

TOPIC 1- GENETICS

Definition

- Genetics is the study of heredity and variation.
- Heredity is the passing on/ transmission of characteristics/ traits from the parents to the offspring/ young ones.
- Variation refers to observable differences that are seen in organisms of the same species or differences between organisms.
- Species refers to a group of organisms that are able to freely and naturally interbreed to give rise to a viable offspring.
- The offspring show slight differences from their parents. For example in human beings, members of the same family differ in shape of nose, skin colour and height.
- This is because of hereditary factors/ genes each of them acquires from parents and the effect of environment.

VARIATION.

- This is the differences among organisms of the same species.
- Variations in human beings are shown in tongue rolling, fingerprints, height, and type of earlobes (attached or free), sex, blood groups, skin colour, and weight.
- In plants variations are observed in length of leaves and internodes and size of fruits.

Types of variation.

- Discontinuous variation.
- Continuous variation.

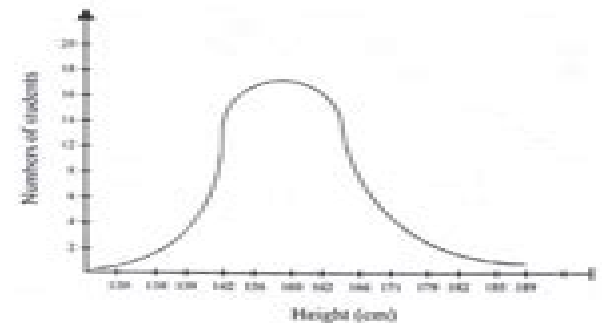
A. Discontinuous variation

- This is a type of variation where there is a distinct/ definite difference in a given characteristic/ without intermediates.
- It is controlled by genes and the environment has no effect.
- Examples include:
 - Ability to roll the tongue.
 - Sex i.e. male or female.
 - ABO Blood groups/ ABO Blood group system.
 - Presence of hair in the nose or ear pinna.
 - Fingerprints.
 - Free or attached earlobes.
 - Wing length, size of abdomen, eye color in *Drosophila melanogaster*.
 - Smooth/wrinkled seed coat, green/yellow color in garden peas.
 - Melanic/light forms in moths.

B. Continuous variation.

- This is a type of variation which shows a wide range of differences for the same characteristic/ trait from one extreme end to the other with intermediates.
- It is controlled by both genes and environment.
- Examples include:
 - Height.
 - Weight.
 - Seeds diameter.
 - Skin colour in humans.
 - Size of seeds and fruits.
 - Length of fingers in humans.
 - Milk yield in cows.
 - Length of leaves.

- For example, when the number of students is plotted against height it gives a **normal distribution curve**.



Causes of variation

- Gamete formation**—during gamete formation/ meiosis, the following meiotic processes cause variation namely:
 - Crossing over**—exchange of chromatid segments cause new gene combinations which causes variation.
 - Independent assortment**—this is the arrangement of homologous chromosomes at the equator of the spindle during metaphase I.
 - This is followed by segregation/ separation into different daughter cells. The resulting daughter cells/ gametes contain different genetic combination which brings about variation.
- Fertilization**—it allows parental genes to be brought together in different combination.
 - This causes different qualities of parents to be combined differently in the offspring.
- Mutations**—mutation is the spontaneous change in the genetic make-up of an organism. These changes may be inherited by the offspring causing variations.

Importance of variation

- Organisms/ individuals with advantageous traits/ variations are favored/ selected by nature and survive to pass on the traits to their offspring.
- It ensures propagation of favorable/ advantageous traits to the future generation/ offspring ensuring quality population/ species.

THE CHROMOSOMES

- They are thread-like structures found in the nuclei of plant and animal cells.
- They contain genetic material called **DNA (Deoxyribonucleic acid)**.
- Each chromosome is made up of two parallel strands called **chromatids**.
- Each pair of chromatids is connected at one point by a structure called **Centromere**.
- In body/ somatic cells each pair of chromosomes has the same length and shape but different versions of the same genes. They are therefore called **homologous chromosomes**.
- During sexual reproduction, each parent contributes one of the chromosomes of the homologous pair.

Form 4 Genetics

Victor M. Corman



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Health Services Reports, 2001 **Public Health Reports**, 2001 **Genetics of Inborn Errors of Metabolism**
Elsayed Abdelkreem, Sunita Bijarnia-Mahay, 2023-10-27 **Genetics** P. K. Gupta, 2007 1 Genetics Epigenetics and Genomics
An Overview 2 Mendel's Laws of Inheritance 3 Lethality and Interaction of Genes 4 Genetics of Quantitative Traits QTs 1
Mendelian Approach Multiple Factor Hypothesis 5 Genetics of Quantitative Traits 2 Biometrical Approach 6 Genetics of
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Physical Basis of Heredity 2 The Nucleus and the Chromosome 11 **Genetics and Reductionism** Sahotra
Sarkar, 1998-10-13 With the advent of the Human Genome Project there have been many claims for the genetic origins of
complex human behavior including insanity criminality and intelligence But what does it really mean to call something
genetic This is the fundamental question that Sahotra Sarkar's book addresses The author analyses the nature of
reductionism in classical and molecular genetics He shows that there are two radically different kinds of reductionist
explanation genetic reduction as found in classical genetics and physical reduction found in molecular genetics This
important book clarifies the meaning of the term genetic shows how molecular studies have affected genetics and provides
the philosophical background necessary to understand the debates over the Human Genome Project It will be of particular
interest to professionals and students in the philosophy of science the history of science and the social studies of science
medicine and technology *Behavioral Genetics* Ronald A. Carson, Mark A Rothstein, 2003-05-22 Nine essays examining the
ethical cultural legal and biological underpinnings of behavioral genetics Scientists conducting human genome research are
identifying genetic disorders and traits at an accelerating rate Genetic factors in human behavior appear particularly
complex and slow to emerge yet are raising their own set of difficult ethical legal and social issues In *Behavioral Genetics*
The Clash of Culture and Biology Ronald Carson and Mark Rothstein bring together well known experts from the fields of
genetics ethics neuroscience psychiatry sociology and law to address the cultural legal and biological underpinnings of
behavioral genetics The authors discuss a broad range of topics including the ethical questions arising from gene therapy
and screening molecular research in psychiatry and the legal ramifications and social consequences of behavioral genetic
information Throughout they focus on two basic concerns the quality of the science behind behavioral genetic claims and the
need to formulate an appropriate ethically defensible response when the science turns out to be good This book is well
written and stimulating The issues it raises are important for scientists and for those working in the legal and social services
fields but they clearly also have relevance for everyone The *New England Journal of Medicine* This is the best introduction to
behavioral genetics that I have read The varying viewpoints are presented with such clarity that this book should appeal to
the general public and serve as a basic text for college courses Jay Katz Elizabeth K Dollard Professor Emeritus of Law

Medicine and Psychiatry Harvey L Karp Professorial Lecturer in Law and Psychoanalysis Yale Law School **The Practical Guide to the Genetic Family History** Robin L. Bennett, 2011-09-20 HELPS YOU DEVELOP AND ASSESS PEDIGREES TO MAKE DIAGNOSES EVALUATE RISK AND COUNSEL PATIENTS The Second Edition of The Practical Guide to the Genetic Family History not only shows how to take a medical family history and record a pedigree but also explains why each bit of information gathered is important It provides essential support in diagnosing conditions with a genetic component Moreover it aids in recommending genetic testing referring patients for genetic counseling determining patterns of inheritance calculating risk of disease making decisions for medical management and surveillance and informing and educating patients Based on the author's twenty five years as a genetic counselor the book also helps readers deal with the psychological social cultural and ethical problems that arise in gathering a medical family history and sharing findings with patients Featuring a new Foreword by Arno Motulsky widely recognized as the founder of medical genetics and completely updated to reflect the most recent findings in genetic medicine this Second Edition presents the latest information and methods for preparing and assessing a pedigree including Value and utility of a thorough medical family history Directed questions to ask when developing a medical family history for specific disease conditions Use of pedigrees to identify individuals with an increased susceptibility to cancer Verification of family medical information Special considerations when adoptions or gamete donors are involved Ethical issues that may arise in recording a pedigree Throughout the book clinical examples based on hypothetical families illustrate key concepts helping readers understand how real issues present themselves and how they can be resolved This book will enable all healthcare providers including physicians nurses medical social workers and physician assistants as well as genetic counselors to take full advantage of the pedigree as a primary tool for making a genetic risk assessment and providing counseling for patients and their families **Understanding Genetics** Rajiv Tyagi, 2009 **Symmetrical Analysis Techniques for Genetic Systems and Bioinformatics: Advanced Patterns and Applications** Petoukhov, Sergey, He, Matthew, 2009-10-31 This book compiles studies that demonstrate effective approaches to the structural analysis of genetic systems and bioinformatics Provided by publisher **Genetic Counseling for Adult Neurogenetic Disease** Jill S. Goldman, 2014-12-01 The adult patient diagnosed with or at risk for a neurogenetic disease has many questions and concerns for the genetic counselor the neurologist and other practitioners Because of the emotional and potentially life altering impact of these diseases on the patient and family counseling can be especially challenging A rare hands on guide to the subject Genetic Counseling for Adult Neurogenetic Disease deals with core issues that differentiate adult neurogenetic counseling from its more familiar pediatric counterpart This innovative book with accompanying videos is designed to fill in deficits in this area typical of training programs in genetic counseling which have pediatrics and prenatal concentrations and neurology which rarely cover genetic counseling For each condition featured chapters include a detailed overview of genetic symptoms diagnostic criteria and management plus guidelines for asking and answering pertinent

questions The major concentration however is on genetic counseling issues and case histories illustrating these issues As an added dimension the accompanying videos depict representative issues and challenges in genetic counseling for specific diseases in addition to the basics of a neurological examination Among the conditions discussed Movement disorders including Parkinson s disease Dementias including Alzheimer s disease Stroke Motor neuron diseases Neuropathies and channelopathies Adult muscular dystrophies Neurocutaneous syndromes Plus a section on neurological and neuropsychological evaluation This is information that will stay relevant as technologies change and genetic understanding evolves Genetic Counseling for Adult Neurogenetic Disease offers advanced clinical wisdom for genetic counselors as well as neurologists neuropsychologists and other referring clinicians

Public Health Genomics Paul Lacaze,Gareth

Baynam,2019-10-17 The use of human genetic data has the potential to significantly improve healthcare however a range of scientific ethical and practical implementation barriers remain

Essential Genetics Daniel L. Hartl,Elizabeth W.

Jones,2006 Completely updated to reflect new discoveries and current thinking in the field the Fourth Edition of *Essential Genetics* is designed for the shorter less comprehensive introductory course in genetics The text is written in a clear lively and concise manner and includes many special features that make the book user friendly Topics were carefully chosen to provide a solid foundation for understanding the basic processes of gene transmission mutation expression and regulation The text also helps students develop skills in problem solving achieve a sense of the social and historical context in which genetics has developed and become aware of the genetic resources and information available through the Internet

Pathogenicity Islands and the Evolution of Pathogenic Microbes J. Hacker,J.B. Kaper,2013-03-09 It has been known for a number of years that not only pathogenicity islands but also plasmids and bacteriophages are able to carry genes whose products are involved in pathogenic processes Accordingly such elements and their products play an important role in pathogenesis due to the intestinal E coli as well due to Shigellae Another interesting aspect which is reflected in different articles is that genomes evolve by acquisition of new pieces of DNA following gene transfer but also by genome reduction Different mechanisms include the deletion of sequences or the elimination of functions by the accumulation of point mutations or rearrangements

Forest Genetics Timothy L. White,W. T. Adams,David B. Neale,2007 This book which contains 20 chapters integrates the varied subdisciplines of genetics and their applications in gene conservation tree improvement and biotechnology Topics covered include genetic variation in natural forests the application of genetics in tree improvement and breeding programmes and genomic sequences and molecular technologies This book will be a valuable resource for students scientists and professionals in the plant sciences especially forest geneticists tree breeders forest managers and other natural resource specialists

Molecular-Genetic Causes Underlying Primary Adrenal Insufficiency: Current Insights Into Diagnosis and Treatments Liliana Dain,Tania Bachega,Maria Candida Barisson Villares Fragoso,2022-10-07

Mendelian Inheritance in Man Victor A. McKusick,1998-06-29 The twelfth edition of this

classic reference work includes More than 2 000 new entries A total of more than 9 000 entries New features and enhancement of the familiar old features Mapping information on more than 4 000 genes of known function Information on specific point mutations responsible for more than 700 genetic disorders or neoplasms Mendelian Inheritance in Man MIM is a genetic knowledgebase that serves clinical medicine and biomedical research including the Human Genome Project It aims to be comprehensive not only complete but also collated integrated and interpreted authoritative not only accurate but also sound in its interpretations and judgements and timely not only up to date but also historically dimensioned From a review of the eleventh edition Reproductive Toxicology Even the convenience of computer based forms of MIM cannot eliminate the need for MIM in book form The preface provides a wonderful synopsis of human genetics The information contained in this text serves as a concise review for those with a genetics background From a review of the tenth edition New England Journal of Medicine Victor McKusick has been for all these years the shepherd of the development of the field of clinical genetics Perhaps his most important pragmatic achievement has been the 10 editions of Mendelian Inheritance in Man which rapidly became and has remained the principal source of information on inherited diseases for all clinical geneticists In addition to the erudite entries in the books the references given with each description represent a magnificent bibliography of clinical genetics With McKusick's leadership and continued interest in gene mapping the book also represents an important compendium of the location of genes on specific chromosomes The book is a magnificent security blanket for the clinical geneticist and should be in the libraries not only of these specialists but also of all others who see patients with diseases that have genetic components

Fundamentals of Mathematical Evolutionary Genetics Yuri M. Svirezhev,V.P.

Passekov,2012-12-06 One service mathematics has rendered the Et moi si j'avais su comment en revenir human race It has put common sense back je riy serais point aile Jules Verne where it belongs on the topmost shelf next to the dusty canister labelled discarded non The series is divergent therefore we may be sense able to do something with it Eric T Bell O Heaviside Mathematics is a tool for thought A highly necessary tool in a world where both feedback and non linearities abound Similarly all kinds of parts of mathematics serve as tools for other parts and for other sciences Applying a simple rewriting rule to the quote on the right above one finds such statements as One service topology has rendered mathematical physics o One service logic has rendered computer science o One service category theory has rendered mathematics All arguably true And all statements obtainable this way form part of the raison d'etre of this series

Biotechnology and Healthy Ageing

Policy Implications of New Research OECD,2003-01-21 If present trends in fertility and life expectancy continue between one quarter and one third of the population in OECD countries will be over 65 years by 2025 The ageing population will have profound social and economic implications Not

Genetic Steroid Disorders Maria I. New,Bert O'Malley,Gary D.

Hammer,Oksana Lekarev,Alan Parsa,Tony T. Yuen,Mone Zaidi,Ahmed Khattab,Anne MacDonald,2023-06-14 Genetic Steroid Disorders Second Edition targets adult and pediatric endocrinologists clinical geneticists genetic counselors reproductive

endocrinologists neonatologists urologists and psychoendocrinologists It is designed to assist these specialists in the diagnosis and treatment of steroid disorders This revision includes a new chapter on Gonadotropins Obesity and Bone and new research on non invasive prenatal diagnosis with cell free DNA Chapters are thoroughly updated covering steroid disorders the genetic bases for the disorder and case presentations This definitive reference belongs in every medical library Presents a comprehensive translational look at all aspects of genetic steroid disorders in one reference work Provides a common language for endocrinologists geneticists molecular pathologists and genetic counselors to discuss and diagnose genetic steroid disorders Saves clinicians and researchers time in quickly accessing the very latest details on genetic tests and diagnoses as opposed to searching through thousands of journal articles Highlights significant discoveries with clinical relevance presenting insight into which medications to use based on the genetic makeup of a patient Teaches the best strategies and most effective use of genetic information in the patient counseling setting

Cell Biology, Genetics, Molecular Biology, Evolution and Ecology PS Verma | VK Agarwal, 2004-09 The revised edition of this bestselling textbook provides latest and detailed account of vital topics in biology namely Cell Biology Genetics Molecular Biology Evolution and Ecology The treatment is very exhaustive as the book devotes exclusive parts to each topic yet in a simple lucid and concise manner Simplified and well labelled diagrams and pictures make the subject interesting and easy to understand It is developed for students of B Sc Pass and Honours courses primarily However it is equally useful for students of M Sc Zoology Botany and Biosciences Aspirants of medical entrance and civil services examinations would also find the book extremely useful

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