

July 23 -- 25, 2014

UG - 1

理学部特別講義

Interplay between differential equations integrable systems and algebraic geometry



Motohico MULASE
Professor of Mathematics,
University of California,
Davis campus

微分方程式, 可積分系についての基本的事項と例を理解し、いくつかの例について微分方程式の相空間を代数幾何的に記述する方法と近年の量子不変量に関する話題について理解を深める。

In this course, we will explain about the fundamental facts about differential equations and integrable systems and their examples. We will explain about the way to describe the phase space in terms of algebraic geometry.

Moreover, we will review recent works on its relation to the quantum invariants.

授業のテーマと到達目標 (Tentative Schedule)

1. Introduction
2. Differential equations and integrable systems
3. Examples
4. A brief guide to algebraic geometry
5. The WKB method
6. Quantum invariants and integrable systems
7. Further discussions I
8. Further discussions II



Olivia DUMITRESCU

Department of Mathematics and Physics,
Leibnitz University of Hannover

対象：学部2年生以上

※履修登録が必要です。詳しくはシラバスをご覧ください。

UG - 2

July 22-- 29, 2014

理学部特別講義 -- Introduction to Natural Sciences, I

1



Yoshiyuki TATSUMI
Professor of Earth and Planetary Sciences,
Kobe University

地球の記憶を掘り起こせ。国際深海科学掘削計画 Drilling into the Memory of the Earth. An Introduction to International Ocean Discovery Program

国際深海科学掘削計画(IODP)は、世界26カ国が共同で行う大型国際共同研究であり、地球の変動と進化を明らかにすることを目的としている。日本はこの計画の主導国として、海底下7000mまでの掘削が可能な最新鋭のライザー掘削船「ちきゅう」を投入している。国際的な検討によって、地震発生帯掘削、海洋島弧掘削、それとマントルへの到達を「ちきゅう」が実施することになった。この講義では、これらの掘削計画の目的や意義を紹介する。

The International Ocean Discovery Program (IODP) is an international marine research collaboration between 26 nations dedicated to advancing scientific understanding of the Earth using specialized ocean drilling platforms staffed by multidisciplinary research scientists. Japan is one of the leading nations of IODP and has provided a cutting-edge, riser-equipped deep sea drilling vessel, CHIKYU, which is capable of drilling up to a 7,000m deep sea floor. Internationally endorsed targets for CHIKYU are seismogenic zones that cause ultra large earthquakes such as Nankai earthquakes, intra-oceanic arcs creating continents that typify the planet Earth, and the Earth's mantle that occupies 80% of this planet. This lecture shall introduce these projects that Japan leads.

2



Masahiko ARAKAWA
Professor of Earth and Planetary Sciences,
Kobe University

地球惑星科学：太陽系の起源と進化 Earth and Planetary Sciences: Origin and Evolution of Solar System

我々の太陽系はどのようにできて、その後進化してきたのでしょうか。太陽系には地球をはじめとする惑星だけでなく、衛星、小惑星、彗星など様々な天体が存在します。このような天体の多様性とその多様性の起源を学びます。また、日本で行われている最新の惑星探査の状況を紹介いたします。

How was our solar system formed and evolved?
Our solar system has eight planets like the Earth and other various bodies such as satellites, asteroids, and comets. In this class, we learn about the origin and the characteristics of these bodies, and the recent progress of the Japanese planetary exploration of asteroids is introduced.

3,4



Yuji YAMAZAKI
Associate Professor of Physics,
Kobe University

ヒッグス粒子はいかにして見つかったか The experiment to find the Higgs particle

この講義では、2012年に発見され、2013年のノーベル物理学賞につながったヒッグス粒子について、どんな粒子で、どのような実験で発見したかを解説します。

1時間目：素粒子の世界、ヒッグス粒子と質量
2時間目：加速器実験による新粒子発見

In 2012, the long-awaited Higgs particle was finally found at the LHC experiment, which has led to the Nobel Prize in Physics 2013. This lecture explains about how the particle gives mass to other elementary particles and how the new particle was found experimentally.

Lecture 1: the world of elementary particles and the Higgs particle
Lecture 2: accelerator and experiments for finding a new particle

5,6



Wayne ROSSMAN
Professor of Mathematics,
Kobe University

How Einstein saw sphere?

In these two lectures we will use only the most basic tools from calculus to introduce two rather remarkable theories. One is the theory of relativity that is now so indispensable for the daily operation of modern-day life. The other is a theory that led to Perelman's solution of the Poincare conjecture, which became headline news worldwide. Our goal is to give an introduction to these two topics that is easily understood and yet still shows their depth. We will approach this with two very down-to-earth applications, as stated in the two titles for the lectures.

Lecture 1: How Einstein saw spheres
Lecture 2: The fence of least perimeter about a farm of given size

UG - 3

July 30 – August 7, 2014

理学部特別講義 -- Introduction to Natural Sciences, II

1



Hidehiro FUKAKI
Associate Professor of Biology,
Kobe University

生物学：植物科学への招待

Biology: Introduction to Plant Science

植物とはどんな生物でしょうか？ 植物はどうやって生きているのでしょうか？ 植物は私たちに何を与えてくれるのでしょうか？ この講義では、植物に関する基礎的な知識を扱うとともに、植物科学の重要性と未来について考えます。

What is a plant? How do plants live? What do plants give us?

This lecture provides basic knowledge on plants and discusses the importance and future of plant science.

2



Mitsuhiro MORITA
Associate Professor of Biology,
Kobe University

脳の進化

Evolution of the Brain

ヒトの脳を理解する事は現代科学の最も重要な問題のひとつです。微細な指の動き、感情、言語、生存競争に必要な計画性といった多様な機能が脳の情報処理によって生まれます。こういった機能が進化の過程で、それぞれ独自の神経回路を形成することによって発達したことを概説します。

The human brain is the last frontier of modern science. Fine control of finger movement, emotion, language, and strategic planning for surviving in wild life, as well as in our society are all the consequences of information processing by the brain. This talk focuses on the evolution of diverse brain functions by virtue of emerging unique neural networks.

3



Takuya SATO
Associate Professor of Biology,
Kobe University

生態学：生物多様性の時空間変動とそのメカニズム

Ecology: Exploring biodiversity in space and time

地球上にはどれほどの生物種が生息しているのでしょうか？ 多様な種は時間的・空間的にどのように共存し、生態系過程（炭素循環等）の一部として機能しているのでしょうか？ この授業では、生態学の基礎理論を通して、上記の問いに答えられる知識を身に着けます。

How many species inhabit the planet earth? How species can co-exist, and function to maintain ecological processes, including carbon and nutrient cyclings? The student will learn basic concepts of Ecology that will be helpful to answer the above questions.

4,5



Ryousuke MATSUBARA
Associate Professor of Chemistry,
Kobe University

化学：分子の科学

Chemistry: Science of Molecules

薬はどのように痛みを和らげるのでしょうか？ 昆虫はどのようにパートナーを見つけるのでしょうか？ 石油からアイスクリームの匂いが作れるのでしょうか？ 化学の基礎を学びとこれらの質問に答えられます。

How does a medicine release a pain? How can insects lure the partner?

Can we make the ice-cream's smell from petroleum?

The student will learn very basic chemistry in this class and acquire the knowledge to answer these questions.

6



Yasuhiro KOBORI
Professor of Chemistry,
Kobe University

化学：光合成と太陽電池

Chemistry: photosynthesis and solar cell

生体分子はどのように太陽光を化学エネルギーに変えるのでしょうか？

有機太陽電池はどのように光電流を生み出すのでしょうか？

本講義では量子化学の基本を学び、光エネルギー変換の仕組みを理解します。

How do biological molecules convert the sunlight to the chemical energy?

How do organic solar cells generate the photocurrent?

The student will learn very basic quantum chemistry to understand the mechanism of the photo-energy conversions.



Kobe Summer School 2014

UG - 4

July 28 -- August 6, 2014

Introduction to Japanese Culture and Society



Hillary PEDERSEN

Lecturer of Japanese Studies,
Ritsumeikan University

1. July 28 (4th Period):

Buddhist Images in Japanese Culture and Society

While many Japanese Buddhist monuments are now popular tourist destinations, the original contexts of their production had wide-reaching effects upon many spheres of Japanese society. Aside from religious meaning, Buddhist image production had profound influence upon the Japanese economy, politics, and foreign relations. This lecture will begin with a discussion of key Buddhist concepts and related visual expressions in Japan. I will explore both distinctive native characteristics as well as the role of Japan in an international network of Buddhist image production.



Kiyomitsu YUI

Professor of Sociology, Kobe
University

2. July 29 (4th Period):

Japanese Sub-culture and Globalization

The lecture will focus on Japanese sub-culture as a global phenomenon in the age of decentered globalization. In its phase of "traveling," this lecture will take up examples of Japanese sub-culture such as costume play and comic market events in conjuncture with contemporary cultural industries in Japan.



Keiko ISHII

Associate Professor of Psychology,
Kobe University

3. July 30 (4th Period):

Cultural Psychology: A Comparative Perspective

Cultural psychologists have explored a mutual relationship between culture and the mind by addressing how cultural practices influence the manner in which people think, feel, and behave, and how people's culturally constructed psychological processes shape social and cultural environments. In my lecture, I will describe the theoretical framework of studies from a cross-cultural perspective. Next, I will present some of the recent studies on the mode of thought in terms of a comparison between Western and Eastern cultures and an exploration of mechanisms underlying cultural differences. Finally, I will discuss future directions in this research area.



Nobuo KAZASHI

Professor of Philosophy, Kobe
University

4. July 31 (4th Period)

Japan's Dilemma over the Nuclear: A Historical Overview

The atomic bombing marks a decisive turn in modern Japan, but its significance has not been univocal. It has become a cornerstone for Japan's post-war pacifism. However, it has been doubly twisted by the fact that Japan has chosen, not only to be under the U.S.'s nuclear umbrella, but also to promote nuclear power generation in the name of "peaceful use," which resulted eventually in the Fukushima disaster. This lecture brings into light Japan's dilemma by reflecting on some critical incidents such as the 1954 contamination of the Lucky Dragon 5 followed by the anti-nuclear surge as well as some nuclear-related works such as Astro Boy, Godzilla and Hiroshima Mon Amour.



Kobe Summer School 2014

UG - 4

July 28 -- August 6, 2014

Introduction to Japanese Culture and Society

5. August 4 (4th Period)



Japan's Hamlet

This lecture will consider how Japanese writers responded to Hamlet, the world-famous Shakespeare tragedy. By introducing several adaptations of the play, I will illustrate how different Japanese authors negotiated the personal, cultural, and national issues and conflicts that arose when they associated their work with Shakespeare's.

Kaori ASHIZU

Associate Professor of English Literature, Kobe University

6. August 5 (4th Period)



Blossoms Before Moss: Rethinking Zen Aesthetics at Saihōji Temple

A UNESCO World Heritage site, Saihōji temple in Western Kyoto is better known today as "The Moss Temple" ("Kokedera"). With its green moss carpet and dry rock waterfall, the garden is often held up as a prime example of medieval Zen landscape design. Pre-modern literature about the temple, however, suggests that Saihōji was celebrated not for its muted moss or austere rocks but for its vibrant cherry blossoms—a feature not commonly associated with Zen in the modern mind. This lecture will examine the vital role played the cherry blossoms in literature about Saihōji, and, in doing so, invite students to challenge their assumptions about Zen Buddhist aesthetics.

Molly VALLOR

Assistant Professor of Japanese Studies, Kobe University

7. August 6 (3rd Period)



Globalizing the Ethics of Emptiness: On the Reception and Possibilities of Watsuji's Ethics in English

Watsuji's Ethics emerged within the context of the influx of Western philosophy into Japan and World War II, as an attempt to carve out a Japanese theory of ethics that might support Japan through this turbulent period. However, Watsuji's reception in the English language has appropriated him for largely different ends. I will examine attempts to use Watsuji to rethink the west's own problems—relationality, the liberal-communitarian debates, moral relativism—focusing on the Buddhist-inspired idea of emptiness as the core of his contribution, thus demonstrating both philosophical analysis and a case in the dynamics of the inter-cultural transfer of philosophical ideas.

Anton Luis Sevilla

Instructor of Ethics, Ateneo de Manila University of Ethics, Philippines

8. August 6 (4th Period): Discussion

Round-table discussion on the topics related to the preceding lectures. The students are encouraged to actively participate in the discussion so as to deepen their understanding and broaden their perspectives.

Moderator:

Hideyuki YAMAMOTO

Professor of American Literature, Kobe University



Kobe Summer School 2014

UG - 5

August 4 --11, 2014 [予定 (詳細は決定次第公示する)]

工学部特別講義 -- Introduction to Material Sciences August 4 - 11 [予定 (詳細は決定次第公示する)]



Franz FAUPEL

Visiting Professor, Ph.D
CAU of Kiel, Germany

材料科学への誘い

-高分子/金属ナノ粒子コンポジットから高機能電子材料まで

Introduction to Material Sciences

Faupel教授は長年にわたって、高分子/金属ナノ粒子コンポジットに関する物性に関する研究を行ってこられました。特に金属-高分子界面の構造に関する研究は世界的にも高い評価を得ており、300にも及ぶ学術論文にその結果が記されています。

特に、半導体技術のフレキシブル基板材料の構造や耐久性にかかわる研究や金属ナノ粒子の電子の挙動についての実験手法の開発においては、化学のみならず、物理学や数学の知識を駆使して、その解釈にあたっておられます。

Faupel教授はクリスチャン・アルブレヒト・キール大学工学部の教授として教鞭をとっておられ、本年7月から客員教授として神戸大学に滞在されます。この期間を活用し、ドイツにおける大学のような学生の国際交流の状況、研究室の様子などの紹介も行われます。講義内容についてはできる限り平易な専門用語を用いることになっていますので、積極的に受講して下さい。

Professor Franz Faupel has been studied on polymer/metal nanocomposite in viewpoints of physics and interfacial chemistry. His studies are published on more than 280 academic papers. Hybrid materials consisting of metal nanoparticles dispersed in a dielectric matrix are the subject of extensive research due to their novel functional properties offering hosts of new applications. Polymers are particularly attractive as matrix. Consequently, various approaches have been reported to incorporate metal nanoparticles into polymers. His research group focuses on the preparation of polymer-based nanocomposites by vapor phase co- and tandem deposition and the resulting functional properties. The techniques involve evaporation and sputtering, respectively, of metallic and organic components and inter alia allow the preparation of composites which contain alloy clusters of well defined composition. Recently, we also started to use inorganic matrix materials. Emphasis is placed on soft-magnetic high frequency materials with cut-off frequencies well above 1 GHz and optical composites with tuned plasmon resonances suitable for ultra thin color filters, Bragg reflectors, and other devices. In addition, antibacterial coatings and sensors for organic vapors are investigated. The latter take advantage of the steep drop of the electrical resistivity at the percolation threshold. Moreover, He recently found a novel approach to produce magnetic nanorods for potential applications in high-density data storage and other fields.

<http://www.tf.uni-kiel.de/~ff/>

<http://www.tf.uni-kiel.de/matwis/matv/index.php>



Kobe Summer School 2014

UG - 6

September 8 ,19,22 (3 days), 2014

農学への招待 (Introduction to Agricultural Sciences)

The Faculty of Agriculture has objectives to train human resources that will be capable to give to communities both locally and internationally through research and technology development on agricultural sciences. In this course, foreign professors invited from overseas give lectures in English to produce human resources equipped with a global perspective in the area of agricultural sciences.

Students who participate in the course listen to not only English lectures, but also commentaries by Japanese professors and work on writing English reports. This class proposes to enrich their international sense by being familiar with lectures and discussions in English and having a chance to find out the present state of agriculture in foreign countries and the research of agricultural sciences.

アフリカ, 特にスーダンにおける灌漑農業の進展について Development of irrigated agriculture in Africa, especially in Sudan



**Bashir
Mohammed
Ahmed Adam**

Agricultural Research
Corporation, Sudan



Haruya TANAKAMARU

Professor of Department
of Agricultural Engineering
and Economics,
Kobe University

東南アジア, 特にフィリピンにおけるプラントヘルスサイエンス Plant health science in Southeast Asia: Focus on the Philippines



**Christian
Joseph
Rili Cumagun**

University of the
Philippines Los
Baños, Philippines



Yukio TOSA

Professor of Department
of Agrobioscience,
Kobe University

乳酸菌など腸内細菌のヘルスバイオサイエンス Health bioscience in gut flora including lactic acid bacteria



**Maarten van
de Guchte**

The French National
Institute for Agricultural
Research, France



Ken-ichi YOSHIDA

Professor of Department of
Agrobioscience,
Kobe University



Kobe Summer School 2014

UG - 7

July 7 -- August 8, 2014

特別講義 —海事を科学する—
Introduction to Maritime Sciences



1 T B A

Akira KAWAGUCHI

Professor,
Department of Computer Science
Grove School of Engineering
The City College of New York



2 T B A

Michael WOODWARD

Lecturer,
School of Marine Science
and Technology
Newcastle University



3 T B A

Takeshi NAKAZAWA

Secretary,
International Association
of Maritime Universities (IAMU)



4 T B A

ROOKS John Matthew

Associate Professor,
Faculty of Maritime Sciences,
Kobe University

Kobe Summer School (Graduate School of Science) 2014



G - 1

July 28 -- August 1, 2014



A mathematical theory of quantum curves



Motohico MULASE

Professor of Mathematics,
University of California,
Davis campus

A mathematical theory of quantum curves : what they are, and what they do

The theme of the course is to present the recent exciting developments around the notion of "quantum curves" that relates many research frontiers of mathematics and theoretical physics. The goal is to develop a mathematical theory of this emerging field of research. Invariants. After reviewing classical theory, we will explain about theoretical background of this new field of mathematics.



Olivia DUMITRESCU

Department of Mathematics and Physics,
Leibnitz University of Hannover

The quantum curves connect classical theory of differential equations and modern theory of topological invariants, such as Gromov-Witten, Seiberg-Witten, and quantum knot invariants.

The course develops a universal structure of these invariants, originated by various groups of physicists, based on geometry and analysis of Riemann surfaces.

1. How do we see the moduli spaces of curves?
2. The parabola $x = y^2$ knows the Witten-Kontsevich theory
3. Quantum invariants give the exact WKB analysis of classical ODEs
4. The simplest example of the topological recursion is Catalan numbers
5. The mathematical framework of the theory is the Hitchin fibrations
6. Geometry of ruled surfaces, log Calabi-Yau spaces, and the Hilbert scheme of points
7. From Gromov-Witten to Seiberg-Witten via a spectral curve - a glimpse of KP equations

This course is designed to be an attractive introduction to the emerging new theory of the field. Motivated students in Mathematics and Mathematical Physics are welcome to the course!

対象：博士課程前期課程・博士課程後期課程

※履修登録が必要です。詳しくはシラバスをご覧ください。