

Research Portal

Application - Canada Graduate Scholarships-Master's Program

Identification (mandatory)

Applicant

Family Name: Rouleau-Desrochers

First Name: Christophe

Middle Names:

Application

Application Title Fueling Next Year's Growth of Trees with Carbon and Nitrogen

Language in which the proposal is written English French

Field of Research natural sciences and/or engineering

Start date or proposed start date of program of study 2024-09-01 **Proposed end date of program of study** 2026-08-31

Number of months of graduate studies completed as of December 31 of year of application

Months of full-time study 4 **Months of part-time study** 0

Supplements/Joint Initiatives

To be considered for one or more Supplements or Joint Initiatives, select all that apply

Proposed Host Organization

Proposed Host Organization #1

Organization The University of British Columbia

Faculty Forestry

Department/Division Forestry

Proposed Host Organization #2
Organization
Faculty
Department/Division

Proposed Host Organization #3
Organization
Faculty
Department/Division

Summary of Proposal

Summary

Temperate forests are closely linked to temperature, a critical factor in regulating tree seasonal activity. Anthropogenic climate change has led to a global rise in temperatures, extending the growing season in numerous ecosystems. As spring arrives earlier and fall events are delayed, trees are expected to use these longer seasons to fix and store more carbon. However, recent research has questioned this major assumption since tests do not always find a correlation between growth and longer seasons. Part of the problem is the use of adult trees where many co-varying factors make teasing out the effect of longer seasons difficult; additionally, effects may be delayed if plants are nutrient-limited. Here, I propose an experiment that can overcome these challenges. By using tree saplings to extend seasons and including a nutrient addition treatment, I will measure growth across two years to test for effects in a controlled design. I hypothesize that an extended growing season influences trees' storage pools, and species capable of utilizing this opportunity may exhibit growth increments in the following year. Additionally, species capable of absorbing nutrients while going through leaf senescence might show further increased growth in the next season.

To assess trees' capacity to extend their activity schedules, I started a major experiment in 2024 across seven tree species under controlled conditions. I used a full factorial design of four treatments including spring warming, fall warming, both, and a control, plus an additional two treatments to test fall nutrient effects. In 2024, I tracked phenological events weekly throughout the entire season. In 2025, I will repeat these measurements, and I will assess growth on both the individual and the cellular level.

Activity details

Certification requirements (mandatory)

Yes No

Does the proposed research involve humans as research participants?

Yes No

Does the proposed research involve animals?

Yes No

Does the proposed research involve human pluripotent stem cells?

Yes No

Does the proposed research involve controlled drugs and/or substances?

Yes No

Does the proposed research involve human totipotent stem cells?

For statistical purposes only

Yes No

Does this application propose research involving Indigenous people?

Sex- and Gender-Based Analysis

Yes No

Are sex (biological) considerations taken into account in this research proposal?

Yes No

Are gender (socio-cultural) considerations taken into account in this research proposal?

Keywords (mandatory)

Biology, Community Ecology, Forest Dynamics, Plant Phenology, Tree physiology, Climate Change, Dendroclimatology, Carbon Cycle, Nutrient Cycling, Warming experiments

Field of Study

Indicate and rank up to three primary fields of study relevant to your proposal, with #1 the most relevant and #3 the least relevant.

1. PLANT AND TREE BIOLOGY
2. PLANT ECOLOGY
3. EVOLUTION AND ECOLOGY

Special circumstances

Do you have any special circumstances to take into consideration that may have affected your research, professional career, record of academic or research achievement or completion of degrees?

Yes No

Fueling Next Year's Growth of Trees with Carbon and Nitrogen

Context: In temperate and boreal forests, temperature plays a crucial role in setting the boundaries for seasonal physiological activity. Thus, with rising temperatures from anthropogenic climate change, the climatically possible growing season has lengthened in many ecosystems worldwide by up to 11 days.^{1,2} Plants have tracked this through shifts in phenology—the study of recurring life history events—which are expected to continue with increasing temperatures.³ In particular, trees have shifted earlier in the spring and may use these extra days to fix more carbon and increase growth during the current growing season.^{4,5} At the same time, fall events in trees (e.g., leaf senescence) have been delayed, but the impacts on their fitness are not well understood. Together earlier spring and delayed fall events are often hypothesized to affect growth in the next growing season. This is rarely tested, however, and tests to date have used adult trees where many co-varying factors make teasing out the effect of longer seasons difficult. Here, I propose an extended season experiment using saplings to mechanistically test this critical hypothesis. My proposed work will provide valuable insight into the regeneration capacity of forests under a warming climate, considering the importance of young trees on forest recruitment.⁶

Research Question: How do extended growing seasons affect tree growth across different species both immediately (in the same year as the extended season) and in subsequent years?

Hypothesis: I hypothesize that an extension of the growing season could modify a tree's capacity to fill carbon and nitrogen storage pools.^{7,8} Trees that use this opportunity by fixing more carbon may experience increased growth in the subsequent growing season.^{9,10} Thus, species capable of accumulating nutrients after growth cessation while going through leaf senescence might exhibit growth increment in the following growing season.¹¹

Objectives: First, I aim to assess tree species' potential to prolong or stretch their activity schedule. Second, I will determine whether trees can absorb nutrients beyond their theoretical growing season. I will also examine if increased carbon pools translate into greater growth increment in the following growing season. Finally, I will investigate potential variations in these responses across deciduous and evergreen species, to test whether different patterns emerge within these distinct groups.

Methodology: To investigate the impact of manipulated spring and fall temperatures on phenological responses, I successfully conducted experiments in 2024 across seven different tree species under controlled conditions, including species that span both fast and short-life strategies (e.g., *Populus balsamifera*) and slow growth and longer lifespan species (e.g., *Quercus macrocarpa*) and including both deciduous and evergreen species.¹² I used a full factorial design of spring and fall warming with two levels each (control/warmed) resulting in four treatments plus an additional two treatments to test fall nutrient effects, using 15 replicates each for a total of 630 individual trees. Throughout the growing season of 2024, I tracked phenological events weekly from the start of the spring treatments through the end of the fall treatments. During the growing season of 2025, the same measurements will be performed. In fall 2025, after the trees have grown in ambient temperatures for the season, I will assess growth on the individual (total biomass) and the cellular level (number of cells and their characteristics), using dendrochronological methods.

Research outreach: Given the widespread impacts of climate change on ecosystems, understanding how forest communities respond to prolonged growing seasons is crucial. Observing the reactions of deciduous and conifer species to extended seasons may reveal potential benefits for some species and harm for others. These shifts are likely to influence forest stand dynamics across North America.

References

1. Körner, C. and Basler, D. Phenology Under Global Warming. *Science* **327**(5972), 1461–1462, March (2010).
2. Menzel, A. and Fabian, P. Growing season extended in Europe. *Nature* **397**(6721), 659–659, February (1999). Number: 6721 Publisher: Nature Publishing Group.
3. Wolkovich, E. M., Cook, B. I., Allen, J. M., Crimmins, T. M., Betancourt, J. L., Travers, S. E., Pau, S., Regetz, J., Davies, T. J., Kraft, N. J. B., Ault, T. R., Bolmgren, K., Mazer, S. J., McCabe, G. J., McGill, B. J., Parmesan, C., Salamin, N., Schwartz, M. D., and Cleland, E. E. Warming experiments underpredict plant phenological responses to climate change. *Nature* **485**(7399), 494–497, May (2012). Number: 7399 Publisher: Nature Publishing Group.
4. Keenan, T. F., Gray, J., Friedl, M. A., Toomey, M., Bohrer, G., Hollinger, D. Y., Munger, J. W., O'Keefe, J., Schmid, H. P., Wing, I. S., Yang, B., and Richardson, A. D. Net carbon uptake has increased through warming-induced changes in temperate forest phenology. *Nature Climate Change* **4**(7), 598–604, July (2014). Number: 7 Publisher: Nature Publishing Group.
5. Wang, H., Wang, H., Ge, Q., and Dai, J. The Interactive Effects of Chilling, Photoperiod, and Forcing Temperature on Flowering Phenology of Temperate Woody Plants. *Frontiers in Plant Science* **11** (2020).
6. Zohner, C. M., Renner, S. S., Sebald, V., and Crowther, T. W. How changes in spring and autumn phenology translate into growth-experimental evidence of asymmetric effects. *Journal of Ecology* **109**(7), 2717–2728, July (2021).
7. Chapin, F. S., Schulze, E., and Mooney, H. A. The Ecology and Economics of Storage in Plants. *Annual Review of Ecology and Systematics* **21**(1), 423–447, November (1990).
8. Lawrence, B. T. and Melgar, J. C. Variable Fall Climate Influences Nutrient Resorption and Reserve Storage in Young Peach Trees. *Frontiers in Plant Science* **9** (2018).
9. Landhäusser, S. M., Pinno, B. D., Lieffers, V. J., and Chow, P. S. Partitioning of carbon allocation to reserves or growth determines future performance of aspen seedlings. *Forest Ecology and Management* **275**, 43–51, July (2012).
10. Martens, L. A., Landhäusser, S. M., and Lieffers, V. J. First-year growth response of cold-stored, nursery-grown aspen planting stock. *New Forests* **33**(3), 281–295, May (2007).
11. Schott, K. M., Pinno, B. D., and Landhäusser, S. M. Premature shoot growth termination allows nutrient loading of seedlings with an indeterminate growth strategy. *New Forests* **44**(5), 635–647, September (2013).
12. Jönsson, A. M., Eklundh, L., Hellström, M., Bärring, L., and Jönsson, P. Annual changes in MODIS vegetation indices of Swedish coniferous forests in relation to snow dynamics and tree phenology. *Remote Sensing of Environment* **114**(11), 2719–2730, November (2010).

ADVISING TRANSCRIPT

Page: 1 of 1
Surname:
Rouleau-Desrochers

Given Name:
Christophe

Student Number:
49411424

Date:
November 22, 2024

Note: Advising transcript is an unofficial record of your UBC academic history.

UBC Credentials									
None to date									
Transfer Credits									
None to date									
2024-25 Winter Session									
M.Sc., In Forestry (Vancouver)									
Term	Course	Credit Value	Course Title		% Grade	Grade	Credit Rec'd	Class Size	Class Avg
1	BIOL_V	301 (3.0)	Biomathematics						
1-2	AANB_V	549B (18.0)	Master's Thesis						
2	CONS_V	310 (3.0)	Ecology in a Changing Climate						
2	FRST_V	507C (3.0)	Topics in Forest Science						
Cumulative Totals									
Credits Attempted: 27.0 Credits Earned: 0.0 Average: 0.0%									
Sessional Average:									
Credits Attempted = Passed Failed Withdrawn Incomplete									
27.0 0.0 0.0 0.0 27.0									

***** End of Record *****



THE UNIVERSITY OF BRITISH COLUMBIA

The University of British Columbia was established by an Act of the Provincial Legislature in 1908 and opened in 1915. The University is a member of the Association of Universities and Colleges of Canada. UBC Okanagan was established as a campus of The University of British Columbia in April 2005. UBC Okanagan assumed responsibility for several Okanagan University College degree programs and all continuing students in those programs on July 1, 2005. Okanagan University College ceased its educational operations as of August 31, 2005.

EXPLANATION OF STUDENT ACADEMIC RECORD

Academic terms

The University operates on a year system. The academic year is divided into two sessions. Winter Session is divided into two terms, Term 1 from September to December and Term 2 from January to April. Summer Session starts in May and ends in August and is comprised of Term 1 (May and June) and Term 2 (July and August). Courses may span a single term (Term 1 or 2) or a full session (Term 1 and 2) for either session.

Distance Education and Technology (DET) courses begin on one of two starting dates during Winter Session, designated in the Term column as A,B,C or D. During the Summer Session, DET courses have only one starting date and are designated with an A or B in the Term column.

Academic Awards

All academic awards (Fellowships, Scholarships, Prizes and Medals) administered by the University and issued subsequent to April 1975, are noted on the transcript of academic record.

Course Numbering

Courses numbered 100 to 199 are primarily for first-year students. Similarly, courses numbered 200 to 299 are primarily for second-year students, courses numbered 300 to 399 are for third-year students, and courses numbered 400 to 499 are for fourth-year students. Courses numbered 500 to 699 are considered graduate-level. Courses numbered 700 and above are clinical courses.

Class Size and Class Average Grades

Effective February 1999, class size and class average grades are shown for most courses. In courses with more than one section, the class size and average are reported for the student's section.

Grading and Course Weight

In May of 1991, The University of British Columbia adopted a percentage grading and credit weighting system. Course weight is expressed in "credits". In general 1 credit represents 1 hour of instruction or 2 to 3 hours of laboratory work per week throughout one term of the Winter Session. A 1-unit course became a 2-credit course.

Courses are normally graded on a percentage basis with a corresponding letter grade derived as shown.

Degree Standings and Averages

Standings are expressed as Class 1 (80% or over), Class 2 (65 to 79%), Class P (50 to 64%) or Honours; not used by all faculties. Effective Winter Session 1996/97, the calculation of the standing and average is based on the average percentage grade of all upper-level (300 or higher) courses used to satisfy the degree requirements (excluding courses graded as Pass/Fail); not used by all faculties. This is not applicable to programs in the Faculty of Graduate Studies.

Personal information will be stored in the Personal Information Bank for the appropriate program.
PROTECTED BY WHEN COMPLETED

Undergraduate Grading Scale

Percent	Letter Grade	Percent	Letter Grade
90-100	A+	64-67*	C+
85-89	A	60-63*	C
80-84	A-	55-59*	C-
76-79	B+	50-54*	D
72-75	B	0-49	F* (Fail)
68-71	B-		

Graduate Grading Scale

Masters Grading Scale		Doctoral Grading Scale	
Percent	Letter Grade	Percent	Letter Grade
90-100	A+	90-100	A+
85-89	A	85-89	A
80-84	A-	80-84	A-
76-79	B+	76-79	B+
72-75	B	72-75	B
68-71	B-	68-71	B-
64-67	C+	0-67	F* (Fail)
60-63	C		
0-59	F* (Fail)		

*Some programs may require higher passing grades; failing grades are assigned a letter grade of "F"

The following standings also apply:

- AEG - aegrotat standing: indicates that the student is granted credit although unable to complete because of illness. A letter grade will also be recorded and that grade converted to a minimum percentage grade for that category for the calculation of averages.
- AUD - audit
- CH - challenge credit
- CIP - course in progress
- CR/D/F - (introduced in 2010/11) excluded from calculation in all averages; granted where a grade is assigned by an instructor but not included on the student's official transcript; grade is converted to CR, D or F standing. CR- credit, satisfactory completion of the requirements of the subject; D- marginal pass (50% - 54%), and not available for those programs or courses that define a passing grade as higher than 50%; F- fail
- EX - exempt
- J - see "A" standing as defined in grading scale prior to May 1991
- P or F - no grade assigned, excluded from calculation in all averages; P- pass, requirements of subject completed satisfactorily, credit granted where applicable; F- fail
- H - (introduced 1999/00 session) no grade assigned, excluded from calculation in all averages; H - honours, exceeds course requirements, credit granted where applicable
- PLA - credit assigned based on prior learning in subject area.
- S - see "S" standing as defined in grading scale prior to May 1991
- SD - standing deferred; excluded from calculation in all averages
- T - thesis in progress; graduating essay not submitted; course continuing
- W - (introduced in 1988/89 session) official withdrawal
- X - time expired; student did not complete course

PRIOR TO MAY 1991

Course Weight and Hours

Course weight was expressed in "units". In general, 1 unit represented 1 lecture hour per week (or a laboratory period of approximately 2 to 3 hours each week) throughout both terms of the Winter Session. Some faculties did not assign a unit value to some courses. The maximum mark possible (max) indicated the weight of a course. A 3-unit course (3 hours of lectures per week throughout the Winter Session) was graded out of a total of 150 marks. This course approximated a 6 semester-hour or a 9 quarter-hour course.

Grading classifications

- | | |
|---------|--|
| Class 1 | - 80% or better (i.e., 120 or more on a maximum of 150) |
| Class 2 | - 65%-79% (i.e., 98 to 119 out of 150) |
| Class P | - 50%-64% (i.e., 75 to 97 out of 150)
except Dentistry, Graduate Studies, Librarianship, Medicine, Nursing and Rehabilitation Medicine where the range is 60% - 64% |
| Class F | - failure, no credit granted: below 50%
except Dentistry, Graduate Studies, Librarianship, Medicine, Nursing and Rehabilitation Medicine: below 60% |

The following standings also apply:

- A - adjudicated pass: indicates that credit is granted and the course need not be repeated although it may not normally qualify as a prerequisite for further work. The grade assigned by the instructor is used in calculation of averages.
- AEG - aegrotat standing: granted to a student who has been successful in studies but unable to write the final exam because of illness or other extenuating circumstances
- AUD - audit
- C - requirements of subject completed satisfactorily; no grade assigned; unit value granted where applicable; excluded from calculation in all averages
- D - standing deferred; excluded from calculation in all averages
- E - exempt
- N - no credit granted; did not write examination or otherwise complete requirements of the course (discontinued beginning 1985- 86 session)
- S - supplemental privilege granted; failure; no credit granted; supplements are not permitted in all faculties
- T - thesis in progress; graduating essay not submitted; course continuing
- W - (introduced in 1988/89 session) official withdrawal
- X - time expired; student did not complete course

Year Standing

In most Faculties each "year" was graded as Class 1, Class 2, Class P, Fail or carried a descriptive clause indicating action taken by the Adjudication Committee.

Degree Standing

Expressed as Class 1, Class 2, Class P, or with Honours; not used by all faculties. In some faculties the calculation of standing was based on the studies of the final two years, in others on the final year only.

THIS DOCUMENT CONTAINS SECURITY FEATURES. HOLD AT AN ANGLE TO VERIFY A WATERMARK BASKET WEAVE DESIGN

Registrariat

Issued on
July 23, 2024

Rouleau-Desrochers Christophe
6880 RUE MARQUETTES
MONTREAL QC
H2G 2Y8

Permanent code
ROUC22019809

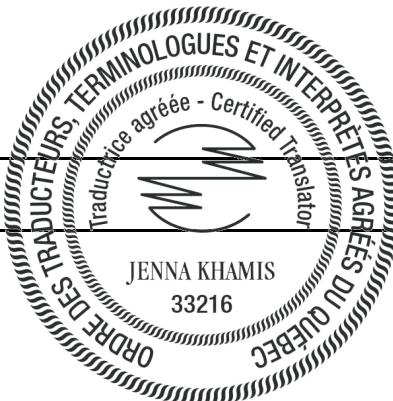
Program Bachelor's degree in Biology, Problem-Based Learning (6713)

Term	Code	Credits	Title	Gr. Avg.	Grade
			French Proficiency Examination		S
Courses taken for the Ecology Certificate					
	BIO1050	3	ANIMAL BIOLOGY		A+
	BIO1700	3	BIODIVERSITY CONSERVATION		A+
	BIO2611	3	PLANT BIOLOGY		A+
	BIO3100	3	GENERAL ECOLOGY		A+
	BIO3500	3	ECOLOGY AND DATA ANALYSIS SEMINAR		A+
	BIO6821	3	WILDLIFE MANAGEMENT		A+
F-2021	HIS4592	3	HISTORY OF INDIGENOUS PEOPLE OF CANADA (UP TO THE 19 TH CENTURY)		A+
F-2021	PHI3017	2	PHILOSOPHY OF BIOLOGICAL SCIENCES (2 CR.)		A+
Courses taken since admission into the program					
W-2022	BIA1002	1	INTRODUCTION TO THE STUDY OF THE CELL (1 CR.)		S
W-2022	BIA1401	4	DIVERSITY OF MICRO-ORGANISMS (4 CR.)		A+
W-2022	BIA2001	5	CELLULAR BIOLOGY AND BIOCHEMISTRY (5 CR.)		A+
W-2022	BIA2002	4	GENE REPLICATION AND EXPRESSION (4 CR.)		A+
F-2022	BIA2101	5	PLANT METABOLISM AND REGULATION (5 CR.)		A+
F-2022	BIA2201	6	ANIMAL AND HUMAN REGULATION (6 CR.)		A+
F-2022	BIA2501	4	IMMUNOLOGY (4 CR.)		A+
W-2023	BIA1200	2	EVOLUTION AND NATURAL SELECTION (2 CR.)		A+
W-2023	BIA1700	6	ORGANISMS AND THE ENVIRONMENT (6 CR.)		A+
W-2023	BIA2600	4	ENVIRONMENTAL INTERACTION (4 CR.)		A+
W-2023	FSM3300	6	INTRO TO EXPERIMENTAL RESEARCH OR PROFESSIONAL PRACTICE (6 CR.)		A+
F-2023	BIA3010	9	METHODOLOGY IN ECOLOGY (9 CR.)		A+
F-2023	BIA3510	4	SPECIALIZATION I IN ECOLOGY (4 CR.)		A+
F-2023	COM1859	3	ISSUES AND PRACTICES OF SCIENTIFIC COMMUNICATION		A+
W-2024	BIA3511	5	SPECIALIZATION II IN ECOLOGY (5 CR.)		A+

***** END OF TRANSCRIPT *****

Credits awarded: 91.0

GPA: 4.30/4.3



Degree: Bachelor of Science (BSc)

Certified copy
Registrar

Date awarded: June 20, 2024

[Signature]

July 23, 2024, by [initials]

THIS DOCUMENT IS PRINTED IN BLUE ON PAPER CONTAINING SECURITY FEATURES – SEE REVERSE

EXPLANATORY NOTES

This note is meant to ensure a better understanding of official student progress as recorded on documents issued in French.

Academic file

Student's academic file, includes admission and registration information and degree conferment data as maintained by the Office of the Registrar, in accordance with existing University policies. Students may request a copy of the information kept in his or her file.

Transcript

A transcript is an official document presenting the cumulative academic record of a student's progress in the programme to which he or she has been admitted. It is prepared by the Office of the Registrar in accordance with the existing University policy.

Symbols used in this transcript

Symbol H

"H" indicates that the course does not taken toward degree. Credit is not included in the Cumulative Grade Point Average (CGPA).

Symbol I

"I" indicates that the course is Incomplete. The student has not yet met the course requirements, and final evaluation cannot be submitted.

Symbol K

"K" indicates the granting of credit based on a prior learning assessment which has been carried out in accordance with existing University regulations. Credit appears on the transcript and academic file.

Symbol L

"L" indicates a failed course or activity that has since been completed.

Symbol P

"P" indicates a prerequisite course. Grade is not included in CGPA.

Symbol R

"R" indicates that the grade is to be assigned at a later date.

Symbol W

"W" indicates an audit course or activity. Grade is not included in CGPA.

Symbol X

"X" indicates withdrawal with permission. Credit does not appear on the transcript or academic file.

Grade of S

"S" indicates that the course requirements have successfully completed. Credit granted, but not included in CGPA.

Grade of V

"V" indicates that the course has successfully completed at another institution under a specific agreement. Credit granted, but not included in CGPA.

Certified true copy

Students may request a certified true copy of their transcript or file. A certified true copy is issued by the Office of the Registrar. It bears the signature of the Registrar and the words "copie conforme". This document may be given directly to the student. If a transcript is sent to another institution, it bears the Official University Seal. A transcript with an official seal cannot be sent to the student.

Credit

Numerical value on the work that student must complete to attain specific course objectives.

Credits earned

"Credits earned" (crédits réussis) is the total number of credits earned towards fulfilment of programme requirements. It includes credits for successfully completed courses and those granted by advanced standing (equivalence). It excludes credit for prerequisite course work (P) and for courses not taken towards the degree (H).

Grading System prior to Fall 1992

A, B, C, and D.

Grading System as of Fall of 1992

A+, A-, B+, B-, C+, C-, D+, D.

Failed Course

A student who does not meet course requirements receives the letter "E" as the grade for that course. Credits for that course do not appear on the transcript.

Credit from another programme within the University

The words "Activité suivie dans le cadre . . ." indicate that the activity has been completed while completing requirements for another programme. Credit for this activity has been assigned to the student's current programme.

Transfer Credits

The words "X Crédits intégrés au programme" indicate that the student has met certain programme requirements prior to admission.

Legend

ABS : Absence EXE : Advanced standing N.A. : Not applicable

Cumulative Grade Point Average

The cumulative grade point average (CGPA) is calculated as follows :

$$M = \frac{\sum PiCi}{\sum Ci}$$

Signification des symboles :

Σ = Combined total of
 P = Numeric value assigned to letter grades
 C = Number of credits assigned to courses for which the letter grade has a numeric value
 i = Specific course or activity
 M = Average

Numeric Values of Grades :

A+ = 4,3	A = 4,0	A- = 3,7	Excellent
B+ = 3,3	B = 3,0	B- = 2,7	Very good
C+ = 2,3	C = 2,0	C- = 1,7	Good
D+ = 1,3	D = 1,0		Pass
E = 0			Fail

$$M = \frac{\left(\left(\sum PiCi \text{ calculated before September 1992} \right) \times \frac{4,3}{4,0} \right)}{\sum Ci} + \frac{\left(\sum PiCi \text{ calculated after September 1992} \right)}{\sum Ci}$$

Calculating the CGPA enroled prior to September 1992

A new grading system was introduced in September 1992 (see grading system above). In accordance with policies accompanying the change, the CGPA of students who began their programme before September 1992 is calculated as follows :

If you have any doubts concerning the validity of this transcript, please contact :

Université du Québec à Montréal
Registariat, Service aux clientèles universitaires
Case postale 8888, succursale Centre-ville
Montréal, QC, Canada
H3C 3P8

Tél.: (514) 987-3132

Security Features

This transcript has been printed on paper with the following features :

- A chain pattern watermark should appear when the transcript is held up to a light source;
- Front :
 - the background is printed blue;
 - the words "Université du Québec à Montréal" are printed as a microline 7/8th inch below the top edge;
 - the word "COPIE" appears when the document is photocopied;
 - the paper will become discoloured where chemicals have been used to alter information;
 - the paper contains fluorescent fibres that are visible only under an ultraviolet light source.
- Overleaf :
 - grey vertical lines are printed on the back of the transcript.

Personal information will be stored in the Personal Information Bank for the appropriate program.
PROTECTED B WHEN COMPLETED



Translator's Declaration

Document: Université du Québec à Montréal Official Transcript—Christophe Rouleau-Desrochers

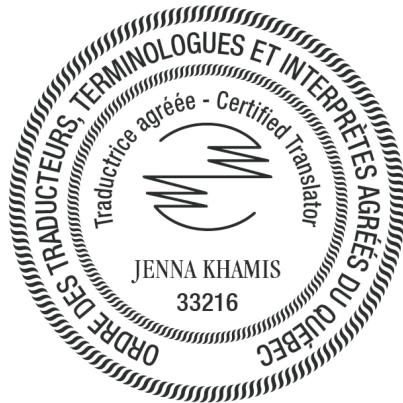
I, the undersigned, Jenna Khamis, Certified Translator from French to English and member in good standing of the *Ordre de traducteurs, terminologues et interprètes agréés du Québec* (OTTIAQ) (member no. 33216), hereby certify hereby declare that I did translate into English the attached French document and that, to the best of my knowledge, the translation accurately reflects the contents and meaning of the French original.

The translation was completed in accordance with the *Règles de pratique professionnelle de l'Ordre des traducteurs, terminologues et interprètes agréés du Québec* (OTTIAQ). Under these rules, the certified translator is required to comply with OTTIAQ's code of ethics and to follow a rigorous process when completing and revising the translation to provide reasonable assurance that the translation is an appropriate equivalent to the source text.

This certification is valid provided that no changes are made to the translation without my prior approval.

Certified at Montreal, Quebec on November 6, 2024

Jenna Khamis, C. Tr.



Rouleau-Desrochers Christophe
6880 RUE MARQUETTE
MONTREAL QC
H2G 2Y8

Date d'émission
23 juillet 2024
Code permanent
ROUC22019809

Programme: baccalauréat en biologie en apprentissage par problèmes (6713)

Trimestre	Sigle	Crédits	Titre	Moyenne du groupe	Résultat
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			Test de maîtrise du français		S
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Activités suivies dans le cadre du certificat en écologie

BIO1050	3	BIOLOGIE ANIMALE	A+
BIO1700	3	CONSERVATION DE LA BIODIVERSITE	A+
BIO2611	3	BIOLOGIE VEGETALE	A+
BIO3100	3	ECOLOGIE GENERALE	A+
BIO3500	3	SEMINAIRE EN ECOLOGIE ET ANALYSE DES DONNEES	A+
BIO6821	3	AMENAGEMENT DE LA FAUNE	A+
AUT.2021 HIS4592	3	HISTOIRE DES AUTOCHTONES DU CANADA (JUSQU'AU XIX S.)	A+
AUT.2021 PHI3017	2	PHILOSOPHIE DES SCIENCES BIOLOGIQUES (2 CR.)	A+

Activités suivies depuis l'admission au programme

HIV.2022 BIA1002	1	INITIATION A L'ETUDE DE LA CELLULE (1 CR.)	S
HIV.2022 BIA1401	4	DIVERSITE DES MICROORGANISMES (4 CR.)	A+
HIV.2022 BIA2001	5	BIOCHIMIE ET BIOLOGIE CELLULAIRE (5 CR.)	A+
HIV.2022 BIA2002	4	REPLICATION ET EXPRESSION DES GENES (4 CR.)	A+
AUT.2022 BIA2101	5	METABOLISME ET REGULATION DES VEGETAUX (5 CREDITS)	A+
AUT.2022 BIA2201	6	REGULATION ANIMALE ET HUMAINE (6 CR.)	A+
AUT.2022 BIA2501	4	IMMUNOLOGIE (4 CR.)	A+
HIV.2023 BIA1200	2	EVOLUTION ET SELECTION NATURELLE (2 CR)	A+
HIV.2023 BIA1700	6	ORGANISMES ET ENVIRONNEMENT (6 CREDITS)	A+
HIV.2023 BIA2600	4	INTERACTION ENVIRONNEMENTALE (4 CR)	A+
HIV.2023 FSM3300	6	INIT.A LA RECHERCHE EXPERIM.OU PRAT.PROF. (6CR)	A+
AUT.2023 BIA3010	9	METHODOLOGIE EN ECOLOGIE (9 CR)	A+
AUT.2023 BIA3510	4	SPECIALISATION I EN ECOLOGIE (4 CR)	A+
AUT.2023 COM1859	3	ENJEUX ET PRATIQUES DE LA COMMUNICATION SCIENTIFIQUE	A+
HIV.2024 BIA3511	5	SPECIALISATION II EN ECOLOGIE (5 CR.)	A+

----- FIN DU RELEVÉ -----

Crédits réussis : 91.0

Moyenne cumulative : 4.30/4.3

Grade : bachelier ès sciences (B.Sc.)

Date d'obtention : 20 juin 2024

Copie conforme au dossier
Registraire

23 juillet 2024, par

Personal information will be stored in the Personal Information Bank for the appropriate program.

PROTECTED BY WHEN COMPLETED

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