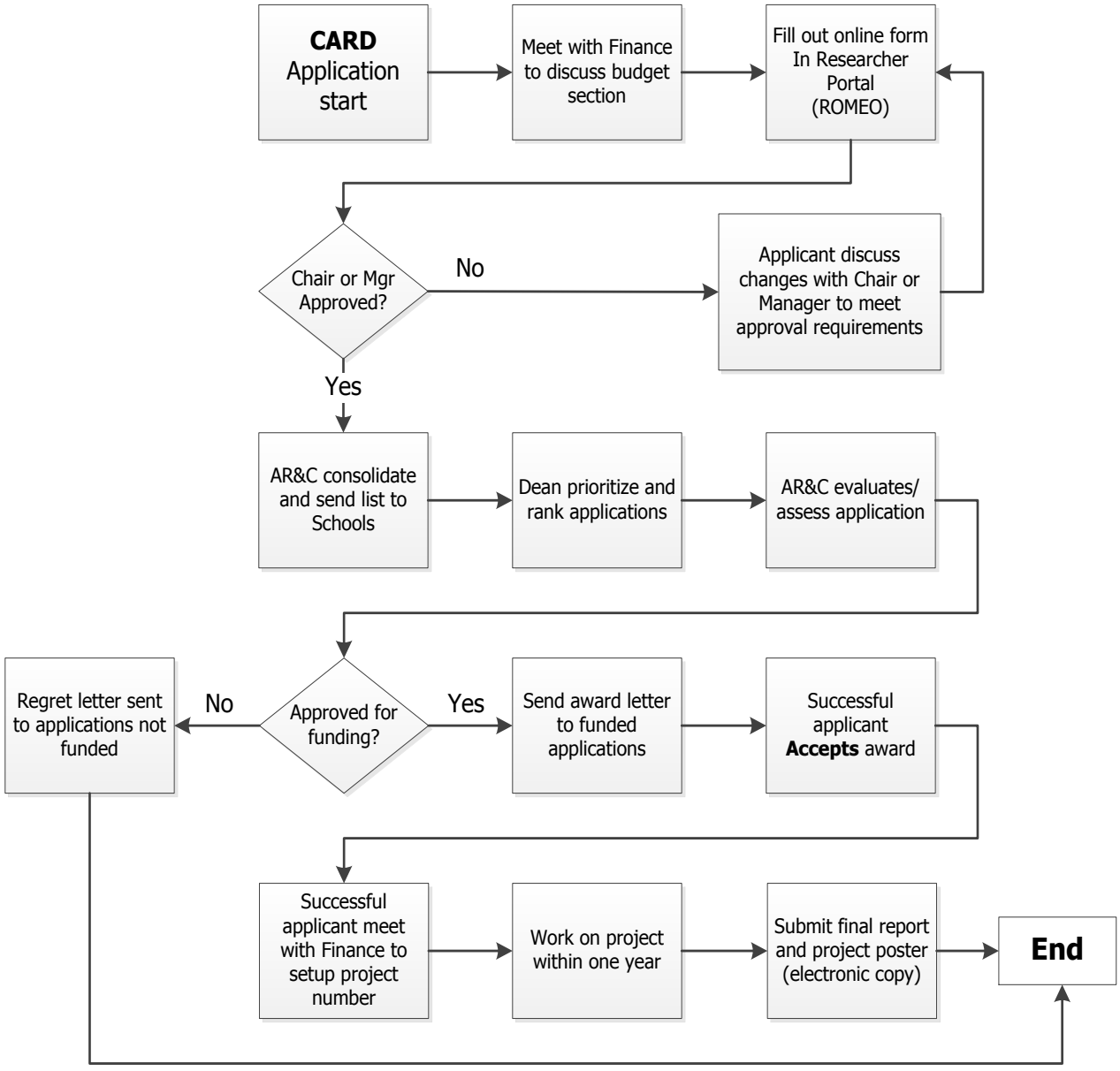
For projects involving humans, animals, biohazards and radioactive materials, appropriate College approval may be required prior to the awarding of the grant. Applicants are encouraged to review the following policies:

- R1 – Research Involving Human Subjects,
- R3 - Animal Care and Research, and
- R7 - Research Involving Biohazards and Radioactive Materials

In accordance with the College's Intellectual Property and Copyright Policy (section 5.5.2), any IP generated by the project will be owned by Red River College. Policy A10 – Intellectual Property and Copyright can be found on the College's website.

The following shows a simple flow chart to follow when submitting a CARD application.

CARD Application Process Flow



5. Evaluation Process

Each application are reviewed and ranked by members of the CARD selection committee appointed by the Office of Research Partnerships & Innovation.

Applications are assessed on the basis of the following criteria:

1. quality of the proposal and budget justification;
2. reflection of RRC's core values and central themes;
3. fit with the College's Strategic Institutional Research Plan;
4. maximizes the building of research capacity;
5. value to the College of the proposed work and the visibility it may provide to the College;
6. projects that employ RRC learners or graduates will be given priority; and
7. addressing or advancing workforce needs/private sector partnerships

See **Assessment** section for the evaluation criteria scoring rubric.

6. Requested Funding

Applicants are encouraged to meet with the Research Financial Administrator (Chris Huynh) prior to filling up the application form. This is to ensure an accurate budget is being requested. *Note that project budget overruns will be the responsibility of the respective school.* For successful applicants, another meeting with the Research Financial Administrator is required to setup/create a project cost number where all project expenses will be charged to.

The following expenses are eligible for support.

Instructor Release time
Faculty can opt to use the fund for a course release in order to perform the activities needed to complete the project

Salaries for students or professional support
Detailed tasks and activities including the period of employment must be provided in the budget justification section for students and/or professional support (e.g. technologists). The proposed hourly rate must be specified. Fringe benefits calculation must also be included (e.g. *Budgeted Salary= Hourly Rate*# hours*1.05 Stat pay for contract employees*1.1175 Fringe*). Contact Finance (Chris Huynh) for assistance on this section.

Materials and supplies
The list of materials and consumables needed to complete the project must be provided.

Equipment
For equipment purchase, the applicant must prove that none exist within the College. Equipment cost from $750 to $10,000 must provide an official quotation as per College Policy M1-Purchasing.

Travel
Complete details on the purpose of trip, destination, duration, mode and cost of travel must be provided and clearly justified. Conference travels related to dissemination of research results are also eligible.

Expenses not supported by the fund:

- instructor/faculty salary (release time is an eligible expense)
- equipment servicing
- membership fees

Other expenses not mentioned must be explained and justified in the budget justification section on the application form.

7. Conditions of the Award

Successful applicants are expected to complete the research project within one year after accepting the award. For research involving human subjects, animals, and biohazards, the applicant is expected to secure appropriate approvals prior to the release of funds. If appropriate approvals are not received within three (3) months, following the award notice, AR&C may re-allocate the funds to other potential projects **without notice to the applicant**.

The award recipient is responsible for the setting up the project costing with the finance department (ideally within a month following the acceptance of the award). ***Project overruns (over-expenditure) is the responsibility of the awardees respective School or Department.***

Unspent funds will be returned to the master CARD fund budget centre for reinvestment. Awardees may request the period of the award to be extended with justification and approval from the School Dean. The Dean-approved extension request, accompanied by a Progress Report, must be sent to AR&C not later than two months prior to the original end date of the award.

A final report must be submitted to AR&C within two months of the award end date. An electronic project poster is also required, and must also be included with the Final Report (Appendix A shows a low resolution sample project posters).

Future application for CARD fund will not be considered unless all final reports from previous awards have been submitted to AR&C.

8. Assessment

Due to the differences in the types of applied research project, the weight of each criterion is adjusted appropriately.

A. Applied Research or Knowledge Translation Projects						
Quality of proposal	Student involvement	Fit with the College research focus area	Advancement of technology or knowledge transfer	Risk assessment	Partnership or partnership potential	TOTAL
20%	20%	16%	16%	16%	12%	100%

B. Applied Research Incentive Projects						
Quality of proposal	Advancement of technology or knowledge transfer	Fit with the College research focus area	Risk assessment	Partnership or partnership potential	Student involvement	TOTAL
20%	20%	16%	16%	16%	12%	100%

Criteria	***Details***
Quality of proposal	✓ clear objectives and deliverables ✓ suitability of the applied research with school ✓ importance of the research to the College ✓ proposed budget is fully justified
Student involvement	✓ students involved as project team members ✓ student activities are directly related to their field of studies ✓ transformative change eminent in student learning/career
Fit with the College research focus area	✓ proposed project is consistent with institutional research plan ✓ aligns the research focus areas ✓ relates to an existing research centre's theme
Advancement of technology or knowledge transfer	✓ serves as a catalyst for larger or longer term project ✓ can build up research capacity ✓ demonstration of technology or proof of concept ✓ potential to apply for external funding (e.g. NSERC, SSHRC, CIHR, NRC-IRAP)
Risk assessment	✓ work plan and timetable clearly articulated ✓ project can be completed on time and on budget ✓ research activities does not pose harm to students/researchers ✓ safety precautions clearly articulated
Partnership or partnership potential	✓ proposed research is directly related to an industry problem ✓ partnership/industry involvement clearly presented ✓ industry contribution (cash or in-kind) to support the project

The dissemination of research results category is assessed with a slightly different criteria.

C. Dissemination of Research Results						
Fit with the College research focus area	Advancing the College	Potential outcome	Partnership	Attendance	Student involvement	TOTAL
20%	20%	20%	16%	16%	8%	100%

Criteria	***Details***
Fit with the College research focus area	✓ conference has elements consistent with RRC Institutional Research Plan ✓ conference is related to RRC Strategic Plan ✓ conference presentation of paper/research
Advancing the College	✓ attendees are from international, national or provincial (off-campus) ✓ publication in journal
Potential outcome	✓ the College gains national exposure ✓ the College gains research partners ✓ College to receive a high billing/prestige as a result
Partnership	✓ partnership with MB Associations and Organizations ✓ partnership with National organizations ✓ partners co-sponsoring event
Attendance	✓ number of potential attendees ✓ conference previous successes identified
Student involvement	✓ students will be invited to observe, or otherwise at conference ✓ students will be asked to help organize and support conference

For inquiries, contact:

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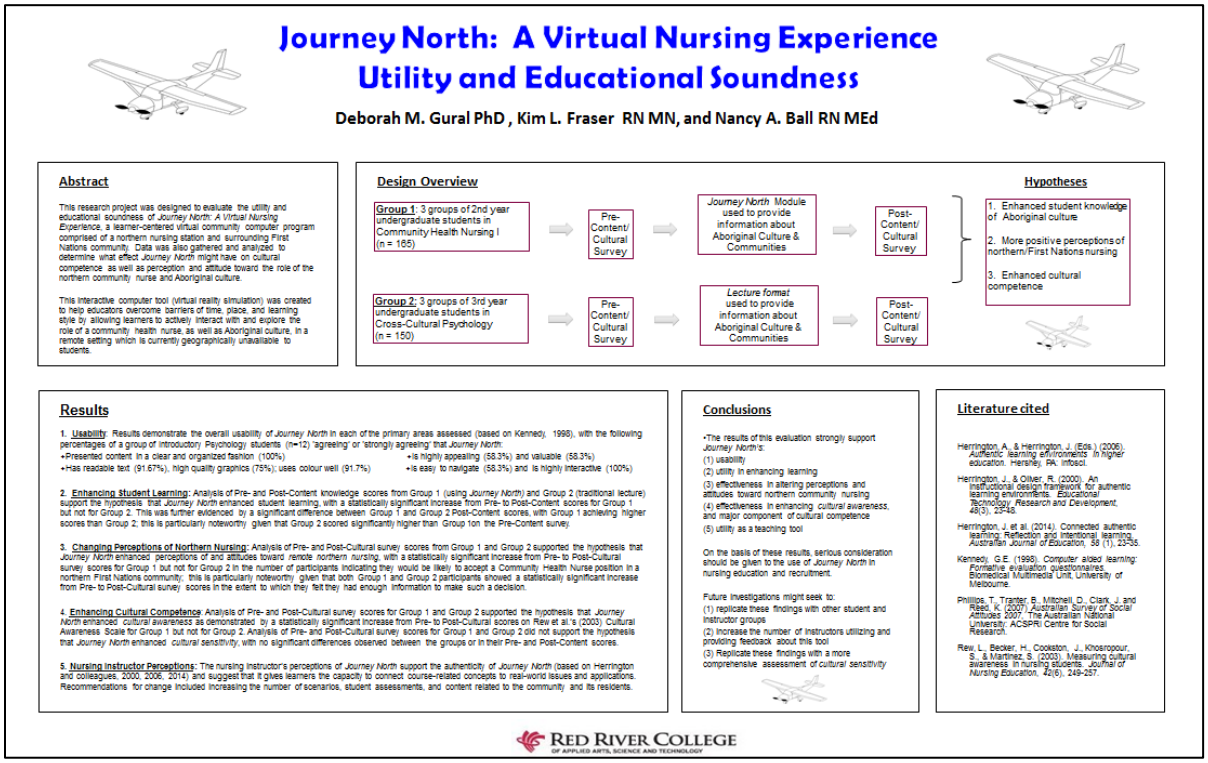
Appendix A: Sample Project Poster from previous CARD projects



Journey North: A Virtual Nursing Experience
Utility and Educational Soundness

Deborah M. Gural PhD , Kim L. Fraser RN MN, and Nancy A. Ball RN MEd

Abstract

This research project was designed to evaluate the utility and educational soundness of *Journey North: A Virtual Nursing Experience*, a learner-centered virtual community computer program comprised of a northern nursing station and surrounding First Nations community. Data was also gathered and analyzed to determine what effect *Journey North* might have on cultural competence as well as perception and attitude toward the role of the northern community nurse and Aboriginal culture.

This interactive computer tool (virtual reality simulation) was created to help educators overcome barriers of time, place, and learning style by allowing learners to actively interact with and explore the role of a community health nurse, as well as Aboriginal culture, in a remote setting which is currently geographically unavailable to students.

Design Overview

Group 1: 3 groups of 2nd year undergraduate students in Community Health Nursing I (n = 165) → Pre-Content/ Cultural Survey → *Journey North* Module used to provide information about Aboriginal Culture & Communities → Post-Content/ Cultural Survey

Group 2: 3 groups of 3rd year undergraduate students in Cross-Cultural Psychology (n = 150) → Pre-Content/ Cultural Survey → *Lecture format* used to provide information about Aboriginal Culture & Communities → Post-Content/ Cultural Survey

Hypotheses

1. Enhanced student knowledge of Aboriginal culture
2. More positive perceptions of northern/First Nations nursing
3. Enhanced cultural competence

Results

1. **Usability**: Results demonstrate the overall usability of *Journey North* in each of the primary areas assessed (based on Kennedy, 1998), with the following percentages of a group of introductory Psychology students (n=12) 'agreeing' or 'strongly agreeing' that *Journey North*:
   - Presented content in a clear and organized fashion (100%)
   - Is highly appealing (58.3%) and valuable (58.3%)
   - Has readable text (91.67%), high quality graphics (75%); uses colour well (91.7%)
   - Is easy to navigate (58.3%) and is highly interactive (100%)

2. **Enhancing Student Learning**: Analysis of Pre- and Post-Content knowledge scores from Group 1 (using *Journey North*) and Group 2 (traditional lecture) support the hypothesis that *Journey North* enhances student learning, with a statistically significant increase from Pre- to Post-Content scores for Group 1 but not for Group 2. This was further evidenced by a significant difference between Group 1 and Group 2 Post-Content scores, with Group 1 achieving higher scores than Group 2; this is particularly noteworthy given that Group 2 scored significantly higher than Group ton the Pre-Content survey.

3. **Changing Perceptions of Northern Nursing**: Analysis of Pre- and Post-Cultural survey scores from Group 1 and Group 2 supported the hypothesis that *Journey North* enhanced perceptions of and attitudes toward remote northern nursing, with a statistically significant increase from Pre- to Post-Cultural survey scores for Group 1 but not for Group 2 in the number of participants indicating they would be likely to accept a Community Health Nurse position in a northern First Nations community; this is particularly noteworthy given that both Group 1 and Group 2 participants showed a statistically significant increase from Pre- to Post-Cultural survey scores in the extent to which they felt they had enough information to make such a decision.

4. **Enhancing Cultural Competence**: Analysis of Pre- and Post-Cultural survey scores for Group 1 and Group 2 supported the hypothesis that *Journey North* enhanced *cultural awareness* as demonstrated by a statistically significant increase from Pre- to Post-Cultural scores on Rew et al.'s (2003) Cultural Awareness Scale for Group 1 but not for Group 2. Analysis of Pre- and Post-Cultural survey scores for Group 1 and Group 2 did not support the hypothesis that *Journey North* enhanced *cultural sensitivity*; with no significant differences observed between the groups or in their Pre- and Post-Content scores.

5. **Nursing Instructor Perceptions**: The nursing instructor's perceptions of *Journey North* support the authenticity of *Journey North* (based on Herrington and colleagues, 2000, 2006, 2014) and suggest that it gives learners the capacity to connect course-related concepts to real-world issues and applications. Recommendations for change included increasing the number of scenarios, student assessments, and content related to the community and its residents.

Conclusions

•The results of this evaluation strongly support *Journey North's*:
(1) usability
(2) utility in enhancing learning
(3) effectiveness in altering perceptions and attitudes toward northern community nursing
(4) effectiveness in enhancing *cultural awareness*, and major component of cultural competence
(5) utility as a teaching tool

On the basis of these results, serious consideration should be given to the use of *Journey North* in nursing education and recruitment.

Future investigations might seek to:
(1) replicate these findings with other student and instructor groups
(2) increase the number of instructors utilizing and providing feedback about this tool
(3) Replicate these findings with a more comprehensive assessment of *cultural sensitivity*

Literature cited

Herrington, A., & Herrington, J. (Eds.) (2006). *Authentic learning environments in higher education*. Hershey, PA: Infosci.

Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational Technology, Research and Development, 48*(3), 23-48.

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Kennedy, G.E. (1998). *Computer aided learning: Formative evaluation questionnaires*. Biomedical Multimedia Unit, University of Melbourne.

Phillips, T., Tranter, B., Mitchell, D., Clark, J. and Reed, K. (2007) Australian Survey of Social Attitudes 2007. The Australian National University, ACSPRI Centre for Social Research.

Rew, L., Becker, H., Cookston, J., Khosropour, S., & Martinez, B. (2003). Measuring cultural awareness in nursing students. *Journal of Nursing Education, 42*(6), 249-257.

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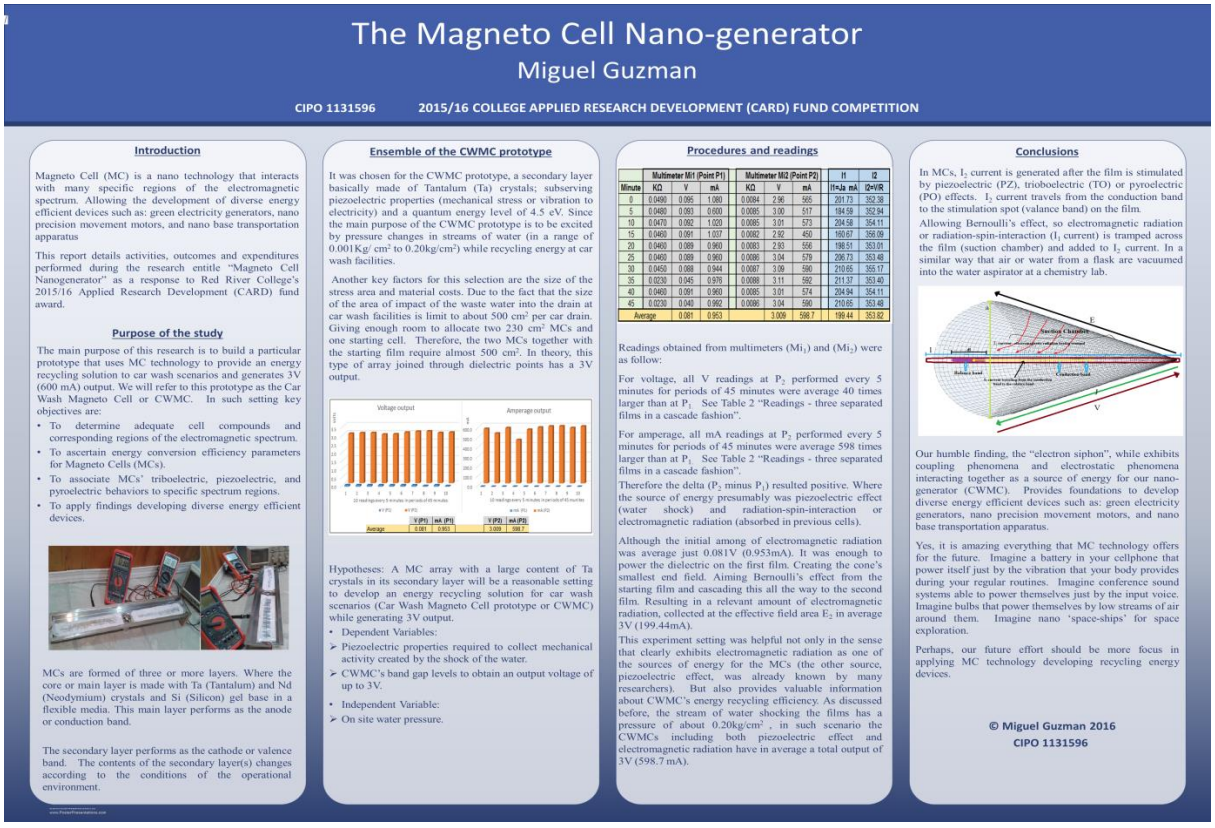

The Magneto Cell Nano-generator

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CIPO 1131596 2015/16 COLLEGE APPLIED RESEARCH DEVELOPMENT (CARD) FUND COMPETITION

Introduction

Magneto Cell (MC) is a nano technology that interacts with many specific regions of the electromagnetic spectrum. Allowing the development of diverse energy efficient devices such as: green electricity generators, nano precision movement motors, and nano base transportation apparatus

This report details activities, outcomes and expenditures performed during the research entitle "Magneto Cell Nanogenerator" as a response to Red River College's 2015/16 Applied Research Development (CARD) fund award.

Purpose of the study

The main purpose of this research is to build a particular prototype that uses MC technology to provide an energy recycling solution to car wash scenarios and generates 3V (600 mA) output. We will refer to this prototype as the Car Wash Magneto Cell or CWMC. In such setting key objectives are:

- To determine adequate cell compounds and corresponding regions of the electromagnetic spectrum.
- To ascertain energy conversion efficiency parameters for Magneto Cells (MCs).
- To associate MCs' triboelectric, piezoelectric, and pyroelectric behaviors to specific spectrum regions.
- To apply findings developing diverse energy efficient devices.

MCs are formed of three or more layers. Where the core or main layer is made with Ta (Tantalum) and Nd (Neodymium) crystals and Si (Silicon) gel base in a flexible media. This main layer performs as the anode or conduction band.

The secondary layer performs as the cathode or valence band. The contents of the secondary layer(s) changes according to the conditions of the operational environment.

Ensemble of the CWMC prototype

It was chosen for the CWMC prototype, a secondary layer basically made of Tantalum (Ta) crystals; subserving piezoelectric properties (mechanical stress or vibration to electricity) and a quantum energy level of 4.5 eV. Since the main purpose of the CWMC prototype is to be excited by pressure changes in streams of water (in a range of 0.001Kg/ cm^2 to 0.20kg/cm^2) while recycling energy at car wash facilities.

Another key factors for this selection are the size of the stress area and material costs. Due to the fact that the size of the area of impact of the waste water into the drain at car wash facilities is limit to about 500 cm^2 per car drain. Giving enough room to allocate two 230 cm^2 MCs and one starting cell. Therefore, the two MCs together with the starting film require almost 500 cm^2. In theory, this type of array joined through dielectric points has a 3V output.

Hypotheses: A MC array with a large content of Ta crystals in its secondary layer will be a reasonable setting to develop an energy recycling solution for car wash scenarios (Car Wash Magneto Cell prototype or CWMC) while generating 3V output.

- Dependent Variables:
  - Piezoelectric properties required to collect mechanical activity created by the shock of the water.
  - CWMC's band gap levels to obtain an output voltage of up to 3V.
- Independent Variable:
  - On site water pressure.

Procedures and readings

	Multimeter M#1 (Point P1)			Multimeter M#2 (Point P2)			I1	I2
Minute	KΩ	V	mA	KΩ	V	mA	I1=Ja mA	I2=VR
0	0.0490	0.095	1.080	0.0094	2.96	565	291.73	352.38
5	0.0480	0.093	0.600	0.0085	3.00	517	184.58	352.94
10	0.0470	0.092	1.020	0.0085	3.01	573	294.58	354.11
15	0.0460	0.091	1.037	0.0082	2.92	450	160.67	356.09
20	0.0460	0.089	0.960	0.0083	2.93	556	190.51	353.01
25	0.0460	0.089	0.960	0.0086	3.04	579	296.73	353.48
30	0.0450	0.088	0.944	0.0087	3.09	590	210.65	355.17
35	0.0230	0.045	0.976	0.0088	3.11	592	211.37	353.40
40	0.0460	0.091	0.960	0.0085	3.01	574	294.94	354.11
45	0.0230	0.040	0.962	0.0086	3.04	590	210.65	353.48
Average		0.081	0.953		3.009	598.7	199.44	353.62

Readings obtained from multimeters (Mi_1) and (Mi_2) were as follow:

For voltage, all V readings at P_2 performed every 5 minutes for periods of 45 minutes were average 40 times larger than at P_1. See Table 2 "Readings - three separated films in a cascade fashion".

For amperage, all mA readings at P_2 performed every 5 minutes for periods of 45 minutes were average 598 times larger than at P_1. See Table 2 "Readings - three separated films in a cascade fashion".

Therefore the delta (P_2 minus P_1) resulted positive. Where the source of energy presumably was piezoelectric effect (water shock) and radiation-spin-interaction or electromagnetic radiation (absorbed in previous cells).

Although the initial among of electromagnetic radiation was average just 0.081V (0.953mA). It was enough to power the dielectric on the first film. Creating the cone's smallest end field. Aiming Bernoulli's effect from the starting film and cascading this all the way to the second film. Resulting in a relevant amount of electromagnetic radiation, collected at the effective field area E_2 in average 3V (199.44mA).

This experiment setting was helpful not only in the sense that clearly exhibits electromagnetic radiation as one of the sources of energy for the MCs (the other source, piezoelectric effect, was already known by many researchers). But also provides valuable information about CWMC's energy recycling efficiency. As discussed before, the stream of water shocking the films has a pressure of about 0.20kg/cm^2 , in such scenario the CWMCs including both piezoelectric effect and electromagnetic radiation have in average a total output of 3V (598.7 mA).

Conclusions

In MCs, I_2 current is generated after the film is stimulated by piezoelectric (PZ), trioboelectric (TO) or pyroelectric (PO) effects. I_2 current travels from the conduction band to the stimulation spot (valance band) on the film.

Allowing Bernoulli's effect, so electromagnetic radiation or radiation-spin-interaction (I_1 current) is tramped across the film (suction chamber) and added to I_2 current. In a similar way that air or water from a flask are vacuumed into the water aspirator at a chemistry lab.

Our humble finding, the "electron siphon", while exhibits coupling phenomena and electrostatic phenomena interacting together as a source of energy for our nano-generator (CWMC). Provides foundations to develop diverse energy efficient devices such as: green electricity generators, nano precision movement motors, and nano base transportation apparatus.

Yes, it is amazing everything that MC technology offers for the future. Imagine a battery in your cellphone that power itself just by the vibration that your body provides during your regular routines. Imagine conference sound systems able to power themselves just by the input voice. Imagine bulbs that power themselves by low streams of air around them. Imagine nano 'space-ships' for space exploration.

Perhaps, our future effort should be more focus in applying MC technology developing recycling energy devices.