

Cape Breton University
Annual Research Report
2016

Introduction

This document is the fourth Annual Research Report for Cape Breton University. The annual research report uses the fiscal year as the reporting period to be compiled when the Canadian Association of University Business Officers' (CAUBO) annual financial reports are released. The report covers the period April 1, 2015 to March 31, 2016. While data in the report is shown in year-by-year graphic and tabular breakdowns, much of that data is also reported in three-year rolling totals. These figures better indicate trends in CBU's research climate and tend to take account of large individual grants that can have an inordinate effect on a single year's totals.

CBU's research activities are obviously very diverse and, therefore, difficult to quantify using one set of statistics or metrics in isolation from other sources of data and contextual description. To give a robust and complete picture of the research environment at CBU, the annual report examines every avenue of research work. The data reports on a varied range of activities including success in obtaining research funding, scholarly articles published, dissemination of research findings and commercialization and industry engagement. In addition to these quantitative measures, the annual report also includes a number of stories from individual researchers and groups that exemplify some of the kinds of innovation for which CBU is recognized. In this way, the Office of Research and Graduate Studies is pleased to present what we feel is an accurate characterization of the current state of research at CBU.

Financial data were taken from the CAUBO website and procured from the CBU Finance Office in preparation of the 2017 CAUBO report. Some data for academic publications were obtained from *Web of Science*¹. Industry engagement metrics were taken from the annual Springboard Atlantic reports. In addition, CBU researchers were asked to self-report via a survey related to research activities to gather some of the other data².

1. Research Highlights

The past year has brought many new research accomplishments. The following profiles offer a few examples of these outstanding achievements.

Adango Miadonye, Professor of Chemistry

Dr. Adango Miadonye is the winner of the 2016 President's Award for Excellence in Research. A Professor of Chemical Engineering and Chemistry, Adango Miadonye has received global recognition in the field of petroleum engineering and petroleum chemistry. Dr. Miadonye has been with CBU for more than 15 years and has been an Adjunct Professor of Petroleum Engineering at Dalhousie University since 2010. His impressive publication record includes 80 peer-reviewed articles, numerous book chapters, and frequent presentations at important national and international conferences. He is also the Program Chairperson and a member of the Board of Trustees (Atlantic Canada) for the Society of Petroleum Engineers. An accomplished and respected student supervisor, Dr. Miadonye is extensively cited and has formed the basis for several industrial collaborations. Well-respected by his colleagues nationally and internationally, Dr. Miadonye has been a leader and contributor to his professional academic community holding offices and serving on committees with numerous academic and

¹ *Web of Science*, previously known as (*ISI*) *Web of Knowledge*, is a Thomson Reuters product - world's leading citation database, covering authoritative, multidisciplinary content from 10,000+ high impact journals worldwide. It covers sciences, social sciences, arts and humanities, and includes Open Access journals and over 110,000 conference proceedings. Coverage: 1900-present available online.

² 53 responses were obtained, which is approximately 20% less than previous two years.

professional societies. He serves as Editor, Associate Editor and Editorial Board member to several petroleum engineering journals. Currently, Dr. Miadonye is interested in research investigating rheology and transport properties of reservoir fluids, heavy oil and bitumen, providing knowledge to improve production, enhanced oil recovery, upgrading, refining and transportation of one of Canada's richest resources. Dr. Miadonye's goal, in collaboration with industrial partners, is to develop a new, cleaner oil sands technology, an engineered micro-bubbles process that facilitates oil separation from the sand grains. The new technology has a potential to mitigate several environmental issues associated with current technologies and improve the bitumen recovery rate to over 60 percent. The successful outcome of this research idea promises millions of dollars in cost savings for one of Canada's largest industries.

Jason Loxton, Laboratory Technologist

The past year has been one of remarkable achievement for CBU's Jason Loxton. In July, he and a group of co-researchers published "Graptolite community responses to global climate change and the Late Ordovician mass extinction" in the prestigious *Proceedings of the National Academy of Sciences of the USA*. This study of nearly 22,000 fossils reveals that cataclysmic changes were happening in ancient species of plankton nearly 400,000 years before the first of Earth's five great extinctions. Mr. Loxton's research aims to fill in or provide narrative for the periods of time surrounding mass extinctions. He explains that "ordinarily when you look at mass extinction studies, what you're looking at is whether species are present or absent." While this is a useful practice that has in many ways defined the discipline, Mr. Loxton points out that "if you're studying the cod fishery, you could [ask] are cod there, or are there no cod? There are still cod there, there have always been cod there, but if you look only at whether cod are present or absent, you miss the entirety of the cod collapse." Instead of focusing on presence or absence, Mr. Loxton's work examines the valuable data that arises out of abundance and relative population. While this international collaboration may prove quite significant, Mr. Loxton humbly describes this work as filling in the "baby bookmarks" of mass extinction geological studies and "finishing up the tasks of all the granddaddies of geology from the 1850s."

Felix Odartey-Wellington, Associate Professor of Communication

The trajectory of Felix Odartey-Wellington's career is nothing if not unique. From his origins as a broadcaster and practicing lawyer in Ghana to Associate Professor of Communication specializing in Media Studies, it might be surprising to some to learn that Dr. Odartey-Wellington is also a Public Affairs Officer in the Canadian Armed Forces. Then again, given his research background, perhaps not. Dr. Odartey-Wellington describes his research nature as having a "media ecological focus." In short, he studies how the evolution of media technology shapes human affairs and experiences. This includes social, power and economic relations. This work has brought him into a number of dynamic international research collaborations. Most recently, Dr. Odartey-Wellington has worked with the Ghana Center for Democracy and Development, renowned Ghanaian investigative journalist Anas Aremeyaw Anas and similarly with Dr. Amin Alhassan of the University for Development Studies in Ghana. Together they have shed light on how emerging media technologies have enabled new forms and opportunities of surveillance, political violence and corruption as well as civil resistance.

Kathy Snow, Assistant Professor of Education

Dr. Kathy Snow is the recipient of the 2016 Canadian Association for University Continuing Education (CAUCE) Graduate Research Award for her doctoral dissertation which examined First Nations students' transition experiences in post-secondary education. She also received the CBU Instructional Leadership Award in May. Dr. Snow's current research interests are broad and include scientific literacy, science education, decolonizing and Indigenous pedagogy, blended-learning, educational technology, instructional design and networked learning. These project interests are united; however, they all focus on access and accessibility to education. The project entitled "Foundations for Student Persistence and Success in Inuit Nunangat" was awarded by ArcticNet and it is the result of an interdisciplinary and multi-university collaboration, with team members from the University of Winnipeg, University of Prince Edward Island and a partnership support from Inuit Tapiriit Kanatami. This two-year project aims to identify, generate, and mobilize knowledge about key factors and practices that contribute to student persistence and achievement in Inuit Nunangat. In a second related project, Mi'kmaw student success in Nova Scotia is highlighted through a series of case studies in Nova Scotia schools with the funding support provided by the Nova Scotia Provincial Department of Education Inter University Research Network. Dr. Snow is very involved with local educational outreach and research related to the UNESCO Bras d'Or Lake Biosphere. In this capacity, she has worked with members of the CBU School of Science and Technology to host several events for public school children, their teachers and interested community members including ASK CBU Science Odyssey, the askcbu.ca resource sharing portal, Ski Ben Eoin Survivor and the Bras d'Or Watch. In addition to Dr. Snow's work at CBU, she serves as the editor of the *Journal of Professional, Online, and Continuing Education* (JPOCE), as an associate editor for the *International Journal of ELearning and Distance Education* (IJEDE) and has been an invited speaker/panelist to several national conferences on ELearning in education. It is therefore very fitting indeed that Dr. Snow will be among the first to hold a prestigious CBU Teaching Chair in Blended and Online Learning.

Esther Abel, 2016 BSc Psychology (Hons) Graduate

In recent years, the CBU Psychology department has developed a reputation for its active and productive research collaborations between undergraduate students and faculty. One such esteemed example is recent Psychology (Hons) graduate Esther Abel. Esther worked alongside Dr. Peter MacIntyre for several years in various capacities and most recently on her Honours thesis that focuses on the field of positive psychology. Her thesis "Meaningful photos in idiodynamic method analyzing a positive intervention" provided the solid foundation for her successful application to the University of East London Masters of Science in Applied Social Psychology. As in the case of many who came before her, we are encouraged by the promising career ahead of Esther.

2. Research Funding

The situation at every university is unique; this is especially true with regard to research, and a direct comparison of research funding between universities is not always possible. However, it is still important to get a sense of where the standing is in relation to similar institutions regionally and nationally. As a comparison group, we chose universities on the basis that they may be 'peers' of CBU because they provide a similar range of programs or else are of a similar size, in terms of overall student numbers. These institutions are Acadia University, Bishop's University, Brandon University, Mount Allison University, Mount Saint Vincent University, Nipissing University, Saint

Francis Xavier University, Saint Mary's University and Université de Moncton. The data for these individual universities are presented in anonymous form in the following tables and charts. The total research funding presented below was taken from Table 3.1 from the annual CAUBO reports³. The number of faculty at each university was taken from the Statistics Canada University College Academic Staff Survey⁴ in the absence of any current consistent sources of such information. It is noted that this data will be reviewed next year, and assuming a linear change from 2010 to 2015, it will be updated for 2011 forward accordingly in time for the 2017 Annual Research Report.

Table 2.1 and Chart 2.1 show the average funding per faculty member between 2009-11 and 2013-15 (at CBU, data is available for 2014-16). The trend over the last four years has in most cases been a modest increase (less than incrementally in step with past figures), stagnation, or decrease. The jump in CBU's funding per/faculty member puts our position within our peer group at an unprecedented second place. While this should be read as a point of pride, it also reflects the growing trend among smaller universities toward decreased Tri-Agency funding. The three-year rolling figures also reflect this decrease, with CBU and its comparators receiving over \$5 million less of the research budget in 2013-15, compared with 2008-10.

Table 2.1. Total Research Funding per Faculty Member

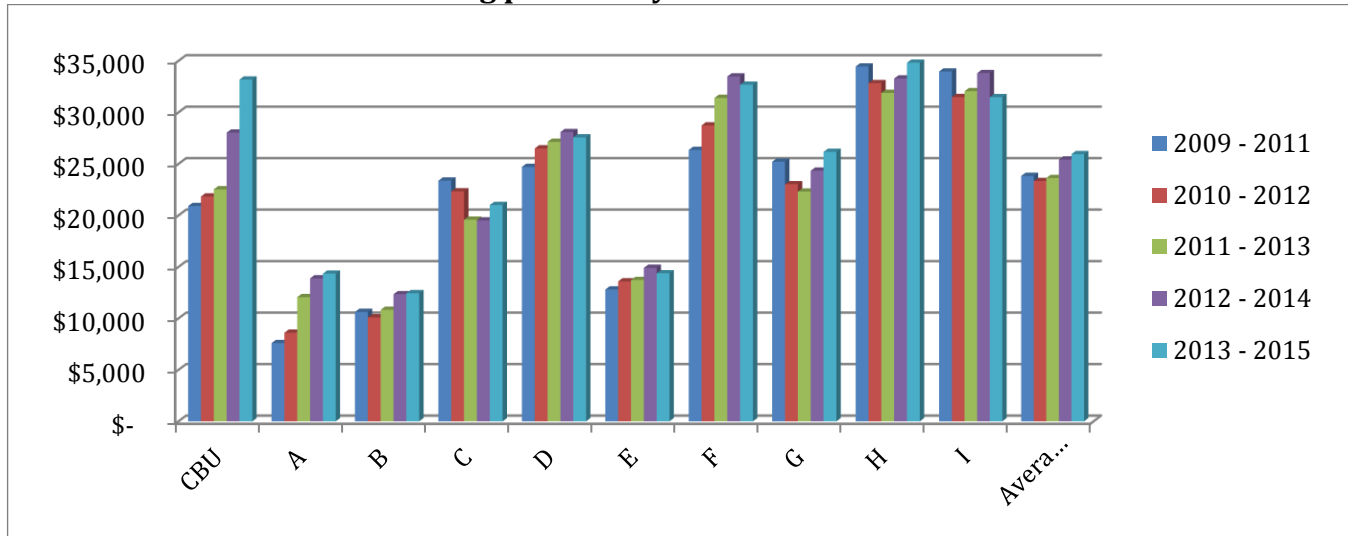
University^a	2009-11	2010-12	2011-13	2012-14	2013-15	2014-2016^b
CBU	\$20,902	\$21,832	\$22,528	\$28,033	\$33,190	\$40,558
A	\$7,596	\$8,602	\$12,058	\$13,877	\$14,339	
B	\$10,624	\$10,092	\$10,828	\$12,341	\$12,435	
C	\$23,375	\$22,331	\$19,579	\$19,508	\$21,003	
D	\$24,705	\$26,506	\$27,142	\$28,087	\$27,572	
E	\$12,804	\$13,588	\$13,721	\$14,903	\$14,372	
F	\$26,356	\$28,737	\$31,404	\$33,489	\$32,688	
G	\$25,211	\$23,020	\$22,309	\$24,336	\$26,167	
H	\$34,455	\$32,840	\$31,893	\$33,291	\$34,827	
I	\$33,965	\$31,485	\$32,063	\$33,815	\$31,474	
Average	\$23,824	\$23,331	\$23,626	\$25,416	\$25,946	
CBU Rank	7	7	5	5	2	

^a Average over the three year period indicated.

^b 2015-16 Data for other universities will not be available until June 2017.

³ There was a change in reporting practice for CBU in 2011. To enable an accurate comparison, the values for 2008 – 2010 were adjusted to use the current reporting practice. The unmodified values are reported in the 2013 Research Report.

⁴ The survey ended in 2010 and the data since 2011 & 2012 were assumed to be the same as the 2010 data. This leads to slight inaccuracies in the comparisons. More accurate data source needs to be identified going forward as this information continues to lose currency and value. A new census has been completed; next year will hopefully offer more accurate figures in this regard.

Chart 2.1 Total Research Funding per Faculty Member

In addition to looking at the total research funding, it is also informative to analyze the distribution of CBU research funding. Table 2.2 shows the breakdown of CBU research funding by source.

Table 2.2 CBU Research Funding^a

Funding Source	2009-11	2010-12	2011-13	2012-14	2013-15	2014-16
SSHRC	\$86,000	\$198,000	\$173,000	\$217,000	\$196,000	\$246,000
NSERC	\$184,000	\$134,000	\$173,000	\$157,000	\$173,000	\$199,000
CIHR	\$14,000	\$13,000	\$14,000	\$13,000	\$11,000	\$0
CFI	\$32,000	\$183,000	\$289,000	\$284,000	\$341,000	\$369,000
CRC	\$457,000	\$419,000	\$350,000	\$291,000	\$258,000	\$274,000
Other Federal	\$481,000	\$488,000	\$462,000	\$760,000	\$1,281,000	\$1,803,000
Nova Scotia	\$196,000	\$321,000	\$340,000	\$891,000	\$915,000	\$873,000
NotforProfit	\$159,000	\$219,000	\$126,000	\$173,000	\$156,000	\$265,000
Business	\$63,000	\$246,000	\$395,000	\$385,000	\$421,000	\$660,000
Miscellaneous	\$900,000	\$465,000	\$450,000	\$276,000	\$331,000	\$266,000
Total	\$2,571,000	\$2,685,000	\$2,771,000	\$3,448,000	\$4,082,000	\$4,989,000

^a Average over the three-year period indicated.

From 2009-11 to 2014-16, the Tri-Agency funding has shown an increase from \$283,000 to \$445,000, with the majority (ranging 88 – 100% over the 7-year period) coming from NSERC and SSHRC combined funding. The shift in distribution of funds from NSERC to SSHRC shows new commitments in funding from SSHRC. As SSHRC funding continues to eclipse NSERC, this past year reveals the most starkly visible account of that disparity yet. Rather than exemplifying an issue with CBU's researchers, it is more likely part of a wider reaching trend among all of Canada's small universities who have been witnessing diminishing research funding from NSERC. It may have been cause for dismay in regards to NSERC funds; however, the NSERC funding seems to have rebounded the last couple of years; in fact, there is a considerable increase in the last three-year average.

Canadian Foundation for Innovation (CFI) funding has increased since 2009-11 and has grown substantially over the past three years. This is related to faculty hires in the previous year and the continued focus by the ORGS on ensuring that CBU's CFI allocation is used. As 2016 saw the completion of several CFI projects, there was also some decline in applications as our allocation envelop was nearing its conclusion. Canada Research Chairs (CRC) funding declined from \$457,000 in 2009-11 to \$258,000 in 2013-15 and increased slightly to \$274,000 in 2014-16. This is due in part to a reduction of CBU's chair allocation from five to four (in 2008) to three (in 2010)⁵, although currently we have climbed to an allocation of four. Changes in the allocation are directly due to changes in the total Tri-Agency funding CBU secures. While CBU's Tri-Agency funding increased, it accounts for a smaller percentage of the total Tri-Agency funding; an algorithm is used to determine our number of chairs. The funding received from the Nova Scotia government through the NSRIT (our provincial matching body for CFI funding) has stabilized at \$873,000 in 2014-16. Looking forward, we have a new allocation envelop and CRC nominations on the horizon for 2017-2018, which will result in more CFI applications. CFI has changed perimeters in the type of applications they fund, and so future projects will have an increased emphasis on collaboration with multiple applicants and users.

Business funding has continued to grow from a negligible base in 2009-11 to \$660,000 in 2014-2016. This is a massive increase of over 50%, and is largely contributed to the significant increase in Verschuren Centre (VC) industrial contracts. The sustained growth in this area of funding also reflects the work undertaken by the Industry Partnerships & Research Commercialization Manager in generating this income. Other federal funding has continued to increase from 2012 to the 2016 reporting period, sitting now at \$1,803,000.

Overall from 2009-11 to 2014-16, the total research funding has grown from \$2.6 to just under \$5 million. Up until 2013, that total had stabilized around \$2.8 million, but a significant jump in last year has caused this number to nearly double. The table below will also show that for the last two years, CBU's total research funding has in fact been in excess of \$5 million.

Table 2.3 CBU research funding by year (in 000s)

Funding Source	2009	2010	2011	2012	2013	2014	2015	2016
SSHRC	\$ 47	\$157	\$53	\$384	\$ 81	\$187	\$320	\$230
Health Canada	\$0	\$17	\$0	\$0	\$0	\$0	\$0	\$0
NSERC	\$303	\$62	\$186	\$153	\$179	\$138	\$202	\$257
CIHR	\$7	\$30	\$4	\$6	\$33	\$0	\$0	\$0
CFI	\$65	\$0	\$31	\$517	\$320	\$16	\$686	\$405
CRC	\$513	\$458	\$400	\$400	\$250	\$223	\$300	\$300
Other Federal	\$379	\$586	\$459	\$402	\$525	\$1,353	\$1,965	\$2,091
NS	\$313	\$187	\$89	\$686	\$245	\$1,743	\$576	\$120
Not for Profit	\$0	\$420	\$56	\$181	\$140	\$199	\$129	\$467
Business	\$0	\$0	\$190	\$548	\$446	\$162	\$656	\$1,162
Misc.	\$1,649	\$530	\$522	\$342	\$485	\$0	\$291	\$291
Total	\$3,276	\$2,447	\$1,990	\$3,619	\$2,704	\$4,021	\$5,522	\$5,423

⁵ Total of Tier I and Tier II chairs with Tier I counting as two Tier II chairs.

3. Highly Qualified Personnel (HQP) Training

Data on HQP were obtained primarily through the survey of faculty for the period April 1, 2015 to March 31, 2016. The results of this survey are presented in Table 3.1. CBU has a limited number of graduate programs, however 15 faculty reported holding adjunct appointments at other universities giving them the opportunity to supervise or co-supervise graduate students. In the past year, there has been a slight decrease in supervision/co-supervision activities for undergraduate and graduate level. Since becoming functional and growing over the past two years, a number of CBU's CFI spaces have taken on more undergraduate and graduate students. The number of postdocs and technicians has increased slightly. This trend is inspiring since there was a decline of almost 20% in the number of respondents to the 2016 faculty research survey.

Table 3.1. Research Assistants Supervised and Co-Supervised

Research Assistants	Supervision			Co-Supervision		
	2013-14	2014-15	2015-16	2013-14	2014-15	2015-16
Undergraduates	119	134	110	31	59	52
Graduates	50	92	73	35	95	29
Post-doctoral Fellows	7	7	12	0	10	6
Technicians	15	13	14	8	18	8
Other	28	53	34	9	24	31

4. Industry Engagement

During the last year CBU faculty, students and researchers have worked with a variety of partners locally, regionally and nationally. We value the opportunity to work with industry and community partners and seek out new ways in which our expertise can benefit organizations of varying sizes. Although lead by faculty experts, most projects are designed to provide opportunities for undergraduate and graduate students to get involved. Partners often benefit from PhD and post-doctoral fellow involvement as well.

Industry collaboration projects have continued to grow in size and scope. Many first interactions developed into longer term collaborations, providing partners with access to labs and expert resources that would be difficult, if not impossible, for them to engage outside of a university. To support this research, we continue to benefit from access to a number of provincial and federal programs such as those offered by Springboard Atlantic Inc., NSERC, Innovacorp, NRC/IRAP and Mitacs.

Table 4.1. Industry Engagement Activities

Activity	2012-13	2013-14	2014-15	2015-16
NRC-IRAP Projects	2	14	13	22
Tri-Agency Industry Partnership Grants	2	3	6	6
Provincial Funded Industry Projects	3	4	5	6
R&D Contracts (no sponsored funding)	-	14	10	9
ACOA AIF Projects (subcontract)	1	1	1	1
Industry Workshops	8	9	9	12

Experts throughout the institution and in our various academic departments have engaged in projects this year, providing expertise through the social sciences and humanities, business and science disciplines aimed directly at partner R&D questions. To support existing collaborators and

to encourage new partnerships, we continue to lead regular industry-university workshops, seminars and educational sessions on campus and within the community. These sessions are led by internal and external experts and are designed to increase the expertise within the community, while developing new opportunities for collaborations.

5. Knowledge Creation and Mobilization

It has become increasingly important for faculty to use a variety of methods for knowledge mobilization to attract awards and nominations. Knowledge Creation and Mobilization activities were captured through the faculty survey and are reported for the period April 1, 2015 to March 31, 2016. Table 5.1 presents the results obtained from the survey, while Chart 5.1 shows the number of scholarly articles published for the period between 2010-12 and 2014-16 obtained from *Web of Science*¹ for the comparison group. It is important to note that the *Web of Science* database does not capture all publications and hence this data does not represent a complete picture of publication activity at CBU. While the numbers of scholarly articles published annually has increased significantly in the last two years, CBU continues to be ranked 9th in its comparison group. To achieve a position within the top five ranked universities would require doubling the annual scholarly articles.

Table 5.1. Knowledge Creation and Mobilization

Dissemination Method	2012-13	2013-14	2014-15	2015-16
Academic Articles	96	103	131	140
Arts Exhibitions	0	0	7	0
Books	14	9	14	19
Chapters	48	42	39	39
Introduction/Preface	9	5	4	12
Conference Presentations	234	227	227	254
Conference Organization	40	41	38	77
Journal Editor	30	35	15	27
Articles Reviewed	197	247	294	266
Community Events	120	135	133	180
Newspaper articles	39	43	79	59
Radio	96	83	104	97
Television	29	19	12	31
Expert advice	61	59	113	99
Policy	23	20	30	19
Blogs	56	37	13	63
Videos	31	21	32	36
Websites	27	31	45	49
Other media	5	14	25	23

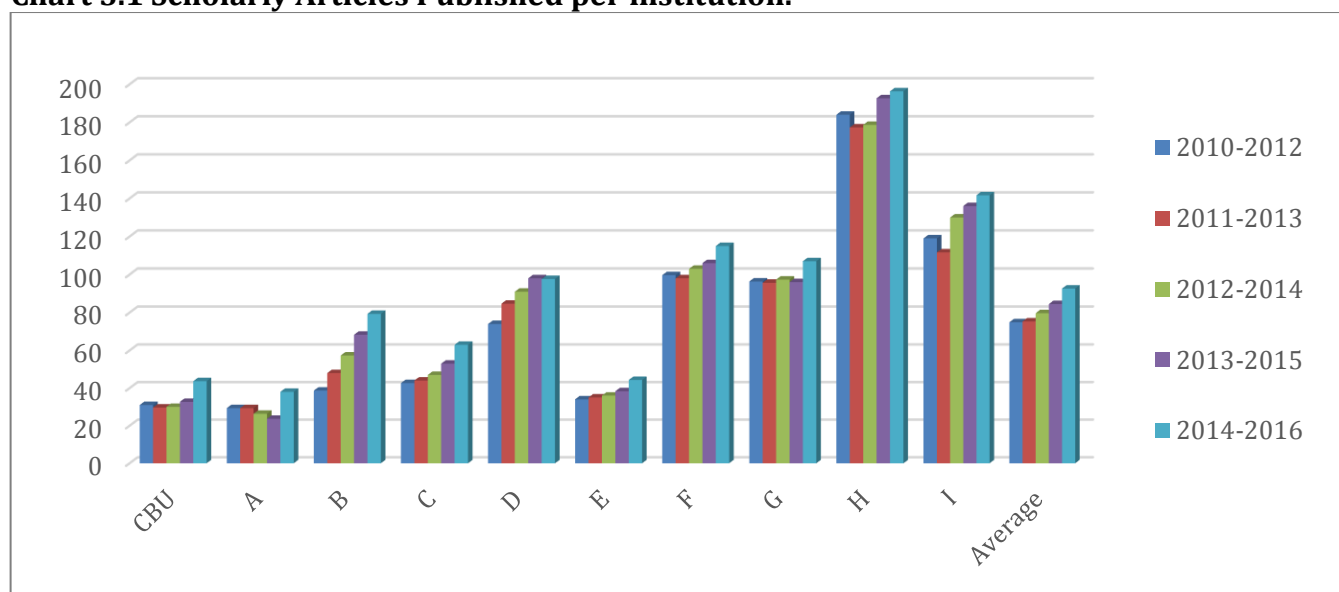
Chart 5.1 Scholarly Articles Published per institution.

Chart 5.1 shows the number of scholarly articles published for the period between 2010-12 and 2014-16 for the comparison group. These data were obtained from *Web of Science*.¹

6. Research Collaborations - Internal, regional (Atlantic), national and/or international

Table 6.1. Collaborations

Collaboration	2012-13	2013-14	2014-15	2015-16
Internal to CBU	68	74	124	125
With Community	39	56	70	64
With Other University	92	97	135	147
With Industry	17	41	73	73
With Nongovernmental Organization	27	30	53	45
With Government Agency	30	28	65	41

7. Research Environment

The research environment within CBU during 2015/16 continues to thrive and build on the success of grant awards received in previous years. The research culture that continues to grow and deepen now has taken a notable turn toward student engagement. From the Thesis SnapShot series that allows students to refine and workshop their major research projects, to the steadily increasing presence of undergraduates in CFI labs, CBU's research culture appears to be successfully permeating the undergraduate experience.

Internal Funding

The CBU research environment also provides support to researchers via its internal grant process which is overseen by the ORGS and provides funding for both Start-up and Research Policy (RP) Grants. Start-up grants, aimed at new tenure-track faculty, provide up to \$2,000 and during 2015/16, five projects were granted support. RP grants are managed in a calendar year, with

funding rounds held up to twice a year (Winter and Fall terms) to fund a maximum of \$8,000 per applicant. During 2015-16, the Winter and Fall rounds resulted in 26 projects being funded.

8. Concluding remarks

Research activity at CBU is vibrant, diverse and productive. Thanks to an increase in external funding and a robust publication record, in addition to the wide variety of community-based research activities, the research culture at CBU is growing. It is important that we use these gains to continue our development and foster stronger supports for researchers. Our status as a small institution both enables the particular flavor of the research at CBU and makes us proud of the impressive achievements of our researchers. A key move going forward will be to work with colleagues at other similar sized institutions to ensure the excellent research happening at small institutions is recognized as a valuable contribution to the national research scene. We need to remain advocates for the necessary resources to do our work.

List of Abbreviations

AC	Animal Care
ACOA AIF	Atlantic Canada Opportunities Agency – Atlantic Innovation Fund
CAUBO	Canadian Association of University Business Officers
CCBS	Centre for Cape Breton Studies
CFI	Canada Foundation for Innovation
CIHR	Canadian Institutes of Health Research
CRC	Canada Research Chair
FYE	Fiscal Year Ending
HQP	Highly Qualified Personnel
NRC-IRAP	National Research Council – Industrial Research Assistance Program
NSERC	Natural Sciences and Engineering Research Council
NSRIT	Nova Scotia Research and Innovation Trust
ORGS	Office of Research & Graduate Studies
RE	Research Ethics
SSHRC	Social Sciences and Humanities Research Council
VC	Verschuren Centre