Umbrella Framework for Undergraduate Bio-Physical Sciences Programs
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Organization:
1. Umbrella structure to bring together all integrative bio-physical science programs.
2. Would include the 4 current joint programs (Math-Biology, Biology-Computer Science, Physiology-Physics, Physiology-Math) as well as the interdisciplinary departmental options (Biology-Quantitative Biology and the proposed Physics-Biophysics and Chemistry-Biophysical Chemistry).
3. The proposal is to make explicit the courses these programs already share to streamline timetabling as well as to develop integrative courses to contribute to these programs to make them truly interdisciplinary.
4. The programs would each continue to exist as streams (or pillars) within the umbrella structure, but with their shared portions identified and aligned so that students would more easily be able to choose and move between them.

Rationale for creating an “Umbrella Entity” for the current and proposed joint programs and departmental options:
1. “One-stop shop” for students
   a. One place where students can see all of their options
   b. Visibility – all together so can advertise together as an area where McGill is already a leader in research and also a place where students can study at undergraduate level
   c. Make it easy for students to move between different streams rather than all being in separate silos
2. Be truly interdisciplinary – have something greater than the sum of its parts to give students an excellent and unique training opportunity
   a. Create truly interdisciplinary courses that are taught by profs across several departments and give the students different viewpoints on key components of quantitative biosciences
3. Create an entity for the students taking interdisciplinary biosciences to make connections with profs in different departments and with each other (a home for the grass-roots society students have already formed – McGill Integrated Bioscience Society [MIBS])
Shared courses already found in all or most programs

BIOL 200 - Molecular Biology (3 cr) F (usually prereq for PHGY 209 but waived for PHGY-PHYS)
BIOL 201 - Cell Biology (3 cr) W (usually prereq for PHGY 210 but waived for PHGY-PHYS)
CHEM 212 - Organic Chemistry (4 cr) F,W (hidden pre/coreq for PHGY 209/210 and thus in all progs)
MATH 222 - Calculus 3 (3 cr) F, W (required in all progs)
MATH 223 - Linear Algebra (3 cr) F, W (required in all programs)
BIOL 301 – Molecular Biology Lab (4 cr) F,W (required in 4/7, would be in 5/7 but no space; not in PHGY-PHYS or PHGY-MATH)
MATH 315 – Ordinary Differential Equations (3 cr) F, W (required in 5/7; not in CHEM or COMP-BIOL)
MATH 323 – Probability (3 cr) F, W (required in 5/7; not in CHEM or PHGY-PHYS)

Integrated courses to be used across the “streams”

BIOL 2xx - Physical Biology of the Cell (3 or 4 credits)
>> would replace BIOL 200/201 as pre-requisite for these students
>> Fall course for which the partner course would be BIOL/PHYS 319
** BIOL 219 – Physical Biology of the Cell (4 credits) coming to AC to be approved for Fall 2017

BIOL 319/PHYS 319 – Introduction to Biophysics (3 credits)
>> would work as partner course with BIOL 2xx
>> together would lead students to PHYS 519 (Advanced Biophysics), CHEM 514 (Biophysical Chemistry) and/or BIOL 551 (Principles of Cellular Control) – may require students to take 2/3 of these courses (or at least have available as complementary)
** Exists

BIOL 395 – Quantitative Biology Seminar course (1 credit)
>> Integrated seminar course in which profs in quantitative biosciences lecture on their work and/or work around seminar series
** Exists

BIOL 3xx – Quantitative Biosciences Lab (3-4 credits)
>> Integrated lab course with experiments spanning range of quantitative biosciences
>> Resources would be needed for lab course – lecturer/technician; will need longer term planning
** Using existing BIOL 301 for time-being

COMP 2xx – [Programming for Life Sciences] (3 credits)
>> BIOL, BIOL-MATH, COMP-BIOL have COMP 202 (Foundations of Programming) or COMP 250 (Introduction to Computer Science) as required
**Computer Science is working on introductory programming course for life science students but won’t be ready for Fall 2017

PHYS/CHEM 3xx – Bio-Physical Statistical Mechanics (3 credits)
>> Integrated course that would replace PHYS 333 (Thermal and Statistical Physics) or CHEM 365 (Statistical Thermodynamics) for these students
** PHYS 329 – Statistical Physics with Biophysical Application (3 credits) coming to AC to be approved for Fall 2017
INTE 4xx – Bio-Physical Sciences Honours Research Project (6 credits)

Research required only for honour’s students – majors should take 396 courses to get interdisciplinary research experience outside of their home departments (if in single department)

Honours projects to be interdisciplinary and co-supervised across departments – include e.g. approval from course coordinator, proposal, progress report, final report, poster or presentation in research day at end

** Using departmental Honours courses for now; will establish later

### Bio-Physical Sciences Core (34 credits)

- BIOL 219 - Physical Biology of the Cell (4 credits)
- BIOL 301 Cell & Molecular Biology Laboratory (4 credits) [space allowing]
- BIOL/PHYS 319 Introduction to Biophysics (3 credits)
- BIOL 395 Quantitative Biology Seminar 1 (1 credit)
- CHEM 212 Introductory Organic Chemistry 1 (4 credits)
- COMP 202 Foundations of Programming (3 credits) [replace later with life sci version]
- MATH 222 Calculus 3 (3 credits)
- MATH 223 Linear Algebra (3 credits)
- MATH 315 Ordinary Differential Equations (3 credits)
- MATH 323 Probability (3 credits)
- PHYS 329 Statistical Physics with Biophysical Application (3 credits) [double-prefix with CHEM later]

### Implementation

1. Add as much of the core as feasible to each of the current and proposed programs
2. Bring for approvals – Department, Academic Committee (+ Biomedical Curriculum Committee if necessary), Faculty of Science, SCTP (+ APC for new programs)
   a. Two new courses
      i. BIOL 219 - Physical Biology of the Cell (4 credits)
      ii. PHYS 329 - Statistical Physics with Biophysical Application (3 credits)
   b. Five revised programs
      i. Biology – Quantitative Biology (Major + Honours)
      ii. Biology & Mathematics (Major)
      iii. Computer Science & Biology (Major & Honours)
      iv. Physiology & Mathematics (Major)
      v. Physiology & Physics (Major)
   c. Two new programs
      i. Chemistry – Biophysical Chemistry (Major & Honours)
      ii. Physics – Biological Physics (Major & Honours)
3. Advertise set of bio-physical programs together
Administration

1. “Program Committee” – members of departments involved: Biology, Chemistry, Computer Science, Mathematics, Physics, Physiology
   a. Student members
2. Advising – through existing departmental advisors that meet at least annually, or dedicated advisor
3. Joint admission group and movement btw programs
   a. Working with Enrolment Services to establish separate admission group for existing joint programs so can normalize admission standards (not an easy program)
   b. Students entering through joint programs could move into PEMC or BBL and vice versa
   c. Students entering through BBL (e.g. Quant Biol) not hard to move into PEMC
   d. Because of demand, harder to move from PEMC in BBL, but would only need to do that to move from Biophysics or Biophysical Chemistry to Quant Biol

Ideas for webpage “portal”

1. Need to advertise as Integrated Bio-Physical Science Undergraduate “options” available at McGill all in one place
2. Shared core of certain courses
3. Integrated, shared “value-added” courses
4. Different streams - specialize in area of interest
5. Ability to move between streams - flexibility
6. Ability to move into base departmental programs – flexibility/fall back

Recruitment and outreach

1. Mechanism for contacting high schools and CEGEPS – SOUSA? MIBS also already doing outreach
2. Plan for recruitment through new student orientation
3. Peer to peer, support for MIBS (McGill Integrated Bioscience Society)
4. Representation of students on committees, cross-talk with faculty
5. Alumni organization (outreach, basic fundraising)