Academy of Science Annual Business Meeting / Réunion annuelle de l'Académie des sciences
Wednesday, November 17, 2021, 19:30 – 20:30 / mercredi 17 novembre 2021, 19h30 – 20h30
Virtual Meeting / Rencontre virtuelle

#	Item	🗣	⏳
Agenda			
1	Introduction & Welcome / Introduction et mot de bienvenue	J. Smol	5 minutes
2	Approval of 2020 Minutes and follow up / Procès verbal 2020 et suivi	J. Smol	3 minutes
3	Report from the President / Rapport du président	J. Smol	15 minutes
4	Report of the Secretary/ Rapport du secrétaire	D. Thomas	3 minutes
5	Reports from the Directors of the Divisions / Rapport des Directeurs des Divisions • Applied Sciences and Engineering / Sciences appliquées et génie • Earth, Ocean and Atmospheric Sciences / sciences de la terre, de l'océan et de l'atmopshère • Life Sciences / sciences de la vie • Mathematical and Physical Sciences / mathématiques et sciences physiques	F. Rosei B. Boudreau P. O'Campo G. Murphy	10 minutes
6	Report from Director of the new Division Biological Sciences Rapport du directeur de la nouvelle division des sciences biologiques	G. Bell	2 minutes
7	Introduction of Academy 3 President-Elect / Présentation du président élu de l'Académie 3	M. Tremblay	1 minute
8	Other Business / Autres	J. Smol	5 minutes
9	Closing of the Meeting / Clôture de la réunion	J. Smol	2 minutes

Minutes of Annual Business meeting Academy III – COEE 2021// Réunion annuelle de l'Académie des sciences

Wednesday, November 17,2021, 19 30 – 20:31 / mercredi 17 novembre 2021, 19h30 – 20h31

Virtual Meeting / Rencontre virtuelle -The meeting was held by Zoom.
Agenda: approval by Poll and was unanimous
Minutes: approval of the minutes was also unanimous

Attendees: Narayanaswamy Balakrishnan, Vijaya Raghavan, Andrew Sachrajda, Bernie Boudreau, Bing Chen, Catherine Beauchemin, David Bryce, Dennis Salahub, Jamal Deen, Federico Rosei, Gary Slater, Jacques Derome, Jeffrey McDonnell, John Berchhoefer, Keiko Hattori, Luc Vinet, Manuella Vincter, Marco Amabili, Marlon Lewis, Paul Young, Pavel Cheben, Glen MacDonald, Agnes Herzberg, Pawel Hawrylak, Raymond Kapral, Stephen Holdcroft, Thomas Oxland, Xingfang Li, Xuebin Zhang, Benoit Roux, Bhagirath Singh, Michel Tremblay, Sandra Davidge, Alejandro Marangoni, Lawrence Mysak, Patricia O'Campo, Graham Bell, Chris Le, Jacques Cote David Thomas, John Smol, Michael Dence, John Bechhoefer, Christopher Dragan (observer)

John Smol: President of Academy III introduced himself and the incoming Secretary for Academy III, David Thomas.

He mentioned and updated the following:
- He commended the COVID-19 working group's impressive efforts and its upcoming activities.
- Notable are the collaborations with the G7, Austrian Academy of Science, and the re-establishment of the Huntsman Medal.
- Operationally, the split of the Life Sciences is now a reality (with the new division of Biological Sciences). The need for this change is driven by the consistently large number of nominees but also the breadth of the science topics "from soil science to brain function" it covers. The split generates a Biological Sciences Division and a Medical Sciences Division. Nominees and their nominators can choose the more appropriate committee for their dossier. Graham Bell has generously agreed to chair the Biological Sciences Division for one year and to find a new chair (now accomplished (April 2022).
- John Smol thanked the Walter House team for their assiduous support for all of us, and also Bernard Boudreau and Keiko Hattori for their efforts and service to the RSC membership committee.
- He announced, and congratulated, Michel Tremblay as the new President-elect of Academy III.
- John Smol mentioned that the Membership committee will be granting extra slots to all academies, though B slots can already be adjusted on a yearly basis.
- David Thomas (Secretary) spoke about when he was more involved with the RSC 20 years ago and how the LS split is now a reality, with congratulations. Reading through all of the committee documents of 2021, there were several notable ones, including having "a bootcamp" for committee members on how to handle EDI and unconscious bias. He encouraged the Academy to take a stand against fake news and its role in education.
- Federico Rosei (Director ASE): presented his Divisional report, noting a sharp increase in the number of candidates, probably due to the pandemic. This meant that the committee needed to recruit a new member and form 3 subcommittees. He called for a readjustment in slot numbers, especially the B list should be more dynamic. He thanked Marco Amabili for his efforts to create a new award for ASE, to be named after Michael Païdoussis Medal, it is to be in mechanics and will be open to international candidates as well.
- Bernard Boudreau (Director EOAS): Noted there was a decline in the total number of nominees this

year. He also noted that there no evidence of gender bias, and the next committee will be equally Male and Female. MT asked whether the downturn in nominations is due to the 1-year eligibility period. It is harder for a smaller division such as EOAS to continue submitting several nominations a year, though quality of submissions has remained top notch.

- Patricia O'Campo (Director LS): Noted there were more files this year (108 vs 98), divided between biology and medicine, 19 were elected, including 1 foreign fellow. The challenge of balancing the two subcommittees will no longer be a challenge (with the new Biological Sciences Division), and her division is championing better training on EDI. She was optimistic that the split will be good in the long run.
- Luc Vinet: spoke for MPS, he congratulated Michel Tremblay for winning the Prix Wilder-Penfield and Federico Rosei for winning the Prix Marie-Victorin. There is a steady drop of nominees since the 1-year renomination rule, as well as the pandemic. Diversity was impacted, Math only had 1 inductee this year - the president of NSERC.
- Graham Bell (Director BIOS): spoke of how he was surprised to be invited by Jeremy McNeil to be invited to be appointed director of the new Biological Sciences Division. He is anxious to know how many nominations will be submitted this year.
- Michel L. Tremblay is pleased to have been selected as president-elect. He will reach out to the academy III members for their thoughts and ideas towards initiating additional programs at the Academy. He suggested making the nomination process more accessible to ensure that we increase the number of nominations. This should benefit recognition of academic excellence from faculty members at small universities, from Indigenous, women scientists and engineers, and scientists from underrepresented francophone institutions. He hopes that the split in the Life Sciences division will generate a more diverse selection of nominees. He wants the Academy to be more proactive in promoting our members' accomplishments and impact the government towards promoting science and engineering policies. He also desires that the RSC and their respective affiliated institutions better recognize new Academy III members.
- John Smol spoke about how the membership of the Academy is dominated by the U15 Group of Canadian Research Universities and concurred that smaller institutions need better representation.
- John Smol thanked the Directors, the selection committees and Walter House for their hard work. He looked forward to seeing everyone at next year's COEE. He again recommended that members attend the AGM in Calgary.

Meeting adjourned at 8:31pm

Report of the President (John P. Smol); Academy III Business Meeting; 7:30pm; Nov 17, 2021

Greetings everyone! Salutations à tous!

I am delighted that you are joining us for the 2021 Academy of Science Business Meeting, albeit remotely again this year.

I would especially like to welcome and congratulate any new fellows that we have attending, and very much hope you will continue to attend our annual meetings.

As I noted last year, I had the "interesting" fortune of being elected President of the Academy of Science about 1 month before Covid-19 hit. Now, another year later, the pandemic is still with us, but, despite these challenging circumstances, it continued to be an important year for the RSC and perhaps especially for the Academy of Science.

As we have always argued, the RSC is eminently qualified to provide scientific advice, and in this capacity, we have the obligation to foster responsible information transfer. There has often been the feeling, though, that the RSC never reached its full potential. We have been working very hard to increase our engagement with policy makers and the public-at-large.

With strong support from Darren Gilmour and the Walter House Team, and in partnership with the *Globe and Mail*, *FACETS* (the official open-access journal of the Academy of Science), and *Let's Talk Science*, I believe the RSC's role in mobilizing independent expertise during the pandemic has been inspiring. Nearly 700 Canadians – including many with no affiliation with the RSC – have volunteered time to produce 23 peer-reviewed Policy Briefings and over 150 op-ed style informed perspectives in the *Globe and Mail*.

As I did last year, I have the pleasure to again acknowledge the outstanding work of Dr. Tom Marrie of Dalhousie University, and his team, for the outstanding success of the RSC Task Force on COVID-19 Tom Marrie has recently stepped down from this leadership role, and he has been replaced by the former President of the RSC, Chad Gaffield. I was pleased to suggest to the RSC Council that Tom be awarded the RSC Centenary Medal for his outstanding contributions to the RSC, and delighted he is receiving that recognition this year.

Our earlier contributions dealt mainly with issues linked to the pandemic, but we have since expanded to other topics of broad public interest, such as those related to the environment and climate change, with several op-eds published in the *Globe and Mail* since February.

Independent expertise such as this are important as it enables Canadians to distinguish between legitimate science and false or misleading narratives.

Ceci est un appel à l'action ! Nous devons davantage accompagner votre dévouement à la science, et faciliter la transmission de données probantes aux décideurs politiques, aux politiciens et au grand public.

Many of these initiatives have also been published in longer formats in *FACETS*. In addition, working collaboratively with the *Globe and Mail* and *Let's Talk Science*, our audience has been greatly expanded. For example, since the publication of the first Policy Briefing on COVID-19 in June 2020, there have been over 42,000 downloads of Policy Briefings and Essay Collections on the RSC website. Indeed, from Jan 1 to October 1, 2021, about twice as many users (145,000) have accessed the RSC website as compared to the full calendar year 2020 (78,000). In addition, we have partnered again with *the Globe and Mail* with our virtual town halls.

This exemplifies our momentum and the power of the RSC and the contributions that science and other scholarly activities can make to the common good of this country and the world. We have a model that works!

Of course, we would like to have other initiatives started, and we hope that Fellows and Members of the

College, and perhaps especially Fellows from the Academy of Science, will come forward to continue our engagement with the public and policy makers. Independent expertise and evidence-based policy is

critical for democracies to function.

The RSC needs you, Canada needs you, the world needs you. Continued engagement is critical.

While on the topic of publications, the official Academy of Science open-access journal *FACETS*, published by the not-for-profit Canadian Science Publishing, and publisher of many journals Academy III fellows will be familiar with, continues to thrive. In addition to publishing versions of our reports and policy briefings in an academic format, the journal contains many other papers from RSC Fellows and College Members. The founding editor, Jules Blais of the University of Ottawa, recently published an editorial summarizing the success of the journal over its first 5 years. For example, articles in *FACETS* are indexed on all the major platforms. Importantly, RSC Fellows and Members receive a 30% discounted APC rate on submissions of Research articles, Communications, Notes, Science Applications Forum articles and Comments. Review articles, perspectives, and editorials are free. The journal has recently named a co-editor-in-chief, Fanie Pelletier of the Université de Sherbrooke, who is a RSC College member.

Moving on to other initiatives, similar to last year, given the pandemic, many of our international efforts were either "on hold" or being held remotely. Nonetheless, initiatives are underway. For example, I was pleased to represent the RSC, along with other fellows and members, at the Austrian Academy of Sciences Joint Academy Day with the RSC which was held (remotely) in March 2021. A number of sessions were held, including ones on "Multicultural Citizenship" and "Healthy Societies", as well as panels dedicated to responsibilities of academies in the 21st century, interdisciplinary cooperation on global problems, and the COVID-19 crisis. In addition, I chaired and spoke at a panel entitled: "Arctic and Alpine Environmental Change".

As President of the Academy of Science, I will also have the pleasure of presenting (again remotely) the Huntsman Medal to Dr. Shubha Sathyendranath on November 26. The Academy of Science values its 42-year association with the A.G. Huntsman Award for Excellence in the Marine Sciences, underscoring the importance of marine science to Canadians. We have now solidified our relationship with the Huntsman Foundation, with the signing of a MOU in December.

Finally, many of you have heard about the work of Dr. Marie D'Iorio's committee, who is Chair of the RSC Membership Committee. For over a year, her committee has been undertaking the critical task of updating our structure and distribution of new Fellows and Members of College. This will potentially have important implications for our Academy. Council is working its way through the report but one important change, that has already been implemented by RSC Council, is that the former Life Science Divisions has been split into two divisions, namely Medical Sciences and Biological Sciences. So, we now have 5 divisions in the Academy of Science. For those of you who are involved in RSC nominations this year, you will see the five divisions are already listed in the nomination package.

For current fellows in the Life Sciences Division, this does mean some changes, as the Life Sciences Division no longer exists, and so these fellows will need to decide if they wish to be in the Medical Sciences or the Biological Sciences division. Our current plan is to simply ask Life Science fellows which division they will be more comfortable in and re-assign them.

I have asked Graham Bell (McGill University), former President of the RSC, and who has graciously agreed to act as interim Director for the new Biological Sciences Division during its inaugural year, to speak to us about this new Division, later on in our meeting. Patricia O'Campo (University of Toronto), who was the Director of Life Sciences, will continue on in her role as a Director, but now of the new Medical Sciences Division.

Finally, I want to take this time to thank several people for their excellent work for the RSC. First, Darren Gilmour and our Walter House team, who have worked very hard and efficiently to make things work in these very difficult times.

I would also like to thank retiring EOAS Director Bernie Boudreau (Dalhousie University) for all his hard work, and I welcome the new EOAS Director Keiko Hattori, University of Ottawa. I would also like to welcome David Thomas (McGill University) as our new Secretary of the Academy of Science, replacing Gary Slater (University of Ottawa), whose exemplary service in this capacity for 4 years is legendary.

I also want to welcome Michel Tremblay (McGill University) who will become the President-Elect of our Academy after this COEE. I have asked Michel to say a few words as well later in this meeting.
Thanks also to everyone who has worked on committees and so forth for the RSC, especially the Selection Committees, who do a very important and difficult job.
Thank you. Merci.

John P. Smol, OC, PhD, FRSC, FRS
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President, Academy of Science, Royal Society of Canada
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Appendix: Reports of the Selection Committees of the Divisions of Academy III

Chair's report, Fellowship Committee of the Division of Applied Science and Engineering, Academy of Science, **the Royal Society of Canada.**

Our division received 75 candidates for regular fellowship and four candidates as international fellows for the current nomination cycle, 2020-2021. This represents a substantial increase, since in the previous two cycles the number of candidates was around 40-50. The number of nominations had decreased once the rules changed, limiting the validity of each nomination to one cycle. It is likely that the increase was somehow related to the pandemic.

As such, after consulting the previous division director Claudio Canizares, another past division director [Michel Tremblay], the Academy's President John Smol, the President (Jeremy McNeil) and the Secretary (Sheila Embleton) of the RSC, I consulted the committee and after discussion we decided to split the ASE committee into three "disciplinary" sub-committees [materials/chemical/biomedical engineering; mechanical/civil engineering; electrical/computer engineering], assigning about 25 nomination packages to each. To this end I recruited one additional committee member with expertise in biomedical engineering (Raj Rangayyan). I myself participated as voting member in one sub-committee [materials/chemical/biomedical] and as non-voting moderator in the other two. Looking at the composition of the committee and of other potential choices, it is clear that maintaining a reasonably balanced geographical / disciplinary / EDI representation is always a challenge for the ASE Division.

Committee members first identified any conflict of interest, then sent their scores to me and or Chris Dragan. Chris computed the average scores and standard deviations for each candidate, then shared the corresponding Excel files with each sub-committee.

Each sub-committee was tasked with selecting 6-7 finalists for a second plenary round, through which we selected our recommended candidates for election as well as selection of our international fellows. Even though I voted in only one sub-committee, I read all files which allowed me to participate in the discussions. Before each meeting, I recapped our selection criteria (reported below, "inherited" from C. Canizares), our objectives and the importance of considering equity, diversity and inclusion (EDI) in our deliberations and selections. Only one committee member (Hoda ElMaraghy) was absent in the first phase meeting due to scheduling conflict but she provided her ranking and comments prior to the meeting, and only one was absent in the final plenary session (Howard Wheater, likely due to the time difference; he also provided his ranking prior to the meeting).

During the final plenary round, we selected, as expected, the full number of candidates we were allowed to select. The meetings were all very collegial and the discussions were respectful and constructive.

The committee members for this cycle were:

Simaan AbouRizk (UofA)

Cristina Amon (UofT)

Robert Boily (Inforex)

Reza Iravani (UofT)

Hoda ElMaraghy (UWindsor)

Thomas Oxland (UBC)

Raj Rangayyan (UofC)

Federico Rosei (INRS)

Bonnie Schmidt (Let's talk science)

Sherman Shen (Waterloo)
Howard Wheater (UofS)

David Wilkinson (UBC)

David Zhang (Chinese University of Hong Kong)

Christopher Dragan from the RSC assisted us throughout the process.

Subsequent to the sub-committee meetings, we had shortlisted candidates for discussion in the final plenary session.

After a fairly long introductory discussion FR suggested that, in the interest of time, candidates should be voted by majority on who should be in or out of the final selection.

The next round determined the following "moves." During the final round we decided as follows (in alphabetical order):

N. Balakrishnan (McMaster)

Michael Eskin (Manitoba)
Masoud Farzaneh (UQAC)

Lyndon Jones (Waterloo)

Shana Kelley (University of Toronto)

Mohini Sain (University of

Toronto)

Qiang Yang (HKUST)

Karim Zaghib (McGill University)

During the final plenary meeting we also assessed the four international candidates. Only one international fellow was approved among four candidates, namely Harold Vincent Poor from Princeton University. In addition to an outstanding CV and record of honours and accomplishments, he has an honorary degree from UWaterloo and is a Fellow of the Canadian Academy of Engineering. His detailed appraisal describes numerous collaborations, joint papers and other contributions to Canada over a period of several decades.

Following discussion, all the other candidates were removed from consideration due to lack of contributions to Canada.

Selection criteria:

(1) recognized international leaders in the field, as confirmed by references of similar or higher stature.

(2) extensive publication lists in the best journals in their respective fields, with substantial citations (as appropriate within their discipline).

(3) fellows of their own professional societies and preferably of more than one society as well as other academies.

(4) major awards, honours and distinctions, at the national and preferably international level.

(5) significant funding for supporting their research.

(6) outstanding track record of supervision of highly qualified personnel.

I cautioned the committee that the last two criteria are essentially only applicable to candidates from academia. The job description for scholars in industry and national laboratories does not include supervision of young scientists and often does not require to secure external funds. In addition, scholars from industry are less likely to publish in scholarly journals and more likely to submit patent applications; they should be assessed in relation to their realizations in applied research. There were in fact extensive debates about several crucial aspects, including how to assess candidates who have somewhat different profiles (for example from industry, or from national laboratories), whether Canadian citizens who reside abroad should be expected to have contributions to Canada, and whether certain candidates were a good "fit" for our division of applied science and engineering. Additional details are found at the end of this report, in the section on feedback from committee members.

In the case of international candidates, I insisted that their level of scholarship and distinction should be (much) higher than that of typical regular fellows and in addition, they should have demonstrated contributions to Canada.

Feedback from committee members:

After our plenary session I asked committee members to send some constructive criticism and feedback by email. Most committee members seemed satisfied with the process and made positive remarks about this year's process.

I slightly edited their comments for clarity.

TO mentioned that the guidelines should be clearer, in particular concerning expectations of "contributions to Canada" for regular candidates who do not live in Canada, in particular if they have carried out a significant part of their career abroad. This is a point that has been debated during committee meetings as the written guidelines are somewhat ambiguous.

SS highlighted that industry candidates since are not easily recognized since their profile is often very different from the majority of candidates, who are from academia. He also indicated that the number of slots offered to each division should be proportional to the number of nominations.

RB would like to rank the evaluation criteria in order of importance (or define a percentage for each criterion) as is often the case in awards programs. He also thinks it is important to have robust evaluation criteria that can be applied to academics as well as candidates from industry and from national laboratories (e.g. the National Research Council, the Canadian Space Agency etc.). Candidates from the private sector or from national labs tend to have fewer publications; they may be encouraged to apply for patents instead of publish papers. They typically are not expected to train young scientists and may not necessarily need to secure external funds.

BS remarked that last year we had nearly 60 files to review and that was very challenging, given the time constraints. The way it worked this year was more manageable. She indicated that the report might clearly state a threshold that drives subcommittee structure, unless that becomes a permanent operating feature.

RR suggests discussing with other RSC committees how applied science is defined. If candidates are moved around the Academy's and more candidates are put into this basket, the ASE committee should get more slots for candidate recommendations. He also finds that the number of seats available for each division's committee should be made proportional to the number of nominations received instead of a fixed number (which was determined how?).

HE remarked that this year's selection process worked very well. The sub-groups scheme greatly reduced the efforts and was just as rigorous as before.

CA noted the importance of having a clear definition of Applied Science. She proposed that the first step in the selection process should be to determine whether the applications are submitted to the right division section or need to be moved. In her view this year there were 2-3 cases that some committee members thought did not correspond to ASE. These cases had been previously submitted to other sections, apparently more suitable, and were not successful.

2021 EOAS Ranking and Explanation

The following ranking was agreed by consensus of the EOAS DCSNF during a Zoom conference on 8 February 2021. Participating were: Bernard Boudreau (Chair), Sarah-Jane Barnes, Irena Creed, Keiko Hattori, Peter Leavitt, Graham Pearson, Nigel Roulet, Kim Strong and Christopher Dragan (RSC).

Scoring

Soring was done independently and without consultations prior to the meeting. Scores below are the mean of the 8 individual rankings (minus COIs). Perfect top score is 1 and lowest score would be 15. We recognize that all rankings, including our own, are subjective.

Recommended for Fellowships (in alphabetical order)

The following nominees have received the highest levels of support from the Selection Committee members. They are undoubtedly at the top of their respective fields (Internationally and domestically) and have publication records, impact levels and involvement in scientific leadership that can only be described as exceptional.

Arthur Dyke (retired from Geological Survey of Canada)

Dr. Arthur Dyke has revolutionized our understanding of North American ice sheets and sea level change inspired by four decades of innovative mapping across Arctic Canada as an Officer of the Geological Survey of Canada. His prescient reconstructions of environmental change spanning the past 20,000 years are prominently recognized world-wide and continue to illuminate sister disciplines ranging from oceanography and geophysics to biology and archeology, elevating Canada's international scientific legacy. 239 refereed publications and maps, 14539 Citations, H = 49.

Julie Laroche (Dalhousie U.)

She has pioneered the combined application of molecular approaches with large-scale thinking, which has become the foundation of much of modern biological oceanography. She has as a result fundamentally changed our understanding of the global nitrogen cycle and the role of iron in limiting the primary productivity of the planet. 112 publications, 23233 Citations, H = 65.

Boris Worm (Dalhousie U.)

An internationally leading marine ecologist and fisheries scientist, his work has profoundly and visibly advanced current thinking in both fisheries science and biological oceanography. His research focuses on human effects on marine ecosystems, spatial fisheries ecology, large-scale patterns and drivers of marine biodiversity, and solutions for marine management and conservation. 131 publications, 2 Books, 35542 Citations, H = 68.

Xuebin Zhang (Environment and Climate Change Canada)

Internationally eminent contributions to understanding how and why the climate, including its extreme weather and climate events with major societal impacts, has changed over the past century and how it is likely to change in the future. 147 publications, 1 Books, 31253 Citations, H = 65.

Foreign Fellow candidate

No to fellowship

ACADEMY OF SCIENCE
DIVISION OF LIFE SCIENCES
DIVISION COMMITTEE FOR THE SELECTION OF NEW FELLOWS
REPORT OF THE COMMITTEE - 2021

Date: March 1, 2021

A. Committee members:

1. Patricia O'Campo (University of Toronto) *Biomedical 2 subcommittee – Chair*
2. V. Wee Yong (University of Calgary) *Biomedical 2 subcommittee - Secretary*
3. Doug Chivers (University of Saskatchewan) *Biology subcommittee*
4. Lenore Fahrig (Carleton University) *Biology subcommittee*
5. Rui Wang (York University) *Biology subcommittee*
6. Sara Iverson (Dalhousie University) *Biology subcommittee*
7. Nada Jabado (McGill University) *Biomedical 1 subcommittee*
8. David Huntsman (University of British Columbia) *Biomedical 1 subcommittee*
9. Shoukat Dedhar (University of British Columbia) *Biomedical 1 subcommittee*
10. Rima Rozen (McGill University) *Biomedical 1 subcommittee*
11. Judy Illes (University of British Columbia) *Biomedical 2 subcommittee*
12. Harold Robertson (Dalhousie University) *Biomedical 2 subcommittee*

B. Number of files reviewed by the committee: 106 + 2 Foreign Fellow nomination = **108.** (Note: there were 97 + 1 foreign files last year).

The regular fellow files were divided for evaluation into 34 for Biology, and 37 each for Biomedical 1 and 2 subcommittees.

In Stage 1 of scoring, the top 10 average scored files from each subcommittee were identified to enter Stage 2. Each reviewer then individually ranked the 30 files in Stage 2 and the average for each candidate was obtained. The ranking was sent by Patricia to committee members on Feb 26th. A Zoom meeting lasting 90 minutes occurred on March 1 2021 to formally select and approve the files to be recommended for election.

C. Representativeness of the selected fellows.

As in previous years, we had to select candidates for election, identified below. We have carefully examined the representativenessby: excellence of the file, sex, ethnic minority, french speaking and university with low representation in the LS division.

- There are 5 women (Davidge, MacDonald,McCoy, McMillan, Straus) in the recommended list
- One indigenous scholar (King) is in the recommended list
- Regrettably, only 2 (Brun, Hendry) are from the Biological Sciences.
- Three of the selected academics are from francophone universities (Brun and Rudd, University of Montreal; Simard, Laval).
- Of the selected dossiers, one (Sutherland) is from a university without medical school (Lethbridge).

The committee recommends that all these individuals, in addition to the foreign nomination, be welcome as fellows of the RSC.

D. List of candidates recommended for election (in alphabetical order):
- Brun, Yves, University of Montreal
- Davidge, Sandra, University of Alberta
- Hendry, Andrew, McGill University
- Hill, Michael, University of Calgary
- King, Malcolm, University of Saskatchewan
- Macdonald, Noni, Dalhousie University
- Macmillan, Harriet, McMaster University
- Matlashewski, Greg, McGill University
- McCoy, Cathy, University of Calgary
- Northoff, Georg, University of Ottawa
- Roux, Benoit, University of Chicago
- Rudd, Christopher, University of Montreal
- Simard, Jacques, University of Laval
- Straus, Sharon, University of Toronto
- Sutherland, Robert, Lethbridge University
- Szatmari, Peter, University of Toronto
- Turecki, Gustavo, McGill University
- van der Kooy, Derek, University of Toronto
- Yaffe, Martin, University of Toronto

E. **Foreign fellow:** The committee received two foreign candidatures and recommended Dr. Nils Stenseth, University of Oslo, for election.

Suggestions/Comments regarding the nomination and review processes:

- The division of Life Sciences receives nominations from the biological sciences and from the biomedical sciences fields. The experiences with this issue over the past decade suggests that these two research fields of the RSC should be examined in different divisions. While we do not think that the integration of the two fields resulted in only two biology candidates nominated in the final recommendations, we would like to formally recommend that the RSC convene an ad hoc committee in 2021 to consider splitting the LS division into two novel divisions: *biological sciences* and *biomedical sciences*. This will result in a fairer and more consistent review.

- It is recommended that reviewers attend a session on what constitutes a successful RSC candidate. There is uncertainly amongst some reviewers as to whether excellence in fundamental science equates with excellence in clinical or societal achievements, and this contributed to some variability in the scoring of a candidate.

- It is strongly recommend that our committee takes unconscious bias training modules designed to make reviewers aware of gender bias often present in candidate reviews. Overall, we are comfortable that the review panel selected the final list of candidates based on considerations of excellence, equity and diversity issues.

- We experienced occasional challenges due to sub-committee members being from the same university resulting in conflicts, complex review reassignments to avoid conflicts, and fewer scores for some files. Nonetheless, in Stage 1, all files were ranked by at least 3 reviewers (and at least 10 reviewers per file in Stage 2). RSC should provide greater guidance to new and incoming chairs to avoid having multiple reviewers from the same institution.

- Finally, we would like to propose that in the LS division, the Chair of the committee be a non-voting member of the committee. This will make the discussion on the selection of final selections easier and more collegial.

This Life Science Division report is submitted by Dr. Patricia O'Campo (Chair) and Dr. Wee Yong (Secretary).

Yours truly,

Patricia O'Campo Ph.D., F.R.S.C.

V. Wee Yong, Ph.D., F.R.S.C.

2021 Nominees for Royal Society Fellowship from Mathematical and Physical Sciences Committee

March 18, 2021

Recommendations for election (in alphabetical order)

- Alejandro Adem, The University of British Columbia
- John Bechhoefer, Simon Fraser University
- Curtis Berlinguette, The University of British Columbia
- Sheelagh Carpendale, Simon Fraser University
- Richard Cook, University of Waterloo
- Steven Holdcroft, Simon Fraser University
- Xing-Fang Li, University of Alberta
- David London, Université de Montréal
- Norman W. Murray, University of Toronto
- Raymond Ng, The University of British Columbia

Detailed descriptions of each nominee follow in order as presented above.

Alejandro ADEM (Mathematics, UBC)

Algebraic topology is the broad and deep field of mathematics that aims to study topological spaces using abstract algebra. Group cohomology is a specialization within this field that aims to study and elucidate group properties through the study of group actions and in turn provide insight into their structures.

Alejandro Adem is one of the world's leading experts in this area. He has made important qualitative and calculational contributions to the theory of group cohomology and applied his results to different problems in algebraic topology. For instance, he used spherical fibrations to solve the longstanding problem of characterizing topological spaces with periodic cohomology. He also produced the first large-scale computations for the cohomology of sporadic simple groups. Moreover, he used equivariant topology and representation theory to establish the fundamental properties of twisted orbifold K-theory and to offer fresh perspectives on their connections with string theory. These breakthroughs were highly acclaimed and will have a lasting influence within the field.

A testimony of the importance of Adem's work is the fact that some of his results have been published in the two most prestigious journals in mathematics: the *Annals of Mathematics* and *Inventiones Mathematicae*. Adem also authored two very well received and impactful monographs based on his research discoveries: one entitled *Cohomology of Finite Groups* and the other *Orbifolds and Stringy Topology*. These books, which are already regarded as classics, have by-and-large shaped the eponym fields. Adem has also been deeply involved in the training of young researchers and has supervised more than 40 PhD students and postdocs. In addition, he is in high demand as a speaker.

Adem has received numerous awards and distinctions, among which the Jeffery-Williams prize of the Canadian Mathematical Society (CMS) for outstanding contributions. He is a Fellow of both the CMS and the American Mathematical Society (AMS), as well as a corresponding member of the Mexican Academy of Sciences.

A highly distinguished group of mathematicians wrote in support of Alejandro Adem's election to the Royal Society of Canada. U. Tillmann from Oxford wrote that Adem is the "leading and most prominent algebraic topologist in Canada. He has a lasting impact on mathematics." W. Lück from Bonn notes that "One paper in the *Annals of Mathematics* and three in *Inventiones* is outstanding." E. Friedlander from USC said of Adem that "He has an admirable record as a mentor. He is extremely well qualified for FRSC." Finally, J. Morava from Johns Hopkins states that "Adem is a leading figure in mathematics today (…) his work will focus the efforts of generations of mathematicians."

Over and above all that precedes, Adem has an extraordinary service track record as editor of journals, Director of the Pacific Institute for the Mathematical Sciences (PIMS), CEO of MITACS, and now, President of the Natural Sciences and Engineering Research Council of Canada (NSERC).

John Bechhoeffer, Simon Fraser University, Appraisal of FRSC nominee, March 2021

At the nanoscale concepts of heat, work, energy and enthropy are modified in fundamental ways, as the clear separation between large objects and their molecular constituents begins to blur and fluctuations begin to play a key role. Extending our understanding of statistical physics and biophysics to nanoscale systems is essential to making progress in nanotechnology. Bechhoefer has become a global leader in this field, one of the most prominent experimentalists and theorists uncovering how the laws of thermodynamics "scale down" to microscopic systems. Bechhoefer made several seminal contributions elucidating the role, nature and applications of thermal fluctuations at the nanoscale. His work validated Landauer's principle, establishing the limit on the energy cost of erasure of information, confirming the long sought link between thermodynamics and information processing. His "information as a fuel" work was awarded the million dollar Foundational Institute Grant. In related work Bechhoefer group showed how a small system can be constructed to cool exponentially faster than typical, an observation with practical implications warranting publication in *Nature* in August 2020. His proposal how to control thermal fluctuations allowed Bechhoefer to revolutionize the atomic force microscopy (AFM) allowing for quantitative force measurements, an advance considered second only to the inventionof AFM itself by Bining(Nobel Prize). This significant advance was cited over 4000 times and incorporated into commercial AFMs, enabling quantitative AFM measurements with large impact on nanotechnology. In biophysics Bechhoefer introduced a class of "kinetic" models of DNA replication, allowing for the understanding of how, despite the randomness of the underlying replication, the duration of the process is tightly controlled. His work on DNA replication led to a prestigious collaborative research award from the Human Frontiers Science Program. These outstanding results led the referees to describe Professor Bechhoefer as a scientist who "holds an enviable national and international reputation" and "who has made a number of seminal contributions to both experiment and theory". The extremely positive evaluations come from referees who are globally recognized experts in nanotechnology, thermodynamics and biophysics at the nanoscale. Goldstein is a Schlumberger Prof at Cambridge, Franklin Medal and FRS; Grutter is a McGill Prof, former CIFAR Nanoelectronics Program Director, APS Fellow and FRSC; Jarzynski, Prof at uMaryland, is APS Fellow, Sackler and Onsager Prize winner, member of US NAS; Leibler is Perkin Professor at New York University and IAS at Princeton, recipient of Delbruc Prize, Humboldt Research Prize, and member of US NAS. Slater is Professor at uOttawa, APS Fellow and FRSC. Goldstein describes Bechhoefer as scientist who "made seminal contributions to several distinct areas of science, including nanotechnology, the nonlinear dynamics of pattern formation, molecular biophysics, and statistical physics. Grutter says" Bechhoefer's contribution to AFM calibration method allows the AFM, one of the core tools of nanoscience, to easily *quantitatively* measure forces. His is the second highest cited paper in the field of AFM". Jarzynski writes: "Bechhoefer has become one of the most prominent experimentalists in the field of stochastic thermodynamics, which seeks to understand how the laws of thermodynamics "scale down" to microscopic systems". Slater describes Bechhoefer as "one of the most original, creative and impactful physicist/biophysicist in our country, a true trailblazer of international reputation and stature." With seminal contributions to nanotechnology and statistical mechanics reported in over 100 papers in prestigious journals such as Nature, Phys.Rev.Letters, PNAS and Rev. Mod. Physics, recognition as APS and Sloan Fellow, Bechhoeffer is clearly deserving the recognition of the Fellowship of the RSC.

Curtis BERLINGUETTE

Prof. Curtis P. Berlinguette is a Professor of Chemistry and Chemical & Biological Engineering at the University of British Columbia. He is a CIFAR Program Co-Director and Principal Investigator at the Stewart Blusson Quantum Matter Institute (SBQMI).

Prof. Berlinguette leads an interdisciplinary team of sscientists and engineers at UBC seeking ways to discover and scale disruptive clean energy materials. He tackles important problems in clean energy applications including CO_2 utilization, next-generation solar cells, and self-driving labs. He is CEO of a company that is commercializing smart windows to reduce the energy footprint of buildings. The real-world impact of his research is also seen in the diverse companies that sponsor his research, which includes Google, 3M, and TOTAL. The fundamental advances he is making are seen in his publication list, which include a remarkable 13 publications in Nature/Science journals.

His letter writers include top international scientists from Harvard, Berekely and the University of Toronto. Dan Nocera from Harvard, the recognized world leader in green energy writes:

> "The depth of his scholarship and willingness to attack difficult problems together with his creative flair makes him stand out as the top young chemist in energy science in the world today."

He compares Berlinguette's work to that of Michael Grätzel (H index 274), the world leader in solar cells, top candidate for the Nobel prize in Chemistry, and writes that Berlinguette has made discoveries that eluded Grätzel. He goes on to write:

> "**Curtis' research portfolio establishes him as THE star of materials energy science**. He shows a pioneering spirit by tackling the fundamental processes of energy conversion by inventing a dizzying array of new approaches with a creative flair that is head and shoulders above his peers."

Sheelagh Carpendale, Simon Fraser University (Information visualization)

Over the last few years, it has become an adage that 'data is the new oil'. Data, long critical to scientific endeavours, is now increasingly relied upon for a wide range of social and economic analysis and policy making. Professor Sheelagh Carpendale is fundamentally committed to empowering people to make data, and information, more accessible, transparent and comprehensible. She has introduced a game changing technique referred to as constructive visualization that builds on people's inherent understanding and experience with the physical world to enable non-experts to comprehend, create and engage with data and data visualizations. She has collaborated to increase the use and accessibility across a wide range of disciplines and organizations, including the WHO, patient care, education, nutrition and more. These collaborations have been at the highest level: her work with the British Antarctic Survey won a BAFTA award.

Her referees are themselves high achievers in information visualization (Shneiderman is a Fellow of the AAAS, ACM, IEEE and NAI), human-computer interaction (Greenberg is a FRSC and an ACM Fellow, and Mazalek and Mandryk are members of the RSC College) and statistics (Reid is an Officer of the Order of Canada, a Fellow of the Royal Society of Canada, of London and of Edinburgh and of the AAAS, and a Foreign Associate of the National Academy of Sciences). Professor Shneiderman notes Professor Carpendale's "valuable contributions to 3D visualization, collaborative computing, and tabletop interfaces" and notes her "receipt of the IEEE Visualization Career Award and election to the ACM CHI Academy" as indications "her work is widely recognized and valued". Professor Greenberg notes that Professor Carpendale's work is truly interdisciplinary, citing her influence in Chemistry "as evident in her high-impact paper in the Proc. National Academy of Science". Professors Mazalek and Mandryk both refer to Professor Carpendale's dedication to the mentorship and training of students and postdocs, with Professor Mandryk citing how Professor Carpendale has "seed[ed] the international community with many of its rising stars who [have] received accolades themselves". Professor Reid summarizes the high praise of all the referees, writing "Professor Carpendale and the students under her leadership have created a remarkable and remarkably original oeuvre that inspires and educates all of us. Prof[essor] Carpendale is a national treasure."

Richard J. COOK (Statistics, University of Waterloo)

The statistical analysis of life history processes is crucial to the understanding of patterns in events and related factors that occur over the lifetime of an individual. In health research, for example, stochastic models are used to study the onset, progression, and treatment of disease; in economics and social science, they are used to study educational attainment, employment, and income. The scope of application for statistical methods in these areas is vast.

Richard Cook is one of the world's leading researchers in the development of models and statistical methods for studying life history processes. He is also a major force in promoting the use of such methods in medicine, where his work has had a major impact on areas such as transfusion medicine, cancer trials, and rheumatology. He has an outstanding record of important methodological papers which have changed the way in which trials with recurrent event outcomes (e.g., repeated asthma attacks) are designed and analyzed, improved interim monitoring during clinical trials, and refined statistical analysis in cases where both terminal events and event-dependent losses to follow-up are present. Moreover, he has made major contributions to the design and analysis of studies based on multi-state models, and shown how to deal with thorny issues such as process-dependent selection of subjects and dropouts in longitudinal studies.

Richard Cook's impact in statistics and medicine is evident through his extensive publication record, which comprises over 140 methodological articles, nearly 200 in health science, and two highly cited, prescient, and influential books on the analysis of recurrent events, as well as through the multiple accolades which he has received, including the Canadian mid-career CRM-SSC Prize in Statistics (2007), the Gold Medal in Research of the Statistical Society of Canada (2017), a Canada Research Chair (2005-19), and a fellowship in the American Statistical Association (2007). Furthermore, he has been a superlative mentor to over 25 PhD students. His *Google Scholar* h-index currently stands at 87, with nearly 33,000 citations to his work.

The letters in support of Richard Cook's nomination to the Royal Society of Canada were written by luminaries in the field: O. Aalen is one of the creators of dynamic event history analysis and a fellow of the Norwegian Academy of Science and Letters; V. Farewell, N. Jewell, and R. Prentice are among the world's top researchers in biomedical statistics, and the recipients of nearly all possible honors in the field; and G. Guyatt, FRSC, OC, is a world leader in evidence-based medicine and a member of the Canadian Medical Hall of Fame. These five referees unanimously praise Richard Cook for his contributions, which are described as "beyond outstanding" in their breadth, scope, originality, and importance. Aalen describes him as "undoubtedly one of the foremost researchers in the analysis of complex history data," and Farewell confirms that he is a "pre-eminent researcher worldwide in event history analysis." Jewell and Prentice are equally effusive, noting that Richard Cook is "an outstanding biostatistician with few peers in his generation nationally and internationally," prolific and impactful, with "contributions (that) include considerable ingenuity and have both high reliability and high impact." Finally, Guyatt praises him for his impressive "commitment to building capacity for quantitative health research in Canada."

In sum, Richard J. Cook is unquestionably deserving of Fellowship in the Royal Society of Canada.

Steven HOLDCROFT, Simon Fraser University (Chemistry)

Steven Holdcroft is a world leader in electrochemical materials for clean energy technology. His ground-breaking work on hydrocarbon membranes revolutionized fuel cell technology as part of pollution-free energy conversion devices. His work fundamental work on electrode structures and pore size distribution has provided insight into gas transport, proton conductivity and electrochemical activity. Steven Holdcroft has been at the centre of this area and is leading internationally in the field of polymer chemistry, membrane science and electrochemistry.

Holdcroft's impact has been recognized by numerous awards, including the CSC Rio Tinto/Alcan Award for his outstanding contributions in Electrochemistry, the CIC Macromolecular Science and Engineering Division Award and others. Holdcroft has published more than 260 papers that have receive in excess of 17,000 citations to date and has an H-index of 71.

His leadership during a 12-year partial secondment to Canada's National Research Council - Institute for Fuel Cell Innovation (NRC-IFCI) was instrumental in building Canada's global reputation in leading-edge fuel cell technology research, and for the promotion of Canada's commercialization of fuel cell technology. He founded the Catalysis Research for Polymer Electrolyte Fuel Cell Network (CaRPE-FC), one of the largest collaborative research projects of its kind, to foster fundamental catalyst research in fuel cell technology.

The referees who are specialists in materials, fuel cell and membrane technologies describe his approach as innovative and recognize his ability for translational work by maintaining a "strong link with industry and the practical exploitation of his research". Crudden concludes that his "work has enabled unparalleled insight into the relationship between structure and function for these highly important materials." Wilkinson writes "that professor Holdcroft has had a significant impact on the fuel cell industry in Canada and elsewhere."

Xing-Fang Li, University of Alberta (Chemistry)

Our environment is under threat from a wide range of man-made pollutants that find entry into our food chain and present a threat to us all. Clean water is at the centre of this issue. While the disinfection of drinking water is one of the important public health achievements of the twentieth century, chemical reactions between natural organic as well as inorganic matter present in water can lead to an unintended formation of toxic by-products - and this is at the core of Professor Li's research. **Dr. Xing-Fang Li** is an internationally recognized expert in analytical chemistry and water research, having focused her work on the development of innovative analytical techniques for the detection of environmental contaminants, microbial pathogens, and biomolecular interactions.

Li has been recognized for her achievements by receiving the Chemical Institute of Canada's Environment Research and Development Award for her "distinguished contributions to research and development in the field of environmental chemistry", the Canadian Society for Chemistry's W.A.E. McBryde Medal for her "significant achievements in pure or applied analytical chemistry", and most recently the CSC's Ricardo Aroca Award for "distinguished contributions to the field of analytical chemistry". In her work she is spanning the disciplines between analytical chemistry and toxicology "demonstrating the depth and breadth of her work", as is pointed out by Jerald Schnoor from the University of Iowa. Li has published 175 papers to date, has a H-index of 50 and her work has attracted more than 7500 citations.

Susan Richardson from U South Carolina states that Li is a "highly creative, innovative scientist and is making transformative advances in environmental chemistry" that have provided "insights into human exposure and health effects of environmental contaminants."

As David Sedlak from the University of California Berkeley puts it "Dr. Li's research group has produced far-reaching results." And her work on the risks of chlorinated drinking water has had a "major impact on the drinking water research community."

David London (Université de Montréal)

Dr. London is an exceptional theoretical physicist who has made critical contributions to our understanding of the "the standard model of particle physics (SMPP)", currently the most successful physical model of Nature at the most fundamental scales. Dr London's contributions are particularly notable because they link fundamental theoretical concepts to experimental results. He is responsible for innovative approaches that allow intricate and abstract concepts to be tested experimentally. Dr. London is a world expert in the field of "flavour physics" and charge-parity (CP) violation, the foundational idea at the basis of the lack of matter/anti-matter symmetry in the Universe. Indeed, he is considered "one of the fathers and main contributor of the very successful Flavour Physics Program", in the words of Joaquim Matias (UAB Barcelona, Head). The experimental confirmation of CP violation in B-mesons is widely considered one of the most promising avenues to study physics "beyond the standard model of particle physics", a major experimental and theoretical quest. Dr. London has contributed to the study of CP violation by designing analysis methods that reduce the uncertainties in the contrasting of experiment and theory. Dr. London has also contributed to many different aspects of "new physics", such as exotic fermions, CP violation in beta decay, supersymmetry, etc. Cliff Burgess (McMaster/Perimeter, FRSC) writes "Dr. London has the kind of international stature that is rare even among the rarified ranks of RSC fellows". In addition, Prof. Boris Kayser (Fermilab) adds "This B physics program is without a doubt one of the leading successes of elementary particle physics of the last several decades. Nobody, anywhere in the world, has done more to create the theoretical arena in which this program has played out – and will continue to play out – than David London". His publication record show 152 refereed articles with over 11,000 citations, tow of which have been cited over 500 times, with an h-index of 54. Dr. London was awarded the 2014 CAP-TRIUMF Medal for contributions to Subatomic Physics.

Norman Murray (Toronto)

Dr. Murray is Canadian astronomer of international stature, well known for his contributions to a broad spectrum of astrophysical problems, from theories of planet formation, to the long-term evolution of the Solar System, to the astrophysics of accretion onto supermassive black holes, to the "feedback" effects of star formation and black hole accretion on the evolution of galaxies. He has contributed key revolutionary insights to each of these diverse problems, a feat reserved to an elite group of scientists able to draw from diverse fields to solve some of the most difficult and pending problems in Astrophysics. This versatility is widely recognized in the community: one of his referees, Prof. Andrea Ghez (UCLA, 2020 Physics Nobel Laureate) writes that "Professor Murray is a world-wide leader in the field of Theoretical Astrophysics and he has done transformational work in an unusually wide-range of areas, ranging from planetary dynamics to large- scale feedback occurring on multiple scales in galaxies". This assessment is confirmed and extended by Prof. Reinhard Genzel (Max-Planck Institute for Extraterrestrial Physics, 2020 Physics Nobel Laureate), who writes "He is one of the relatively few 'Renaissance' theoreticians in astronomy, with an incredible breadth, deep physical knowledge and a knack for connecting basic theoretical work with observations". His nomination package include strong support from three other recognized world leaders in Astrophysics: Peter Goldreich (UC Berkeley, National Medal of Science, Astronomy Shaw Prize winner), Juna Kollmeier (Carnegie, Director of Sloan Digital Sky Survey V), Scott Tremaine (CITA, Princeton, FRS, FRSC, Member US National Academy of Sciences). Prof. Murray has been since 1993 a {rofessor at the Canadian Institute for Theoretical Astrophysics (CITA) at the University of Toronto, and has been CITA's director since 2006. Honours and awards include: Canada Research Chair since 2001, Fellow of the American Physical Society, Ontario's Premier Research Excellence Award, Fellow of the American Association for the Advancement of Science, Miller Visiting Professor at UC Berkeley. Publications: 168 refereed papers, 16,029 citations, h-index= 71.

Raymond Ng, The University of British Columbia (Computer Science and Computational Genomics)

Dr. Ng has made pioneering contributions to data clustering, outlier detection and health informatics. He has led the development of novel computational techniques to mine genomics, proteomics and clinical data that have enabled the development of biomarker panels for various chronic diseases, including diagnosing acute rejection of transplanted hearts, diagnosing and prognosing acute exacerbations for Chronic Obstructive Pulmonary Disease and Cystic Fibrosis patients.

Within computer science, he is most well-known internationally for two central problems in data mining: outlier detection and data clustering. Dr. Ng's randomized clustering algorithm proposed in 1994 was the first of its kind, that can scale up to large data sets that contain millions of records and tens of thousands of attributes. The method also minimizes the need for human domain knowledge. For over two decades, his method has been used as a benchmark for new clustering algorithms. Dr. Ng identified two pioneering approaches for efficiently detecting outliers in large multidimensional data sets. In 1998, with Knorr (his doctoral student), Ng first proposed a novel approach for identifying global outliers. Two years later, Ng and his collaborators proposed a complementary framework for identifying local outliers. These two notions of outliers have completely transformed the field.

In the early days of genome sequencing, Dr. Ng recognized the huge potential for data mining to transform personalized medicine and genomics. In the field of cancer, Dr. Ng has been the lead computational scientist in interdisciplinary projects to analyze human DNA copy number variations in normal and diseased populations, particularly in lung cancers. Together with Shah (his doctoral student), Ng proposed novel machine learning based models to capture spatial dependencies of regions in comparative genomic hybridization arrays. Beyond cancer applications, Ng also recognized the huge potential computational techniques can be applied to the management of various chronic diseases. For over a decade, he has been the Chief Informatics Officer of the Centre of Excellence for the Prevention of Organ Failures (PROOF Centre). He leads a team of computational biologists, statisticians, data scientists to handle all aspects of data analytics, particularly on multi-omics analysis. From a computation research standpoint, the key publications revolve around the development of novel pipelines and quality control tools for mining genomics and proteomics data. The team was awarded a 2010 Best Practices Award by the Bio-IT World organization, which is the largest organization in the US for health informatics research and development. The PROOF Centre was the first Canadian university-based organization to win the award.

His referees are themselves high achievers in both Computer Science and Medicine. Professor Jagadish, who ranks among the top 15 researchers in databases in the world, states "In the specific topic of outlier detection and explanation, I cannot think of anyone else in the world whose contributions equal [Prof. Ng's]." Professor Ozsu (FRSC) states "Prof. Ng is an outstanding computer scientist with international recognition. He has made important and foundational contributions in data management, data mining, and bioinformatics that have established him as a preeminent researcher and scientific leader." Professor McManus (FRSC, FCAHS, FACC, FCCS, FRCPC, FCAP, FAHA, FCCP) states that "The profoundly important nature of this [Professor Ng's] work relates to two main facets – one, the biomarker signatures have performance characteristics like sensitivity and sensitivity that are much improved over any previously existent laboratory test in given medical conditions, and two, his work has affected many particular disease populations including solid organ transplantation, cancers, common and mortal lung diseases like COPD, asthma, and cystic fibrosis, heart failure, hardening of the arteries, and others. Dr Ng's skills and insights have been a major component of a revolution in how we imagine the way the systems of the body enable, prevent and interact with risks and insults like ischemia, air pollution, genetic mistakes and infectious or immune insults. "