

A low-angle photograph of a large, mature tree with thick, gnarled branches and dense green foliage. The tree's canopy fills most of the frame. In the background, a multi-story building with a light-colored facade and dark window frames is visible through the leaves. The sky is a pale, overcast grey.

Learn on the Planet
Open online courses from Kyoto University

KyotoUx

December 2018

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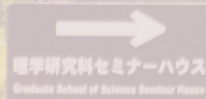


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Learning at Kyoto University

Introduction

Since 2012, “the year of the MOOC” called by the New York Times, the MOOC -Massive Open Online Courses- have been globally expanding and progressing beyond the United States as the origin of the MOOC. Kyoto University joined edX, one of the major global MOOC providers in May 2013. Since then, with the community of the world’s leading universities, we have been actively providing high-quality online courses all over the world through edX. Since the first course “The Chemistry of Life” was provided in 2014, Kyoto University has provided 13 courses of our various research fields and attracted over 185,000 learners from many countries and regions around the world (as of December, 2018). Kyoto University, as a globally leading university in diverse research fields, will also keep contributing internationally to the education.

“Learn on the Planet” gives you brief information about our fascinating online courses as well as some articles on the MOOC initiatives. All the courses are freely available. Enroll in a course you have an interest in and dive into a new world with learners from all over the world!

What is MOOC ?

MOOC (Massive Open Online Courses) is a course offered online that can be accessed for free or at low cost. A number of world leading universities and educational institutions join this open education project. Thousands or tens of thousands of people from across the world register for each course and pursue their studies by viewing lecture videos and taking assignments online. Like regular university courses, MOOC is run over a period of several weeks to several months, and certificates may be issued at the end of the period to students achieving a certain passing grade.

Since 2012, there have been many MOOC providers including edX, Coursera, FutureLearn, which are offered in English, as well as the so-called "Regional MOOC" for non-English speakers such as FUN (France), MiriadaX (Spain), JMOOC (Japan).

What is edX ? What is KyotoUx ?

Kyoto University announced that it had become the first Japanese member of edX in May 2013. Founded by MIT and Harvard University, edX is a MOOC provider composed of world leading universities. Kyoto University's courses are offered through edX under the name "KyotoUx."

Please take the high-quality online courses by internationally famous researchers from Kyoto University. We hope the lectures will be a gate for you to be a student at Kyoto University.

edX Courses - Programs & Degrees - Schools & Partners edX For Business Search Sign In Register

京都大学 KYOTO UNIVERSITY KyotoUx

KyotoUx

Free online courses from Kyoto University

Founded in 1897, Kyoto University is acknowledged as one of the most accomplished research-oriented universities in Asia. The validity of that reputation is testified by the accolades conferred on our alumni researchers, most notably eight Nobel Prize laureates who undertook vital research during their time at the university. In addition to those awards, several other Kyoto University faculty members have received respected accolades, including two Fields Medals and one recipient of the Gauss Prize.

Visit the [KyotoUx Facebook page](#) for more information.

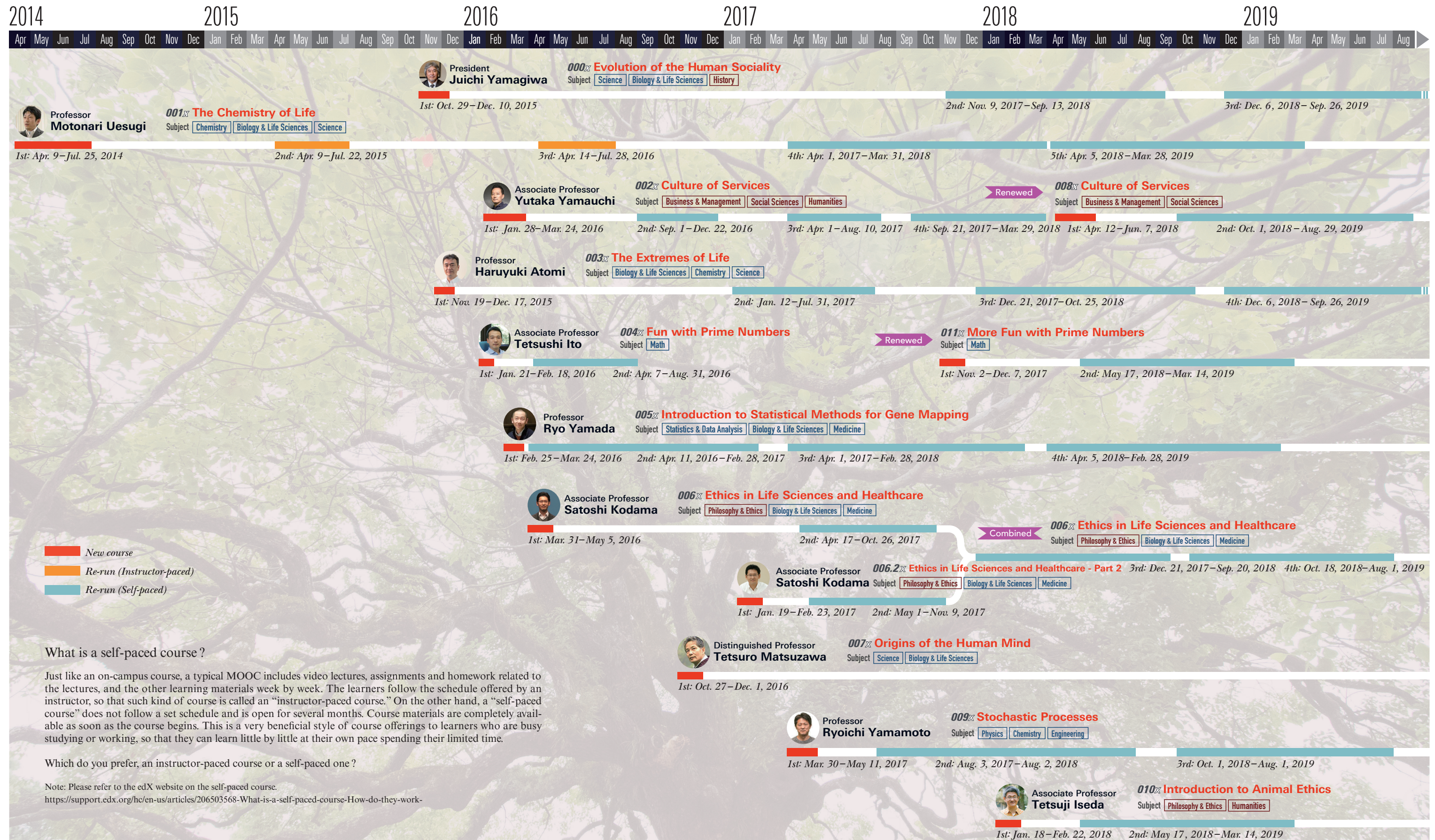
Kyoto University MOOCs
Browse free online courses in a variety of subjects. Kyoto University courses found below can be audited free or students can choose to receive a verified certificate for a small fee. Select a course to learn more.

<p>KyotoUx Ethics in Life Sciences and Healthcare: Exploring...</p> <p>Current Self-Paced</p>	<p>KyotoUx Culture of Services: Paradox of Customer Relations</p> <p>Current Self-Paced</p>	<p>KyotoUx Stochastic Processes: Data Analysis and Computer...</p> <p>Current Self-Paced</p>
<p>KyotoUx Introduction to Animal Ethics</p> <p>Current Self-Paced</p>	<p>KyotoUx More Fun with Prime Numbers</p> <p>Current Self-Paced</p>	<p>KyotoUx The Chemistry of Life</p> <p>Current Self-Paced</p>

www.edx.org/school/kyotoux

Course Offerings

KyotoUx has provided the following courses in 2014 – 2019.



What is a self-paced course?

Just like an on-campus course, a typical MOOC includes video lectures, assignments and homework related to the lectures, and the other learning materials week by week. The learners follow the schedule offered by an instructor, so that such kind of course is called an “instructor-paced course.” On the other hand, a “self-paced course” does not follow a set schedule and is open for several months. Course materials are completely available as soon as the course begins. This is a very beneficial style of course offerings to learners who are busy studying or working, so that they can learn little by little at their own pace spending their limited time.

Which do you prefer, an instructor-paced course or a self-paced one?

Note: Please refer to the edX website on the self-paced course.
<https://support.edx.org/hc/en-us/articles/206503568-What-is-a-self-paced-course-How-do-they-work->

EVOLUTION OF THE HUMAN SOCIALITY

A QUEST FOR THE ORIGIN OF OUR SOCIAL BEHAVIOR



京都大学 第26代 総長
山極 壽一

"NOW, WE SHOULD RECONSIDER OUR EVOLUTIONARY HISTORY
AND THE PATHWAY OF HUMAN SOCIALITY FOR DIRECTION OF OUR FUTURE SOCIALITY."





President Juichi Yamagiwa

KyotoUx 000x
Open online courses from Kyoto University

Subject **Science** **Biology & Life Sciences** **History**

霊長類学を通じて
Approach to the Origin of the Human Sociality Through Primatology
人類の社会性の起源に迫る

About Through the process of evolution, animals have developed their biological features and their cultures based on their surrounding environments. How we live our lives today is a direct result of features developed from our primate ancestors as they adapted to new environments.

In primatology, it is essential to think about how cultural development and biological natures are inseparable.

This course will help you rediscover the process of evolution and will introduce primatological studies conducted by researchers at Kyoto University, Japan. Based on carefully conducted research on primate species, we will explore the origins of human beings and provide you with examples of common similarities between human beings and non-human primates.

We will analyze basic features, such as foraging, mating, aggression, and communication from the primatological viewpoint. Furthermore, cultural and social aspects of human society, from the formation of family groups to community activities, will be considered thoroughly in comparison to those of monkeys and apes.

Our goal is to broaden your view of humans to a wider extent and think dynamically about your biology in terms of human evolution. Through acquiring knowledge of basic primatology in this course, you will establish a viewpoint to think and discuss the evolutionary process of human, and human society, in conjunction with those of our close relatives.

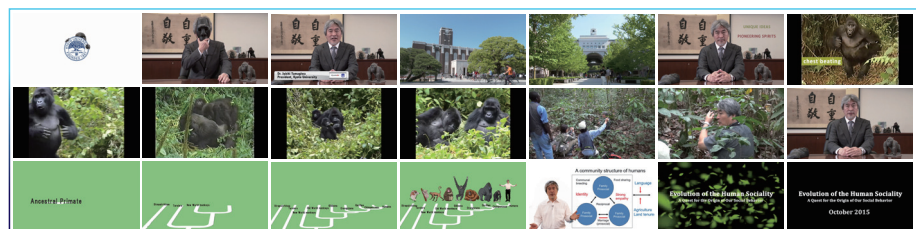
Period
1st Oct. 29–Dec. 10, 2015 (6 Weeks)
2nd Nov. 9, 2017–Sep. 13, 2018 (Self-paced)
3rd Dec. 6, 2018–Sep. 26, 2019 (Self-paced)

Topics
Week 1 History & Concept of Japanese Primatology
Week 2 What Primatologists Found on Japanese Macaques
Week 3 The Places Where Humans and Primates Evolved
Week 4 Food and Sex Shape Primate Sociality
Week 5 Aggression and Society
Week 6 Evolution of Life History Strategy

Banner



Trailer



Learner's Voice



"Just audited as the course is closed, thanks for making and offering this course and keeping the course content open!"

Message from Co-instructor

Shun Hongo
Program-specific researcher
Centre for African Area Studies, Kyoto University

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The Chemistry of Life

Flip Virtual to Real
Solid support
Surprise visit to Vietnam
by Prof. Motonari Uesugi

物質-細胞統合システム拠点 化学研究所 生体機能化学研究系 教授

上杉 志成

Using Molecular Drawing Software

STEP 1: Drawing of a Chemical Structure

Draw Mode: Draw, Erase, Text

Color: Middle, Solid, Transparency

Undo, Redo, Clear

“By bringing together knowledge from multidisciplinary fields, we are empowered with the ability to generate new ideas. In this course, we focus on idea generation by integrating chemistry and biology.”



Professor Motonari Uesugi

KyotoUx 001x
Open online courses from Kyoto University

Subject Chemistry Biology & Life Sciences Science

Institute for Integrated Cell-Material Sciences/
Institute for Chemical Research

生物と化学を結びつけ、
 Cultivate Your Creativity by Integrating Biology and Chemistry
 発想力を磨く

About Chemistry and biology are traditionally taught as separate subjects at the high school level, where students memorize fundamental scientific principles that are universally accepted. However, at the university level and in industry, we learn that science is not as simple as we once thought. We are constantly confronted by questions about the unknown and required to use creative, integrated approaches to solve these problems. By bringing together knowledge from multidisciplinary fields, we are empowered with the ability to generate new ideas. The goal of this course is to develop skills for generating new ideas at the interface between chemistry and biology by analyzing pioneering studies.

Period

- 1st Apr. 9–Jul. 25, 2014 (15 Weeks)
- 2nd Apr. 9–Jul. 22, 2015 (15 Weeks, Instructor-paced)
- 3rd Apr. 14–Jul. 28, 2016 (15 Weeks, Instructor-paced)
- 4th Apr. 1, 2017–Mar. 31, 2018 (Self-paced)
- 5th Apr. 5, 2018–Mar. 28, 2019 (Self-paced)

Topics

- Unit 1 Understanding Chemical Structures
- Unit 2 Writing and Synthesizing DNA
- Unit 3 DNA/RNA Applications
- Unit 4 Idea Generation Techniques
- Unit 5 Writing Amino Acids
- Unit 6 Writing and Synthesizing Proteins
- Unit 7 Combinatorial Chemistry & Chemical Genetics
- Unit 8 Fluorescent Molecules for Tracking Biology
- Unit 9 Fluorescent Proteins for Tracking Biology
- Unit 10 Review of Ideas
- Unit 11 Ideas for Fooling Sugars and Fats
- Unit 12 Ideas for Fighting against Cancer & Virus
- Unit 13 Review of Ideas

Banner



Trailer



Learner's
Voice



"I believe this course will elevate my thinking and prepare me to do well in my future career. Ghana, in particular and Africa as a whole will profit from the knowledge acquired."



"Is soo good and i am welcoming any courses like this one and this course is a great course that I hope to get it and i am from somalia there is no any courses or highly educations like this so am gonna saying all the best."

Message from
Learner

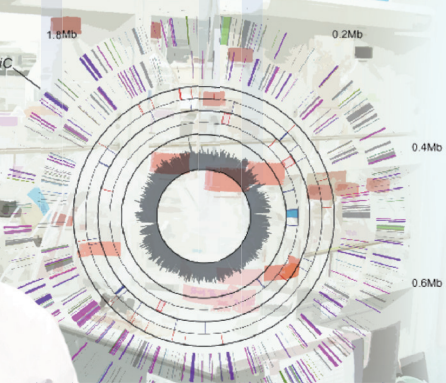
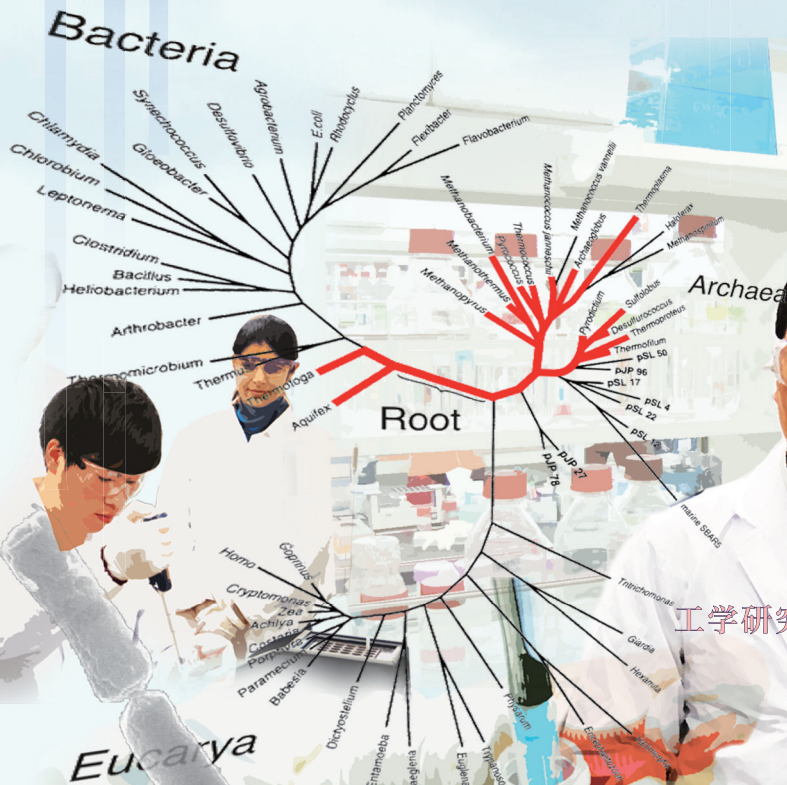
Hue Thi Vu

Former Graduate Student, Institute for Chemical Research

See p.30

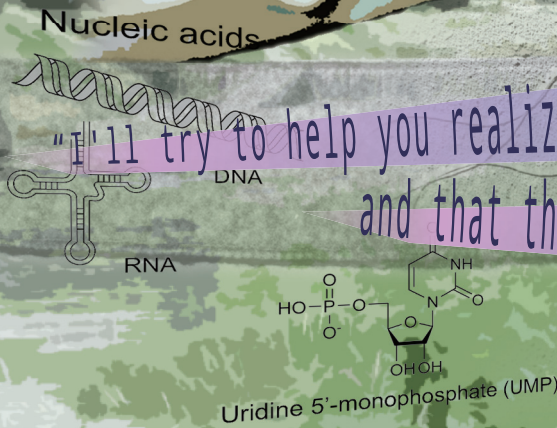
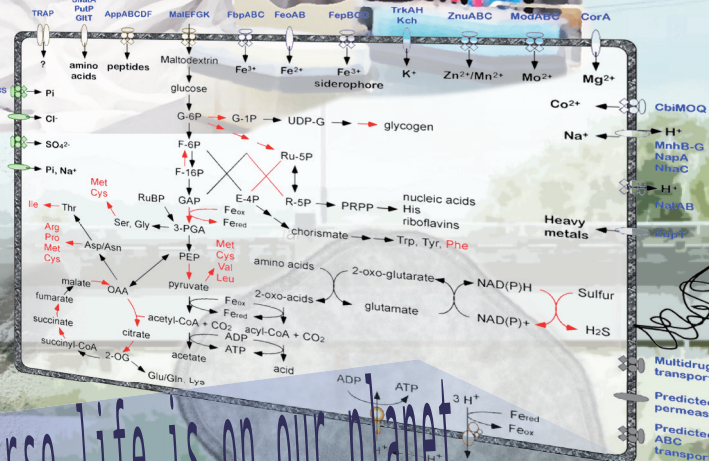
The Extremes of Life

Microbes and Their Diversity



工学研究科 合成・生物化学専攻 生物化学講座 教授

跡見晴幸



"I'll try to help you realize just how diverse life is on our planet, and that the diversity is largely found on the microbial world."





Professor Haruyuki Atomi

KyotoUx 003x
Open online courses from Kyoto University

Department of Synthetic Chemistry and Biological
Chemistry, Graduate School of Engineering

Subject **Biology & Life Sciences** **Chemistry** **Science**

極限環境微生物から
Discover Diversity of Life Through Extremophiles
生物多様性の仕組みを解く

About Life on our planet is diverse. While we can easily recognize this in our everyday surroundings, an even more diverse world of life can be seen when we look under a microscope. This is the world of microorganisms. Microorganisms are everywhere, and although some are notorious for their roles in human disease, many play important roles in sustaining our global environment. Among the wide variety of microorganisms, here we will explore those that thrive in the most extreme environments, the extremophiles.

In this course, we will discover how diverse life is on our planet and consider the basic principles that govern evolution. We will also learn how we can classify organisms. Following this, we will have a look at several examples of extreme environments, and introduce the microorganisms that thrive under these harsh conditions. We will lay emphasis on the thermophiles, extremophiles that grow at high temperatures and will study how proteins from thermophiles can maintain their structure and function at high temperatures.

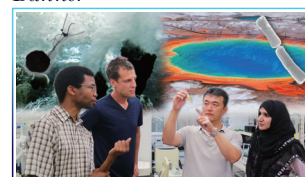
Period

1st	Nov. 19–Dec. 17, 2015 (4 Weeks)
2nd	Jan. 12–Jul. 31, 2017 (Self-paced)
3rd	Dec. 21, 2017–Oct. 25, 2018 (Self-paced)
4th	Dec. 6, 2018–Sep. 26, 2019 (Self-paced)

Topics

Week 1	Evolution and the Diversity of Life
Week 2	Life in Boiling Water
Week 3	Diversity of Extremophiles
Week 4	Genome Sequences

Banner



Trailer



Learner's
Voice



“Very interesting course with clear lectures and assignments! It is accessible to anyone whether you have no biology experience or a lot. I gained a new appreciation of the diversity of life.”



“Very interesting subject. Because we are only beginning to understand the extremophiles, a course that compile all available information is a real gem. Good material and videos. I enjoyed participating.”

Message from
Teaching
Assistant



Takahiro Shimosaka

Ph.D. candidate of Department of Synthetic Chemistry and Biological Chemistry,
Graduate School of Engineering, Kyoto University

My participation as a teaching assistant for KyotoUx was a valuable experience. Students from various countries and backgrounds took the course, and discussions with them gave me an opportunity to see many different ways of thinking. Likewise, the discussions exposed the learners to the perspectives of others from all over the world. Since MOOCs are readily accessible, they provide students with a convenient way to deepen their understanding of a variety of subjects. I expect MOOCs to significantly influence the way we learn far into the future.

Introduction to Statistical Methods for Gene Mapping

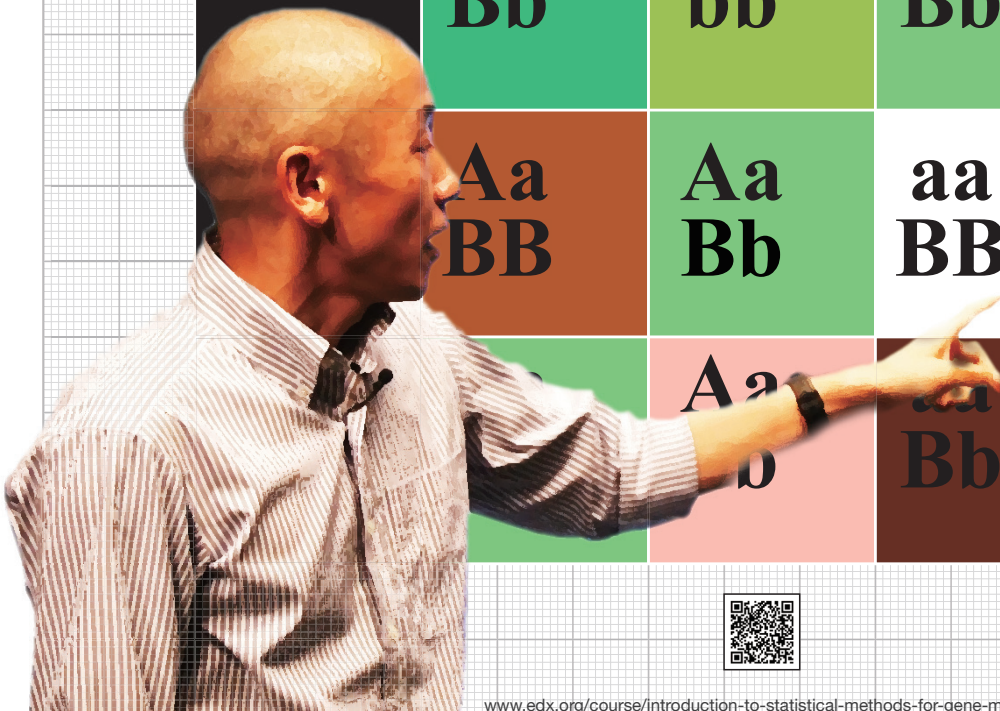
医学研究科 医学研究科附属ゲノム医学センター 統計遺伝学分野 教授

山田 亮

"We hope many students find our introductory lecture interesting and get motivated to study further

topics in statistical genetics to understand biological heterogeneity from statistical standpoints."

	AB	Ab	aB	ab
AB	AA BB	AA Bb	Aa BB	Aa Bb
Ab	AA Bb	AA bb	Aa Bb	Aa bb
aB	Aa BB	Aa Bb	aa BB	aa Bb
ab	Aa bb	aa bb	aa Bb	aa bb



www.edx.org/course/introduction-to-statistical-methods-for-gene-mapping



Professor Ryo Yamada

Graduate School of Medicine

KyotoUx 005x
Open online courses from Kyoto University

Subject Statistics & Data Analysis Biology & Life Sciences Medicine

生物多様性を解明する
Master Statistical Skills to Elucidate Diversity

統計スキルを身につける

About

This course is a primer to statistical genetics and covers an approach called linkage disequilibrium mapping, which analyzes non-familial data and has been successfully used to identify genetic variants associated with common and complex genetic traits.

We hope many students find this introductory course interesting and are motivated to study further topics in statistical genetics to understand biological variation from statistical standpoints.

Previous knowledge of molecular genetics and basic statistical concepts, such as statistical tests and estimation, is required. Basic knowledge on genetic variations is offered at the start of the course.

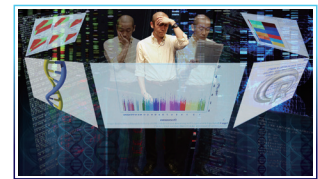
Period

- 1st Feb. 25 – Mar. 24, 2016 (4 Weeks)
- 2nd Apr. 11, 2016 – Feb. 28, 2017 (Self-paced)
- 3rd Apr. 1, 2017 – Feb. 28, 2018 (Self-paced)
- 4th Apr. 5, 2018 – Feb. 28, 2019 (Self-paced)

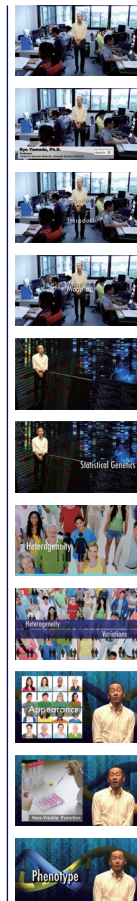
Topics

- Section 1 Basic Knowledge for Gene Mapping
- Section 2 Linkage Disequilibrium
- Section 3 GWAS and Multiple Testing
- Section 4 Common Variants and Rare Variants

Banner



Trailer



Hello, everyone. I'm Ryo Yamada, Professor of Statistical Genetics.

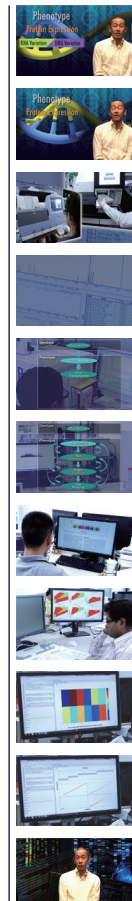
Welcome to our lecture course, "Introduction to statistical methods for gene mapping," provided by unit of statistical genetics, Center for Genomic Medicine, Graduate School of Medicine, Kyoto University.

Statistical genetics is a study field to apply statistics and mathematics to understand the heterogeneity in biological phenomena in general.

The heterogeneity is one of the fundamental features in biology that we can see as the variation among various species.

And also we can see the variation among individuals in human beings.

We can see variations in appearance, but variation is also present in non-visible functions and all these features are called phenotypes.



These phenotypic variations are rooted to various patterns of protein expression, and protein's variation is based on variation in RNA expressions, and RNAs' variations are linked to DNA variation.

These days, various high-throughput experimental technologies enable us to evaluate all of these variations in multiple layers, DNA layer, RNA layer and protein layer, altogether.

And we call the approach to handle the whole sets of each layer as Genome, Transcriptome and Proteome.

When we try to understand these complex heterogeneity with large amount of data sets, or big data, statistical genetics is the "must."

Because statistical genetics provides various methods to struggle with these data sets.

We hope many students find our introductory lecture interesting and get motivated to study further topics in statistical genetics to understand biological heterogeneity from statistical standpoints.

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Ethics in Life Sciences and Healthcare: Exploring Bioethics through Manga



DO YOU THINK IT IS PERMISSIBLE
FOR THEM TO WITHHOLD
THE NAME OF THE ILLNESS OR
HOW LONG THE PATIENT HAS LEFT TO LIVE
FOR THE SAKE OF THE PATIENT?

文学研究科 思想文化学専攻 思想文化学講座 准教授

児玉 聡



THIS IS THE QUESTION OF WHETHER
OR NOT IT IS ACCEPTABLE TO LIE
TO PATIENTS FOR THEIR OWN GOOD.
FIRST, LET'S LOOK AT THE POSITION
THAT ONE SHOULD NOT LIE.



2. Pros & Cons of Cancer Disclosure

Pros One should not lie.
• Tell them the truth so
that they can live their
last days to the fullest
Probably the patient
prefers the truth even if
they are deceived





Associate Professor Satoshi Kodama

Graduate School of Letters

Combined

KyotoUx 006x

Open online courses from Kyoto University

Subject **Philosophy & Ethics** **Biology & Life Sciences** **Medicine**

漫画を通じて考える
Consider and Discuss Informed Consent, Enhancement, etc. Through Manga
がん告知・ドレーピング

About

Is it okay to take pills to help you ace exams? Should you be able to choose the sex of your child? Is abortion murder? These controversial questions will be explored through Manga in this bioethics course. Bioethics is an interdisciplinary field of study that looks into ethical, legal, and social implications of life sciences and health care.

This course will help you understand key ethical issues surrounding crucial problems that profoundly impact your life from birth to death.

Period

006x

1st Mar. 31–May 5, 2016 (5 Weeks)

2nd Apr. 17–Oct. 26, 2017 (Self-paced)

006.2x

1st Jan. 19–Feb. 23, 2017 (5 Weeks)

2nd May 1–Nov. 9, 2017 (Self-paced)

Combined

3rd Dec. 21, 2017–Sep. 20, 2018 (Self-paced)

4th Oct. 18, 2018–Aug. 1, 2019 (Self-paced)

Topics

Week 1 The Ethics of Assisted Reproductive Technology

Week 2 The Ethics of Truth-Telling

Week 3 Is Abortion Murder ?

Week 4 What's wrong with Enhancement ?

Week 5 Is Euthanasia Wrong ?

Week 6 Living-Donor Organ Transplantation

Week 7 Cloning Technology

Week 8 ES Cells and iPS Cells

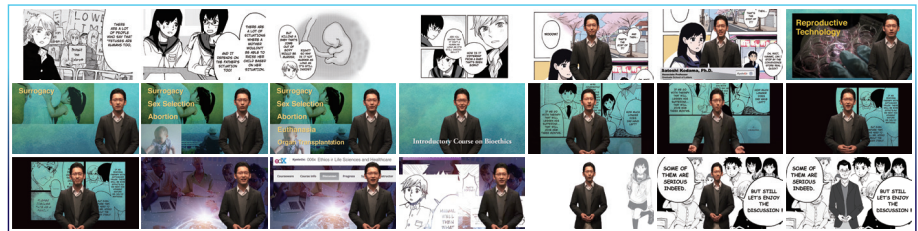
Week 9 Lifespan and Eternal Life

Week 10 Brain Death and Organ Transplants

Banner



Trailer



Learner's Voice



"I would like to congratulate the creators of this course, because although I participated in several online courses, my experience with this course was enjoyable. The videos lasted adequate time and the inclusion of manga improved the experience. I'm from Chile and I love the manga, so I liked the use that gave to this to show the course topics."



"It was much more fun than I studied life ethics alone. I could read the opinion of the person of various countries and was able to have a valuable experience. Thank you very much for your advice."

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Origins of the Human Mind

Age-class composition of Bossou community



高等研究院 特別教授
松沢 哲郎

“What Does It Mean To Be Human?”



Bossou Chimpanzees





Distinguished Professor Tetsuro Matsuzawa

KyotoUx 007x

Open online courses from Kyoto University

Kyoto University Institute for Advanced Study/
Primate Research Institute

Subject Science Biology & Life Sciences

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Know about Humans in Comparison with Chimpanzees

About

The human mind is an evolutionary product, just like the body. However, the mind does not remain in fossil form like bones and teeth. Therefore, to better study and understand our minds and their evolutionary origins we need to compare our cognitive features with those of different living primates. This approach is called “Comparative Cognitive Science (CCS).” The CCS is a unique combination of psychology and primatology. It tries to give answers to fundamental questions such as “what is uniquely to human?”, “where did it come from?”, “how did we get here?”, and “where do we go?” This intensive course focuses on chimpanzees, the closest relatives of humans.

This course covers selected areas of current research on the CCS. We focus on behavioral studies of nonhuman animals, especially chimpanzees. Since the chimpanzee and the human share the latest common ancestor only about five million years ago, this great ape provides the key to understanding our nature.

Period

1st Oct. 27–Dec. 1, 2016 (5 Weeks)

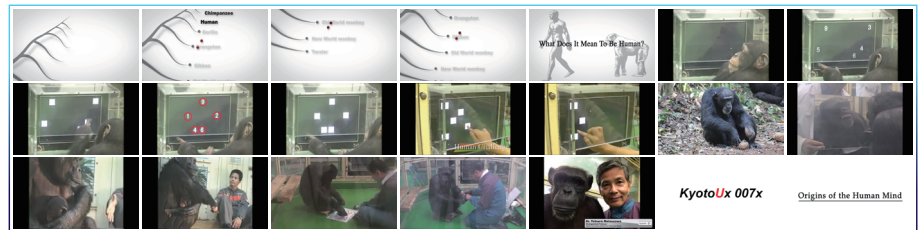
Topics

- Week 1 Introduction to Primate World
- Week 2 Matsuzawa Methodology
- Week 3 Imitation and Language
- Week 4 Stable Supine Posture and Imagination
- Week 5 Green Corridor Project as a Conservation Practice

Banner



Trailer



Learner's Voice



“This is a short course, but a great overview of primates, and especially chimpanzees. You'll learn the result of decades of work, and learn interesting things on how do chimpanzees think, what do they like to do, how they imitate or learn to count, and learn about how to protect them. The lectures have embedded videos of real-life experiments, and it's great to watch them and learn about them from someone's own experience. All in all, I'm looking forward to a possible sequel.”



“This course offers an introduction to the human ancestry, how the primates brains work and how have we evolved over thousand of years of existence. We get insights through the experiments and researches with primates (specifically chimpanzees) of the professor Tetsuro Matsuzawa. In four weeks you will learn about differences between the primates, the thinking behaviour of them, always compared to humans.”

Message from Learner

Hiroya Takiyama

Graduate Student, Section of Language and Intelligence,
Primate Research Institute

See p.30

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Culture of Services

Paradox of Customer Relation



“What are services?”

A wearable camera

The view from the wearable camera.

Omotenashi = おもてなし

A Japanese word for hospitality.

Wikipedia:

- "Omotenashi" indicates a **heartly welcome and services** toward guests.
- As seen by alms, or osetai during O-hen-ro (pilgrimage through Shikoku island in Japan), services based on spirits of **dedication** are known to be of Japanese culture.

Sushi (edomae)

Nigeri Sushi is served on top of vinegared rice.

The fish is usually prepared by hand to be fresh.

Research method

- Sushi bars
 - 733 bars
 - 4,335 reviews
- French restaurants
 - 813 reviews
 - 6.86

経営管理大学院 経営管理講座 准教授



山内 裕

Mr. Kenichi Hashimoto

The owner and chef of Ryozanpaku, a traditional Japanese restaurant in Kyoto

Interview

The executive chef and general manager of Kobe Kitano Hotel

Mr. Hiroshi Yamaguchi

“This course is very unique and you cannot find it anywhere else. It combines several different disciplines such as management, sociology, anthropology, and philosophy.

In this course, you will learn these paradoxical characters of services by examining actual examples and developing theoretical concepts.”



www.edx.org/course/culture-of-services-paradox-of-customer-relations-0

“Let's create the future of services together!”



Associate Professor Yutaka Yamauchi

Graduate School of Management

Renewed

KyotoUx 008x

Open online courses from Kyoto University

Subject **Business & Management** **Social Sciences**

サービスの現場を分析し、
What's True Hospitality? Look into
Actual Services in Japan
真のおもてなしを知る

About

Services are everywhere in our society. We cannot live without them. More than 70% of advanced economies fall under the category of the service sector. Other sectors, such as agriculture and manufacturing, also seek to incorporate service business.

What is service? While the existing discourse on services emphasizes customer satisfaction, hospitality, and clear design, this course offers a radically new perspective on services.

The coursework will explore major underlying theories of service, including customer satisfaction and service quality. In addition, learners will be exposed to competitive analyses, and explore the contradictory relationships inherent in services from an intersubjective perspective.

In this business and management course, you will learn how to analyze customer interactions, using video data taken in actual service organizations. Through discussions of a variety of services such as sushi bars, restaurants, hotels, and apparel, you will explore the complex nuances and begin to see services differently.

Period

002x

1st Jan. 28–Mar. 24, 2016 (8 Weeks)

2nd Sep. 1–Dec. 22, 2016 (Self-paced)

3rd Apr. 1–Aug. 10, 2017 (Self-paced)

4th Sep. 21, 2017–Mar. 29, 2018 (Self-paced)

Renewed

008x

1st Apr. 12–Jun. 7, 2018 (8 Weeks)

2nd Oct. 1, 2018–Aug. 29, 2019 (Self-paced)

Topics

Week 1 Introduction

Week 2 Service Experience: Comparative Analysis

Week 3 Existing Theories of Service

Week 4 Ethnomethodology: Analysis of Customer Interactions

Week 5 Hospitality: A Critical Perspective

Week 6 Aesthetic of Service: Taste and Manners

Week 7 Dialectic of Customer Relations

Week 8 Service Design from Cultural Perspective

Banner



Trailer



Learner's Voice



“Let me congratulate you for making this MOOC, complex, but at the same time accessible. I really enjoyed it. I hope more MOOCs from you come later, and I hope to meet you one day in order to do a study in Kyoto University!!”

Message from Co-instructor

Naoto Sato

Ph.D. candidate of Graduate School of Informatics

See p.29

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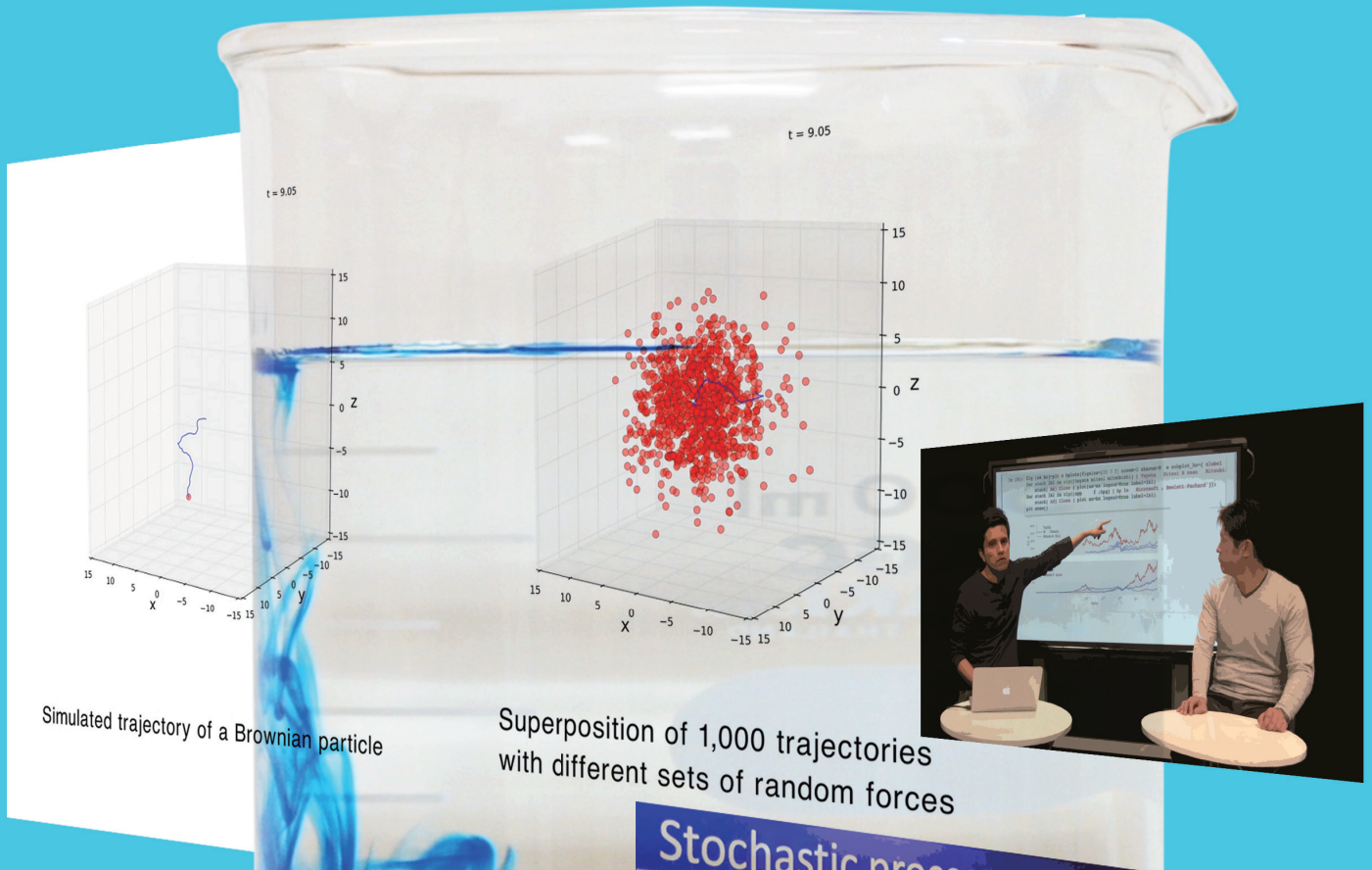
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011x

Stochastic Processes

Data Analysis and Computer Simulation



Simulated trajectory of a Brownian particle

Superposition of 1,000 trajectories with different sets of random forces



Stochastic process

And also,

$$S_Y(\omega) = \int_{-\infty}^{\infty} dt e^{i\omega t} \varphi_Y(t)$$

Wiener-Khinchine theorem:

$$\varphi_Y(t) \xrightleftharpoons[\text{Fourier Eq (15)}]{\text{inverse Fourier Eq (14)}} S_Y(\omega)$$

Sum rules:

$$\varphi_Y(0) = \frac{1}{2\pi} \int_{-\infty}^{\infty} d\omega S_Y(\omega)$$

$$S_Y(0) = \int_{-\infty}^{\infty} dt \varphi_Y(t)$$

Stochastic Processes: Data Analysis and Computer Simulation

“I hope you will be attracted to the interesting phenomena taking place in the microscopic world of molecules.”

工学研究科化学工学専攻化学工学基礎講座

山本 量一





Professor Ryoichi Yamamoto

KyotoUx 009x
Open online courses from Kyoto University

Department of Chemical Engineering,
Graduate School of Engineering

Subject Physics Chemistry Engineering

複雑な現象を
Grasp Complicated Phenomenon by Computer Simulation
コンピュータシミュレーションで捉える

About

The motion of falling leaves or small particles diffusing in a fluid is highly stochastic in nature. Therefore, such motions must be modeled as stochastic processes, for which exact predictions are no longer possible. This is in stark contrast to the deterministic motion of planets and stars, which can be perfectly predicted using celestial mechanics.

This course is an introduction to stochastic processes through numerical simulations with a focus on the proper data analysis needed to interpret the results. We will use the Jupyter (iPython) notebook as our programming environment. It is freely available for Windows, Mac, and Linux through the Anaconda Python Distribution.

You will first learn the basic theories of stochastic processes. Then, you will use these theories to develop your own python codes to perform numerical simulations of small particles diffusing in a fluid. Finally, you will analyze the simulation data according to the theories presented at the beginning of course.

At the end of the course, we will analyze the dynamical data of more complicated systems, such as financial markets or meteorological data, using the basic theory of stochastic processes.

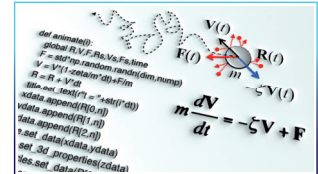
Period

- 1st Mar. 30 – May 11, 2017 (6 Weeks)
- 2nd Aug. 3, 2017 – Aug. 2, 2018 (Self-paced)
- 3rd Oct. 1, 2018 – Aug. 1, 2019 (Self-paced)

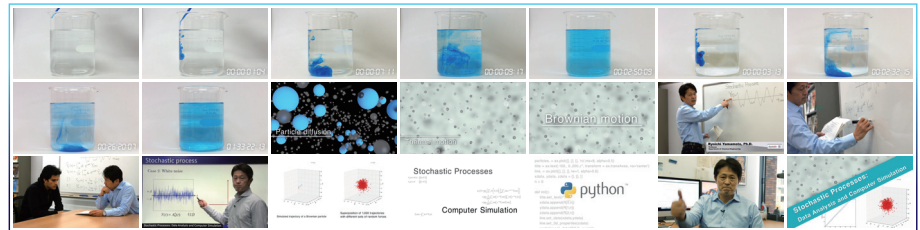
Topics

- Week 1 Python Programming for Beginners
- Week 2 Distribution Function and Random Number
- Week 3 Brownian Motion 1: Basic Theories
- Week 4 Brownian Motion 2: Computer Simulation
- Week 5 Brownian Motion 3: Data Analyses
- Week 6 Stochastic Processes in the Real World

Banner



Trailer



Message from Co-instructor



John J. Molina
Assistant Professor

When Professor Yamamoto asked me if I would be interested in helping him deliver his KyotoUx course on “Stochastic Processes” I thought it would be an interesting exercise, but I did not anticipate that I would learn so much about the subject while we were preparing the course. I studied most of the material during my own undergraduate courses, a little over ten years ago, but I did this without using any numerical calculations. I now believe this is a huge handicap, because numerical simulations allow you to tackle much more complicated and interesting problems than you can reasonably solve using just pen and paper. A sound theoretical understanding is of course still necessary, but once you understand the problem, you are (possibly) just a few lines of Python code away from the answer. I believe this was Professor Yamamoto’s inspiration when developing this course. The theory of “Stochastic Processes” can seem arid and abstract when first introduced, and for non-physicists the study of Brownian motion is probably not very appealing, but the same framework can be used to describe stock markets or population dynamics. Studying the topic with the aid of computer simulations allows one to easily “see” what is happening, and how the different assumptions and parameters affect the behaviour of the system. I hope this course will provide a stepping-stone for students around the world to start using the tools of statistical mechanics to understand the world around them.

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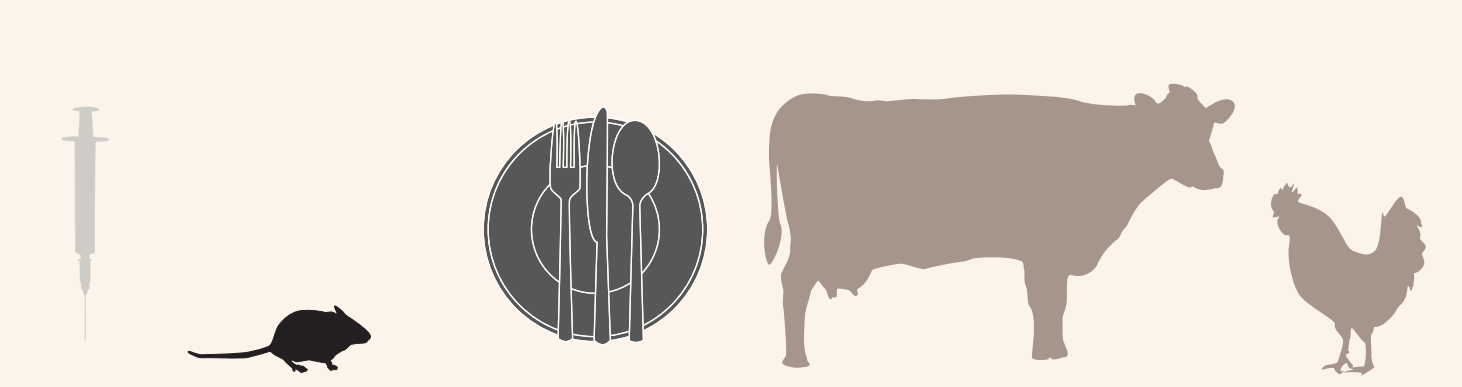
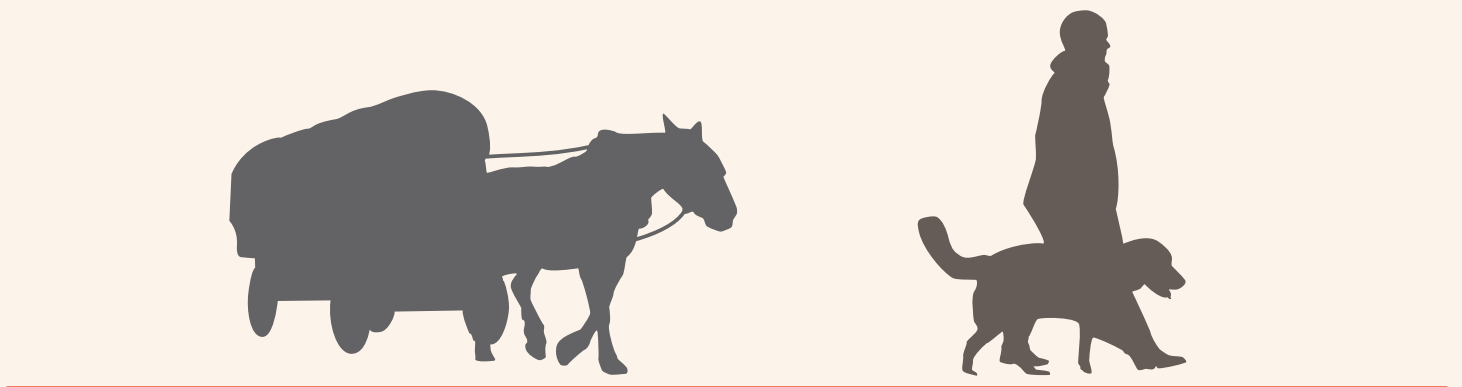
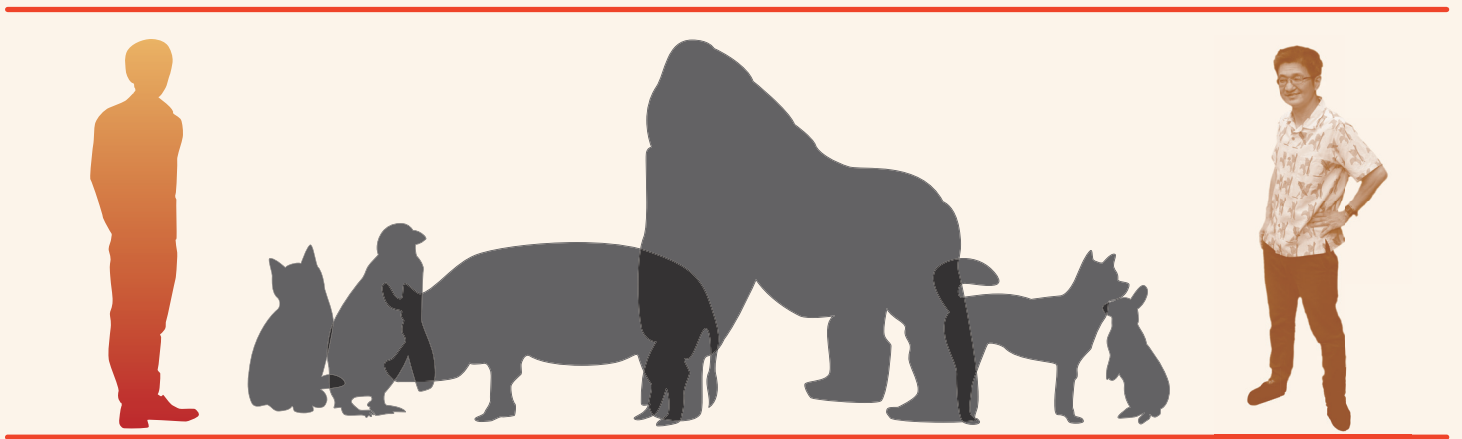
011x

Introduction to Animal Ethics

文学研究科 現代文化学専攻 現代文化学講座 准教授

伊勢田 哲治

*“Let us consider together
what the relationship between humans and animals should be!”*





Associate Professor
Tetsuji Iseda
 Graduate School of Letters

KyotoUx 010x
 Open online courses from Kyoto University

Subject **Philosophy & Ethics** **Humanities**

あなたは自分で育てた豚を
 食べることができますか？
 Can you cook a pig that you have raised?

About

Why do many of us who eat pigs condemn those who eat dogs? Is there any difference between lab mice and companion hamsters that justify the use of the former for drug tests? Our attitude toward animals is full of seeming inconsistencies and unexplained conventions. Animal ethics is the field that tries to make sense of human-animal relationships using insights from philosophical ethics, and this course is an introduction to the field.

This course has several distinctive characteristics from other animal ethics education materials. First, this course uses situations of animals in Japan as illustrative cases, which makes this course as a means to learn something about Japanese culture. Second, it also uses Manga to think about actual situations.

By listening to the lectures and thinking through the issues presented, you will acquire the ability to think more clearly and systematically about human-animal relationships.

Period

1st Jan. 18–Feb. 22, 2018 (5 Weeks)
 2nd May 17, 2018–Mar. 14, 2019 (Self-paced)

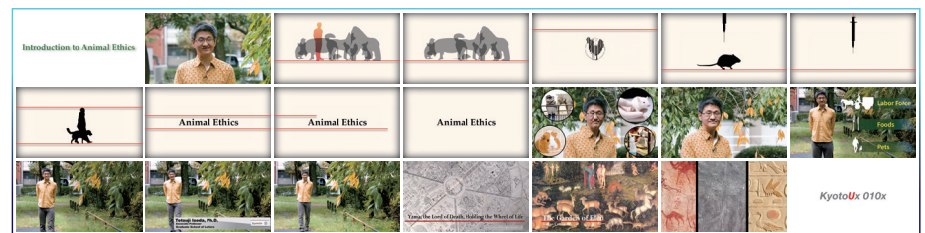
Topics

- Week 1 Training of Companion Animals
- Week 2 Neutering of Companion Animals
- Week 3 Animal Experimentation for Cosmetics
- Week 4 Eating Farm Animals
- Week 5 Environmental Enrichment in Zoos

Banner



Trailer



Lecture Videos

1 What is Animal Ethics?

- A relatively new field in applied ethics that deals with various aspects of human-animal relationship
- 'Animals' in this lecture: non-human animals, mainly mammals and birds.

1 Intensive Livestock Industry in Japan

Number (thousand) used in total

Corporate	6,972
Others	1,423
Total	8,395

1 Intensive Livestock Industry in Japan

- Statistics about livestock industry in Japan (2016)
- 1.3 million dairy cattle in 17,000 farms (73 cattle per farm)
- 2.5 million head cattle in 32,000 farms (80 cattle per farm)
- 8.2 million pigs in 4,800 farms (1,700 pigs per farm)
- 173 million egg-laying hens in 2,400 farms (72,000 chickens per farm)
- 134 million broiler chickens in 2,400 farms (57,000 chickens per farm)

4 Pros and Cons of Neutering Animals

- Alternative points of view
- Coexistence with the nature as opposed to dominance?
- Respect for animals?

4 Are Great Apes Different?

Great Apes

- Chimpanzee
- Human
- Orangutan
- Gorilla
- Common Chimpanzee
- Bonobo

4 Are Great Apes Different?

- Great Ape Project
- Jane Goodall, Peter Singer, and others
- Great Ape Rights
- Right to life
- Individual Freedom Protection
- Prohibition of Torture

Learner's Voice



"This is a great course and I learned a great deal from taking it."



"Nothing to say, it was great !"

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More Fun with Prime Numbers

The Mysterious World of Mathematics

理学研究科 数学・数理解析専攻基礎数理解講座 准教授

2 3 伊藤 哲史 5 7

"I invite you to the mysterious world of prime numbers."

2 3 5

13 17

3 3 7



www.edx.org/course/more-fun-with-prime-numbers



Associate Professor Tetsushi Ito

Renewed

KyotoUx 011x

Open online courses from Kyoto University

Department of Mathematics,
Graduate School of Science

Subject **Math**

素数の奥深い世界に飛び込め!

Explore the Mysterious World of Prime Numbers!

About

2, 3, 5, 7, 11, 13, 17, 19, 23, 29 are all prime numbers and they hold special significance. Mathematicians from ancient times to the 21st century have been working on prime numbers, as they're one of the most mysterious and important subjects in mathematics.

In this course, I will present several attractive topics on prime numbers. You will learn basic concepts of prime numbers from the beginning. They obey mysterious laws. Some laws are easily verified by hand, some laws were discovered 100 years ago, and some laws are yet to be discovered. Surprisingly, prime numbers are also applied to cryptography today. You will also learn how to construct practical cryptosystems using prime numbers.

The original course "Fun with Prime Numbers" was first offered in 2015 and attracted many students. This course in 2017 will be offered as its refined and upgraded version. All the lecture videos will be renewed, and a new topic on cryptography will be added so as to enliven and satisfy even the students who took the previous course.

No previous knowledge of prime numbers is required in this course. Calculating with a pen and paper, you will explore the mysterious world of prime numbers. The course is designed to encourage you to attack unsolved problems, and hopefully, discover new laws of your own in the future!

Period

004x

1st Jan. 21–Feb. 18, 2016 (4 Weeks)

2nd Apr. 7–Aug. 31, 2016 (Self-paced)

Renewed

011x

1st Nov. 2–Dec. 7, 2017 (5 Weeks)

2nd May 17, 2018–Mar. 14, 2019 (Self-paced)

Topics

Week 1 What are Prime Numbers?

Week 2 Sums of Two Squares

Week 3 The Reciprocity Laws

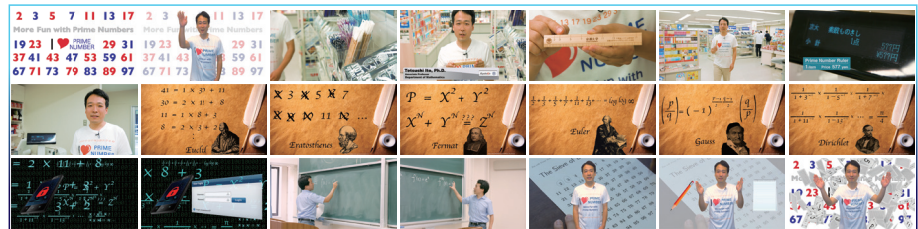
Week 4 Prime Numbers and Cryptography

Week 5 Mystery of Prime Numbers: Past, Present, and Future

Banner



Trailer



Learner's Voice



"I very much liked the way the course catered for a wide range of mathematical abilities. Very capable participants could get most from the lectures. Those, like myself, with lesser ability could get a lot from the quizzes and homework. A splendid course that does not need any improvement."

000x

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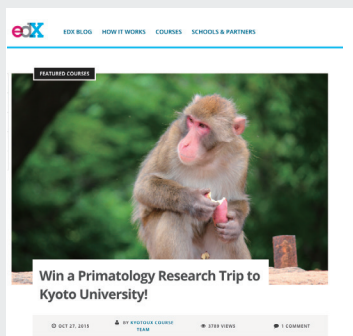


Oct. 13, 2015

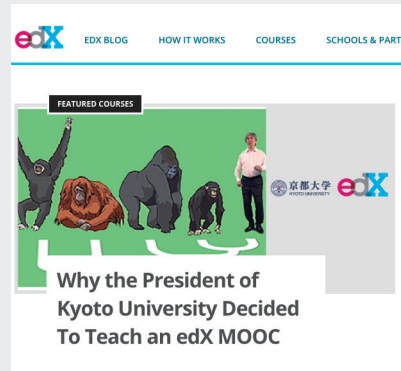
edX blog

Why the President of Kyoto University Decided to Teach an edX MOOC

"Join Juichi Yamagiwa, President of Kyoto University in Evolution of Human Sociality: A Quest for the Origin of Our Social Behavior starting on October 29. This first-ever course, taught by a sitting president from one of edX's member universities, explores the roots of human society through the lens of primates."



blog.edx.org/win-a-primatology-research-trip-to-kyoto-university?track=blog



blog.edx.org/why-the-president-of-kyoto-university-decided-to-teach-an-edx-mooc

Oct. 27, 2015

edX blog

Win a Primatology Research Trip to Kyoto University!

"The upcoming Kyoto University course Evolution of the Human Sociality: A Quest for the Origin of Our Social Behavior on edX has already been attracting attention, and will be offered by the President of Kyoto University, a world-leading primatologist himself!"



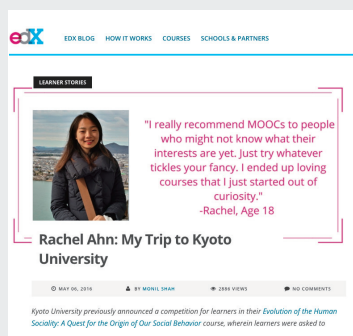
blog.edx.org/kyoto-university-invites-student-winners-to-japan?track=blog

Mar. 10, 2016

edX blog

Kyoto University Invites Student Winners to Japan

"Kyoto University previously announced a competition for learners in their Evolution of the Human Sociality: A Quest for the Origin of Our Social Behavior course. Read on to learn about the winners of the competition and their trip to Japan."



blog.edx.org/rachel-ahn-learner-story?track=blog

May 6, 2016

edX blog

Rachel Ahn: My Trip to Kyoto University

"Kyoto University previously announced a competition for learners in their Evolution of the Human Sociality: A Quest for the Origin of Our Social Behavior course, where learners were asked to submit a research proposal as a coursework assignment. Two winners were selected, and won an all expense paid trip to Kyoto University. Rachel Ahn was one of the winners."



http://www.kyoto-u.ac.jp/ja/mm/jitsuha/170330_2.html

Email Newsletter to Introduce the MOOC Initiative at Kyoto University

The members of KyotoUx Team were interviewed and covered on the official website of Kyoto University. The production process of the MOOC courses was reported. You will find many photos of the shooting with President Yamagiwa and Professor Yamamoto.

Here is a part of them.

Impact on Education at Kyoto University

Case Studies and Voices

000x **Evolution of the Human Sociality** President **Juichi Yamagiwa**



Shun Hongo as a co-instructor

Ph.D., Program-specific researcher,
Centre for African Area Studies, Kyoto University

My best experience in creating KyotoUx course materials is to make questions about a developing academic field and to discuss their answers seriously with the learners from all over the world. The primatology is a quite young academic field which has been studied for about 60 years. So, the hypotheses that assume the trajectory of human social evolution based on societies and ecology of primates greatly depend on each researcher. However, because the course should provide questions with correct answers, I tried considering and making them to avoid any inconsistency. But some questions and contradictions that I had not expected at first did arise and were presented on the Discussion page when about 300 learners had considered and

solved the questions. When reading their comments, I could feel that all the learners really wanted to understand, and that I should respond to them carefully and thoughtfully. At that time when I was a graduate student, I did not expect that such kind of “real” discussion would be going on in the MOOC as it is not face-to-face learning. It was a very pleasant surprise to me and I could learn a lot from the experience.



002x **Culture of Services** Associate Professor **Yutaka Yamauchi**



Nao Sato as a co-instructor

Ph.D. candidate of Graduate School of Informatics

It was a very good experience for me to join an initiative of MOOC for the first time by giving a lecture for one of the 8-week course. The KyotoUx course “Culture of Services,” offered by Associate Professor Yamauchi and me, stimulates a conventional concept of “service.” Our basic idea may be new and difficult, but you can view the lecture videos as many times as you want, so that you can understand much better through the MOOC than a usual on-campus lecture. In addition, the learners’ comments from all over the

world helped us review our research objectively. Through this experience, I could realize massive potential in “online learning” again.





Hue Thi Vu as a learner

Former Graduate Student, Institute for Chemical Research

Chemistry of Life is an interesting science course. It's easy to follow but very informative at the same time. It's great for a chemistry student like me who wants to learn more about Biology. The contents are very interesting, especially the topic on idea generation technique. The way Prof. Uesugi delivered the lessons are also very intriguing.

I came to Japan to pursue graduate study in Chemical Biology. With the recommendation from Prof. Uesugi, I got supported by the Japanese government with MEXT scholarship.

I am doing my graduate study in the Chemical Biology laboratory of Prof. Uesugi. It's one of the best Chemical Biology research groups, which has been providing me with a very good condition to do my research. I will be finishing my Master study by next April and will continue to the Ph.D. course.



Hiroya Takiyama as a learner

Graduate Student, Section of Language and Intelligence, Primate Research Institute, Kyoto University

What is a human? – an intriguing question many people attempt to solve. Comparative Cognitive Science (CCS), we learned through this course, is the research that focuses on this question. The course was set up in a sophisticated way. First, it explained why we should study primates. It is important for us to answer the aforementioned question in a scientific way. Second, we were taught how to study CCS. Usually, we tend to think results as the most important part in research. However, methodology is indeed essential. We should not believe everything we are told but think by ourselves. Third, we learned the interesting works done by the professor and his colleagues. What is the

difference between humans and other apes? What is the unique point of a human? Focusing on these questions allows us to understand humans well. At the end of this course, we also got to know more about conservation of chimpanzees. A lot of primates including chimpanzees are now endangered, and it is necessary for us to start paying attention and take action their conservation. Conservation is not easy, but we should not give up just because it is difficult. I enjoyed this course a lot with all the precious knowledge lectures shared with. If you haven't tried yet, I strongly recommend you to join us.

Messages from Instructors



Associate Professor **Yutaka Yamauchi** *002x* **Culture of Services**

I use the MOOC in several regular courses in Kyoto University. I require students to take the MOOC prior to classroom discussions and then to prepare presentation on the covered materials. I provide additional reading materials and assignments. My MOOC is quite accessible to a broad audience because of the familiar theme to most people, namely service. I use it in my undergraduate course “Service Management” and students have no problem grasping the ideas. At the same time, because its academic content is quite advanced, I can use the MOOC for my graduate course “Advanced Service Design.” The value of MOOC is beyond reducing time to deliver standard parts of the course. MOOC materials are carefully designed and structured so that learning is optimized; I had never spent so

much time on preparing for lectures before this MOOC. The students can quickly gain important ideas but also repeatedly review the segments of video lectures to clarify and deepen their understanding. Furthermore, my MOOC contains various video data of actual service settings. It is helpful for the students to go over the video data and analyze them on their own prior to classroom discussion; this is much more effective than reading business cases. Finally, classroom discussions can delve into deep theoretical topics because the students have learned much prior to the sessions. Having intensive discussions with students who have prepared well is a truly rewarding experience for an instructor.



Associate Professor **Tetsushi Ito** *004x* **Fun with Prime Numbers**

It was an exciting experience for me to give KyotoUx course 004x “Fun with Prime Numbers.” I think a good thing of edX’s platform is, thanks to its well-organized system and the support of our staffs, students can share the atmosphere of the lecture room. Each week, immediately after the video became available, many students posted messages to BBS; some were simply chatting about their impressions, some were asking questions, and some were pointing out a serious flaw which I had to correct. Though it is online, I think they could have a feeling of learning together in the lecture room. This feeling is very

important because it gives motivation to learn new topics. Also, I was surprised how MOOC is really ‘massive’. Without MOOC, I could not imagine several hundred students from more than 100 countries were taking the same course at the same time. Because mathematics is a widely-studied subject of science, I think more people from all over the world can have a chance to learn it together by MOOC. Currently, I am preparing a new course titled “More Fun with Prime Numbers.” I will revise the contents and add more topics. The new course number will be 011x. (11 is a prime number.)

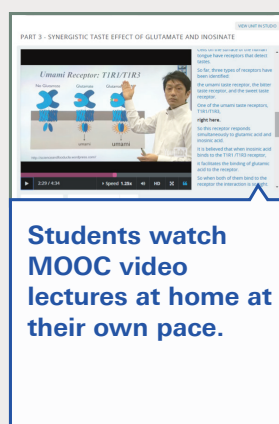
Report

The created MOOCs enable various educational development.

Report 1

Professor **Motonari Uesugi**
001x The Chemistry of Life

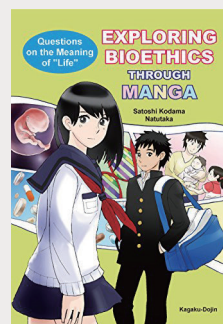
MOOCs can be used as preparation and supplementary materials for on-campus classes at Kyoto University as well as in the other international universities. Prof. Uesugi has kept using his MOOC for his on-campus class “Organic Chemistry of Life” as a flipped classroom every year since 2014. He told us that he could find a big merit of the online course that he could spare most time for group work, presentation, and discussion in his class because his students took his online course prior to and outside of class, and that he could implement such flipped classrooms with the MOOC offered in English at the universities in and outside of Japan.



Report 2

Associate Professor **Satoshi Kodama**
006x Ethics in Life Sciences and Healthcare: Exploring Bioethics through Manga

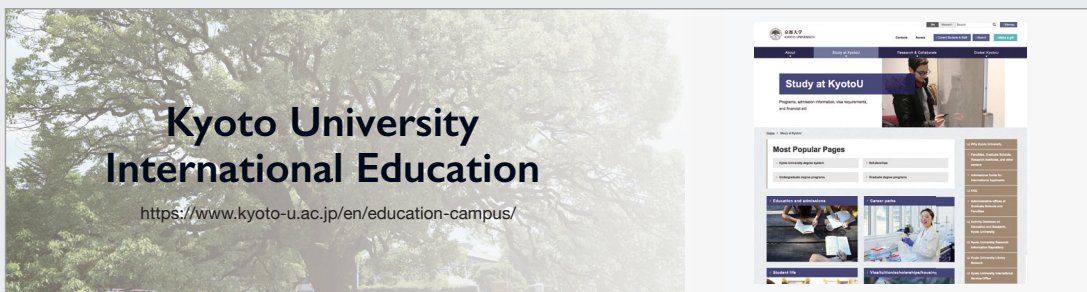
This course’s contents at large are based on the text book, *Exploring Bioethics Through Manga: Questions on the Meaning of “Life,”* written by the instructor Assoc. Prof. Kodama and Natutaka. It was originally published in Japanese in 2013. The success of the MOOC offered in 2016 and 2017 led to the new release of the English version of the book in 2018. Please check the link: <https://www.kagakudojin.co.jp/special/pod/c12134eng.html>



Title: Exploring Bioethics through Manga: Questions on the Meaning of “Life”
Publisher: Kagaku-Dojin Publishing Company, INC (May 2, 2018)
Author: Satoshi Kodama & Natutaka

Learning at Kyoto University

The courses that stimulate your curiosity through edX are only a part of what Kyoto University offers. If you want to deepen and widen the content you have learned in edX, let's study together at Kyoto University. We are creating a great environment as an international educational institution and working on international collaborative education programs including JGP, for example. Kyoto University welcomes international students from around 100 countries and regions throughout the world. For details, please refer to the following URLs.



**Kyoto University
International Education**
<https://www.kyoto-u.ac.jp/en/education-campus/>

The screenshot shows the Kyoto University International Education website. The header includes the university logo and navigation tabs for 'Study at KyotoU', 'Research & Exchange', and 'Other Topics'. The main content area features a 'Study at KyotoU' section with a video thumbnail, a 'Most Popular Pages' section with search filters, and a 'Research & Exchange' section with a video thumbnail.



**Kyoto University
International Education
Administration Office**
www.jgp.kyoto-u.ac.jp/iea/en

The screenshot shows the Kyoto University International Education Administration Office website. The header includes the IEA logo and navigation tabs for 'Home & News', 'About IEA Office', 'For International Students', and 'Contact'. The main content area features a 'Home & News' section with a video thumbnail, an 'Events & News' section with a list of events, and a 'Why Kyoto University?' section with a video thumbnail.



**JGP
Top Global University Project
Japan Gateway Kyoto University
Top Global Program**
www.jgp.kyoto-u.ac.jp/en

The screenshot shows the JGP (Japan Gateway Project) website. The header includes the JGP logo and navigation tabs for 'Home', 'About JGP', 'For International Students', and 'Contact'. The main content area features a 'Home' section with a video thumbnail, a 'For International Students' section with a list of programs, and a 'Contact' section with a video thumbnail.



Learn on the Planet

Open online courses from Kyoto University

KyotoUx

Edited by
KyotoUx

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