Darwinian Evolution and Modern Medicine

Department: Fudan International Summer Session 2025

<table>
<tr><td>Course Code</td><td colspan="7">MED130348</td></tr>
<tr><td>Course Title</td><td colspan="7">Darwinian Evolution and Modern Medicine</td></tr>
<tr><td>Credit</td><td>2</td><td>Experiment (including Computer) Credit</td><td>0</td><td>Practice Credit</td><td>0</td><td>Aesthetic Education Credit</td><td></td></tr>
<tr><td>Credit Hours Per Week</td><td>9 credit hours per week, 36+3 tutorial hours in total (one credit hour is 45 minutes)</td><td>Education on The Hard-Working Spirit Credit Hours</td><td></td><td>Language of Instruction</td><td>English</td><td>Honors Course</td><td>□Yes
☑No</td></tr>
<tr><td>Course Type</td><td colspan="3">☐Core General Education Course
☐Specific General Education Course
☐Basic Course in General Discipline
☑Others</td><td colspan="4">2+X Major ：
☐Professional Core Course
☐Professional Advanced Course
Non 2+X Major ：
☐Professional Compulsory Course
☐Professional Elective Course</td></tr>
<tr><td>Course Objectives</td><td colspan="7">（Including value, knowledge and ability objectives）

1. Teach the development and application of evolutionary theory in modern medicine;
2. Enable students to learn and utilize Darwin's theory of evolution to re-examine and explore diseases and medical processes;
3. Apply evolutionary theory experiments and methods in medical research to gain a macroscopic understanding of the laws of medical development.</td></tr>
<tr><td>Course Description</td><td colspan="7">This course applies the basic thinking and theory of Darwin's theory of evolution, and analyzes the natural and human selection and development of genetics, development, disease, and medicine in 12 themes. The content includes subversion and reflection on existing medicine, understanding medicine and humanities from a higher perspective, exploring the direction of medical scientific research, the vision of future medicine, and its contribution to human health.
The characteristic is to vertically deepen the study of classified medical knowledge while horizontally deepening the understanding of medical history, development, and future. It is the first course in domestic medical schools that combines evolutionary theory with medicine. The FIST course was launched in 2019 and 2021, and received a warm response. In 2022, it will become a blended online and offline course and has been accepted. I am</td></tr>
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	now applying for summer focused English teaching. This course has a total of 36 class hours, mainly taught in class, including classroom discussions and questioning. Using course reports as the assessment method.

Course Requirements:

1. Undergraduate and graduate students majoring in medicine, biology, bio-informatics, etc
2. Have good practice ability
3. Attending lectures and visiting on site
4. Be encouraged to read related papers and participate in group discussion in class

Teaching Methods:

- Lecture
- Visiting
- Practice

Course Director's Academic Background:

Yi Feng Ph.D. & M.D. Professor

Dr. Yi Feng is a professor of Integrative Medicine and Neurobiology of Shanghai Medical College, Fudan University. She obtained her Ph.D. in Neurobiology and Integrative Medicine at Fudan University in China, then a visiting scholar at Gothenburg University of Sweden during 2008-2009 and worked at Stanford University as a visiting associate professor from 2013-2016.

Dr. Feng focuses on her study on the effect and mechanism study of acupuncture on gynecological diseases, such as perimenopausal syndrome and polycystic ovary syndrome by using cellular and molecular technology, as well as 3D tissue clearing imaging and *in vivo* near-infrared II live imaging. Her research has been supported by the Chinese Special Fund for Postdoc, the Chinese Post-doc Fund, and the National Science Foundation of China (NSFC) etc. By far, she has published 60 scientific papers and 17 scientific books.

She is good at teaching and clinic. By far, she is involved in 9 undergraduate courses such as *Introduction to Integrated Traditional Chinese and Western Medicine, Multidisciplinary Teaching Based on Diseases, Masters of Traditional Chinese and Western Medicine and Humanistic Literacy, Darwin's Evolutionary Theory and Modern Medicine*, and 6 graduate courses. She also led undergraduate and graduate students in science and technology innovation, winning multiple awards.

Publications:

(1) 演化医学启示录--人类疾病的过去与未来 .复旦大学出版社. 2022.9 薛人望 **冯异** 主编 978-7-309-16106-9 307 千字

(2) 医学组织透明化三维成像. 复旦大学出版社. 2020.6 978-7-309-14885-5 **冯异** 主编 358 千字

(3) Yan Xiao1,2,，#, Lixia Yang3，#，Yicong Wang1,2,, Yu Wang1,2, , Yuning Chen1 , Wenhan Lu4 , Zhenle Pei1 , Ruonan Zhang1 , Yao Ye5 , Xiaowei Ji5 , Suying Liu5，Xi Dong5 , Yonghua Xu3,* , **Yi Feng**1,2,*. Pulsed Low-intensity focused ultrasound (LIFU) activation of ovarian follicles. IEEE Open Journal of Engineering in Medicine and Biology. 2024;5:316-329.

(4) Wei Hu#; Lu Meng#; Chao Wang; Wenhan Lu; Xiaoyu Tong; Rui Lin; Tao Xu; Liang Chen; An Cui; Xiaoqing Xu; Anni Li; Jia Tang; Hongru Gao; Zhenle Pei; Ruonan Zhang; Yicong Wang; Yu Wang; Wendong Han; Ning Jiang; Chenglong Xiong; **Yi Feng***; Kuinyu Lee*; Mingquan Chen*. Spatiotemporal observations of host pathogen interactions in mucosa during SARS-CoV-2 infection indicate a protective role of ILC2s. Microbiology Spectrum. 2023 Dec 12;11(6):e0087823. doi:

10.1128/spectrum.00878-23. Epub 2023 Nov 8.

(5) Chang J, Guo B, Gao Y, Li W, Tong X, **Feng Y*,** Abumaria N*. Characteristic Features of Deep Brain Lymphatic Vessels and Their Regulation by Chronic Stress. Research 2023;6:Article 0120. https://doi.org/10.34133/ research.0120

(6) Cheng-Feng He, Wen-Jiao Xue , Xiao-Die Xu, Jian-Tao Wang , Xin-Ru Wang, **Yi Feng***, Hou-Guang Zhou* and Jing-Chun Guo*. Knockdown of NRSF Alleviates Ischemic Brain Injury and Microvasculature Defects in Diabetic MCAO Mice. Front. Neurol. 13:869220. doi: 10.3389/fneur.2022.869220

(7) Feifei Zhang1,2*, Tong Ma3*, Xiaoyu Tong3*, Yanjun Liu3, Peng Cui3, Xiaoqing Xu3, Jiemei Shi3, Wei Hu3, Wenhan Lu3, Zhenle Pei3, Minzhen Xu3, Xin Li1,2, Congjian Xu1,2 and **Yi Feng3**. Electroacupuncture improves metabolic and ovarian function in a rat model of polycystic ovary syndrome by decreasing white adipose tissue, increasing brown adipose tissue, and modulating the gut microbiota. Acupuncture in Medicine .2022. 1–13 DOI: 10.1177/09645284211056663

(8) Hongru Gao† , Xiaoyu Tong† , Wei Hu† , Yicong Wang, Kuinyu Lee, Xiaoqing Xu, Jiemei Shi, Zhenle Pei, Wenhan Lu, Yuning Chen, Ruonan Zhang, Zheyi Wang, Ziyu Wang, Chengzhi Han, Yu Wang and **Yi Feng***. Three-dimensional visualization of electroacupuncture-induced activation of brown adipose tissue via sympathetic innervation in PCOS rats. Chinese Medicine.2022 https://doi.org/10.1186/s13020-022-00603-w

(9) Wei Hu†, Junda Chen†, Caixia Sun†, Xiaoyu Tong, Wenhan Lu, Ziyong Ju, Yong Xia, Zhenle Pei1, Mingzhen Xu, Xiaoqing Xu, Jiemei Shi, Yi Li, Haofeng Chen, Yizhou Lu, Ying Ying, Hongru Gao, Aaron J.W. Hsueh, Fan Zhang, Zhi Lü,*, **Yi Feng*.** Spatial topological analysis of the sympathetic neurovascular characteristic of acupoints in the Ren meridian using advanced tissue-clearing and near infrared II imaging. Computational and Structural Biotechnology Journal. 2021. https://doi.org/10.1016/j.csbj.2021.04.010 8;19:2236-2245

(10) Xiaoyu Tong, Yanjun Liu，Xiaoqing Xu, Jiemei Shi, Wei Hu, Tong Ma, Peng Cui, Wenhan Lu, Zhenle Pei, Mingzhen Xu, Feifei Zhang, Xin Li, and **Yi Feng***. Ovarian Innervation Coupling With Vascularity: The Role of Electro-Acupuncture in Follicular Maturation in a Rat Model of Polycystic Ovary Syndrome. Front. Physiol., 29 May 2020 https://doi.org/10.3389/fphys.2020.00474

Awards & Honors

2023, Third Prize of the 9th National College Student Basic Medical Innovation Research and Experimental Design Forum

2021, First Prize of Scientific and Technological Progress Award of China acupuncture and moxibustion Society, acupuncture and moxibustion Science of China meeting

2020, Third Prize of the 6th National College Student Basic Medical Innovation Research and Experimental Design Forum

Third Prize in the 2020 Yangtze River Delta Urban Youth Entrepreneurship and Innovation Competition

First Prize in the 2020 Fudan University High Level Talent and Second Postdoctoral Entrepreneurship Competition

In 2017, Fudan University Shanghai Medical College awarded the "Outstanding Teacher Award"

Academic Achievements:

2022 the National Natural Science Foundation of China's general project "Panoramic Analysis of GnRH Neuron Networks in the Hypothalamus and Comparison of Central Mechanisms of Electro-acupuncture and Manual Acupuncture in the Treatment of PCOS"
2020 the National Natural Science Foundation of China's general project "Exploring the Neuro-vascular Coupling Mechanism of Acupuncture Stimulated Follicular Development through Multi-modal Molecular Imaging"
2020, Fudan Universitycoronavirus Pneumonia Prevention and Control Research Project "Research on SARS CoV-2 Multiple Organ Infection Pathway and Mechanism"
2019 Shanghai Municipal Science and Technology Major Project "International Human Phenotypic Group Plan (Phase I)" Molecular Mechanisms and Tissue Phenotypes of Histone Carcinogenic Mutations in Pediatric Gliomas Based on Brain Models "
2017 the National Natural Science Foundation of China's general project "Research on the role of neovascularization in follicular development and acupuncture induced ovulation Using Whole Tissue Transparent Staining Combined with 3D Imaging Technology "

Instructor's Academic Background:

Aaron Hsueh Ph.D.

Professor of Obstetrics and Gynecology at Stanford University School of Medicine, former director of the Department of Reproductive Biology. Mainly engaged in research in reproductive medicine and bioinformatics, published over 400 SCI papers, and won awards such as the NIH Research Career Development Award and the American Reproductive Society Research Award. He used to be the chief scientist of the Chinese Academy of Sciences and the Shanghai Academy of Life Sciences. Appointed as Senior Teaching Consultant at Fudan University School of Basic Medicine in 2018, and Chief Scientist at Fudan University Institute of Integrated Traditional Chinese and Western Medicine in 2019.

Members of Teaching Team

Name	Gender	Professional Title	Department	Responsibility
Yi Feng	Female	Professor	Department of Integrative Medicine and Neurobiology, School of Basic Medical Sciences, Shanghai Medical College, Fudan University	Organize and coordination, lectures, practical courses, and grading
Aaron Hsueh	Male	Professor	Department of Integrative Medicine and Neurobiology, School of Basic Medical Sciences, Shanghai Medical College, Fudan University	lectures

Course Schedule (Please supply the details about each lesson)**:**

Week 1	6 h	● Natural selection and the fossil evidence (自然选择及化石证据), Transition Forms and Adaptation ● Sexual Selection (性选择) ● Human-accelerated selection (人为选择)

		6 h	● Origin of species, coevolution, and genetic basis of evolution (物种起源, 协同演化,及演化论的遗传基础) ● Genomic revolution (基因组学革命) ● Chromosomal Evolution, Evo-Devo (演化发育生物学)
		6 h	● Evolution and maladjusted （演化与环境不适应） ● Misconception about evolution (对演化论的误解) ● Darwinian medicine (达尔文医学)
	Week 2	6 h	● 阶段性评价—思考题 练习 ● Hormonal genomics (激素的基因组学) ● 演化与女性疾病
		6 h	● Evolution Beyond Biology 超越生物学的演化 (Memes 模因, Languages 语言) ● Evolution and culture（演化与文化） ● Future of human evolution (人类未来的演化) ● Visiting the Human Science Museum, Pathology Museum, and Pathogenic Biology Museum of the Medical College (参观医学院人体科学馆、病理馆和病原生物馆)
		6 h	● 考核: 小课题展示、讨论 6 学时 Aaron J.W. Hsueh & 冯异

The design of class discussion or exercise, practice, experience and so on:

1. During the course, visits and teaching will also be arranged for the Human Science Museum, Pathology Museum, and Pathogenic Biology Museum of the Medical College.
2. Extract the key content of each lesson through in class assignments and form short answer questions for students to complete.
3. Encourage students to use their learned knowledge to conduct research on new medical evolution phenomena and theoretical research mechanisms, and form a 5-10 minute PPT presentation or video explanation.
4. After the course ends, choose a topic on medical evolution to write a paper, which will be the main content of the course grade evaluation.

If you need a TA, please indicate the assignment of assistant:

Yes. The TA will help with recording attendance, participation, organizing field trips.

Grading & Evaluation (Provide a final grade that reflects the formative evaluation process)**:**

Attendance	20 %
Assignment(s)	30 %
Course Paper	40 %
Presentation	10 %

Usage of Textbook: ☑ Yes(complete textbook information form below) ☐ No

Textbook Information (No more than two textbooks) **:**

Title	Author	ISBN	Publishing Time	Publisher	Type I	Type II

演化医学启示录--人类疾病的过去与未来.	薛人望、冯异	978-7-309-16106-9307	2022.9	复旦大学出版社.	☑Self-compiled Textbook (Published) □Non-mainland Textbook □Other Textbook (Published)	□National Planning Textbook □Provincial and Ministerial Planning Textbook □School Level Planning Textbook □Others
					□Self-compiled Textbook (Published) □Non-mainland Textbook □Other Textbook (Published)	□National Planning Textbook □Provincial and Ministerial Planning Textbook □School Level Planning Textbook □Others

Teaching References (Including author, title, publisher, publishing time,ISBN)**:**

1. 《物种起源说》 达尔文著 9787101134155 中华书局 2018
2. 《天演论》 赫胥黎著 严复译 9787802207417 中国画报出版社 2010
3. 《我们为什么生病：达尔文医学的新观念》 R.M.尼斯， G.C.威廉斯 9787544329910 海南出版社 2009

Table column size can be adjusted according to the content.