

Department of Chemistry  
Tel: 902-585-1172  
Email: john.murimboh@acadiau.ca



**Catherine Podeszinski**  
Program Officer, GSC26  
NSERC  
350 Albert Street  
Ottawa, ON K1A 1H5

May 28, 2009

**Re: Appeal of Decision on NSERC Discovery Grant Application (312584-2009)**

Dear Ms. Podeszinski:

I thank the committee (GSC26) and the referees for their time and effort in evaluating the applications from this year's Discovery Grant competition. Their work is greatly appreciated. Nevertheless, I feel compelled to appeal the committee's decision not to fund my application to renew my NSERC Discovery Grant (312584-2009). My appeal is based on: 1) an incorrect assessment of the number of my publications as an independent researcher under Excellence of the Researcher; 2) incorrect statements made by one of the referees and GSC26 under Merit of the Proposal; and most importantly, 3) unfair consideration for initial three-year grant holders seeking their first renewal.

**1. Excellence of the Researcher (rated Moderate)**

The committee "noted that only [a] few of the publications listed reflected work done as an independent researcher and questioned the somewhat limited research output" (GSC26, 2009). This statement reflects the comments of one of the referees, who noted that only "three of these [publications] (including the patent) were not co-authored by the PI's former Ph.D. supervisor" (Referee A, 2009). However, both the GSC's and the referee's comments **incorrectly** identified the number of independent publications listed in my application. **Four independent publications**—not co-authored by my PhD supervisor (Professor CL Chakrabarti)—were clearly listed in my application; not only three as cited by Referee A and GSC26. The four independent publications are listed below using the original numbering from my Personal Data Form. (DGP Application, 2008, pp. 5, 7)

1. J Murimboh, Device and method for sample collection. *United States Provisional Patent*. 18 pages. Submitted October 2008. (inNOVAcorp), Springboard, NSERC
2. **I Gaabass**, JD Murimboh, NM Hassan, A study of diffusive gradients in thin films for the chemical speciation of Zn(II), Cd(II), Pb(II), and Cu(II): The role of kinetics, *Water Air Soil Pollut*, Accepted **October 27, 2008** (minor revision). Manuscript No. WATE3137. 29 pages. (NSERC)
6. NJ O'Driscoll, **T Messier**, M Robertson, J Murimboh, Suspension of multi-walled carbon nanotubes (CNTs) in freshwaters: Examining the effect of CNT size, *Sci Tot Env*, Submitted **July 25, 2008**. Manuscript No. STOTEN-S-08-013531. 18 pages. (NSERC)

- <sup>†</sup>15. PE Rasmussen, R Dugandzic, N Hassan, J Murimboh, DC Grégoire, Challenges in Quantifying Airborne Metal Concentrations in Residential Environments, *Can J Anal Sci Spectrosc*, **2006**, *51*, 1–8.

Despite any concern about the number of independent publications, Referee A's overall evaluation on the Excellence of the Researcher was very strong. The referee stated that "taking into account that the PI works at a mostly undergraduate institution, three significant contributions in three years is **impressive**" (Referee A, 2009).

With respect to other aspects concerning the Excellence of the Researcher, Referee A's comments were equally strong.

This referee is also **amazed** by the fact that the PI was **successful** in a CFI application **on his own** and, in **another one**, with a group, and that he has secured funding from **several other sources**. He is to be **comm[e]nded** for this **achievement**. His now being **Director** of research labs at Acadia also demonstrates his **significance** to the Department of Chemistry. (Referee A, 2009)

Referee B was impressed with my progress as an independent researcher, the quality of publications, and my ability to attract external funding. As shown in my Personal Data Form (DGP Application, 2008, pp. 3.1–3.4), I was awarded **five** external research grants (NSERC, CFI-LOF, Springboard, inNOVAcorp, and CRTI) as a PI over the past four years and **four** research grants (CFI-LEF, 2 RTI, and CRTI) as a co-applicant during this period.

My sense is that the applicant has **rapidly established** himself as an **independent researcher** and has made **appreciable progress** with his first cycle of support. His papers, with v[a]rious co-authors, continue to appear in the technical literature. They **meet/exceed** international levels of quality. I was especially **impressed** with the new access to state of the art spectroscopic instruments. The applicant has been very **s[u]ccessful** in **attracting new funds** for operating expenses and the purchase of **new equipment**. Continuing access to these instruments is essential to the success of this grant. The resources (both financial and technical) to maintain these instruments [seem] to be in place so that the research environment is **promising**. (Referee A, 2009).

In addition to my appointment as Director of the KC Irving Environmental Science Research Labs, which was highlighted by Referee A, my other professional activities during this period include serving as a member of the **Scientific Program Committee** for CSC2006, being a **co-organizer** of the Metal Speciation Symposium for CSC2007, **refereeing** a number of journal articles and an application for an NSERC Strategic Grant, and various **outreach activities** (e.g. Chemistry "Magic" Shows). These and other activities were described in my Personal Data Form

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<sup>†</sup> This publication arose from unfunded research before I was awarded my first NSERC Discovery Grant. In addition, since the nature of the work is significantly different from my current research program, it was not included in my Progress Report.

(DGP Application, 2008, pp. 2, 9). Based on my professional activities, training of HQP, publication record, and invited presentations, Referee C ranked my contributions as “good”.

Dr. Murimboh has contributed 11 publications in the primary literature, mostly in **good journals**. He has also given **several invited presentations** to a number of differen[t] associations. He is **actively involved** in other **professional activities** including **outreach**. Overall, I would rank the contributions, including the training of **HQP** of Dr. Murimboh as being “**good**” for the 2002-2008 review period. (Referee C, 2009)

In view of the **correct** number of independent publications (**four**) and the **enthusiastic endorsement** of my accomplishments by all three referees, I request the appeals committee to reconsider GSC26’s evaluation of the Excellence of the Researcher.

## **2. Merit of the Proposal (rated Moderate)**

My research proposal was reviewed by three referees: Referee A, who rated his/her ability to assess my application as **satisfactory**; Referee B, who rated himself/herself as **high**; and Referee C, who did not include a self-assessment. Although one of the referees raised a few unfounded concerns, all three referees made very favourable comments on the Merit of the Proposal. In addition, I shall demonstrate that **all the critical comments** made by Referee A are either **incorrect** or **not relevant** to the proposed research.

The GSC raised two issues about my research proposal: 1) “lack of detail about the specific compounds that will be determined in the speciation studies” (GSC26, 2009), and 2) “the new ICP-MS purchased with CFI support will prove useful in strengthening the research plans” (GSC26, 2009). These comments largely reflect the concerns of Referee A, who recommended that I should place

more emphasis on the very sensitive ICP-MS instrument that was purchased with CFI money. For example, the proposal says that CLE-AdCSV will be used for complexometric titration because of its high sensitivity and [low] detection limits. However, ICP-MS is not only a more sensitive technique but it also allows simultaneous multielemental analysis, whereas CLE-AdCSV is usually applied to a single analyte. Furthermore, the proposal keeps talking of speciation studies of toxic metals but nowhere will the actual chemical form of each element be determined. Mass spectrometry (in combination with LC in the particular case) would be required for this purpose. (Referee A, 2009)

These were the only negative comments that I received from any of the referees. However, all of Referee A’s main concerns: lack of emphasis on ICP-MS; relatively poor sensitivity of CLE-AdCSV; lack of detail about the specific compounds that will be studied; and the LC-ICP-MS studies are neither correct nor relevant to the proposed research. Furthermore, they likely misled the GSC in their evaluation of my Discovery Grant Application. A detailed response to the concerns is given below.

### *High sensitivity and low detection limits of ICP-MS*

Referee A's recommendation to place more emphasis of my research program on ICP-MS is particularly puzzling as ICP-MS is **already** an integral part of my research. The focus of my research is on *in situ*, **multi-element** speciation (DGP Application, 2008, p. 7)—all metal concentrations collected by the *in situ* passive samplers will be determined by ICP-MS (DGP Application, 2008, p. 18). In fact, \$3,607 /year of my budget was specifically dedicated towards partial support for the operation and maintenance of the ICP-MS (DGP Application, 2008, p. 7)—an additional \$10k /year<sup>‡</sup> will be funded from my other research grants. In addition, the purchase of a laminar flow hood (\$3,616) was budgeted for in year 1 to prevent contamination during sample preparation and handling prior to analysis by ICP-MS. However, I wish to emphasize that although ICP-MS is essential to the success of my research, it is not the focus of my research, as it would be difficult to compete with the numerous large, high profile research groups around the world (e.g. Ralph Sturgeon, NRC Ottawa; Joe Caruso, University of Cincinnati; Ryszard Łobiński, Université de Pau et des Pays de l'Adour, to name but a few). Rather, I use ICP-MS as a tool to support and strengthen my research program on chemical speciation—the situation is analogous to synthetic chemists who use NMR, mass spectroscopy and x-ray crystallography to characterize their products.

Referee A's critique that ICP-MS is more sensitive than Competing Ligand Exchange – Adsorptive Cathodic Stripping Voltammetry (CLE-AdCSV) also demonstrates a lack of expertise in this area. For example, free metal ion concentrations as low as  $10^{-13}$  –  $10^{-14}$  M have been reported for nickel by complexometric titration with CLE-AdCSV (Xue et al., 2001). This is many orders of magnitude lower than can be achieved by ICP-MS. Furthermore, the critique entirely misses the point of the complexometric titration CLE-AdCSV studies, which is to determine stability constants (DGP Application, 2008, p. 16)—something that **cannot** be done by ICP-MS.

### *Speciation studies*

Although both Referee A and GSC26 perceived a lack of detail about the specific compounds that will be determined in the speciation studies, it is well known that it is **impossible** to isolate individual chemical species in the proposed research. This type of research is classified as physicochemical speciation. It involves the determination of stability constants, rate constants, and diffusion coefficients, which are the focus of my Discovery Grant Application (DGP Application, 2008, p. 15). Although this is strictly defined as “fractionation” by IUPAC (Templeton et al., 2000), the general term chemical speciation in this context has a long tradition in the field (e.g. Sunda and Hanson, 1979) and is still commonly used today (e.g. Slaveykova et al., 2009). After all, how many of us use cubic metres, the SI unit for volume, instead of millilitres or litres? In addition, the use of the term chemical speciation avoids any confusion between the “fractionation” defined by IUPAC and the “size fractionation” studies (DGP Application, 2008, pp. 18–19) in my proposed research. In any case, identifying the

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<sup>‡</sup> It should be noted that the cost of research for the operation and maintenance of ICP-MS is relatively high. The expected cost of operating the ICP-MS is approximately \$13k /year. For example, the current cost of liquid argon which is the source gas for the plasma currently costs \$550 /160m<sup>3</sup> Dewar. Additional consumables include the sampler, skimmer, ion lens and RF load coil. A detailed description of the operating expenses was included in my Budget Justification (DGP Application, 2008, p. 7).

specific compounds is hardly relevant as the main focus of the proposed research is on the **equilibria** and **kinetics** of trace metal speciation, as given from the outset in the title, “Exploring the Link between the **Equilibria** and **Kinetics** of Trace Metal Speciation”, i.e. **stability constants** and **rate constants**. This was re-emphasized in the **short-term** objective which was “to investigate the link between the **equilibria** and **kinetics** of trace metal speciation in the aquatic environment” of my research proposal (DGP Application, 2008, p. 16). It was also the focus of 2 out of the 3 main themes in my Proposed Approach and Methodology: “2) measurement of **rate constants** and diffusion coefficients using *in situ* passive samplers, and 3) measurement of **stability constants** by **complexometric titration**” (DGP Application, 2008, p. 16). These themes were also identified in the Referee B’s comments (Referee B, 2009).

Finally, I wish to note that LC-ICP-MS, the technique recommended by Referee A (2009) for determining the actual chemical form of each element, **cannot** be used for this research because freshwaters are dynamic supermixtures (DGP Application, 2008, p. 16). This is because the metal binding components in freshwaters are in a constant state of fragmentation and rearrangement. As I stated in my research proposal, this effect arises from the physical and chemical heterogeneity of humic substances, which are ubiquitous in freshwaters. Furthermore, LC-ICP-MS **cannot** provide definitive information about the chemical form of an element as ICP-MS only provides elemental information and chemical species can only be **inferred** from their **retention time** using the approach proposed by Referee A. Furthermore, although LC-ICP-MS was a state-of-the-art technique about 20 years ago (e.g. Klinkenberg, 1990), the field has since evolved to liquid chromatography (LC) separation with simultaneous detection by both ICP-MS and significantly more advanced and expensive mass spectroscopic techniques, such as electrospray tandem mass spectrometry (ES/MS/MS) (e.g. Tastet et al., 2008a) or electrospray Q-TOF MS/MS (e.g. Tastet et al., 2008b), which are able to provide the molecular information required for species identification.

#### *Additional Comments by the Referees*

Despite the concerns outlined above, Referee A noted that the development of the improved *in situ* passive sampler is justified and that the size fractionation studies, which have been little studied, are important and will likely provide results that are environmentally significant.

Nonetheless, the improvement of [the] *in situ* passive sampler is **warranted**, as well as a study of the effect of filtration on the fractionation of elements in environmental aqueous samples. Indeed, relatively **little information** can be found in the literature on the latter. Yet, it may **significantly** affect the chemical speciation of analytes. Ultimately, such information would also likely be **useful** to water treatment plants, which may alter their filtration procedure as a result. (Referee A, 2009)

Referee B, who ranked his/her ability to assess my application as **high**, highlighted the fact that my research proposal was novel and original. It was further noted that the proposed research was both ambitious and feasible.

Modified versions of the passive sampling device will be evaluated, characterized and applied to studies that modify the thickness of the gradient gel that serves as a model for the stagnant boundary layer that contacts the bio-membrane. I found th[is] application to be **well structured, logical** in its presentation and **easy to understand**. Moreover many of the ideas were **novel**. The scope of the proposed studies is **ambitious** yet seemed to be **workable**. I give this application **top marks** for **originality**... Moreover, I consider that the operation of the modified device to be **well founded** in operating theory so that regardless of the outcomes, **advances** in our understanding can be made. (Referee B, 2009)

Referee C rated the proposal as good to excellent. In addition the referee noted that the proposal was well written and that the proposed methods are well presented and feasible.

The proposal is **well laid out** and **clearly presents** the applicants progress as well as how his proposed research fits into his field of study in general. Knowledge gaps have been **clearly identified**. The methods are **well presented** and to this reader, the proposed methods seem **feasible**. I would assess the proposal as being **good to excellent**. I would **recommend funding** for the proposed research. Possibly not 53k/yr... perhaps within the range of 35-40k. (Referee C, 2009)

In light of the evidence that clearly refutes all of Referee A's concerns and the enthusiastic comments of **all** the referees in support of the proposed research, I request that the appeals committee reconsider GSC26's evaluation of the Merit of the Proposal.

### **3. Contributions to the Training of Highly Qualified Personnel (rated Strong)**

GSC26 rated my contributions to the training of HQP as strong, and consequently, did not provide any comments as per section 6.10 of the Peer Review Manual (NSERC, 2009c). However, since Referee C commented that, "it appears that the emphasis of Dr. Murimbo[h's] HQP training is primarily at the UG level" (Referee C, 2009), I wish to note that "The Discovery Grants Program values contributions to training at **all levels**, including **undergraduate** and graduate students, postdoctoral fellows, technicians and research associates" (NSERC, 2009c). Furthermore, the Peer Review Manual 2008 states that a "researcher working at a university without a graduate program should **not** be penalized for limited or no graduate student supervision experience if it is clear that there are solid contributions to other levels of trainees" (NSERC, 2009).

As I described on my Personal Data Form (DGP Application, 2008, pp. 4, 8), several of my students have received awards for their research, all have followed a career in science, and a number have pursued graduate studies. My Contributions to the Training of HQP are reflected in the comments of Referee A, who noted that

The PI appears to be forming **quality HQP**, as several of his students received **awards** for their work. He is to be **comm[e]nded** for **successfully** performing research, which is often published in journals with a **high impact factor**, using mostly **undergraduate students**. In the referee's own experience, that is **no easy**

**task**, as it involves a **lot of training** for, usually, little if any payback. (Referee A, 2009)

In addition, Referee B “was pleased to note that the **bulk** of the requested funds will be committed to the **training of HQP** and that operating expenses remain relatively modest” and that “the proposed budget is **entirely appropriate**” (Referee B, 2009).

In view of the above, I urge the appeals committee to leave my ranking unchanged at strong.

#### **4. Unfair Consideration for Initial Three-Year Grant Holders**

Most importantly, the results from this year’s Discovery Grant competition directly **contradict** GSC26’s comments from my previous NSERC Discovery Grant, which stated:

As is the policy in Chemistry for all new applicants, the committee recommended an initial grant of **three years** rather than **five**. The applicant should interpret this recommendation as an opportunity to be re-evaluated and to possibly have funding adjusted if appropriate with the increased needs as the research program develops. At the time of the first renewal in three years, the committee will **typically award** a second term of two years. (GSC26, 2006)

According to the Cambridge Dictionary (2008), “typically” is an adverb that is “used when you are giving an average or usual example of a particular thing”. In the context of the 2006 Message to the Applicant (GSC26, 2006), it would have been “usual” for my NSERC Discovery Grant to be renewed for a second term.

It is especially troubling that the “Enhancements to Peer Review in the 2009 Discovery Grants Competition” (NSERC, 2009a) was not announced until April 17, 2009, **over 5 months after the deadline** for submission of the Discovery Grant Applications. None of the criteria in the Enhancements to Peer Review or the Discovery Grants Evaluation Indicators (NSERC, 2009e) were published before or during the Discovery Grants application process. How are applicants expected to prepare “winning proposals” when we don’t know what the criteria are?

If NSERC wishes to change the criteria in mid-stream, then fairness dictates that applicants should at least be informed of the changes **before** the application process. Furthermore, if the GSC’s 2006 Message to the Applicant and the evaluation criteria can be **retroactively annulled**, then quite simply, none of NSERC’s documents or the GSC’s comments are worth the paper they are written on.

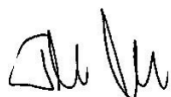
Finally, I wish to note that the drop in the success rate from 71% to 63.5% directly contradicts the findings of the International Review Committee (Nicholson et al., 2008) who emphasized that the success rate should **not** be reduced because “a significant intentional reduction in the DGP success rate – in order to concentrate funds on fewer researchers – would have a **disproportionate impact** on those currently receiving smaller grants. This would result in **reduced** research support in the smaller provinces and in small institutions.” This recommendation was also supported by NSERC Management (2009b) who stated that “small grants should **not be cut** and, by extension, the success rate in the DGP is **not too high**”.

However, the results from this year's DGP show that small, primarily undergraduate universities have been disproportionately affected by the recent "enhancements" to the NSERC peer review process, with most small, primarily undergraduate universities attaining success rates less than 35%.

In summary, the goal of the proposed research was to select a niche research area that builds on my expertise, so that I could conduct internationally competitive research and make significant contributions to the field, while avoiding direct competition with much larger research groups at more research intensive institutions. According to the referees' own assessments, the proposed research is **novel and ambitious** (Referee B, 2009), **feasible** (Referee C, 2009), and **environmentally significant** (Referee A, 2009). I have also demonstrated that all the concerns raised by Referee A are either incorrect or irrelevant to the proposed research. In addition, I have shown that GSC26 **incorrectly assessed** the Excellence of the Researcher and the Merit of the Proposal. In view of the above and the **enthusiastic comments** from all three referees, there is **overwhelming evidence** to support the renewal of my Discovery Grant. Therefore, I respectfully urge NSERC to reconsider the decision to withdraw support from my Discovery Grant.

Thank you in advance for your time and effort in considering my appeal.

Sincerely,



John Murimboh, PhD  
Assistant Professor

#### **Attachments**

GSC26, *Message to Applicant*, 2006.

GSC26, *Message to Applicant*, 2009.

Murimboh, *Discovery Grant Application*, 2008

*Referee Report – Application for a Grant*, Referee A (2009).

*Referee Report – Application for a Grant*, Referee B (2009).

*Referee Report – Application for a Grant*, Referee C (2009).

#### **Citations**

GSC26. (2006). *Message to Applicant*, Discovery Grant Program (Application No. 312584-2006).

GSC26. (2009). *Message to Applicant*, Discovery Grant Program (Application No. 312584-2009).



- Klinkenberg, H., Van der Wal, S., Frusch, J., Terwint, L., and Beeren, T. (1990). Determination of tellurium compounds by LC-ICP-MS. *Atomic Spectroscopy*, 11, 198-201.
- Murimboh, J. (2008). Discovery Grant Application.
- Nicholson, P., Davies, G., Kaspi, V., Mayer, L. A., Olsen, K., Robson, A., Winnacker, E., Tibshirani, R. (2008). Report of the International Review Committee on the Discovery Grants Program, [http://www.nserc-crsng.gc.ca/doc/Reports-Rapports/Consultations/GSCStructure/ReportOfTheInternationalReviewCommitteeOnTheDiscoveryGrantsProgram\\_e.pdf](http://www.nserc-crsng.gc.ca/doc/Reports-Rapports/Consultations/GSCStructure/ReportOfTheInternationalReviewCommitteeOnTheDiscoveryGrantsProgram_e.pdf). Accessed on May 17, 2009.
- NSERC. (2009a). *Enhancements to Peer Review in the 2009 Discovery Grants Competition*, [http://www.nserc-crsng.gc.ca/Media-Media/NewsRelease-CommuniqueDePresse\\_eng.asp?ID=126](http://www.nserc-crsng.gc.ca/Media-Media/NewsRelease-CommuniqueDePresse_eng.asp?ID=126). Accessed on May 17, 2009.
- NSERC. (2009b). *Management Response to the International Review of the Discovery Grants Program*, [http://www.nserc-crsng.gc.ca/doc/Reports-Rapports/Consultations/GSCStructure/ManagementResponsetotheInternationalReviewoftheDiscoveryGrantsProgram\\_e.pdf](http://www.nserc-crsng.gc.ca/doc/Reports-Rapports/Consultations/GSCStructure/ManagementResponsetotheInternationalReviewoftheDiscoveryGrantsProgram_e.pdf). Accessed on May 17, 2009.
- NSERC (2009c). *Peer Review Manual 2008*, updated February 2009. [http://www.nserc-crsng.gc.ca/doc/Reviewers-Examineurs/CompleteManual2008-ManualEvalComple\\_t\\_eng.pdf](http://www.nserc-crsng.gc.ca/doc/Reviewers-Examineurs/CompleteManual2008-ManualEvalComple_t_eng.pdf). Accessed on April 29, 2009.
- NSERC (2009d). *2009 Competition Statistics Discovery Grants Program*. [http://www.nserc-crsng.gc.ca/doc/Discovery-Decouverte/2009\\_Stats\\_e.pdf](http://www.nserc-crsng.gc.ca/doc/Discovery-Decouverte/2009_Stats_e.pdf). Accessed on May 28, 2009.
- NSERC. (2009e). *Discovery Grants Evaluation Indicators*. [http://www.nserc-crsng.gc.ca/doc/Professors-Professeurs/RatingScale\\_eng.pdf](http://www.nserc-crsng.gc.ca/doc/Professors-Professeurs/RatingScale_eng.pdf). Accessed on May 26, 2009.
- Referee A. (2009). *Referee Report – Application for a Grant* (Application No. 312584-2009).
- Referee B. (2009). *Referee Report – Application for a Grant* (Application No. 312584-2009).
- Referee C. (2009). *Referee Report – Application for a Grant* (Application No. 312584-2009).
- Slaveykova, V. I., Karadjova, I. B., Karadjov, M., and Tsalev, D. L. (2009). Trace Metal Speciation and Bioavailability in Surface Waters of the Black Sea Coastal Area Evaluated by HF-PLM and DGT. *Environmental Science & Technology*, 43(6), 1798–1803. doi: [10.1021/es802544n](https://doi.org/10.1021/es802544n).
- Sunda, W. G.; Hanson, P.J. Chemical speciation of copper in river water. Effect of total copper, pH, carbonate, and dissolved organic matter. In: *Chemical Modeling in Aqueous Systems: Speciation, Sorption, Solubility, and Kinetics: Based on a Symposium Cosponsored by the Society of [sic] Environmental Geochemistry and Health and the ACS Division of Environmental Chemistry at the 176th Meeting of the American Chemical Society, Miami Beach, Florida, September 11–13, 1978*, ACS Symposium Series (1979), 93
- Templeton, D. M., Ariese, F., Cornelis, R., Danielsson, L. G., Muntau, H., van Leeuwen, H. P., et al. (2000). Guidelines for terms related to chemical speciation and fractionation of elements. Definitions, structural aspects, and methodological approaches. *Pure and Applied Chemistry*, 72(8), 1453–1470.

- Tastet, L., Schaumlöffel, D., Bouyssiére, B., and Lobinski, R. (2008a). Identification of selenium-containing proteins in selenium-rich yeast aqueous extract by 2D gel electrophoresis, nanoHPLC-ICP MS and nanoHPLC-ESI MS/MS. *Talanta*, 75(4), 1140–1145. doi: [10.1016/j.talanta.2008.01.003](https://doi.org/10.1016/j.talanta.2008.01.003).
- Tastet, L., Schaumlöffel, D., and Lobinski, R. (2008b). ICP-MS-assisted proteomics approach to the identification of selenium-containing proteins in selenium-rich yeast. *Journal of Analytical Atomic Spectrometry*, 23(3), 309-317. doi: [10.1039/b713805a](https://doi.org/10.1039/b713805a).
- Woodford, K., and G. Jackson. *Cambridge Advanced Learner's Dictionary*. Cambridge University Press, 2003.
- Xue, H. B., Jansen, S., Prash, A., and Sigg, L. (2001). Nickel Speciation and Complexation Kinetics in Freshwater by Ligand Exchange and DPCSV. *Environmental Science & Technology*, 35(3), 539–546. doi: [10.1021/es0014638](https://doi.org/10.1021/es0014638).



APR 17 2009

**MESSAGE TO APPLICANT**

**MESSAGE AU CANDIDAT**

This message represents the consensus opinion of the selection committee that reviewed your application.

Ce message reflète le consensus de l'opinion du comité de sélection qui a examiné votre demande.

Applicant's Name, Institution / Nom de famille, établissement du candidat	Murimboh, John JD, 312584-2009, Acadia
Type of Grant / Genre de subvention	Discovery Grants Program - Individual
Committee / Comité	Analytical and Physical Chemistry
Application Title / Titre de la demande	Exploring the link between the equilibria and kinetics of trace metal speciation

The Committee rated your application as follows / Le comité a attribué les cotes suivantes à votre demande de subvention :

Excellence of the Researcher(s) / Excellence du ou des chercheurs :	Moderate
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The committee felt that the evidence presented for Excellence of the researcher was moderate in comparison to the other researchers under review. The committee noted that only few of the publications listed reflected work done as an independent researcher and questioned the somewhat limited research output..

Merit of the Proposal / Mérite de la proposition :	Moderate
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The committee felt that the proposal lacked detail about the specific compounds that will be determined in the speciation studies. In addition, the committee agreed with the referee who noted that the new ICP-MS purchased with CFI support will prove useful in strengthening the research plans. Overall, the committee felt that the merit of the proposal was moderate in comparison to the other researchers under review.

Training of Highly Qualified Personnel / Formation de personnel hautement qualifié :	Strong
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Cost of Research / Coût de la recherche :	
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Additional Comments / Commentaires additionnels :	
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**Referee Report - Application for a Grant**  
**Rapport de l'examineur - Demande de subvention**

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Family name, given name and initials(s) of applicant / Nom de famille, prénom et initiale(s) du candidat <b>Murimboh, JD (John)</b>	Application no. / N° de la demande <b>312584</b>
Type of grant / Type de subvention <b>Discovery Grants - Individual</b>	Committee / Comité <b>026</b>

I rate my ability to assess this particular application as / Mes compétences évaluer cette demande sont

High / Elevées

Satisfactory / Satisfaisantes

Low / Faibles

**SCIENTIFIC EXCELLENCE OF THE RESEARCHER**

Since 2006 (i.e. his last NSERC application), the PI had eleven publications, including one provisional patent and one submitted. Only three of these (including the patent) were not co-authored by the PI's former Ph.D. supervisor, which begs the question: when will the PI fully fly on his own? Nonetheless, taking into account that the PI works at a mostly undergraduate institution, three significant contributions in three years is impressive. This referee is also amazed by the fact that the PI was successful in a CFI application on his own and, in another one, with a group, and that he has secured funding from several other sources. He is to be commended for this achievement. His now being Director of research labs at Acadia also demonstrates his significance to the Department of Chemistry.

**MERIT OF THE PROPOSAL**

The proposed research is a continuation of the PI's previously NSERC-funded research using mostly the same equipment, instead of putting more emphasis on the very sensitive ICP-MS instrument that was purchased with CFI money. For example, the proposal says that CLE-AdCSV will be used for complexometric titration because of its high sensitivity and detection limits. However, ICP-MS is not only a more sensitive technique, but it also allows simultaneous multielemental analysis, whereas CLE-AdCSV is usually applied to a single analyte. Furthermore, the proposal keeps talking of speciation studies of toxic metals but nowhere will the actual chemical form of each element be determined. Mass spectrometry (in combination with LC in this particular case) would be required for this purpose.

Nonetheless, the improvement of in situ passive sampler is warranted, as well as a study of the effect of filtration on the fractionation of elements in environmental aqueous samples. Indeed, relatively little information can be found in the literature on the latter. Yet, it may significantly affect the chemical speciation of analytes. Ultimately, such information would also likely be useful to water treatment plants, which may alter their filtration procedure as a result.

**CONTRIBUTION TO THE TRAINING OF HIGHLY QUALIFIED PERSONNEL**

The PI appears to be forming quality HQP, as several of his students received awards for their work. He is to be commended for successfully performing research, which is often published in journals with a high impact

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factor, using mostly undergraduate students. In the referee's own experience, that is no easy task, as it involves a lot of training for, usually, little if any payback.

**Referee Report - Application for a Grant**  
**Rapport de l'examineur - Demande de subvention**

Please type / Veuillez dactylographier

Family name, given name and initials(s) of applicant / Nom de famille, prénom et initiale(s) du candidat <b>Murimboh, J. (John)</b>	Application no. / N° de la demande <b>312584</b>
Type of grant / Type de subvention <b>Discovery Grants - Individual</b>	Committee / Comité <b>026</b>

**Confidence Level / Niveau de confiance**

I rate my ability to assess this particular application as / Mes compétences évaluer cette demande sont

 High / Elevées Satisfactory / Satisfaisantes Low / Faibles**Merit of the Proposal:**

The applicant proposes to continue chemical speciation studies that can lead to improvements in our understanding of the availability of metals to living organisms or to biological processes within aqueous (marine, estuarine or fresh waters). More generally these studies will lead to an increased understanding of the risks that they pose.

Three objectives are targeted: (i.) passive samplers, (ii.) their application to the determination of rate constants and diffusion coefficients and (iii.) stability constants as determined by complexometric titrations. Initially, the interaction of various ligands and natural organic matter with four metals (Cd, Cu, Ni, and Zn) will be studied. Modified versions of the passive sampling device will be evaluated, characterized and applied to studies that modify the thickness of the gradient gel that serves as a model for the stagnant boundary layer that contacts the bio-membrane.

I found this application to be well structured, logical in its presentation and easy to understand. Moreover many of the ideas were novel. The scope of the proposed studies is ambitious yet seemed to be workable. I give this application top marks for originality.

The applicant proposes to replace the hydrogel that serves to mimic the stagnant diffusion layer with a membrane filter (thin Empore chelating/ion exchange disk). This is anticipated to circumvent the heterogeneities of the hydrated gel and potentially will result in a sampler assembly that provides more repeatable operation. Moreover, I consider that the operation of the modified device to be well founded in operating theory so that regardless of the outcomes, advances in our understanding can be made.

I was pleased to note that the bulk of the requested funds will be committed to the training of HQP and that operating expenses remain relatively modest. To me the proposed budget is entirely appropriate.

**Excellence of the Researcher**

My sense is that the applicant has rapidly established himself as an independent researcher and has made appreciable progress with his first cycle of support. His papers, with various co-authors, continue to appear in the technical literature. They meet/exceed international levels of quality. I was especially impressed with the new access to state of the art spectroscopic instruments. The applicant has been very successful in attracting new funds for operating expenses and the purchase of new equipment. Continuing access to these instruments is essential to the success of this grant. The resources (both financial and technical) to maintain these instruments seems to be in place so that the research environment is promising.

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Form / Formulaire 140 (2008W)



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 Murimboh (312584)

**Excellence of Researcher.**

Dr. Murimboch is currently an Assistant Professor within the Dept. Of Chemistry at Acadia Univ. a position he has held since 2004. He has held a modest NSERC Discovery since 2006, with one other other source of significant funding which he will hold until 2012.

Dr. Murimboch currently has 3 UG, 1 PhD and 1 Tech in progress. He has graduated 7 UG and 1 MSc. To date, it appears that the emphasis of Dr. Murimboch training of HQP is primarily at the UG level.

Dr. Murimboch has contributed 11 publications in the primary literature, mostly in good journals. He has also given several invited presentations to a number of difference associations. He is actively involved in other professional activities including outreach.

Overall, I would rank the contributions, including the training of HQP of Dr. Murimboch as being "good" for the 2002-2008 review period.

**Merit of the Proposal.**

Dr. Murimboch has requested ca. 53K/yr over 5 years to "explore the links between equilibria and kinetics of Trace Metal Speciation".

His objective for the funding period is to develop quantitative models and in situ passive sampling devices for monitoring and interpreting trace metal speciation in natural waters. The majority of the requested funds are for the training of HQP.

The proposal is well laid out and clearly presents the applicants progress as well as how his proposed research fits into his field of study in general. Knowledge gaps have been clearly identified. The methods are well presented and to this reader, the proposed methods seem feasible. I would assess the proposal as being good to excellent.

I would recommend funding for the proposed research. Possibly not 53K/yr...perhaps within the range of 35-40K.

page 1 of 1  
MURIMBOCH(31258)



APR 12 2006

**MESSAGE TO APPLICANT**

**MESSAGE AU CANDIDAT**

This message represents the consensus opinion of the selection committee that reviewed your application.

Ce message reflète le consensus de l'opinion du comité de sélection qui a examiné votre demande.

Family Name, Initials, and University of Applicant / Nom de famille, initiales et université du candidat	Type of Grant / Genre de subvention
Murimboh, John, J.D. Acadia 312584-2006	Discovery Grant - Individual / Subvention à la découverte - individuelle
Committee / Comité	
Analytical & Physical Chemistry / Chimie analytique et physique	

The committee would like to congratulate the applicant on a successful proposal. As is the policy in Chemistry for all new applicants, the committee recommended an initial grant of three years rather than five. The applicant should interpret this recommendation as an opportunity to be re-evaluated and to possibly have funding adjusted if appropriate with the increased needs as the research program develops. At the time of the first renewal in three years, the committee will typically award a second term of two years. The committee extends its best wishes for a successful research career.

1/1





**Referee Report - Application for a Grant**  
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**Confidence Level / Niveau de confiance**

I rate my ability to assess this particular application as / Mes compétences évaluer cette demande sont

High / Elevé

Satisfactory / Satisfaisante

Low / Faible

I read this application with keen interest. My sense is that it represents a contribution to the evolving ideas by a member of the next generation of scientists who are interested in the chemical speciation of trace elements within the natural environment.

The research thrust is focussed on increasing our understanding of how components of the environment can attenuate the inherent toxicity of a trace metal ion. Studies/designs of novel sampling devices will be complemented with availability/toxicity studies that will be interpreted with the free ion activity model (FIAM) and biotic ligand model (BLM) and will be rounded out with kinetic speciation studies that can be used to relate the rate of metal release from a biological matrix to toxicity. I was pleased to note an emphasis on the proposed development of modified in situ sampling techniques and on increasing our understanding of the applicability and limitations of these new devices. These passive sampling devices are attractive because they are simple to use and provide a time-averaged estimate of the quantities of analyte metals. By the same token, how rapidly the concentrations within the collector will adjust in response to changing concentrations in the bulk medium will have to be explored experimentally. I consider that improved sampler designs will aid environmental scientists appreciably if they can provide insight into what fraction of the metal burden is actually being collected.

Recent literature examining metal speciation and uptake has assumed the applicability of the Free Ion Activity Model (FIAM) and the Biotic Ligand Model (BLM). In addition to several underlying assumptions with respect to the functioning of these models, both BLM and FIAM have been criticized because they fail to deal with the possible contribution(s) that labile metal complexes can have on metal uptake. My sense is that there have been nearly as many exceptions reported as studies that unambiguously supported the models. Any headway in this area would be most welcome.

The proponent has integrated his requests for support from different sources so that I do not sense any overlap between the various requests. In terms of budgeting, the current proposal reserves a large portion of the total (~80% in years 2-4) for the support of graduate students. Continuing access to sophisticated spectroscopic instruments will be assured through the "Acadia Centre for Microstructural Analysis" and partial support of maintenance has been arranged (\$3,000/anum). (The individual instruments that will be available will depend in part, on the applicant's success with his CFI application and with his Research Tools and Instruments application.) The purchase of a laminar flow hood is essential for his proposed assays with microbial cultures. In addition, my sense is that the requested support of \$5,500 for materials and supplies is relatively modest for a new laboratory that will support several students. In total, the budget seems entirely appropriate.

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