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Paul MacDonald, Ph.D.
Chair, Graduate Education Committee
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Dear Dr. MacDonald:

We are writing to express our strong support for the proposed dual degree — the Master of Science in Biochemistry and Master of Arts in Patent Practice. This dual degree is consistent with the strategic plan of the law school and the interdisciplinary objectives of the Spangenberg Center for Law, Technology & the Arts.

Sincerely yours,

Jessica Berg and Michael Scharf
Co-Deans, School of Law

MA in Patent Practice/MS in Biochemistry (plan B) Dual Degree Proposal

This document contains a proposal for a dual degree between the Department of Biochemistry in the School of Medicine (MS degree, plan B) and the Law School (MA in Patent Practice).

I. Background and Justification

The purpose of the degree program is to prepare a cadre of biochemistry students for successful careers as patent agents. In any given year, recently graduated engineers and scientists enroll in law school with the goal of becoming patent lawyers, but over the past few years, a growing number have become reluctant to invest in a three-year JD program. The proposed *Masters in Patent Practice* seeks to provide a viable alternative for these students, with a focus on students with a biological background. The most likely undergraduates would be science or engineering majors with the likelihood that biology and premed students who failed to enter medical school would predominate (in part based upon the requirements for entry). The one technological area of patent practice where an advanced degree leads to a significant difference in marketability is the life science field.

A career as a patent agent enables engineers and biomedical scientists to stay close to their technological specialty, yet provides a livelihood that has comparative advantages over that of a practicing engineer or bench scientist.[1] Indeed, the patent law landscape over the past 10 years has witnessed the growing importance of patent agents. Most IP boutique firms or IP practice groups within general firms have at least one, and oftentimes several, patent agents; and it is also common for patent agents to work in-house for corporations of all sizes. The *Masters in Patent Practice* will not only prepare the engineer and biomedical scientist to take the patent bar, but will introduce them to the nuances of patent searching, the complexities of patent drafting, and the arcana commonly associated with patent law doctrine and USPTO regulations.

Over the past several years, the United States Patent and Trademark Office has received increasingly more patent applications. In 2013, 571,612 patent applications were filed with the patent office. This compares with 456, 321 in 2008 and 342,441 in 2000. Job postings for patent agents in intellectual property law journals and websites reflect these numbers. Anecdotal evidence also suggests a demand for patent agents.

Moreover, in the initial review of the MA in Patent Practice proposal, the Board of Reagents review observed that there is a demand for patent agents (i.e. see

[1] For example, according to the American Intellectual Property Lawyers Association's "Report of the Economic Survey 2013," the average salary of a patent agent with fewer than five years of experience at a private law firm is $92,250, with the first and third quartile range of $55,500 to $126,250.

www.intelproplaw.com/JobsAvailable/). For example, the University of Dayton reviewer wrote: “in the forty plus years that this reviewer has been practicing law, there has been a persistent shortage of people qualified and licensed by the United States Patent and Trademark Office to prepare, file and prosecute patent applications. The proposed Masters in Patent Practice will help alleviate that shortage. This program is unique to Ohio.” The reviewer from the University of Toledo stated “CWRU has clearly shown that there are jobs for patent agents and that patent applications are increasing and a growth field.” It is the intent of this program to provide individuals with a competitive edge to this professional discipline.

The formal acceptance of the stand alone MA in Patent Practice was approved by the Board of Reagents in March 2015. This degree is currently advertised within the materials associated with admissions into the Law School.

II. Administration

School of Law Liaison: Craig Nard, Professor of Law, School of Law
Biochemistry Department Liaison: William Merrick, Professor of Biochemistry, Department of Biochemistry.

Professors Nard and Merrick will meet every other month during the initial phases of the program to best address problems these dual degree students might be having beyond those of the stand alone MA in Patent Practice (overseen by Professor Nard) and those in the stand alone or other dual degree programs associated with the MS in Biochemistry (overseen by Professor Merrick). In particular, there is a twelve year history with a similar program, the dual degree JD/ MS in Biochemistry.

III. Program Structure

If one were to acquire the MA and MS degrees independently, it would require the completion of 30 hours for the MA program and 36 hours for the MS program (a total of 66 credit hours). In the dual degree program, cross counting allows for a reduction in the total number of class hours to 45 credit hours for both degrees as described below. The 30 credit hour and 36 credit hour numbers are for the independent programs as accredited through the Board of Reagents in Columbus.

The proposed dual degree requires students to complete 45 credit hours. The MS in Biochemistry requires 24 credit hours of coursework for the completion of the MS degree (plan B). The School of Law requires 21 credit hours of coursework for the completion of the MA program as part of the dual degree. To be compliant with the manner in which both degrees are certified by the Board of Reagents, students will count 11-12 Law credit hours towards the MS in Biochemistry and count 9 hours of Biochemistry credits toward the MA in Patent Practice. Thus, there is an approximately equal reduction in both programs in accumulating the

total number of credit hours that are required to satisfy the requirements of the stand alone programs as approved by the Board of Reagents.

The advantage of this dual degree program over either an MA with certificate in Biochemistry or an MS in Biochemistry with a certificate in Patent Practice is that the student will receive a recognized degree (either MA or MS) rather than a certificate which has no true academic definition (i.e. some CWRU certificate programs are completed with as few as 10 to 12 hours).

It should be noted that the anticipated number of students, perhaps as many as 6 per year, will not add a sufficient burden for the Law School classes (the MA in Patent Practice in particular), the biomedical classes nor the administration such that no additional personnel (faculty or staff) will be required for this program in either the Law School or the School of Medicine.

IV. Dual Degree Curriculum: Examples

Students begin in the School of Law although the fundamental Biochemistry course is also taken (BIOC 407, 408). The anticipation is that the entering student will be practicing in patent law and therefore the primary guidance in terms of job placement will reflect advising from the School of Law. The advisor in Biochemistry will provide insight into the most recent developing areas of research and technology that the student would be likely to encounter in their future employment.

Year 1: First year curriculum.

	Semester 1		Semester 2	
	LAWS IP Survey	(3)	LAWS IP Elective course	(3)
	LAWS Patent Law	(3)	LAWS Patent Preparation II	(2)
	LAWS Patent Preparation I	(3)	BIOC elective	(3)
	BIOC 407	(4)	BIOC 408	(4)
Year 2.	BIOC 412	(3)	LAWS Patent Bar Review	(4)
	BIOC elective	(3)	LAWS Experiential Elective**	(3)
	BIOC elective	(3)	BIOC elective	(3)
			EXAM 600	(1)

Alternate, 18 month fast track

Year 1: First semester		Semester 2	
LAWS IP Survey	(3)	LAWS IP Elective course	(3)
LAWS Patent Law	(3)	LAWS Patent Preparation II	(2)
LAWS Patent Preparation I	(3)	LAWS Patent Bar Review	(4)
BIOC 407	(4)	BIOC elective	(3)
BIOC 412	(3)	BIOC 408	(4)

Year 2: First semester

LAWS Experiential Elective**	(3)	or LAWS IP Venture Clinic	(3)
BIOC elective	(3)		
BIOC elective	(3)		
BIOC elective	(3)		
EXAM 600	(1)		

Biochemistry electives for the first and second year

BIOL 426 (3)	BIOL 424 (3)***
BIOC 420 (3)	BIOL 426 (3)
BIOC 430 (1) Comp. Biol.	BIOC 454 (3)
NTRN 452 (3)	GENE 531 (2-3)
PHRM 409 (3)	BIOC 460 (3)
SYBB 411 (1-4)	SYBB 411 (1-4)
PHRM 528 (3)***	SYBB 459 (3)
BIOC 601 (1-4)	CLBY 450 (3)***
	PATH 416 (3)
	BIOC 601 (1-4)

**The experiential elective refers to an externship with a corporation (i.e. Parker Hannifin, Cleveland Clinic Innovations, Bridgestone America, etc.) or a law firm.

***recommended by previous JD/MS students as being useful for patent law and also being good classes

A more complete description of the Biochemistry and Law required courses and electives is in the Appendix.

Alternatively, up to 6 credits of BIOC 601 could be taken during the summer after the first year freeing up time during the regular semesters. However, of the total 24 hours required in Biochemistry, 18 hours must be in courses that are letter graded.

Courses to count towards the MS in Biochemistry are Patent Law (3), Patent Preparation I (3), IP Survey (3) and Experiential elective (3) for a total of 12 credit hours.

Courses to count towards the MA in Patent Law would be either BIOC 407, BIOC 408 and one of the technically oriented BIOC electives (credit to be either 3 or 4 hours)

To fulfill the MS degree portion of the dual degree program, students will focus their capstone writing requirement (EXAM 600; see Appendix) on the subject of their work in the Department of Biochemistry. This proposal may reflect either a current research article, material from one of the graduate classes or research the student may have performed as part of BIOC 601 credit. The MS Advisor will serve as a (co-)supervisor of this proposal.

Successful completion of the program would require 45 credits:

Total Hours in the School of Law:	21
Total Hours in the Department of Biochemistry:	24
Total Hours in the Dual Degree Program:	45

V. Dual Degree Student Advising

Dual degree students will be advised concerning matters related to the MA in Patent Practice degree by Professor Craig Nard, Director of the Spangenberg Center for Law, Technology and the Arts. Dual degree students will be advised concerning matters related to the MS in Biochemistry by the Graduate Program Advisor as designated by the Graduate Education Committee of the Department of Biochemistry (currently Professor William Merrick). At the end of each semester, the student will meet with both the MA advisor and the MS advisor to discuss progress and to select classes for the coming semester.

By regulations of the School of graduate Studies, Master's students are required to maintain a GPA of 2.75 or greater within the School of Graduate Studies; this will be applied to the combined GPA for Biochemistry or approved Biochemistry elective courses. The MA in Patent Practice program requires a GPA of at least 2.75; this will apply to all courses taken towards the MA in Patent Practice degree.

Twice a year, immediately after the beginning of the fall and spring semesters, or more frequently if necessary, the Director of MA Patent Practice and the Graduate Program Advisor of the Department of Biochemistry will meet to discuss the progress of all students in the program.

VI. Admissions

Target enrollment in the program is about six students each year. Students wishing to enroll in the dual degree program apply to and are admitted into the dual degree program directly. As the MA in Patent Practice does not require the LSAT or other standardized exam, the MS in Biochemistry Program will accept either the GRE, MCAT or LSAT as the standardized exam for acceptance into the dual degree program. This is in lieu of the more standard GRE score that is used for admittance into the individual M. S. or Ph. D. programs in Biochemistry. Applications will be jointly reviewed by the directors of the two programs. Once students have been admitted, they will consult with the Department of Biochemistry Department Liaison and Law School Liaison to determine their appropriate course of MA study and the MS Advisor of the Department of Biochemistry to determine their appropriate program of MS study. In order that the admitted student can immediately take graduate courses in the biological sciences, they must have taken a full year course in each of the following: introductory chemistry, organic chemistry and introductory biology. Additional course work such as genetics, physics and calculus would enhance the applicant's portfolio.

Given the nature of this dual degree and the cost savings to the student (the equivalent of 20 credit hours), no financial aid will be offered by either the Law School or the Department of Biochemistry to students in this program.

VII. Tuition Revenue Mechanics:

A written agreement about the management of tuition revenues will exist between the Law School and the Department of Biochemistry. The text of this agreement is shown below:

Graduate student tuition revenues filter back to the student's home school. The MS Biochemistry student's home is based in the School of Medicine. The MA student's home is based within the School of Law. It is anticipated the dual MA/MS students will be home based in the School of Law. Tuitions paid to the School of Law will be fully retained by the Law School. Tuitions paid to the School of Graduate studies will be split 20% to the School of Law and 80% to the School of Medicine. This split reflects the primary advising role played by the School of Law in the final placement of the student into an employment opportunity.

VIII. Approval Signatures:

Interim Dean, School of Law *Michael Scharf or Jessica Berg*	X
Chair, Department of Biochemistry *Dr. Michael A. Weiss*	X

Dean, School of Medicine *Dr. Pamela B. Davis*	X
Dean, School of Graduate Studies Dr. Charles Rozek	X

IX. Student Activities:

It is noted that for either the experiential elective or the IP Venture Clinic, the student will have direct exposure to the workings of the patent process. The School of Law will assist in the placement of the student in the relevant environment.

Other appropriate activities for the MA/MS students include attending the weekly seminars, as well as annual named lectureships, participating in annual retreats, and one or more journal clubs (see also casemed.case.edu/gradprog/index.php). Within the Law School, students will be involved with informal networking experiences with potential employers and participate in Law School activities as they choose (see law.case.edu/StudentLife.aspx)

X. Advantages of the Joint Degree Program

There are several advantages to the students in the MA/MS program. The key advantage will be the integration of the two disciplines during the time that the students are receiving their training, thus allowing the students to develop a unique focus on their studies in each of the two disciplines. In addition, the usual Master's of Science in Biochemistry is a two year program but the students in the dual degree program will be able to complete the program requirements in just 12 months beyond the time required for obtaining the MA degree (or sooner if they take the alternate, accelerated track). This is reflected in the credit savings for the two degrees (36 + 30 = 66 hours) vs. the dual degree which requires 45 credit hours. This savings in credit hours is thus seen in both time (18 or 24 months vs. 3 years) and in expense, roughly the cost of an additional semester or two.

Appendix – Elective courses

Suggested Biochemistry Elective Courses

Fall Semester

BIOL 426 – Genetics - Transmission genetics, nature of mutation, microbial genetics, somatic cell genetics, recombinant DNA techniques and their application to genetics, human genome mapping, plant breeding, transgenic plants and animals, uniparental inheritance, evolution, and quantitative genetics.
Offered as BIOL 326 and BIOL 426.

BIOC 407 – Introduction to Biochemistry: From molecules to medical science. Overview of the macromolecules and small molecules key to all living systems. Topics include: protein structure and function; enzyme mechanisms, kinetics and regulation; membrane structure and function; bioenergetics; hormone action; intermediary metabolism, including pathways and regulation of carbohydrate, lipid, amino acid, and nucleotide biosynthesis and breakdown. The material is presented to build links to human biology and human disease. One semester of biology is recommended.
Offered as BIOC 307, BIOC 407, and BIOL 407.

BIOC 408 – Molecular Biology - An examination of the flow of genetic information from DNA to RNA to protein. Topics include: nucleic acid structure; mechanisms and control of DNA, RNA, and protein biosynthesis; recombinant DNA; and mRNA processing and modification. Where possible, eukaryotic and prokaryotic systems are compared. Special topics include yeast as a model organism, molecular biology of cancer, and molecular biology of the cell cycle. Current literature is discussed briefly as an introduction to techniques of genetic engineering. Recommended preparation: BIOC 307/407.
Offered as BIOC 308, BIOL 308, BIOC 408, and BIOL 408.

BIOC 412 – Proteins and Enzymes - Aspects of protein and nucleic acid function and interactions are discussed, including binding properties, protein-nucleic acid interactions, kinetics and mechanism of proteins and enzymes, and macromolecular machines.
Recommended Preparation: CHEM 301.
Offered as BIOC 312 and BIOC 412.

BIOC 420 – Current Topics in Cancer - The concept of cancer hallmarks has provided a useful guiding principle in our understanding of the complexity of cancer. The hallmarks include sustaining proliferative signaling, evading growth suppressors, enabling replicative immortality, activating invasion and metastasis, inducing angiogenesis, resisting cell death, deregulating cellular energetics, avoiding immune destruction, tumor-promoting inflammation, and genome

instability and mutation. The objectives of this course are to (1) examine the principles of some of these hallmarks, and (2) explore potential therapies developed based on these hallmarks of cancer. This is a student-driven and discussion-based graduate course. Students should have had some background on the related subjects and have read scientific papers in their prior coursework. Students will be called on to present and discuss experimental design, data and conclusions from assigned publications. There will be no exams or comprehensive papers but students will submit a one-page critique (strengths and weaknesses) of one of the assigned papers prior to each class meeting. The course will end with a full-day student-run symposium on topics to be decided jointly by students and the course director. Grades will be based on class participation, written critiques, and symposium presentations.
Offered as BIOC 420, MBIO 420, MVIR 420, PATH 422, and PHRM 420.

BIOC 430 – **Computational Biology** (Shoham module)- The course is designed for graduate students who will be focusing on one or more methods of structural biology in their thesis project. This course is divided into 3-6 sections (depending on demand). The topics offered will include X-ray crystallography, nuclear magnetic resonance spectroscopy, optical spectroscopy, mass spectrometry, cryo-electron microscopy, and computational and design methods. Students can select one or more modules. Modules will be scheduled so that students can take all the offered modules in one semester. Each section is given in 5 weeks and is worth 1 credit. Each section covers one area of structural biology at an advanced level such that the student is prepared for graduate level research in that topic.
Offered as BIOC 430, CHEM 430, PHOL 430, and PHRM 430.

BIOC 601 – Research – permission of the instructor is required (1-6 hours)

EXAM 600 – MS Qualifying exam - The M. S. qualifying exam is one that is based upon the student's generation of a research proposal that will have an Introduction (what is the history behind the proposal), Materials and Methods (an explanation of the techniques to be used in the proposal), Experimental Design (what are the actual experiments to be performed and what are the controls), and Discussion (what will be learned and how does this fit with the literature). This may be based upon the student's own research (taken as BIOC 601) or on a recent research article of the student's interest. The "preliminary data" that would start off the Experimental Design section could either be the student's lab data or the figures from the research article that the student has chosen as the basis for the proposal. For the qualifying exam, the student will prepare a 10 to 20 page document as described above and then defend the proposal to a committee of three faculty. Dr. Merrick will chair the committee and the two other faculty members will be selected based upon the research area of the proposal. In most instances, the defense of the proposal will take about 90 minutes.

NTRN 452 – Nutritional Biochemistry and Metabolism - Mechanisms of

regulation of pathways of intermediary metabolism; amplification of biochemical signals; substrate cycling and use of radioactive and stable isotopes to measure metabolic rates. Recommended preparation: BIOC 307 or equivalent.
Offered as BIOC 452 and NTRN 452.

PHRM 409 – Principles of Pharmacology - Principles of Pharmacology introduces the basic principles that underlie all of Pharmacology. The first half of the course introduces, both conceptually and quantitatively, drug absorption, distribution, elimination and metabolism (pharmacokinetics) and general drug receptor theory and mechanism of action (pharmacodynamics). Genetic variation in response to drugs (pharmacogenetics) is integrated into these basic principles. The second half of the course covers selected drug classes chosen to illustrate these principles. Small group/recitation sessions use case histories to reinforce presentation of principles and to discuss public perceptions of therapeutic drug use. Graduate students will be expected to critically evaluate articles from the literature and participate in a separate weekly discussion session. Recommended preparation for PHRM 409: Undergraduate degree in science or permission of instructor.
Offered as PHRM 309 and PHRM 409.

PHRM 528 – Contemporary Approaches to Drug Discovery - This course is designed to teach the students how lead compounds are discovered, optimized, and processed through clinical trials for FDA approval. Topics will include: medicinal chemistry, parallel synthesis, drug delivery and devices, drug administration and pharmacokinetics, and clinical trials. A special emphasis will be placed on describing how structural biology is used for in silico screening and lead optimization. This component will include hands-on experience in using sophisticated drug discovery software to conduct in silico screening and the development of drug libraries. Each student will conduct a course project involving in silico screening and lead optimization against known drug targets, followed by the drafting of an inventory disclosure. Another important aspect of this course will be inclusion of guest lectures by industrial leaders who describe examples of success stories of drug development.
Offered as BIOC 528, PHOL 528, and PHRM 528.

SYBB 411 A – D – Technologies in Bioinformatics - SYBB 311/411A is a 5-week course that introduces students to the high-throughput technologies used to collect data for bioinformatics research in the fields of genomics, proteomics, and metabolomics. In particular, we will focus on mass spectrometer-based proteomics, DNA and RNA sequencing, genotyping, protein microarrays, and mass spectrometry-based metabolomics. This is a lecture-based course that relies heavily on out-of-class readings. Graduate students will be expected to write a report and give an oral presentation at the end of the course.
SYBB 311/411A is part of the SYBB survey series which is composed of the following course sequence: (1) Technologies in Bioinformatics, (2) Data Integration in Bioinformatics, (3) Translational Bioinformatics, and (4) Programming for

Bioinformatics. Each standalone section of this course series introduces students to an aspect of a bioinformatics project - from data collection (SYBB 311/411A), to data integration (SYBB 311/411B), to research applications (SYBB 311/411C), with a fourth module (SYBB 311/411D) introducing basic programming skills.
Graduate students have the option of enrolling in all four courses or choosing the individual modules most relevant to their background and goals with the exception of SYBB411D, which must be taken with SYBB411A.
Offered as SYBB 311A, BIOL 311A and SYBB 411A.

Spring Semester

BIOL 424 – Introduction to Stem Cell Biology –This discussion-based course will introduce students to the exciting field of stem cell research. Students will first analyze basic concepts of stem cell biology, including stem cell niche, cell quiescence, asymmetric cell division, cell proliferation and differentiation, and signaling pathways involved in these processes. This first part of the course will focus on invertebrate genetic models for the study of stem cells. In the second part of the course, students will search for primary research papers on vertebrate and human stem cells, and application of stem cell research in regenerative medicine and cancer. Finally, students will have the opportunity to discuss about ethical controversies in the field. Students will rotate in weekly presentations, and will write two papers during the semester. Students will improve skills on searching and reading primary research papers, gain presentation skills, and further their knowledge in related subjects in the fields of cell biology, genetics and developmental biology. This course may be used as a cell/molecular subject area elective for the B.A. and B.S. Biology degrees.
Offered as BIOL 324 and BIOL 424.

BIOL 426 - Genetics - Transmission genetics, nature of mutation, microbial genetics, somatic cell genetics, recombinant DNA techniques and their application to genetics, human genome mapping, plant breeding, transgenic plants and animals, uniparental inheritance, evolution, and quantitative genetics.
Offered as BIOL 326 and BIOL 426.

BIOC 454 – Biochemistry and Biology of RNA - Systematic overview of RNA biochemistry and biology. Course provides solid foundation for understanding processes of post-transcriptional regulation of gene expression. Topics include: RNA structure, RNA types, RNA-protein interactions, eukaryotic RNA metabolism including mRNA processing, ribosome biogenesis, tRNA metabolism, miRNA processing and function, bacterial RNA metabolism, transcriptomics. BIOC 454 requires an additional research proposal. Recommended preparation for BIOC 354: Undergraduate Biology (1 semester minimum), equivalents of CHEM 301, BIOC 307 or 308, CHEM 223, CHEM 224.
Offered as BIOC 354 and BIOC 454.

BIOC 460 – Introduction to Microarrays - Microarray technology is an exciting

new technique that is used to analyze gene expression in a wide variety of organisms. The goal of this course is to give participants a hands-on introduction to this technology. The course is intended for individuals who are preparing to use this technique, including students, fellows, and other investigators. This is a hands-on computer-based course, which will enable participants to conduct meaningful analyses of microarray data. Participants will gain an understanding of the principles underlying microarray technologies, including: theory of sample preparation, sample processing on microarrays, familiarity with the use of Affymetrix Microarray Suite software and generation of data sets. Transferring data among software packages to manipulate data will also be discussed. Importation of data into other software (GeneSpring and DecisionSite) will enable participants to mine the data for higher-order patterns. Participants will learn about the rationale behind the choice of normalization and data filtering strategies, distance metrics, use of appropriate clustering choices such as K-means, Hierarchical, and Self Organizing Maps.
Course Offered as BIOC 460, PATH 460, CNCR 460.

BIOC 601 – Research – permission of instructor required

CLBY 450 – Cells and Pathogens - Modern molecular cell biology owes a great debt to viral and bacterial pathogens as model systems. In some instances pathogens operate by faithful mimicry of host proteins, and other cases represent the result of extensive molecular tinkering and convergent evolution. This course will also explore numerous mechanisms utilized by pathogens to subvert the host and enhance their own survival. Topics covered include nuclear regulatory mechanisms, protein synthesis and stability, membrane-bound organelles, endocytosis and phagocytosis, and factors that influence cell behavior such as cytoskeleton rearrangements, cell-cell interactions, and cell migration. Additional topics include cell signaling and co-evolution of pathogens and host cell functions. Students are expected to come to class prepared to discuss pre-assigned readings consisting of brief reviews and seminal papers from the literature. Student assessment will be based on effective class participation (approximately 80%) and successful presentation of an independent research topic (approximately 20%).
Offered as CLBY 450, MBIO 450, and MVIR 450.

GENE 531 – Cancer Genetics - This seminar will discuss basic concepts in cancer epidemiology, principles of cancer genetics, inherited cancer syndromes, cytogenetics of cancers, predigree analysis for familial cancer risk and approaches to the differential diagnosis of inherited and familial cancers. Additionally, topics of risk assessment, genetic testing, screening, management and psychosocial issues in providing genetic counseling to patients with familial and inherited cancers will be discussed.

PATH 416 – Fundamental Immunology - Introductory immunology providing an overview of the immune system, including activation, effector mechanisms, and

regulation. Topics include antigen-antibody reactions, immunologically important cell surface receptors, cell-cell interactions, cell-mediated immunity, innate versus adaptive immunity, cytokines, and basic molecular biology and signal transduction in B and T lymphocytes, and immunopathology. Three weekly lectures emphasize experimental findings leading to the concepts of modern immunology. An additional recitation hour is required to integrate the core material with experimental data and known immune mediated diseases. Five mandatory 90 minute group problem sets per semester will be administered outside of lecture and recitation meeting times. Graduate students will be graded separately from undergraduates, and 22 percent of the grade will be based on a critical analysis of a recently published, landmark scientific article.
Offered as BIOL 316, BIOL 416, CLBY 416, and PATH 416.

SYBB 411 A – D – Technologies in Bioinformatics - SYBB 311/411A is a 5-week course that introduces students to the high-throughput technologies used to collect data for bioinformatics research in the fields of genomics, proteomics, and metabolomics. In particular, we will focus on mass spectrometer-based proteomics, DNA and RNA sequencing, genotyping, protein microarrays, and mass spectrometry-based metabolomics. This is a lecture-based course that relies heavily on out-of-class readings. Graduate students will be expected to write a report and give an oral presentation at the end of the course.
SYBB 311/411A is part of the SYBB survey series which is composed of the following course sequence: (1) Technologies in Bioinformatics, (2) Data Integration in Bioinformatics, (3) Translational Bioinformatics, and (4) Programming for Bioinformatics. Each standalone section of this course series introduces students to an aspect of a bioinformatics project - from data collection (SYBB 311/411A), to data integration (SYBB 311/411B), to research applications (SYBB 311/411C), with a fourth module (SYBB 311/411D) introducing basic programming skills.
Graduate students have the option of enrolling in all four courses or choosing the individual modules most relevant to their background and goals with the exception of SYBB411D, which must be taken with SYBB411A.
Offered as SYBB 311A, BIOL 311A and SYBB 411A.

SYBB 459 – Bioinformatics for Systems Biology - Description of omic data (biological sequences, gene expression, protein-protein interactions, protein-DNA interactions, protein expression, metabolomics, biological ontologies), regulatory network inference, topology of regulatory networks, computational inference of protein-protein interactions, protein interaction databases, topology of protein interaction networks, module and protein complex discovery, network alignment and mining, computational models for network evolution, network-based functional inference, metabolic pathway databases, topology of metabolic pathways, flux models for analysis of metabolic networks, network integration, inference of domain-domain interactions, signaling pathway inference from protein interaction networks, network models and algorithms for disease gene identification, identification of dysregulated subnetworks network-based disease classification.
Offered as EECS 459 and SYBB 459.

Required Law School Courses

LAWS 4300 – Intellectual Property Survey - This course is designed to provide students with an overview of several areas of law traditionally associated with intellectual property or IP, including copyright law, which pertains to the protection of literary, musical, and artistic creations and has issues replete with First Amendment implications; patent law and trade secret law, which focus on the protection of technological works ranging from chemical formulae, to software, to biotechnology; and trademark law, which relates to the goodwill associated with corporate identity and product recognition. We will also devote time to the study of the philosophy and economics of intellectual property keeping in mind, throughout the course, the need to strike an optimal balance between incentives to create and commercialize intellectual creations on the one hand and public access to these creations on the other hand.

LAWS 4302 – Patent Law - Basic concepts of patent law as property considered primarily in its substantive aspects, including the relationship to other forms of protection and intellectual property, infringement, and statutory requirements for patents.

LAWS 4311 - Patent Preparation and Drafting I: Patent preparation, drafting, and filing of a patent application are the fundamental aspects of patent practice. Students will learn how to conduct a client-inventor interview, what questions to ask the client-inventor and what information is most important to obtain prior to commencing the patent drafting process. Technical aspects of patentability searching will also be explored. In addition, the student will learn the various parts of the patent application and best practices associated with drafting each part. Emphasis will be placed on specification drafting and claim drafting, and how to claim around prior art. *Significant emphasis will be placed on USPTO Rules of Professional Conduct* – see www.uspto.gov/learning-and-resources/ip-policy/current-practitioners/uspto-rules-professional-conduct

LAWS 4312 - Patent Preparation and Drafting II: The course builds on *Patent Drafting and Prosecution I* and will focus on aspects of patent prosecution post-filing. In particular, students will learn how to respond to an Office Action rejecting the patent application as is typically encountered during the practice before the US Patent and Trademark Office. The student's response will take the form of an Amendment that will reflect changes made to the claims and arguments relating to patentability. The course will also cover the appeals process. *Significant emphasis will be placed on USPTO Rules of Professional Conduct* – see www.uspto.gov/learning-and-resources/ip-policy/current-practitioners/uspto-rules-professional-conduct.

LAWS 4820 - Bar Review: Passing the patent bar is a requirement for practicing before the U.S. Patent & Trademark Office ("USPTO"). This course will introduce

students to 35 U.S.C. (the United States “patent laws”) and 37 C.F.R. (Code of Federal Regulations encompassing the “patent rules”), followed by an in-depth study of the M.P.E.P. (Manual of Patent Examining Procedure), which is the Patent Office’s rule book that covers all the patent laws and rules as interpreted by the USPTO. In addition, the course will cover the particulars of the patent bar exam, including questions from prior exams; essential materials the students need to master to pass the exam, and provide students with several opportunities to hone their bar taking skills.

Suggested Law School Elective Courses

Fall Semester

LAWS 5341 – Commercialization and Intellectual Property Management - This interdisciplinary course covers a variety of topics, including principles of intellectual property and intellectual property management, business strategies and modeling relevant to the creation of start-up companies and exploitation of IP rights as they relate to biomedical-related inventions. The goal of this course is to address issues relating to the commercialization of biomedical-related inventions by exposing law students, MBA students, and Ph.D. candidates (in genetics and proteomics) to the challenges and opportunities encountered when attempting to develop biomedical intellectual property from the point of early discovery to the clinic and market. Specifically, this course seeks to provide students with the ability to value a given technological advance or invention holistically, focusing on issues that extend beyond scientific efficacy and include patient and practitioner value propositions, legal and intellectual property protection, business modeling, potential market impacts, market competition, and ethical, social, and healthcare practitioner acceptance. During this course, law students, MBA students, and Ph.D. candidates in genomics and proteomics will work in teams of five (two laws students, two MBA students and one Ph.D. candidate), focusing on issues of commercialization and IP management of biomedical-related inventions. The instructors will be drawn from the law school, business school, and technology-transfer office. Please visit the following website for more information: fusioninnovate.com.

Spring Semester

LAWS 4315 - Claim Drafting Lab - The patent claim is the most important part of the patent application, because it is the claim that represents the metes and bounds of inventor’s property right. This Lab is devoted to drafting claims, understanding the different types of claims, and how claims differ depending on the nature of the technology. A particular emphasis will be placed on computer-implemented (e.g., software) and biomedical-related inventions (e.g., life science and biomedical devices)

LAWS 5323 - IP Strategy - Intellectual property rights are legally created business assets used by companies to provide a competitive advantage in the marketplace. Companies use intellectual property differently depending on many factors, such as industry, business strategy, culture and maturity. Intellectual property attorneys are considered valuable members of business teams, contributing to business strategy, business planning and other executive level business decisions. Indeed, IP is a boardroom issue.

This class will study the ways intellectual property is used by different companies and how the intellectual property laws impact not only the intellectual property assets, but also the business strategy and business planning. In addition to learning how intellectual property is being used by major corporations, universities, and entrepreneurs/start-ups, the students will pick one company and study how that company manages its intellectual property.

LAWS 6401 - Experiential Elective (IP Venture Clinic): In the IP Venture Clinic ("IPVC"), students, working under the supervision of faculty, represent start-up companies and entrepreneurs from the Blackstone LaunchPad initiative in Northeast Ohio. Students in the Masters of Patent Practice program will work up a general IP protection strategy, working with supervising practitioners to design and implement that strategy. Students will perform prior art searches, drafting claims and participating in the application and prosecution process with the U.S. Patent and Trademark Office (USPTO) and other patent offices worldwide. Importantly, the UPSTO has selected Case Western Reserve University School of Law to participate in the Patent Law School Clinic Certification Program, which provides law students the opportunity to represent clients before the USPTO.

SCHOOL OF MEDICINE
CASE WESTERN RESERVE UNIVERSITY

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December 16, 2014

Dean Pamela Davis
Case Western Reserve School of Medicine
10900 Euclid Avenue
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Re: New dual degree SOM-Law School Master's

Dear Pam:

It is with great enthusiasm that I endorse and recommend the proposal by Prof. William Merrick (Vice Chair for Education) to develop a new Master's Program in Biochemistry in coordination with the graduate curriculum of the CWRU School of Law. The proposed dual MA in Patent Practice/MS in Biochemistry Program would enhance the career opportunities of students keen to engage in intellectual-property and patent-related activities in biotechnology or to have focused roles in law firms.

There are rich educational synergies between respective scientific curricula in Biochemistry and the School of Law. As outlined in Bill's proposal, these include the training of leading lawyers in IP fields with knowledge of biochemical principles and the training of scientists with an understanding of legal principles related to IP and patent law. The rationale for this program reflects a change in student needs. Whereas in past decades recently graduated engineers and scientists often enrolled in law school with the goal of becoming patent lawyers, over the past few years a growing number have become reluctant to invest in a three-year JD program. The proposed *Masters in Patent Practice* thus seeks to provide a viable alternative for these students, with a focus on students with a biochemistry background.

My colleagues and I anticipate that there will be a significant pool of applicants at this interface for whom the existence of a combined degree program will enhance the competitiveness of CWRU relative to peer institutions. The educational approach of the School of Law, with its many small groups, is in general accordance with the educational philosophy of the School of Medicine and congruent in particular with how we teach in Biochemistry.

The existence of such an attractive joint-degree program promises to enhance both the educational environment and the tuition revenue of the Department of Biochemistry. Please note that a senior faculty member at the CWRU School of Law, Craig Nard (Galen J. Roush Professor of Law; Director of the Center for Law, Technology and the Arts) contributed to the design of this joint program and shares our enthusiasm.

Thank you for your consideration. With warm regards for the Holiday Season,

Mike Weiss

cc. Christopher Masotti (CFO)
Prof. Mark Chance (Vice Dean for Research

MA in Patent Practice/MS in Biochemistry (plan B) Dual Degree Proposal

This document contains a proposal for a dual degree between the Department of Biochemistry in the School of Medicine (MS degree, plan B) and the Law School (MA in Patent Practice).

I. Background and Justification

The purpose of the degree program is to prepare a cadre of biochemistry students for successful careers as patent agents. In any given year, recently graduated engineers and scientists enroll in law school with the goal of becoming patent lawyers, but over the past few years, a growing number have become reluctant to invest in a three-year JD program. The proposed *Masters in Patent Practice* seeks to provide a viable alternative for these students, with a focus on students with a biological background. The most likely undergraduates would be science or engineering majors with the likelihood that biology and premed students who failed to enter medical school would predominate (in part based upon the requirements for entry). The one technological area of patent practice where an advanced degree leads to a significant difference in marketability is the life science field.

A career as a patent agent enables engineers and biomedical scientists to stay close to their technological specialty, yet provides a livelihood that has comparative advantages over that of a practicing engineer or bench scientist.[1] Indeed, the patent law landscape over the past 10 years has witnessed the growing importance of patent agents. Most IP boutique firms or IP practice groups within general firms have at least one, and oftentimes several, patent agents; and it is also common for patent agents to work in-house for corporations of all sizes. The *Masters in Patent Practice* will not only prepare the engineer and biomedical scientist to take the patent bar, but will introduce them to the nuances of patent searching, the complexities of patent drafting, and the arcana commonly associated with patent law doctrine and USPTO regulations.

Over the past several years, the United States Patent and Trademark Office has received increasingly more patent applications. In 2013, 571,612 patent applications were filed with the patent office. This compares with 456, 321 in 2008 and 342,441 in 2000. Job postings for patent agents in intellectual property law journals and websites reflect these numbers. Anecdotal evidence also suggests a demand for patent agents.

Moreover, in the initial review of the MA in Patent Practice proposal, the Board of Reagents review observed that there is a demand for patent agents (i.e. see

[1] For example, according to the American Intellectual Property Lawyers Association's "Report of the Economic Survey 2013," the average salary of a patent agent with fewer than five years of experience at a private law firm is $92,250, with the first and third quartile range of $55,500 to $126,250.

www.intelproplaw.com/JobsAvailable/). For example, the University of Dayton reviewer wrote: “in the forty plus years that this reviewer has been practicing law, there has been a persistent shortage of people qualified and licensed by the United States Patent and Trademark Office to prepare, file and prosecute patent applications. The proposed Masters in Patent Practice will help alleviate that shortage. This program is unique to Ohio.” The reviewer from the University of Toledo stated “CWRU has clearly shown that there are jobs for patent agents and that patent applications are increasing and a growth field.” It is the intent of this program to provide individuals with a competitive edge to this professional discipline.

The formal acceptance of the stand alone MA in Patent Practice was approved by the Board of Reagents in March 2015. This degree is currently advertised within the materials associated with admissions into the Law School.

II. Administration

School of Law Liaison: Craig Nard, Professor of Law, School of Law
Biochemistry Department Liaison: William Merrick, Professor of Biochemistry, Department of Biochemistry.

Professors Nard and Merrick will meet every other month during the initial phases of the program to best address problems these dual degree students might be having beyond those of the stand alone MA in Patent Practice (overseen by Professor Nard) and those in the stand alone or other dual degree programs associated with the MS in Biochemistry (overseen by Professor Merrick). In particular, there is a twelve year history with a similar program, the dual degree JD/ MS in Biochemistry.

III. Program Structure

If one were to acquire the MA and MS degrees independently, it would require the completion of 30 hours for the MA program and 36 hours for the MS program (a total of 66 credit hours). In the dual degree program, cross counting allows for a reduction in the total number of class hours to 45 credit hours for both degrees as described below. The 30 credit hour and 36 credit hour numbers are for the independent programs as accredited through the Board of Reagents in Columbus.

The proposed dual degree requires students to complete 45 credit hours. The MS in Biochemistry requires 24 credit hours of coursework for the completion of the MS degree (plan B). The School of Law requires 21 credit hours of coursework for the completion of the MA program as part of the dual degree. To be compliant with the manner in which both degrees are certified by the Board of Reagents, students will count 11-12 Law credit hours towards the MS in Biochemistry and count 9 hours of Biochemistry credits toward the MA in Patent Practice. Thus, there is an approximately equal reduction in both programs in accumulating the

total number of credit hours that are required to satisfy the requirements of the stand alone programs as approved by the Board of Reagents.

The advantage of this dual degree program over either an MA with certificate in Biochemistry or an MS in Biochemistry with a certificate in Patent Practice is that the student will receive a recognized degree (either MA or MS) rather than a certificate which has no true academic definition (i.e. some CWRU certificate programs are completed with as few as 10 to 12 hours).

It should be noted that the anticipated number of students, perhaps as many as 6 per year, will not add a sufficient burden for the Law School classes (the MA in Patent Practice in particular), the biomedical classes nor the administration such that no additional personnel (faculty or staff) will be required for this program in either the Law School or the School of Medicine.

IV. Dual Degree Curriculum: Examples

Students begin in the School of Law although the fundamental Biochemistry course is also taken (BIOC 407, 408). The anticipation is that the entering student will be practicing in patent law and therefore the primary guidance in terms of job placement will reflect advising from the School of Law. The advisor in Biochemistry will provide insight into the most recent developing areas of research and technology that the student would be likely to encounter in their future employment.

Year 1: First year curriculum.

	Semester 1		Semester 2	
	LAWS IP Survey	(3)	LAWS IP Elective course	(3)
	LAWS Patent Law	(3)	LAWS Patent Preparation II	(2)
	LAWS Patent Preparation I	(3)	BIOC elective	(3)
	BIOC 407	(4)	BIOC 408	(4)
Year 2.	BIOC 412	(3)	LAWS Patent Bar Review	(4)
	BIOC elective	(3)	LAWS Experiential Elective**	(3)
	BIOC elective	(3)	BIOC elective	(3)
			EXAM 600	(1)

Alternate, 18 month fast track

Year 1: First semester		Semester 2	
LAWS IP Survey	(3)	LAWS IP Elective course	(3)
LAWS Patent Law	(3)	LAWS Patent Preparation II	(2)
LAWS Patent Preparation I	(3)	LAWS Patent Bar Review	(4)
BIOC 407	(4)	BIOC elective	(3)
BIOC 412	(3)	BIOC 408	(4)

Year 2: First semester

LAWS Experiential Elective**	(3)	or LAWS IP Venture Clinic	(3)
BIOC elective	(3)		
BIOC elective	(3)		
BIOC elective	(3)		
EXAM 600	(1)		

Biochemistry electives for the first and second year

BIOL 426 (3)	BIOL 424 (3)***
BIOC 420 (3)	BIOL 426 (3)
BIOC 430 (1) Comp. Biol.	BIOC 454 (3)
NTRN 452 (3)	GENE 531 (2-3)
PHRM 409 (3)	BIOC 460 (3)
SYBB 411 (1-4)	SYBB 411 (1-4)
PHRM 528 (3)***	SYBB 459 (3)
BIOC 601 (1-4)	CLBY 450 (3)***
	PATH 416 (3)
	BIOC 601 (1-4)

**The experiential elective refers to an externship with a corporation (i.e. Parker Hannifin, Cleveland Clinic Innovations, Bridgestone America, etc.) or a law firm.

***recommended by previous JD/MS students as being useful for patent law and also being good classes

A more complete description of the Biochemistry and Law required courses and electives is in the Appendix.

Alternatively, up to 6 credits of BIOC 601 could be taken during the summer after the first year freeing up time during the regular semesters. However, of the total 24 hours required in Biochemistry, 18 hours must be in courses that are letter graded.

Courses to count towards the MS in Biochemistry are Patent Law (3), Patent Preparation I (3), IP Survey (3) and Experiential elective (3) for a total of 12 credit hours.

Courses to count towards the MA in Patent Law would be either BIOC 407, BIOC 408 and one of the technically oriented BIOC electives (credit to be either 3 or 4 hours)

To fulfill the MS degree portion of the dual degree program, students will focus their capstone writing requirement (EXAM 600; see Appendix) on the subject of their work in the Department of Biochemistry. This proposal may reflect either a current research article, material from one of the graduate classes or research the student may have performed as part of BIOC 601 credit. The MS Advisor will serve as a (co-)supervisor of this proposal.

Successful completion of the program would require 45 credits:

Total Hours in the School of Law:	21
Total Hours in the Department of Biochemistry:	24
Total Hours in the Dual Degree Program:	45

V. Dual Degree Student Advising

Dual degree students will be advised concerning matters related to the MA in Patent Practice degree by Professor Craig Nard, Director of the Spangenberg Center for Law, Technology and the Arts. Dual degree students will be advised concerning matters related to the MS in Biochemistry by the Graduate Program Advisor as designated by the Graduate Education Committee of the Department of Biochemistry (currently Professor William Merrick). At the end of each semester, the student will meet with both the MA advisor and the MS advisor to discuss progress and to select classes for the coming semester.

By regulations of the School of graduate Studies, Master's students are required to maintain a GPA of 2.75 or greater within the School of Graduate Studies; this will be applied to the combined GPA for Biochemistry or approved Biochemistry elective courses. The MA in Patent Practice program requires a GPA of at least 2.75; this will apply to all courses taken towards the MA in Patent Practice degree.

Twice a year, immediately after the beginning of the fall and spring semesters, or more frequently if necessary, the Director of MA Patent Practice and the Graduate Program Advisor of the Department of Biochemistry will meet to discuss the progress of all students in the program.

VI. Admissions

Target enrollment in the program is about six students each year. Students wishing to enroll in the dual degree program apply to and are admitted into the dual degree program directly. As the MA in Patent Practice does not require the LSAT or other standardized exam, the MS in Biochemistry Program will accept either the GRE, MCAT or LSAT as the standardized exam for acceptance into the dual degree program. This is in lieu of the more standard GRE score that is used for admittance into the individual M. S. or Ph. D. programs in Biochemistry. Applications will be jointly reviewed by the directors of the two programs. Once students have been admitted, they will consult with the Department of Biochemistry Department Liaison and Law School Liaison to determine their appropriate course of MA study and the MS Advisor of the Department of Biochemistry to determine their appropriate program of MS study. In order that the admitted student can immediately take graduate courses in the biological sciences, they must have taken a full year course in each of the following: introductory chemistry, organic chemistry and introductory biology. Additional course work such as genetics, physics and calculus would enhance the applicant's portfolio.

Given the nature of this dual degree and the cost savings to the student (the equivalent of 20 credit hours), no financial aid will be offered by either the Law School or the Department of Biochemistry to students in this program.

VII. Tuition Revenue Mechanics:

A written agreement about the management of tuition revenues will exist between the Law School and the Department of Biochemistry. The text of this agreement is shown below:

Graduate student tuition revenues filter back to the student's home school. The MS Biochemistry student's home is based in the School of Medicine. The MA student's home is based within the School of Law. It is anticipated the dual MA/MS students will be home based in the School of Law. Tuitions paid to the School of Law will be fully retained by the Law School. Tuitions paid to the School of Graduate studies will be split 30% to the School of Law and 70% to the School of Medicine. This split reflects the primary advising role played by the School of Law in the final placement of the student into an employment opportunity.

VIII. Approval Signatures:

Interim Dean, School of Law *Michael Scharf or Jessica Berg*	X
Chair, Department of Biochemistry	X

Dr. Michael A. Weiss	
Dean, School of Medicine *Dr. Pamela B. Davis*	X
Dean, School of Graduate Studies Dr. Charles Rozek	X

IX. Student Activities:

It is noted that for either the experiential elective or the IP Venture Clinic, the student will have direct exposure to the workings of the patent process. The School of Law will assist in the placement of the student in the relevant environment.

Other appropriate activities for the MA/MS students include attending the weekly seminars, as well as annual named lectureships, participating in annual retreats, and one or more journal clubs (see also casemed.case.edu/gradprog/index.php). Within the Law School, students will be involved with informal networking experiences with potential employers and participate in Law School activities as they choose (see law.case.edu/StudentLife.aspx)

X. Advantages of the Joint Degree Program

There are several advantages to the students in the MA/MS program. The key advantage will be the integration of the two disciplines during the time that the students are receiving their training, thus allowing the students to develop a unique focus on their studies in each of the two disciplines. In addition, the usual Master's of Science in Biochemistry is a two year program but the students in the dual degree program will be able to complete the program requirements in just 12 months beyond the time required for obtaining the MA degree (or sooner if they take the alternate, accelerated track). This is reflected in the credit savings for the two degrees (36 + 30 = 66 hours) vs. the dual degree which requires 45 credit hours. This savings in credit hours is thus seen in both time (18 or 24 months vs. 3 years) and in expense, roughly the cost of an additional semester or two.

Appendix – Elective courses

Suggested Biochemistry Elective Courses

Fall Semester

BIOL 426 – Genetics - Transmission genetics, nature of mutation, microbial genetics, somatic cell genetics, recombinant DNA techniques and their application to genetics, human genome mapping, plant breeding, transgenic plants and animals, uniparental inheritance, evolution, and quantitative genetics.
Offered as BIOL 326 and BIOL 426.

BIOC 407 – Introduction to Biochemistry: From molecules to medical science. Overview of the macromolecules and small molecules key to all living systems. Topics include: protein structure and function; enzyme mechanisms, kinetics and regulation; membrane structure and function; bioenergetics; hormone action; intermediary metabolism, including pathways and regulation of carbohydrate, lipid, amino acid, and nucleotide biosynthesis and breakdown. The material is presented to build links to human biology and human disease. One semester of biology is recommended.
Offered as BIOC 307, BIOC 407, and BIOL 407.

BIOC 408 – Molecular Biology - An examination of the flow of genetic information from DNA to RNA to protein. Topics include: nucleic acid structure; mechanisms and control of DNA, RNA, and protein biosynthesis; recombinant DNA; and mRNA processing and modification. Where possible, eukaryotic and prokaryotic systems are compared. Special topics include yeast as a model organism, molecular biology of cancer, and molecular biology of the cell cycle. Current literature is discussed briefly as an introduction to techniques of genetic engineering. Recommended preparation: BIOC 307/407.
Offered as BIOC 308, BIOL 308, BIOC 408, and BIOL 408.

BIOC 412 – Proteins and Enzymes - Aspects of protein and nucleic acid function and interactions are discussed, including binding properties, protein-nucleic acid interactions, kinetics and mechanism of proteins and enzymes, and macromolecular machines.
Recommended Preparation: CHEM 301.
Offered as BIOC 312 and BIOC 412.

BIOC 420 – Current Topics in Cancer - The concept of cancer hallmarks has provided a useful guiding principle in our understanding of the complexity of cancer. The hallmarks include sustaining proliferative signaling, evading growth suppressors, enabling replicative immortality, activating invasion and metastasis, inducing angiogenesis, resisting cell death, deregulating cellular energetics, avoiding immune destruction, tumor-promoting inflammation, and genome

instability and mutation. The objectives of this course are to (1) examine the principles of some of these hallmarks, and (2) explore potential therapies developed based on these hallmarks of cancer. This is a student-driven and discussion-based graduate course. Students should have had some background on the related subjects and have read scientific papers in their prior coursework. Students will be called on to present and discuss experimental design, data and conclusions from assigned publications. There will be no exams or comprehensive papers but students will submit a one-page critique (strengths and weaknesses) of one of the assigned papers prior to each class meeting. The course will end with a full-day student-run symposium on topics to be decided jointly by students and the course director. Grades will be based on class participation, written critiques, and symposium presentations.
Offered as BIOC 420, MBIO 420, MVIR 420, PATH 422, and PHRM 420.

BIOC 430 – **Computational Biology** (Shoham module)- The course is designed for graduate students who will be focusing on one or more methods of structural biology in their thesis project. This course is divided into 3-6 sections (depending on demand). The topics offered will include X-ray crystallography, nuclear magnetic resonance spectroscopy, optical spectroscopy, mass spectrometry, cryo-electron microscopy, and computational and design methods. Students can select one or more modules. Modules will be scheduled so that students can take all the offered modules in one semester. Each section is given in 5 weeks and is worth 1 credit. Each section covers one area of structural biology at an advanced level such that the student is prepared for graduate level research in that topic.
Offered as BIOC 430, CHEM 430, PHOL 430, and PHRM 430.

BIOC 601 – Research – permission of the instructor is required (1-6 hours)

EXAM 600 – MS Qualifying exam - The M. S. qualifying exam is one that is based upon the student's generation of a research proposal that will have an Introduction (what is the history behind the proposal), Materials and Methods (an explanation of the techniques to be used in the proposal), Experimental Design (what are the actual experiments to be performed and what are the controls), and Discussion (what will be learned and how does this fit with the literature). This may be based upon the student's own research (taken as BIOC 601) or on a recent research article of the student's interest. The "preliminary data" that would start off the Experimental Design section could either be the student's lab data or the figures from the research article that the student has chosen as the basis for the proposal. For the qualifying exam, the student will prepare a 10 to 20 page document as described above and then defend the proposal to a committee of three faculty. Dr. Merrick will chair the committee and the two other faculty members will be selected based upon the research area of the proposal. In most instances, the defense of the proposal will take about 90 minutes.

NTRN 452 – Nutritional Biochemistry and Metabolism - Mechanisms of

regulation of pathways of intermediary metabolism; amplification of biochemical signals; substrate cycling and use of radioactive and stable isotopes to measure metabolic rates. Recommended preparation: BIOC 307 or equivalent.
Offered as BIOC 452 and NTRN 452.

PHRM 409 – Principles of Pharmacology - Principles of Pharmacology introduces the basic principles that underlie all of Pharmacology. The first half of the course introduces, both conceptually and quantitatively, drug absorption, distribution, elimination and metabolism (pharmacokinetics) and general drug receptor theory and mechanism of action (pharmacodynamics). Genetic variation in response to drugs (pharmacogenetics) is integrated into these basic principles. The second half of the course covers selected drug classes chosen to illustrate these principles. Small group/recitation sessions use case histories to reinforce presentation of principles and to discuss public perceptions of therapeutic drug use. Graduate students will be expected to critically evaluate articles from the literature and participate in a separate weekly discussion session. Recommended preparation for PHRM 409: Undergraduate degree in science or permission of instructor.
Offered as PHRM 309 and PHRM 409.

PHRM 528 – Contemporary Approaches to Drug Discovery - This course is designed to teach the students how lead compounds are discovered, optimized, and processed through clinical trials for FDA approval. Topics will include: medicinal chemistry, parallel synthesis, drug delivery and devices, drug administration and pharmacokinetics, and clinical trials. A special emphasis will be placed on describing how structural biology is used for in silico screening and lead optimization. This component will include hands-on experience in using sophisticated drug discovery software to conduct in silico screening and the development of drug libraries. Each student will conduct a course project involving in silico screening and lead optimization against known drug targets, followed by the drafting of an inventory disclosure. Another important aspect of this course will be inclusion of guest lectures by industrial leaders who describe examples of success stories of drug development.
Offered as BIOC 528, PHOL 528, and PHRM 528.

SYBB 411 A – D – Technologies in Bioinformatics - SYBB 311/411A is a 5-week course that introduces students to the high-throughput technologies used to collect data for bioinformatics research in the fields of genomics, proteomics, and metabolomics. In particular, we will focus on mass spectrometer-based proteomics, DNA and RNA sequencing, genotyping, protein microarrays, and mass spectrometry-based metabolomics. This is a lecture-based course that relies heavily on out-of-class readings. Graduate students will be expected to write a report and give an oral presentation at the end of the course.
SYBB 311/411A is part of the SYBB survey series which is composed of the following course sequence: (1) Technologies in Bioinformatics, (2) Data Integration in Bioinformatics, (3) Translational Bioinformatics, and (4) Programming for

Bioinformatics. Each standalone section of this course series introduces students to an aspect of a bioinformatics project - from data collection (SYBB 311/411A), to data integration (SYBB 311/411B), to research applications (SYBB 311/411C), with a fourth module (SYBB 311/411D) introducing basic programming skills.
Graduate students have the option of enrolling in all four courses or choosing the individual modules most relevant to their background and goals with the exception of SYBB411D, which must be taken with SYBB411A.
Offered as SYBB 311A, BIOL 311A and SYBB 411A.

Spring Semester

BIOL 424 – Introduction to Stem Cell Biology –This discussion-based course will introduce students to the exciting field of stem cell research. Students will first analyze basic concepts of stem cell biology, including stem cell niche, cell quiescence, asymmetric cell division, cell proliferation and differentiation, and signaling pathways involved in these processes. This first part of the course will focus on invertebrate genetic models for the study of stem cells. In the second part of the course, students will search for primary research papers on vertebrate and human stem cells, and application of stem cell research in regenerative medicine and cancer. Finally, students will have the opportunity to discuss about ethical controversies in the field. Students will rotate in weekly presentations, and will write two papers during the semester. Students will improve skills on searching and reading primary research papers, gain presentation skills, and further their knowledge in related subjects in the fields of cell biology, genetics and developmental biology. This course may be used as a cell/molecular subject area elective for the B.A. and B.S. Biology degrees.
Offered as BIOL 324 and BIOL 424.

BIOL 426 - Genetics - Transmission genetics, nature of mutation, microbial genetics, somatic cell genetics, recombinant DNA techniques and their application to genetics, human genome mapping, plant breeding, transgenic plants and animals, uniparental inheritance, evolution, and quantitative genetics.
Offered as BIOL 326 and BIOL 426.

BIOC 454 – Biochemistry and Biology of RNA - Systematic overview of RNA biochemistry and biology. Course provides solid foundation for understanding processes of post-transcriptional regulation of gene expression. Topics include: RNA structure, RNA types, RNA-protein interactions, eukaryotic RNA metabolism including mRNA processing, ribosome biogenesis, tRNA metabolism, miRNA processing and function, bacterial RNA metabolism, transcriptomics. BIOC 454 requires an additional research proposal. Recommended preparation for BIOC 354: Undergraduate Biology (1 semester minimum), equivalents of CHEM 301, BIOC 307 or 308, CHEM 223, CHEM 224.
Offered as BIOC 354 and BIOC 454.

BIOC 460 – Introduction to Microarrays - Microarray technology is an exciting

new technique that is used to analyze gene expression in a wide variety of organisms. The goal of this course is to give participants a hands-on introduction to this technology. The course is intended for individuals who are preparing to use this technique, including students, fellows, and other investigators. This is a hands-on computer-based course, which will enable participants to conduct meaningful analyses of microarray data. Participants will gain an understanding of the principles underlying microarray technologies, including: theory of sample preparation, sample processing on microarrays, familiarity with the use of Affymetrix Microarray Suite software and generation of data sets. Transferring data among software packages to manipulate data will also be discussed. Importation of data into other software (GeneSpring and DecisionSite) will enable participants to mine the data for higher-order patterns. Participants will learn about the rationale behind the choice of normalization and data filtering strategies, distance metrics, use of appropriate clustering choices such as K-means, Hierarchical, and Self Organizing Maps.
Course Offered as BIOC 460, PATH 460, CNCR 460.

BIOC 601 – Research – permission of instructor required

CLBY 450 – Cells and Pathogens - Modern molecular cell biology owes a great debt to viral and bacterial pathogens as model systems. In some instances pathogens operate by faithful mimicry of host proteins, and other cases represent the result of extensive molecular tinkering and convergent evolution. This course will also explore numerous mechanisms utilized by pathogens to subvert the host and enhance their own survival. Topics covered include nuclear regulatory mechanisms, protein synthesis and stability, membrane-bound organelles, endocytosis and phagocytosis, and factors that influence cell behavior such as cytoskeleton rearrangements, cell-cell interactions, and cell migration. Additional topics include cell signaling and co-evolution of pathogens and host cell functions. Students are expected to come to class prepared to discuss pre-assigned readings consisting of brief reviews and seminal papers from the literature. Student assessment will be based on effective class participation (approximately 80%) and successful presentation of an independent research topic (approximately 20%).
Offered as CLBY 450, MBIO 450, and MVIR 450.

GENE 531 – Cancer Genetics - This seminar will discuss basic concepts in cancer epidemiology, principles of cancer genetics, inherited cancer syndromes, cytogenetics of cancers, predigree analysis for familial cancer risk and approaches to the differential diagnosis of inherited and familial cancers. Additionally, topics of risk assessment, genetic testing, screening, management and psychosocial issues in providing genetic counseling to patients with familial and inherited cancers will be discussed.

PATH 416 – Fundamental Immunology - Introductory immunology providing an overview of the immune system, including activation, effector mechanisms, and

regulation. Topics include antigen-antibody reactions, immunologically important cell surface receptors, cell-cell interactions, cell-mediated immunity, innate versus adaptive immunity, cytokines, and basic molecular biology and signal transduction in B and T lymphocytes, and immunopathology. Three weekly lectures emphasize experimental findings leading to the concepts of modern immunology. An additional recitation hour is required to integrate the core material with experimental data and known immune mediated diseases. Five mandatory 90 minute group problem sets per semester will be administered outside of lecture and recitation meeting times. Graduate students will be graded separately from undergraduates, and 22 percent of the grade will be based on a critical analysis of a recently published, landmark scientific article.
Offered as BIOL 316, BIOL 416, CLBY 416, and PATH 416.

SYBB 411 A – D – Technologies in Bioinformatics - SYBB 311/411A is a 5-week course that introduces students to the high-throughput technologies used to collect data for bioinformatics research in the fields of genomics, proteomics, and metabolomics. In particular, we will focus on mass spectrometer-based proteomics, DNA and RNA sequencing, genotyping, protein microarrays, and mass spectrometry-based metabolomics. This is a lecture-based course that relies heavily on out-of-class readings. Graduate students will be expected to write a report and give an oral presentation at the end of the course.
SYBB 311/411A is part of the SYBB survey series which is composed of the following course sequence: (1) Technologies in Bioinformatics, (2) Data Integration in Bioinformatics, (3) Translational Bioinformatics, and (4) Programming for Bioinformatics. Each standalone section of this course series introduces students to an aspect of a bioinformatics project - from data collection (SYBB 311/411A), to data integration (SYBB 311/411B), to research applications (SYBB 311/411C), with a fourth module (SYBB 311/411D) introducing basic programming skills.
Graduate students have the option of enrolling in all four courses or choosing the individual modules most relevant to their background and goals with the exception of SYBB411D, which must be taken with SYBB411A.
Offered as SYBB 311A, BIOL 311A and SYBB 411A.

SYBB 459 – Bioinformatics for Systems Biology - Description of omic data (biological sequences, gene expression, protein-protein interactions, protein-DNA interactions, protein expression, metabolomics, biological ontologies), regulatory network inference, topology of regulatory networks, computational inference of protein-protein interactions, protein interaction databases, topology of protein interaction networks, module and protein complex discovery, network alignment and mining, computational models for network evolution, network-based functional inference, metabolic pathway databases, topology of metabolic pathways, flux models for analysis of metabolic networks, network integration, inference of domain-domain interactions, signaling pathway inference from protein interaction networks, network models and algorithms for disease gene identification, identification of dysregulated subnetworks network-based disease classification.
Offered as EECS 459 and SYBB 459.

Required Law School Courses

LAWS 4300 – Intellectual Property Survey - This course is designed to provide students with an overview of several areas of law traditionally associated with intellectual property or IP, including copyright law, which pertains to the protection of literary, musical, and artistic creations and has issues replete with First Amendment implications; patent law and trade secret law, which focus on the protection of technological works ranging from chemical formulae, to software, to biotechnology; and trademark law, which relates to the goodwill associated with corporate identity and product recognition. We will also devote time to the study of the philosophy and economics of intellectual property keeping in mind, throughout the course, the need to strike an optimal balance between incentives to create and commercialize intellectual creations on the one hand and public access to these creations on the other hand.

LAWS 4302 – Patent Law - Basic concepts of patent law as property considered primarily in its substantive aspects, including the relationship to other forms of protection and intellectual property, infringement, and statutory requirements for patents.

LAWS 4311 - Patent Preparation and Drafting I: Patent preparation, drafting, and filing of a patent application are the fundamental aspects of patent practice. Students will learn how to conduct a client-inventor interview, what questions to ask the client-inventor and what information is most important to obtain prior to commencing the patent drafting process. Technical aspects of patentability searching will also be explored. In addition, the student will learn the various parts of the patent application and best practices associated with drafting each part. Emphasis will be placed on specification drafting and claim drafting, and how to claim around prior art. *Significant emphasis will be placed on USPTO Rules of Professional Conduct* – see www.uspto.gov/learning-and-resources/ip-policy/current-practitioners/uspto-rules-professional-conduct

LAWS 4312 - Patent Preparation and Drafting II: The course builds on *Patent Drafting and Prosecution I* and will focus on aspects of patent prosecution post-filing. In particular, students will learn how to respond to an Office Action rejecting the patent application as is typically encountered during the practice before the US Patent and Trademark Office. The student's response will take the form of an Amendment that will reflect changes made to the claims and arguments relating to patentability. The course will also cover the appeals process. *Significant emphasis will be placed on USPTO Rules of Professional Conduct* – see www.uspto.gov/learning-and-resources/ip-policy/current-practitioners/uspto-rules-professional-conduct.

LAWS 4820 - Bar Review: Passing the patent bar is a requirement for practicing before the U.S. Patent & Trademark Office ("USPTO"). This course will introduce

students to 35 U.S.C. (the United States “patent laws”) and 37 C.F.R. (Code of Federal Regulations encompassing the “patent rules”), followed by an in-depth study of the M.P.E.P. (Manual of Patent Examining Procedure), which is the Patent Office’s rule book that covers all the patent laws and rules as interpreted by the USPTO. In addition, the course will cover the particulars of the patent bar exam, including questions from prior exams; essential materials the students need to master to pass the exam, and provide students with several opportunities to hone their bar taking skills.

Suggested Law School Elective Courses

Fall Semester

LAWS 5341 – Commercialization and Intellectual Property Management - This interdisciplinary course covers a variety of topics, including principles of intellectual property and intellectual property management, business strategies and modeling relevant to the creation of start-up companies and exploitation of IP rights as they relate to biomedical-related inventions. The goal of this course is to address issues relating to the commercialization of biomedical-related inventions by exposing law students, MBA students, and Ph.D. candidates (in genetics and proteomics) to the challenges and opportunities encountered when attempting to develop biomedical intellectual property from the point of early discovery to the clinic and market. Specifically, this course seeks to provide students with the ability to value a given technological advance or invention holistically, focusing on issues that extend beyond scientific efficacy and include patient and practitioner value propositions, legal and intellectual property protection, business modeling, potential market impacts, market competition, and ethical, social, and healthcare practitioner acceptance. During this course, law students, MBA students, and Ph.D. candidates in genomics and proteomics will work in teams of five (two laws students, two MBA students and one Ph.D. candidate), focusing on issues of commercialization and IP management of biomedical-related inventions. The instructors will be drawn from the law school, business school, and technology-transfer office. Please visit the following website for more information: fusioninnovate.com.

Spring Semester

LAWS 4315 - Claim Drafting Lab - The patent claim is the most important part of the patent application, because it is the claim that represents the metes and bounds of inventor’s property right. This Lab is devoted to drafting claims, understanding the different types of claims, and how claims differ depending on the nature of the technology. A particular emphasis will be placed on computer-implemented (e.g., software) and biomedical-related inventions (e.g., life science and biomedical devices)

LAWS 5323 - IP Strategy - Intellectual property rights are legally created business assets used by companies to provide a competitive advantage in the marketplace. Companies use intellectual property differently depending on many factors, such as industry, business strategy, culture and maturity. Intellectual property attorneys are considered valuable members of business teams, contributing to business strategy, business planning and other executive level business decisions. Indeed, IP is a boardroom issue.

This class will study the ways intellectual property is used by different companies and how the intellectual property laws impact not only the intellectual property assets, but also the business strategy and business planning. In addition to learning how intellectual property is being used by major corporations, universities, and entrepreneurs/start-ups, the students will pick one company and study how that company manages its intellectual property.

LAWS 6401 - Experiential Elective (IP Venture Clinic): In the IP Venture Clinic ("IPVC"), students, working under the supervision of faculty, represent start-up companies and entrepreneurs from the Blackstone LaunchPad initiative in Northeast Ohio. Students in the Masters of Patent Practice program will work up a general IP protection strategy, working with supervising practitioners to design and implement that strategy. Students will perform prior art searches, drafting claims and participating in the application and prosecution process with the U.S. Patent and Trademark Office (USPTO) and other patent offices worldwide. Importantly, the UPSTO has selected Case Western Reserve University School of Law to participate in the Patent Law School Clinic Certification Program, which provides law students the opportunity to represent clients before the USPTO.

MA in Patent Practice/MS in Biochemistry (plan B) Dual Degree Proposal

This document contains a proposal for a dual degree between the Department of Biochemistry in the School of Medicine (MS degree, plan B) and the Law School (MA in Patent Practice).

I. Background and Justification

The purpose of the degree program is to prepare a cadre of biochemistry students for successful careers as patent agents. In any given year, recently graduated engineers and scientists enroll in law school with the goal of becoming patent lawyers, but over the past few years, a growing number have become reluctant to invest in a three-year JD program. The proposed *Masters in Patent Practice* seeks to provide a viable alternative for these students, with a focus on students with a biological background. The most likely undergraduates would be science or engineering majors with the likelihood that biology and premed students who failed to enter medical school would predominate (in part based upon the requirements for entry). The one technological area of patent practice where an advanced degree leads to a significant difference in marketability is the life science field.

A career as a patent agent enables engineers and biomedical scientists to stay close to their technological specialty, yet provides a livelihood that has comparative advantages over that of a practicing engineer or bench scientist.[1] Indeed, the patent law landscape over the past 10 years has witnessed the growing importance of patent agents. Most IP boutique firms or IP practice groups within general firms have at least one, and oftentimes several, patent agents; and it is also common for patent agents to work in-house for corporations of all sizes. The *Masters in Patent Practice* will not only prepare the engineer and biomedical scientist to take the patent bar, but will introduce them to the nuances of patent searching, the complexities of patent drafting, and the arcana commonly associated with patent law doctrine and USPTO regulations.

Over the past several years, the United States Patent and Trademark Office has received increasingly more patent applications. In 2013, 571,612 patent applications were filed with the patent office. This compares with 456, 321 in 2008 and 342,441 in 2000. Job postings for patent agents in intellectual property law journals and websites reflect these numbers. Anecdotal evidence also suggests a demand for patent agents.

Moreover, in the initial review of the MA in Patent Practice proposal, the Board of Reagents review observed that there is a demand for patent agents (i.e. see

[1] For example, according to the American Intellectual Property Lawyers Association's "Report of the Economic Survey 2013," the average salary of a patent agent with fewer than five years of experience at a private law firm is $92,250, with the first and third quartile range of $55,500 to $126,250.

www.intelproplaw.com/JobsAvailable/). For example, the University of Dayton reviewer wrote: “in the forty plus years that this reviewer has been practicing law, there has been a persistent shortage of people qualified and licensed by the United States Patent and Trademark Office to prepare, file and prosecute patent applications. The proposed Masters in Patent Practice will help alleviate that shortage. This program is unique to Ohio.” The reviewer from the University of Toledo stated “CWRU has clearly shown that there are jobs for patent agents and that patent applications are increasing and a growth field.” It is the intent of this program to provide individuals with a competitive edge to this professional discipline.

The formal acceptance of the stand alone MA in Patent Practice was approved by the Board of Reagents in March 2015. This degree is currently advertised within the materials associated with admissions into the Law School.

II. Administration

School of Law Liaison: Craig Nard, Professor of Law, School of Law
Biochemistry Department Liaison: William Merrick, Professor of Biochemistry, Department of Biochemistry.

Professors Nard and Merrick will meet every other month during the initial phases of the program to best address problems these dual degree students might be having beyond those of the stand alone MA in Patent Practice (overseen by Professor Nard) and those in the stand alone or other dual degree programs associated with the MS in Biochemistry (overseen by Professor Merrick). In particular, there is a twelve year history with a similar program, the dual degree JD/ MS in Biochemistry.

III. Program Structure

If one were to acquire the MA and MS degrees independently, it would require the completion of 30 hours for the MA program and 36 hours for the MS program (a total of 66 credit hours). In the dual degree program, cross counting allows for a reduction in the total number of class hours to 45 credit hours for both degrees as described below. The 30 credit hour and 36 credit hour numbers are for the independent programs as accredited through the Board of Reagents in Columbus.

The proposed dual degree requires students to complete 45 credit hours. The MS in Biochemistry requires 24 credit hours of coursework for the completion of the MS degree (plan B). The School of Law requires 21 credit hours of coursework for the completion of the MA program as part of the dual degree. To be compliant with the manner in which both degrees are certified by the Board of Reagents, students will count 12 Law credit hours towards the MS in Biochemistry to reach a cumulative total of 36 credit hours and count 9 hours of Biochemistry credits toward the MA in Patent Practice. Thus, there is an approximately equal reduction in both

programs in accumulating the total number of credit hours that are required to satisfy the requirements of the stand alone programs as approved by the Board of Reagents.

The advantage of this dual degree program over either an MA with certificate in Biochemistry or an MS in Biochemistry with a certificate in Patent Practice is that the student will receive a recognized degree (either MA or MS) rather than a certificate which has no true academic definition (i.e. some CWRU certificate programs are completed with as few as 10 to 12 hours).

It should be noted that the anticipated number of students, perhaps as many as 6 per year, will not add a sufficient burden for the Law School classes (the MA in Patent Practice in particular), the biomedical classes nor the administration such that no additional personnel (faculty or staff) will be required for this program in either the Law School or the School of Medicine.

IV. Dual Degree Curriculum: Examples

Students begin in the School of Law although the fundamental Biochemistry course is also taken (BIOC 407, 408). The anticipation is that the entering student will be practicing in patent law and therefore the primary guidance in terms of job placement will reflect advising from the School of Law. The advisor in Biochemistry will provide insight into the most recent developing areas of research and technology that the student would be likely to encounter in their future employment.

Year 1: First year curriculum.

	Semester 1		Semester 2	
	LAWS IP Survey	(3)	LAWS IP Elective course	(3)
	LAWS Patent Law	(3)	LAWS Patent Preparation II	(2)
	LAWS Patent Preparation I	(3)	BIOC elective	(3)
	BIOC 407	(4)	BIOC 408	(4)
Year 2.	BIOC 412	(3)	LAWS Patent Bar Review	(4)
	BIOC elective	(3)	LAWS Experiential Elective**	(3)
	BIOC elective	(3)	BIOC elective	(3)
			EXAM 600	(1)

Alternate, 18 month fast track

Year 1: First semester		Semester 2	
LAWS IP Survey	(3)	LAWS IP Elective course	(3)
LAWS Patent Law	(3)	LAWS Patent Preparation II	(2)
LAWS Patent Preparation I	(3)	LAWS Patent Bar Review	(4)
BIOC 407	(4)	BIOC elective	(3)
BIOC 412	(3)	BIOC 408	(4)

Year 2: First semester

LAWS Experiential Elective**	(3) or LAWS IP Venture Clinic (3)
BIOC elective	(3)
BIOC elective	(3)
BIOC elective	(3)
EXAM 600	(1)

Biochemistry electives for the first and second year

BIOC 420 (3)	BIOC 601 (1-4)
BIOC 430 (1) Comp. Biol.	BIOC 454 (3)
NTRN 452 (3)	GENE 531 (2-3)
PHRM 409 (3)	BIOC 460 (3)
SYBB 411 (1-4)	SYBB 411 (1-4)
PHRM 528 (3)***	SYBB 459 (3)
BIOC 601 (1-4)	CLBY 450 (3)***
	PATH 416 (3)
	GENE 500

**The experiential elective refers to an externship with a corporation (i.e. Parker Hannifin, Cleveland Clinic Innovations, Bridgestone America, etc.) or a law firm.

***recommended by previous JD/MS students as being useful for patent law and also being good classes

A more complete description of the Biochemistry and Law required courses and electives is in the Appendix.

Alternatively, up to 6 credits of BIOC 601 could be taken during the summer after the first year freeing up time during the regular semesters. However, of the total 24 hours required in Biochemistry, 18 hours must be in courses that are letter graded.

Courses to count towards the MS in Biochemistry are Patent Law (3), Patent Preparation I (3), IP Survey (3) and Experiential elective (3) for a total of 12 credit hours.

Courses to count towards the MA in Patent Law would be either BIOC 407, BIOC 408 and one of the technically oriented BIOC electives (credit to be either 3 or 4 hours)

To fulfill the MS degree portion of the dual degree program, students will focus their capstone writing requirement (EXAM 600; see Appendix) on the subject of their work in the Department of Biochemistry. This proposal may reflect either a current research article, material from one of the graduate classes or research the student may have performed as part of BIOC 601 credit. The MS Advisor will serve as a (co-)supervisor of this proposal.

Successful completion of the program would require 45 credits:

Total Hours in the School of Law:	21
Total Hours in the Department of Biochemistry:	24
Total Hours in the Dual Degree Program:	45

V. Dual Degree Student Advising

Dual degree students will be advised concerning matters related to the MA in Patent Practice degree by Professor Craig Nard, Director of the Spangenberg Center for Law, Technology and the Arts. Dual degree students will be advised concerning matters related to the MS in Biochemistry by the Graduate Program Advisor as designated by the Graduate Education Committee of the Department of Biochemistry (currently Professor William Merrick). At the end of each semester, the student will meet with both the MA advisor and the MS advisor to discuss progress and to select classes for the coming semester.

By regulations of the School of graduate Studies, Master's students are required to maintain a GPA of 2.75 or greater within the School of Graduate Studies; this will apply to all courses taken towards the MS in Biochemistry degree. The MA in Patent Practice program requires a GPA of at least 2.75; this will apply to all courses taken towards the MA in Patent Practice degree.

Twice a year, immediately after the beginning of the fall and spring semesters, or more frequently if necessary, the Director of MA Patent Practice and the Graduate Program Advisor of the Department of Biochemistry will meet to discuss the progress of all students in the program.

VI. Admissions

Target enrollment in the program is about six students each year. Students wishing to enroll in the dual degree program apply to and are admitted into the dual degree program directly. As the MA in Patent Practice does not require the LSAT or other standardized exam, the MS in Biochemistry Program will accept either the GRE, MCAT or LSAT as the standardized exam for acceptance into the dual degree program. This is in lieu of the more standard GRE score that is used for admittance into the individual M. S. or Ph. D. programs in Biochemistry. Applications will be jointly reviewed by the directors of the two programs. Once students have been admitted, they will consult with the Department of Biochemistry Department Liaison and Law School Liaison to determine their appropriate course of MA study and the MS Advisor of the Department of Biochemistry to determine their appropriate program of MS study. In order that the admitted student can immediately take graduate courses in the biological sciences, they must have taken a full year course in each of the following: introductory chemistry, organic chemistry and introductory biology. Additional course work such as genetics, physics and calculus would enhance the applicant's portfolio.

Given the nature of this dual degree and the cost savings to the student (the equivalent of 20 credit hours), no financial aid will be offered by either the Law School or the Department of Biochemistry to students in this program.

VII. Tuition Revenue Mechanics:

A written agreement about the management of tuition revenues will exist between the Law School and the Department of Biochemistry. The text of this agreement is shown below:

Graduate student tuition revenues filter back to the student's home school. The MS Biochemistry student's home is based in the School of Medicine. The MA student's home is based within the School of Law. It is anticipated the dual MA/MS students will be home based in the School of Law. Tuitions paid to the School of Law will be fully retained by the Law School. Tuitions paid to the School of Medicine will be split 30% to the School of Law and 70% to the School of Medicine. This split reflects the primary advising role played by the School of Law in the final placement of the student into an employment opportunity.

VIII. Approval Signatures:

Interim Dean, School of Law *Michael Scharf or Jessica Berg*	X
Chair, Department of Biochemistry *Dr. Michael A. Weiss*	X
Dean, School of Medicine *Dr. Pamela B. Davis*	X
Dean, School of Graduate Studies Dr. Charles Rozek	X

IX. Student Activities:

It is noted that for either the experiential elective or the IP Venture Clinic, the student will have direct exposure to the workings of the patent process. The School of Law will assist in the placement of the student in the relevant environment.

Other appropriate activities for the MA/MS students include attending the weekly seminars, as well as annual named lectureships, participating in annual retreats, and one or more journal clubs (see also casemed.case.edu/gradprog/index.php). Within the Law School, students will be involved with informal networking experiences with potential employers and participate in Law School activities as they choose (see law.case.edu/StudentLife.aspx)

X. Advantages of the Joint Degree Program

There are several advantages to the students in the MA/MS program. The key advantage will be the integration of the two disciplines during the time that the students are receiving their training, thus allowing the students to develop a unique focus on their studies in each of the two disciplines. In addition, the usual Master's of Science in Biochemistry is a two year program but the students in the dual degree program will be able to complete the program requirements in just 12 months beyond the time required for obtaining the MA degree (or sooner if they take the alternate, accelerated track). This is reflected in the credit savings for the two degrees (36 + 30 = 66 hours) vs. the dual degree which requires 45 credit hours. This savings in credit hours is thus seen in both time (18 or 24 months vs. 3 years) and in expense, roughly the cost of an additional semester or two.

Appendix – Elective courses

Suggested Biochemistry Elective Courses

Fall Semester

BIOC 407 – Introduction to Biochemistry: From molecules to medical science. Overview of the macromolecules and small molecules key to all living systems. Topics include: protein structure and function; enzyme mechanisms, kinetics and regulation; membrane structure and function; bioenergetics; hormone action; intermediary metabolism, including pathways and regulation of carbohydrate, lipid, amino acid, and nucleotide biosynthesis and breakdown. The material is presented to build links to human biology and human disease. One semester of biology is recommended.
Offered as BIOC 307, BIOC 407, and BIOL 407.

BIOC 408 – Molecular Biology - An examination of the flow of genetic information from DNA to RNA to protein. Topics include: nucleic acid structure; mechanisms and control of DNA, RNA, and protein biosynthesis; recombinant DNA; and mRNA processing and modification. Where possible, eukaryotic and prokaryotic systems are compared. Special topics include yeast as a model organism, molecular biology of cancer, and molecular biology of the cell cycle. Current literature is discussed briefly as an introduction to techniques of genetic engineering. Recommended preparation: BIOC 307/407.
Offered as BIOC 308, BIOL 308, BIOC 408, and BIOL 408.

BIOC 412 – Proteins and Enzymes - Aspects of protein and nucleic acid function and interactions are discussed, including binding properties, protein-nucleic acid interactions, kinetics and mechanism of proteins and enzymes, and macromolecular machines.
Recommended Preparation: CHEM 301.
Offered as BIOC 312 and BIOC 412.

BIOC 420 – Current Topics in Cancer - The concept of cancer hallmarks has provided a useful guiding principle in our understanding of the complexity of cancer. The hallmarks include sustaining proliferative signaling, evading growth suppressors, enabling replicative immortality, activating invasion and metastasis, inducing angiogenesis, resisting cell death, deregulating cellular energetics, avoiding immune destruction, tumor-promoting inflammation, and genome instability and mutation. The objectives of this course are to (1) examine the principles of some of these hallmarks, and (2) explore potential therapies developed based on these hallmarks of cancer. This is a student-driven and discussion-based graduate course. Students should have had some background on the related subjects and have read scientific papers in their prior coursework. Students will be called on to present and discuss experimental design, data and

conclusions from assigned publications. There will be no exams or comprehensive papers but students will submit a one-page critique (strengths and weaknesses) of one of the assigned papers prior to each class meeting. The course will end with a full-day student-run symposium on topics to be decided jointly by students and the course director. Grades will be based on class participation, written critiques, and symposium presentations.
Offered as BIOC 420, MBIO 420, MVIR 420, PATH 422, and PHRM 420.

BIOC 430 – **Computational Biology** (Shoham module)- The course is designed for graduate students who will be focusing on one or more methods of structural biology in their thesis project. This course is divided into 3-6 sections (depending on demand). The topics offered will include X-ray crystallography, nuclear magnetic resonance spectroscopy, optical spectroscopy, mass spectrometry, cryo-electron microscopy, and computational and design methods. Students can select one or more modules. Modules will be scheduled so that students can take all the offered modules in one semester. Each section is given in 5 weeks and is worth 1 credit. Each section covers one area of structural biology at an advanced level such that the student is prepared for graduate level research in that topic.
Offered as BIOC 430, CHEM 430, PHOL 430, and PHRM 430.

BIOC 601 – Research – permission of the instructor is required (1-6 hours)

EXAM 600 – MS Qualifying exam - The M. S. qualifying exam is one that is based upon the student's generation of a research proposal that will have an Introduction (what is the history behind the proposal), Materials and Methods (an explanation of the techniques to be used in the proposal), Experimental Design (what are the actual experiments to be performed and what are the controls), and Discussion (what will be learned and how does this fit with the literature). This may be based upon the student's own research (taken as BIOC 601) or on a recent research article of the student's interest. The "preliminary data" that would start off the Experimental Design section could either be the student's lab data or the figures from the research article that the student has chosen as the basis for the proposal. For the qualifying exam, the student will prepare a 10 to 20 page document as described above and then defend the proposal to a committee of three faculty. Dr. Merrick will chair the committee and the two other faculty members will be selected based upon the research area of the proposal. In most instances, the defense of the proposal will take about 90 minutes.

NTRN 452 – Nutritional Biochemistry and Metabolism - Mechanisms of regulation of pathways of intermediary metabolism; amplification of biochemical signals; substrate cycling and use of radioactive and stable isotopes to measure metabolic rates. Recommended preparation: BIOC 307 or equivalent.
Offered as BIOC 452 and NTRN 452.

PHRM 409 – Principles of Pharmacology - Principles of Pharmacology

introduces the basic principles that underlie all of Pharmacology. The first half of the course introduces, both conceptually and quantitatively, drug absorption, distribution, elimination and metabolism (pharmacokinetics) and general drug receptor theory and mechanism of action (pharmacodynamics). Genetic variation in response to drugs (pharmacogenetics) is integrated into these basic principles. The second half of the course covers selected drug classes chosen to illustrate these principles. Small group/recitation sessions use case histories to reinforce presentation of principles and to discuss public perceptions of therapeutic drug use. Graduate students will be expected to critically evaluate articles from the literature and participate in a separate weekly discussion session. Recommended preparation for PHRM 409: Undergraduate degree in science or permission of instructor.
Offered as PHRM 309 and PHRM 409.

PHRM 528 – Contemporary Approaches to Drug Discovery - This course is designed to teach the students how lead compounds are discovered, optimized, and processed through clinical trials for FDA approval. Topics will include: medicinal chemistry, parallel synthesis, drug delivery and devices, drug administration and pharmacokinetics, and clinical trials. A special emphasis will be placed on describing how structural biology is used for in silico screening and lead optimization. This component will include hands-on experience in using sophisticated drug discovery software to conduct in silico screening and the development of drug libraries. Each student will conduct a course project involving in silico screening and lead optimization against known drug targets, followed by the drafting of an inventory disclosure. Another important aspect of this course will be inclusion of guest lectures by industrial leaders who describe examples of success stories of drug development.
Offered as BIOC 528, PHOL 528, and PHRM 528.

SYBB 411 A – D – Technologies in Bioinformatics - SYBB 311/411A is a 5-week course that introduces students to the high-throughput technologies used to collect data for bioinformatics research in the fields of genomics, proteomics, and metabolomics. In particular, we will focus on mass spectrometer-based proteomics, DNA and RNA sequencing, genotyping, protein microarrays, and mass spectrometry-based metabolomics. This is a lecture-based course that relies heavily on out-of-class readings. Graduate students will be expected to write a report and give an oral presentation at the end of the course.
SYBB 311/411A is part of the SYBB survey series which is composed of the following course sequence: (1) Technologies in Bioinformatics, (2) Data Integration in Bioinformatics, (3) Translational Bioinformatics, and (4) Programming for Bioinformatics. Each standalone section of this course series introduces students to an aspect of a bioinformatics project - from data collection (SYBB 311/411A), to data integration (SYBB 311/411B), to research applications (SYBB 311/411C), with a fourth module (SYBB 311/411D) introducing basic programming skills.
Graduate students have the option of enrolling in all four courses or choosing the individual modules most relevant to their background and goals with the exception

of SYBB411D, which must be taken with SYBB411A.
Offered as SYBB 311A, BIOL 311A and SYBB 411A.

Spring Semester

BIOC 454 – Biochemistry and Biology of RNA - Systematic overview of RNA biochemistry and biology. Course provides solid foundation for understanding processes of post-transcriptional regulation of gene expression. Topics include: RNA structure, RNA types, RNA-protein interactions, eukaryotic RNA metabolism including mRNA processing, ribosome biogenesis, tRNA metabolism, miRNA processing and function, bacterial RNA metabolism, transcriptomics. BIOC 454 requires an additional research proposal. Recommended preparation for BIOC 354: Undergraduate Biology (1 semester minimum), equivalents of CHEM 301, BIOC 307 or 308, CHEM 223, CHEM 224.
Offered as BIOC 354 and BIOC 454.

BIOC 460 – Introduction to Microarrays - Microarray technology is an exciting new technique that is used to analyze gene expression in a wide variety of organisms. The goal of this course is to give participants a hands-on introduction to this technology. The course is intended for individuals who are preparing to use this technique, including students, fellows, and other investigators. This is a hands-on computer-based course, which will enable participants to conduct meaningful analyses of microarray data. Participants will gain an understanding of the principles underlying microarray technologies, including: theory of sample preparation, sample processing on microarrays, familiarity with the use of Affymetrix Microarray Suite software and generation of data sets. Transferring data among software packages to manipulate data will also be discussed. Importation of data into other software (GeneSpring and DecisionSite) will enable participants to mine the data for higher-order patterns. Participants will learn about the rationale behind the choice of normalization and data filtering strategies, distance metrics, use of appropriate clustering choices such as K-means, Hierarchical, and Self Organizing Maps.
Course Offered as BIOC 460, PATH 460, CNCR 460.

BIOC 601 – Research – permission of instructor required

CLBY 450 – Cells and Pathogens - Modern molecular cell biology owes a great debt to viral and bacterial pathogens as model systems. In some instances pathogens operate by faithful mimicry of host proteins, and other cases represent the result of extensive molecular tinkering and convergent evolution. This course will also explore numerous mechanisms utilized by pathogens to subvert the host and enhance their own survival. Topics covered include nuclear regulatory mechanisms, protein synthesis and stability, membrane-bound organelles, endocytosis and phagocytosis, and factors that influence cell behavior such as cytoskeleton rearrangements, cell-cell interactions, and cell migration. Additional topics include cell signaling and co-evolution of pathogens and host cell

functions. Students are expected to come to class prepared to discuss pre-assigned readings consisting of brief reviews and seminal papers from the literature. Student assessment will be based on effective class participation (approximately 80%) and successful presentation of an independent research topic (approximately 20%).
Offered as CLBY 450, MBIO 450, and MVIR 450.

EXAM 600 – MS Qualifying exam - The M. S. qualifying exam is one that is based upon the student's generation of a research proposal that will have an Introduction (what is the history behind the proposal), Materials and Methods (an explanation of the techniques to be used in the proposal), Experimental Design (what are the actual experiments to be performed and what are the controls), and Discussion (what will be learned and how does this fit with the literature). This may be based upon the student's own research (taken as BIOC 601) or on a recent research article of the student's interest. The "preliminary data" that would start off the Experimental Design section could either be the student's lab data or the figures from the research article that the student has chosen as the basis for the proposal. For the qualifying exam, the student will prepare a 10 to 20 page document as described above and then defend the proposal to a committee of three faculty. Dr. Merrick will chair the committee and the two other faculty members will be selected based upon the research area of the proposal. In most instances, the defense of the proposal will take about 90 minutes.

GENE 500 – Advanced Eukaryotic Genetics I - Fundamental principles of modern genetics; transmission, recombination, structure and function of the genetic material in eukaryotes, dosage compensation, behavior and consequences of chromosomal abnormalities, mapping and isolation of mutations, gene complementation and genetic interactions. Recommended preparation: BIOL 362.

GENE 531 – Cancer Genetics - This seminar will discuss basic concepts in cancer epidemiology, principles of cancer genetics, inherited cancer syndromes, cytogenetics of cancers, predigree analysis for familial cancer risk and approaches to the differential diagnosis of inherited and familial cancers. Additionally, topics of risk assessment, genetic testing, screening, management and psychosocial issues in providing genetic counseling to patients with familial and inherited cancers will be discussed.

PATH 416 – Fundamental Immunology - Introductory immunology providing an overview of the immune system, including activation, effector mechanisms, and regulation. Topics include antigen-antibody reactions, immunologically important cell surface receptors, cell-cell interactions, cell-mediated immunity, innate versus adaptive immunity, cytokines, and basic molecular biology and signal transduction in B and T lymphocytes, and immunopathology. Three weekly lectures emphasize experimental findings leading to the concepts of modern immunology. An additional recitation hour is required to integrate the core material with

experimental data and known immune mediated diseases. Five mandatory 90 minute group problem sets per semester will be administered outside of lecture and recitation meeting times. Graduate students will be graded separately from undergraduates, and 22 percent of the grade will be based on a critical analysis of a recently published, landmark scientific article.
Offered as BIOL 316, BIOL 416, CLBY 416, and PATH 416.

SYBB 411 A – D – Technologies in Bioinformatics - SYBB 311/411A is a 5-week course that introduces students to the high-throughput technologies used to collect data for bioinformatics research in the fields of genomics, proteomics, and metabolomics. In particular, we will focus on mass spectrometer-based proteomics, DNA and RNA sequencing, genotyping, protein microarrays, and mass spectrometry-based metabolomics. This is a lecture-based course that relies heavily on out-of-class readings. Graduate students will be expected to write a report and give an oral presentation at the end of the course.
SYBB 311/411A is part of the SYBB survey series which is composed of the following course sequence: (1) Technologies in Bioinformatics, (2) Data Integration in Bioinformatics, (3) Translational Bioinformatics, and (4) Programming for Bioinformatics. Each standalone section of this course series introduces students to an aspect of a bioinformatics project - from data collection (SYBB 311/411A), to data integration (SYBB 311/411B), to research applications (SYBB 311/411C), with a fourth module (SYBB 311/411D) introducing basic programming skills.
Graduate students have the option of enrolling in all four courses or choosing the individual modules most relevant to their background and goals with the exception of SYBB411D, which must be taken with SYBB411A.
Offered as SYBB 311A, BIOL 311A and SYBB 411A.

SYBB 459 – Bioinformatics for Systems Biology - Description of omic data (biological sequences, gene expression, protein-protein interactions, protein-DNA interactions, protein expression, metabolomics, biological ontologies), regulatory network inference, topology of regulatory networks, computational inference of protein-protein interactions, protein interaction databases, topology of protein interaction networks, module and protein complex discovery, network alignment and mining, computational models for network evolution, network-based functional inference, metabolic pathway databases, topology of metabolic pathways, flux models for analysis of metabolic networks, network integration, inference of domain-domain interactions, signaling pathway inference from protein interaction networks, network models and algorithms for disease gene identification, identification of dysregulated subnetworks network-based disease classification.
Offered as EECS 459 and SYBB 459.

Required Law School Courses

LAWS 4300 – Intellectual Property Survey - This course is designed to provide students with an overview of several areas of law traditionally associated with intellectual property or IP, including copyright law, which pertains to the protection of literary, musical, and artistic creations and has issues replete with First Amendment implications; patent law and trade secret law, which focus on the protection of technological works ranging from chemical formulae, to software, to biotechnology; and trademark law, which relates to the goodwill associated with corporate identity and product recognition. We will also devote time to the study of the philosophy and economics of intellectual property keeping in mind, throughout the course, the need to strike an optimal balance between incentives to create and commercialize intellectual creations on the one hand and public access to these creations on the other hand.

LAWS 4302 – Patent Law - Basic concepts of patent law as property considered primarily in its substantive aspects, including the relationship to other forms of protection and intellectual property, infringement, and statutory requirements for patents.

LAWS 4311 - Patent Preparation and Drafting I: Patent preparation, drafting, and filing of a patent application are the fundamental aspects of patent practice. Students will learn how to conduct a client-inventor interview, what questions to ask the client-inventor and what information is most important to obtain prior to commencing the patent drafting process. Technical aspects of patentability searching will also be explored. In addition, the student will learn the various parts of the patent application and best practices associated with drafting each part. Emphasis will be placed on specification drafting and claim drafting, and how to claim around prior art. *Significant emphasis will be placed on USPTO Rules of Professional Conduct* – see www.uspto.gov/learning-and-resources/ip-policy/current-practitioners/uspto-rules-professional-conduct

LAWS 4312 - Patent Preparation and Drafting II: The course builds on *Patent Drafting and Prosecution I* and will focus on aspects of patent prosecution post-filing. In particular, students will learn how to respond to an Office Action rejecting the patent application as is typically encountered during the practice before the US Patent and Trademark Office. The student's response will take the form of an Amendment that will reflect changes made to the claims and arguments relating to patentability. The course will also cover the appeals process. *Significant emphasis will be placed on USPTO Rules of Professional Conduct* – see www.uspto.gov/learning-and-resources/ip-policy/current-practitioners/uspto-rules-professional-conduct.

LAWS 4820 - Bar Review: Passing the patent bar is a requirement for practicing before the U.S. Patent & Trademark Office ("USPTO"). This course will introduce students to 35 U.S.C. (the United States "patent laws") and 37 C.F.R. (Code of

Federal Regulations encompassing the "patent rules"), followed by an in-depth study of the M.P.E.P. (Manual of Patent Examining Procedure), which is the Patent Office's rule book that covers all the patent laws and rules as interpreted by the USPTO. In addition, the course will cover the particulars of the patent bar exam, including questions from prior exams; essential materials the students need to master to pass the exam, and provide students with several opportunities to hone their bar taking skills.

Suggested Law School Elective Courses

Fall Semester

LAWS 5341 – Commercialization and Intellectual Property Management - This interdisciplinary course covers a variety of topics, including principles of intellectual property and intellectual property management, business strategies and modeling relevant to the creation of start-up companies and exploitation of IP rights as they relate to biomedical-related inventions. The goal of this course is to address issues relating to the commercialization of biomedical-related inventions by exposing law students, MBA students, and Ph.D. candidates (in genetics and proteomics) to the challenges and opportunities encountered when attempting to develop biomedical intellectual property from the point of early discovery to the clinic and market. Specifically, this course seeks to provide students with the ability to value a given technological advance or invention holistically, focusing on issues that extend beyond scientific efficacy and include patient and practitioner value propositions, legal and intellectual property protection, business modeling, potential market impacts, market competition, and ethical, social, and healthcare practitioner acceptance. During this course, law students, MBA students, and Ph.D. candidates in genomics and proteomics will work in teams of five (two laws students, two MBA students and one Ph.D. candidate), focusing on issues of commercialization and IP management of biomedical-related inventions. The instructors will be drawn from the law school, business school, and technology-transfer office. Please visit the following website for more information: fusioninnovate.com.

Spring Semester

LAWS 4315 - Claim Drafting Lab - The patent claim is the most important part of the patent application, because it is the claim that represents the metes and bounds of inventor's property right. This Lab is devoted to drafting claims, understanding the different types of claims, and how claims differ depending on the nature of the technology. A particular emphasis will be placed on computer-implemented (e.g., software) and biomedical-related inventions (e.g., life science and biomedical devices)

LAWS 5323 - IP Strategy - Intellectual property rights are legally created business

assets used by companies to provide a competitive advantage in the marketplace. Companies use intellectual property differently depending on many factors, such as industry, business strategy, culture and maturity. Intellectual property attorneys are considered valuable members of business teams, contributing to business strategy, business planning and other executive level business decisions. Indeed, IP is a boardroom issue.

This class will study the ways intellectual property is used by different companies and how the intellectual property laws impact not only the intellectual property assets, but also the business strategy and business planning. In addition to learning how intellectual property is being used by major corporations, universities, and entrepreneurs/start-ups, the students will pick one company and study how that company manages its intellectual property.

LAWS 6401 - Experiential Elective (IP Venture Clinic): In the IP Venture Clinic ("IPVC"), students, working under the supervision of faculty, represent start-up companies and entrepreneurs from the Blackstone LaunchPad initiative in Northeast Ohio. Students in the Masters of Patent Practice program will work up a general IP protection strategy, working with supervising practitioners to design and implement that strategy. Students will perform prior art searches, drafting claims and participating in the application and prosecution process with the U.S. Patent and Trademark Office (USPTO) and other patent offices worldwide. Importantly, the UPSTO has selected Case Western Reserve University School of Law to participate in the Patent Law School Clinic Certification Program, which provides law students the opportunity to represent clients before the USPTO.

Memorandum

To: Pamela B. Davis, MD, PhD
Dean, School of Medicine
Case Western Reserve University

From: Mark Aulisio, PhD
Chair, Faculty Council

Re: Dual Degree Program

Date: June 30, 2015

At its June 15, 2015, meeting, the Faculty Council voted to recommend approval of a Master of Public Health/Master of Science in Nutrition Dual Degree Proposal (Plan B, non-thesis requiring). The program is offered by the Department of Epidemiology and Biostatistics and the Department of Nutrition and includes courses from nutrition, biochemistry, and public health.

In accordance with our SOM practices, an ad hoc committee composed of members of the Faculty Council Steering Committee, Graduate Directors, the SOM members of the Faculty Senate's Committee on Graduate Programs, and the Associate Dean for Graduate Education was created to review the program proposal. The ad hoc committee was Chaired by Nicholas Ziats and met with William Merrick, Professor of Biochemistry and Graduate Advisor. The ad hoc committee reviewed the document, discussed the proposal, and engaged with the program presenter. After the meeting was concluded a summary of changes was created. These changes were adopted and the revised proposal was circulated to the ad hoc committee for a vote. The ad hoc committee approved the reviewed proposal and it was sent to the Faculty Council for a vote.

After your review, I hope you will join me in recommending approval of the proposal for a dual degree between the Department of Biochemistry in the School of Medicine (MS in Biochemistry) and the School of Law (MA in Patent Practice) by the Faculty Senate, as required by the Faculty Handbook.

Please let me know if I can provide any additional information.

Thank you for your consideration.

Sincerely,

Mark Aulisio, PhD
Chair, Faculty Council

cc: Nicole Deming

SCHOOL OF MEDICINE
CASE WESTERN RESERVE UNIVERSITY

Pamela B. Davis, M.D., Ph.D.
Dean
Senior Vice President for Medical Affairs

Office of the Dean

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Visitors and Deliveries
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http://casemed.case.edu

October 19, 2015

Roy Ritzmann, PhD
Chair, Faculty Senate
c/o Rebecca Weiss, Secretary of the University Faculty
Adelbert Hall
7001

Dear Dr. Ritzmann:

As noted in the accompanying memo from Dr. Mark Aulisio, Chair of the School of Medicine's Faculty Council during the 2014-2015 academic year, the Faculty Council has recommended approval of a Master of Patent Practice/Master of Science in Biochemistry Dual Degree Program.

This program will graduate highly trained and competitive public health practitioners who have the skill and ability to develop evidence based policy and programs to address our society's chronic diseases such as cardiovascular disease, diabetes, and obesity. The departments and faculty have experience with the management and coordination necessary for successful dual degree programs.

The proposal approval process is outlined in Dr. Aulisio's memo. An ad hoc Committee was convened to review this new program and after revisions, the program was approved by the Faculty Council.

I concur with the Faculty of Medicine and recommend approval of these amendments.

Please submit the proposed dual degree program to the appropriate committees for their review at their earliest opportunity. I would be pleased to answer any questions that might arise during the review process.

Thank you.

Sincerely,

Pamela B. Davis, MD, PhD

c: Dr. Mark Aulisio, Chair, Faculty Council
Nicole Deming, Assistant Dean for Faculty Affairs and Human Resources, SOM

enclosures

VIII. Approval Signatures:

Co-Dean, School of Law *Michael Scharf or Jessica Berg*	X
Chair, Department of Biochemistry *Dr. Michael A. Weiss*	X
Dean, School of Medicine *Dr. Pamela B. Davis*	X
Dean, School of Graduate Studies Dr. Charles Rozek	X

IX. Student Activities:

It is noted that for either the experiential elective or the IP Venture Clinic, the student will have direct exposure to the workings of the patent process. The School of Law will assist in the placement of the student in the relevant environment.

Other appropriate activities for the MA/MS students include attending the weekly seminars, as well as annual named lectureships, participating in annual retreats, and one or more journal clubs (see also casemed.case.edu/gradprog/index.php). Within the Law School, students will be involved with informal networking experiences with potential employers and participate in Law School activities as they choose (see law.case.edu/StudentLife.aspx)

X. Advantages of the Joint Degree Program

There are several advantages to the students in the MA/MS program. The key advantage will be the integration of the two disciplines during the time that the students are receiving their training, thus allowing the students to develop a unique focus on their studies in each of the two disciplines. In addition, the usual Master's of Science in Biochemistry is a two year program but the students in the dual degree program will be able to complete the program requirements in just 12 months beyond the time required for obtaining the MA degree (or sooner if they take the alternate, accelerated track). This is reflected in the credit savings for the two degrees (36 + 30 = 66 hours) vs. the dual degree which requires 45 credit hours. This savings in credit hours is thus seen in both time (18 or 24 months vs. 3 years) and in expense, roughly the cost of an additional semester or two.

Chair, Department of Biochemistry *Dr. Michael A. Weiss*	X
Dean, School of Medicine *Dr. Pamela B. Davis*	X
Dean, School of Graduate Studies Dr. Charles Rozek	X

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