

BT201

1) What does intermediate disturbance hypothesis suggest? (2 marks)

Ans: The intermediate disturbance hypothesis suggests that communities with a medium (intermediate) level of disturbance may have greater species diversity than communities with very frequent or very rare disturbances.

2) interrelation ship between gene, genome and dynamic character of gene.

Ans: The interactions between the genes within the genome and the dynamic character of the genome

- sketched by Dover (1999) as an internal tangled bank.
- idea of Darwin (1859) • Dover (1999 :
 - ‘external tangled bank’ (the ecology) –
 - the ‘internal tangled bank’ (the genome)
 - the internal tangled bank
- It emphasizes the role of genetic turbulence (gene duplication, genetic sweeps, exon shuffling, transposition, etc.)
- illustrates that there is ample scope for ‘innovation from within genetic turbulence

The genomics revolution

- Three major technological developments of 1990s
 - microtechnology
 - computing –
 - communication.

(note :further details in topic 3)

3) what is primer in PCR?. (3 marks)

Ans: Attempts to pick up the gene by polymerase chain reaction (PCR) using primers from the then-known drosophila mt sequence were unsuccessful, which was

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4) Write at least five factors that shape community structure. (5 marks)

Ans: The climate patterns of the community's location.

- Global climate patterns (variation in temperature, solar energy input, etc. With distance from the equator) can affect community structure. So can more local climate patterns, such effects created by mountain ranges, bodies of water, and even streams and valleys.
- The predictability or variability of climate can also affect community structure – for instance, some species may be unable to survive in a region with sporadic droughts or sporadic drops below freezing.

The geography of the community's location.

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- Geographical features of the area in which the community is found can affect community structure. For instance, island communities that are further away from a mainland tend to have smaller numbers of species than those that are closer to the mainland. This reflects that the chance event of a species arriving from the mainland is less likely when the island is more distant.

The heterogeneity (patchiness) of the environment

- If there is more variation, or heterogeneity, in a community's environment, this may allow for greater species richness because there are more distinct habitats to be occupied.
- For example, imagine a community occupying a field, and another occupying a field that is dotted with piles of rock. The second community may have greater species richness because species that can live in the rocks (but not in the open field) will be present, in addition to those species that can live in the field.

The frequency of disturbances, or disruptive events.

- The frequency of disruptive events (including storms, wildfires, and landslides) can affect the structure of a community. The intermediate

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disturbance hypothesis suggests that communities with a medium (intermediate) level of disturbance may have greater species diversity than communities with very frequent or very rare disturbances.

Interactions between organisms.

- All of the interspecies interactions that can occur between organisms (competition, predation, and various forms of symbiosis) have the potential to shape a community. For instance, two species that compete intensively with one another may be unable to coexist in the same community, or a prey species may be unable to persist in a community that contains a highly effective predator.

5) Phylogenic tree. (5 marks)

Ans:

1) What does intermediate disturbance hypothesis suggest? (2 marks)

2) Define bioinformatics. (2 marks)

Ans: The field of biology specializing in developing hardware and software to store and analyze the huge amounts of data being generated by life scientists. (NIH)

Key Challenge of Bioinformatics

The world of biology is very different from what it was even ten years ago. To bridge the considerable gap between technical data production and its use by scientists for biological discovery

3) Differentiate between species richness and species diversity with examples.

(3 marks)

Ans: richness

Species richness is the number of different species in a particular community. If we found 30 species in one community, and 300 species in another, the second community would have much higher species richness than the first. Diversity
Species diversity is a measure of community complexity. It is a function of both the number of different species in the community (species richness) and their relative abundances (species evenness). Larger numbers of species and more even abundances of species lead to higher species diversity.

(note: further details in topic 23)

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4) Write names of phyla of ameboid protozoa. Also write their mode of locomotion. (3 marks)

Ans: Contains 4 phyla: Foraminifera, Radiozoa, Amoebozoa, and Heliozoa

- Most reproduce asexually through binary fission
- Characterized by pseudopodia
- Food is usually captured by phagocytosis
- Body types range from free flowing to rigid with skeletal supports

5) Significance of whole Genome sequencing. (5 marks)

Ans: • Many bacteria and fungi are important as producers of valuable products,

- for example
- antibiotics,
- medicines,
- vitamins,
- soy sauce,
- cheese,
- yoghurt,
- and other foods made from milk.
- There is considerable interest in analyzing the genomes of these (puñhler and selbitschka 2003).
- Other bacteria are valuable genomic models because of their capacity to degrade environmental pollutants;
- For example,
- the marine bacterium Alcanivorax borkumensis is a genomic model because it produces surfactants and is associated with the biodegradation of hydrocarbons in oil spills (roñling et al. 2004).

Evolutionary position

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- Whole-genome analysis of organisms at crucial or disputed positions in the tree of life can be expected to contribute significantly to our knowledge of evolution.

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- The sea squirt, *ci. Intestinalis* was chosen as a model because it belongs to a group, the Urochordata, with properties similar to the ancestors of vertebrates.
- The study of this species should provide valuable information about the early evolution of the phylum to which we belong ourselves.
- Many other organisms, although not on the list for a genome project to date, have a strong case for being declared as model species for evolutionary arguments. These include the velvet worm, *Peripatus*, traditionally seen as a missing link between the arthropods and annelids, but now classified as a separate phylum in the panarthropoda lineage (nielsen 1995), and the springtail, *folsomia candida*, formerly regarded as a primitive insect, but now suggested to have developed the hexapod bodyplan before the insects separated from the crustaceans (nardi et al. 2003).

Comparative purposes

- Over the last few years, genomicists have realized that assigning functions to genes and recognizing promoter sequences in a model genome can greatly benefit from comparison with a set of carefully chosen reference organisms at defined phylogenetic distances.
- Comparative genomics is developing an increasing array of bioinformatics techniques, such as
 - synteny analysis,
 - phylogenetic footprinting,
 - and phylogenetic shadowing

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- by which it is possible to understand aspects of a model genome from other genomes.
- One of the main reasons for sequencing the chimpanzee's Genome was to illuminate the human genome, and a variety of fungi were sequenced to illuminate the genome of *S. Cerevisiae*.

Ecological significance

- It will be clear that ecological arguments have only played a minor role in the selection of species for whole-genome sequencing, but we expect them to become more important in the future

6 ecological genomics

Ans: Biology and Informational Science

☐ The HGP changed how we view & practice biology.

☐ Biology is an informational science.

✓ Digital genome

✓ Environmental signals ☐ Biology has become a cross-disciplinary science.

Bioinformatics as an intersecting discipline

2: Importance of biodiversity .5 marks

Ans: The new range of models should embrace diverse phylogenetic lineages, varying in their physiology and life-history strategy.

- For example, the model plants *Arabidopsis* and rice both employ the C3 photosynthetic pathway. To complement our genomic knowledge of primary production, new models should be chosen among plants utilizing C4 photosynthesis or crassulacean acid metabolism (CAM). Considering the diversity of life histories, species differing in their mode of reproduction and dispersal capacity should be chosen; for example, hermaphroditism versus gonochorism, parthenogenesis versus bisexual reproduction, et

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