

SPACE IN GEOGRAPHY

15.1 DEFINITION OF SPACE:

"Space is the boundless, three dimensional extent, in which objects and events occur and have relative position and direction" – Wikipedia, 2017. In physics, 'length, width and height' are considered three dimensions of space; but time is considered the fourth dimension that helps to gauge any change in the attributes of space in time. From the ancient times scholars have debated about the nature, existence and substance of space. The oldest conception about space is **Plato's** idea of 'Chora' or 'Khora' which mean space and **Aristotle's** concept of 'Topos' which means place. In the 11th century **Ibn-al-Haytham** defined space geometrically. In the 17th century space was clearly defined, when classical science was founded. Definitions given by some eminent physicists, philosophers and geographers are as follows :

➔ **Gottfried Leibniz** : In 17th century, Gottfried Leibniz, the German philosopher and mathematician, put forward the definition of space. "Space is no more than the collection of spatial relations between objects in the world : Space is that which results from places taken together". According to Leibniz, there is no space when objects in it are excluded. His concept of space is comparable to relationship among the members of a family. No relationship can

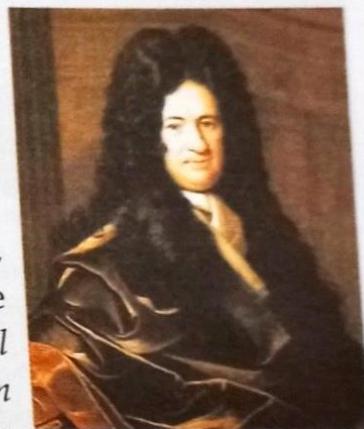


Fig.15.1 Gottfried Leibniz

be there if there is no member in a family. No space is possible if it does not contain any object.

➔ **Sir Isaac Newton** : Newton put forward an idea of space as neutral container. It does not have any relation with the objects and events it contains. It has a separate and neutral existence. "Space must exist independently of matter."

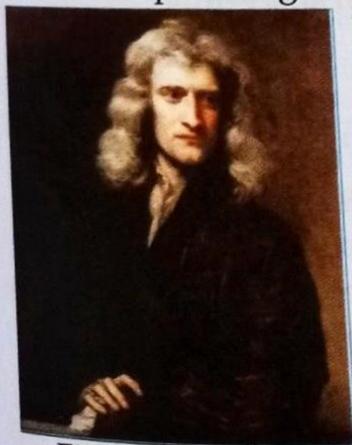


Fig. 15.2 Sir Isaac Newton

He gave an example to explain his theory. The surface of water in a bucket, hanging from a rope, is flat. The bucketful of water is set in spinning at first slowly then rapidly; the surface of water becomes concave. If the bucket is stopped, the water keeps on moving round and round forming concave surface. Water

continues to move for a long time when container bucket is stopped. It acts independently

of the container. Likewise space is independent of objects.

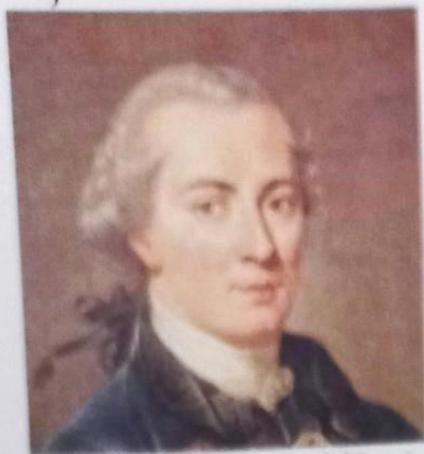


Fig.15.4 Immanuel Kant

→ **Immanuel Kant** : In 1770, Immanuel Kant gave transcendental definition of space. He said that space is not an object or event, it is a structure for holding them. It cannot be sensed or experienced. It is a priori knowledge which is true in definition only; it cannot be judged by experience, neither can it be established by experiments or evidence.

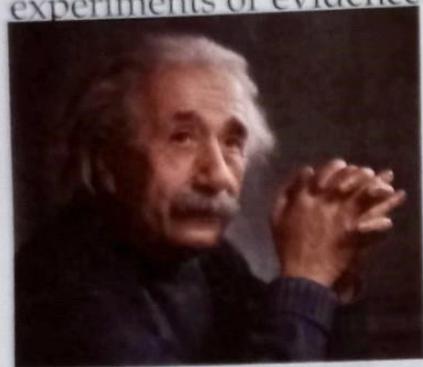


Fig.15.5 Albert Einstein

1963; and Harvey, 1969].

→ **Albert Einstein** : In 1905, Einstein published his famous article on "special theory of relativity" that led to the idea that space and time may be combined to develop a single construct, known as space-time. According to this theory, the speed of light is same for all observers; that means two events that appear simultaneous will not be simultaneous to another observer if they move with respect to one another. In next 10 years, he published "general theory of relativity", where he showed impact of gravity on space-time.

15.2 BACKGROUND OF THE CONCEPT OF SPACE

The concept of space was developed in the ancient time by **Plato** and **Socrates** ('Khorai' means space). **Aristotle** developed the concept of 'Topos' in his "Book iv; Delta". In 11th century, Arab philosophers developed the geometric concept of place "Space qua extension". In 17th century, **Sir Isaac Newton** developed the idea of absolute space. **Gottfried Leibniz** introduced relational aspect of space. In 18th century, metaphysician **Immanuel Kant** developed the concept of 'space' and made it popular.

15.2.1 Concept of Kant on Space :

In "The Nature of Geography" (1939) **Hartshorne** expressed his indebtedness to Kant for his idea of space in geography. Kant had a belief that geography and history are two different disciplines; geography focuses on things, organized on space dimension, while history focuses on things that are organized on time dimension. In this way both the disciplines together enrich our knowledge.

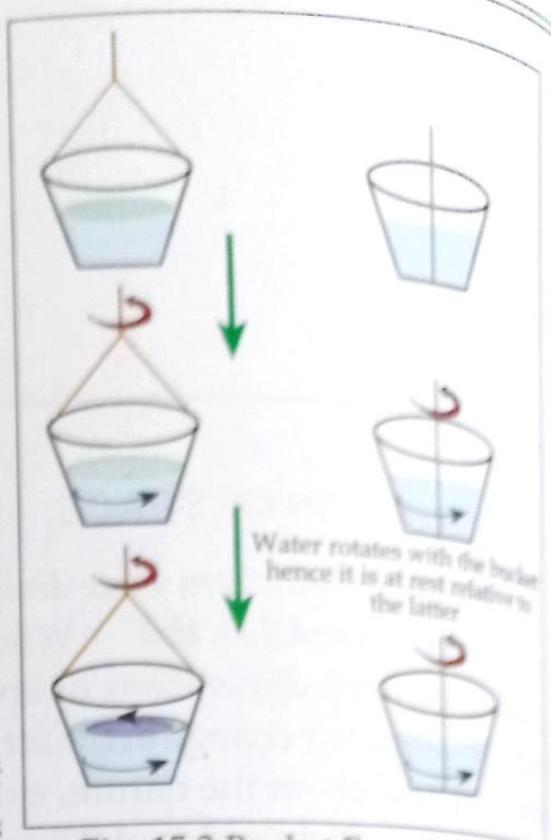


Fig. 15.3 Bucket Experiment of Newton to show the Neutrality of space

"Geography constituted the study of all phenomena organised according dimension of space. History constituted the study of all phenomena organised according to time dimension." – D. Harvey, 1969

Kant's view on space changes from time to time. According to **Jammer** (1954), initially Kant's conception about spatial extent was relative. By the use of the term 'spatial extent' Kant meant the relationships and interactions among matters. By spatial magnitude he meant the intensity of interactions.

In 1763, Kant accepted Newton's idea about space that believes – "space can exist independently of objects."

Popper (1963) found that Kant in 1770 gave *transcendental definition of space* which tells that space is only an idea which is beyond human knowledge and understanding. Space is not a matter or event but a framework for holding them. It cannot be sensed or experienced but can be successfully used for the purpose of gaining knowledge. In this connection he used the term *priory knowledge* to refer to spatial geometry. By *priory knowledge* he meant something beyond test or proof. Hartshorne believed that, in 1775, Kant's idea of space established geography as a distinct discipline among other sciences. "Given the philosophy of space, Kant was able to classify geography in relation to the other sciences and this, according to Hartshorne (1939 and 1958), Kant first did in 1775." – Harvey, 1969

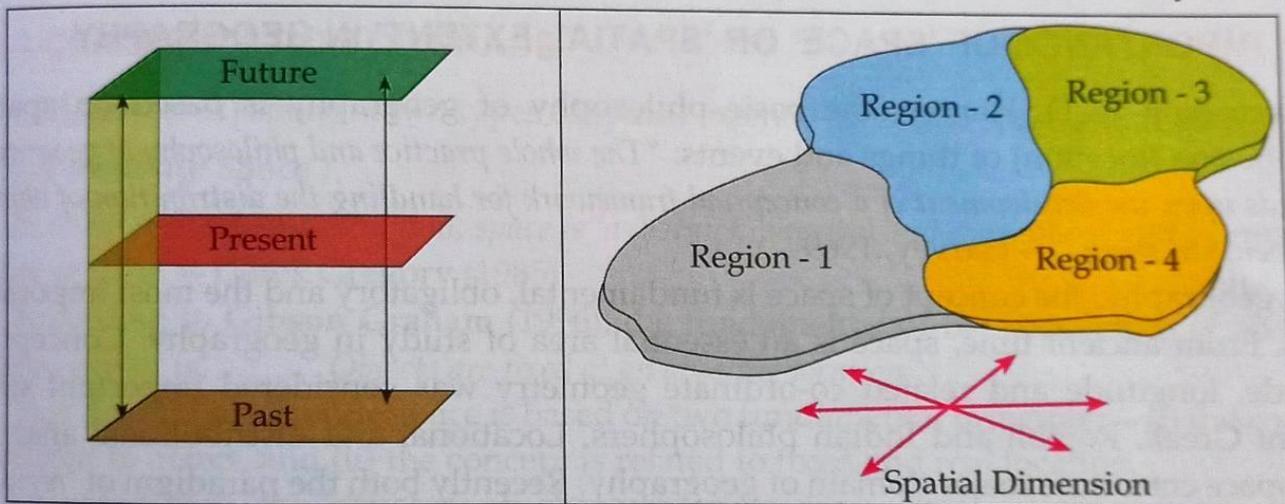


Fig.15.6.A History deals with subjects organised in time dimension

Fig.15.6.B Geography deals with subjects organised in spatial dimension

15.2.2 Concept of W. Bunge about Space and Spatial dimension:

In 1962, **William Bunge** brought out "*Theoretical Geography*" where he gave his view on space. Here he says that the logic of space is the basic tool on which the study of geography as a spatial science depends. "*The science of space (geography) finds logic of space (geometry) a sharp tool.*" – Bunge 1962

According to Bunge, the *distance* between two places depends upon the cost of movement, time needed to cover the distance, social interactions, etc.

He said that it is possible to measure spatial *distance* only by taking into account the *processes and activities* that connect the places. For example, in economic considerations distance is measured by calculating transportation cost, like that considered in Weber's least cost theory. On the other hand, *distance* is measured by the consideration of *social relations* and interactions in the perspective of diffusion of information and ideas. In

case of migration, *distance* between two places is measured on the basis of *intervening opportunities*.

15.2.3 Concept of David Harvey about space :

David Harvey was in favour of various concepts of relative space. He thought that the study on space raises a fundamental question, – “How is it that different human practices create and make use of distinctive conceptualization of space.”



Fig.15.7 Relational space under Social Networking (sites. google.com/a/college.wie.ac.uw)

The concept of *relational space* is derived from it. This concept of space is seen to be developing with every fold of social relation created by practical activities of the whole society.

“Space is folded into social relations through practical activities” – Harvey (1996).

Concept of space is developed in every society by integration of all geographical phenomena and is manifested in all the practical works in a society through social relation and interactions. In the present times the worldwide relational extent of space has been set up with the use of computers and internet, called ‘social networking.’

15.3 IMPORTANCE OF ‘SPACE’ OR ‘SPATIAL EXTENT’ IN GEOGRAPHY

According to D. Harvey, the basic philosophy of geography is based on spatial distribution (location) of things and events. “The whole practice and philosophy of geography depends upon the development of a conceptual framework for handling the distribution of objects and events in space.” – Harvey, 1969

In geography, the concept of space is fundamental, obligatory and the most important of all. From ancient time, space is an essential area of study in geography. Concept of latitude, longitude and related co-ordinate geometry was considered important since ancient Greek, Roman and Indian philosophers. Locational and distributional analysis over space constitute major domain of geography. Recently both the paradigm of ‘*regional analysis*’ and ‘*systematic geography*’ firmly established the practice of spatial analysis. Quantitative techniques established geography ‘as a spatial science’ as it put more emphasis on identifying pattern of spatial distribution and understanding rules or laws governing such pattern. “Space is a basic organizing concept in geographic methodology.” – Harvey, 1969

Nystuen (1963) suggested the following to develop a well integrated conception of spatial distribution:-

- (i) To study spatial distribution of geographically significant phenomena or events.
- (ii) To find out laws governing spatial distribution.

(iii) To understand the relation or interaction among spatially distributed phenomena.

Geographers study distribution of geographically significant events and the reasons thereof. The main objective of geography is to understand the causes influencing distribution. It has been long since geography gives importance to geomorphology of different places, spatial variation in nature of soil, natural vegetation, different climatic conditions, distribution of population, diversity of culture and civilization, etc. In the

present time, spatial distribution of wellbeing, comfort, troubles, sufferings, crisis and reasons thereof have attracted attentions under radical, and welfare approach.

Hartshorne brought out *"The Nature of Geography"* in 1939 and Concept of *"Geography as a Science of space"* in 1958 and stressed the necessity in analyzing spatial dimension of phenomena which are geographically significant. Here he was also successful in establishing geography as a spatial science. He used maps to see the spatial distribution of things, events and interactions.

"Hartshorne's (1939, 1958) vision of geography as a correlative discipline using map comparisons to disclose the functional integration of phenomena over space prepared the way for development of a formal spatial science." – Derck Gregory, 1981. Hartshorne concluded in his *'Nature of Geography'* (1939) that – *"the distinctive aim of geography as a science could be defined in terms of spatial concept"*. He also defined the tasks of geographers *"to describe and analyse the interaction and integration of phenomena in terms of space"* – (Hartshorne, 1939). Hartshorne's idea of spatial distribution was overruled in 1950s, when Schaefer published his article *"Exceptionalism in Geography – A methodological examination"*, instead of *'spatial distribution'*, **'spatial relations'** were considered important. *"..... Spatial relations are the ones that matter in geography and no others."* – Schaefer, 1953

15.4 CLASSIFICATION OF SPACE

J. Blaunt (1961) spoke of two types of spatial extents – absolute space and relative space.

15.4.1 Absolute Space :

In terms of absolute conception, space is 'a distinct, physical and elementary, real or empirical entity in itself.' – Derek Gregory (1985)

According to **Gibson Graham** (1996), the fundamental of the conception of absolute spatial extent is..... *'Objects are fixed at an absolute location'*.

This concept of absolute space is based on two fundamental principles – (i) the concept is related to object, and (ii) the concept is related to fixed and real location.

In geography, the concept of absolute space was introduced at the time of **Kant** who, like **Newton**, came to realize in 1773 that space can exist independently of objects and their relations. **David Harvey** thought that this concept led geographers to consider space as container for objects, interrelations or events. It also led them to accept that the principal objective of geography is to study the diversities and extents of space. In 1939, **Hartshorne** came to be well known as the main advocate



Fig.15.8 Space as a container

of absolute space. Space is the *"area, in itself, is related to the phenomena within it, only in that it contains them in such and such locations."* – Hartshorne, 1939.

Hettner and **Hartshorne** introduced the concepts of uniqueness and identity of space through their works on regional analysis and diversity, based on the idea of absolute space. *"Many of philosophic notions of Hettner and Hartshorne – particularly those to do with regionalism and uniqueness – stem from the 'container' view of space."* – David Harvey, 1969.

Absolute space is discussed in terms of **direction** (orientation), **distance** and **connectiveness** (a result of both direction and distance) or relative position.

"The terms which seem to me to contain the concepts of a geographical point of view are direction or orientation, distance and connection or relative position. Operational definitions of these words are the axioms of the spatial point of view. Other worlds, such as – pattern, accessibility, neighbourhood, circulation etc. are compounds of the basic terms. For abstract models, the existence of these elements and their properties be specified." – (Nystuen, 1968)

Following Nystuen (1963) an example may be cited in this connection. Say, in a field study, it is decided to organize classes in open space that is considered to be isomorphic, with homogeneous surface. Teacher chooses his position on that isomorphic space at random. Students surround



Fig. 15.9 Spatial arrangement with the principle of direction, distance and connectivity.

the teacher to hear him, from a closer distance facing him (her). The spatial arrangement follows three principles (Fig. 15.9) :

- (i) **Direction (Orientation)** : Students face the teacher to hear him clearly and are arranged in arcuate orientation.
- (ii) **Distance** : Students try to get closure to teacher, as audibility decreases with distance.
- (iii) **Connectivity** : Students arrange themselves in rows, organizing in a way to get direct 'line of sight to the teacher'.

This absolute concept of space becomes central in the phase of quantitative analysis. *"Centrality of space and distance as the major focus of geographical interest in the 1960s."* – Johnston and Sidaway, 2004.

15.4.1.1 Geometry of absolute space

In Euclidean geometry, there are concepts of **no dimension** (a point), **one dimension** (a line), **two dimensions** (area), and **three dimensions** (height, length and breadth). Many thinkers are of the opinion that the conception of space in Euclidean geometry is too simple to serve the purpose of geography dealing with space which is, in reality, extremely complex.

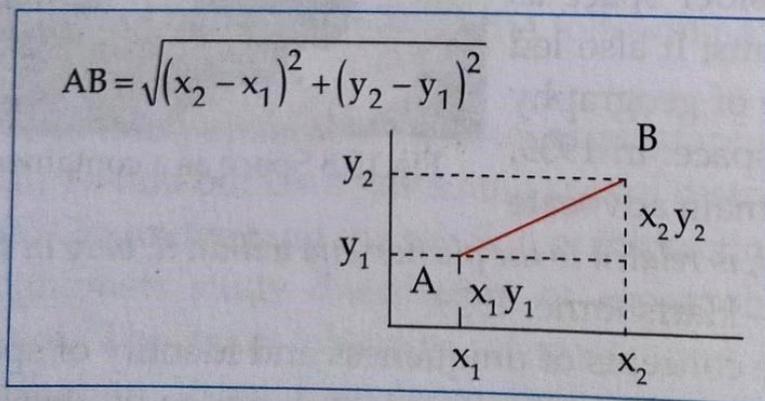


Fig.15.10 Euclidean Geometry on location and distance between two objects

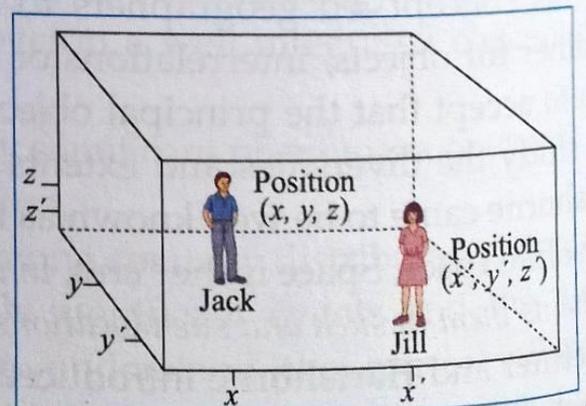


Fig.15.11 Distribution and location of Geographical Phenomena is described through language of geometry

"Classical Euclidean geometry appears almost childishly simple by comparison to.....geographic geometry, which takes into account the realities of transportation." – Tobler, 1963; Harvey, 1969.

The simplest example of the Euclidean geometry is to take the measurement of distance between two points. Suppose there are two points A and B, which stand at X_1, Y_1 , and X_2, Y_2 co-ordinates respectively. The distance between these two points is AB.

Euclidean geometry lost its glory in the first half of the 19th century as geodetic survey gained popularity which could be used successfully for measuring the accurate distance between points on a curved surface of earth. Since then, absolute concept of space faced criticism.

Absolute conception of space or Euclidean geometry is highly esteemed in physics even today but its application in geography is only limited. Relative concept of space gained greater popularity in research works focusing on the theories of position. **Olsson** (1967) cited the instance of impact of urban core on city region surrounding it. The effects of impacts on city region from the city core through different activities at different intensity could not be addressed fully by absolute concept of space (distance). Geography deals with various complex activities, various matters and their varying natures. Euclidean concepts of space are unable to meet this requirement.

Major part of geographical philosophy has not moved beyond Kantian concept of space and so faced serious criticism for last one century. Several geographers argued that geography could not be reduced to geometry. Geometric properties of space could not be used properly for explanation of human behaviour. *"..... much of the philosophy of geography still relies upon Kantian concept of absolute space – a concept that has been discredited for a century or more – while much of the practical work geographers operated with relativistic views of space."* – Harvey, 1969

15.4.2 Relative Space :

According to the theory of relative space, spatial extent is considered as the relationship between different events and matters. This system of interactions is imagined to be constantly changing with time.

"Relative conception of space, in which space is merely a relation between events or an aspect of events, and thus bound to time and process." – D. Gregory, 1988

"Space was treated as a continuous variable; there was very little on its discontinuous nature in some aspects of human organisation." – Johnston and Sidaway, 2004

According to **Gibson Graham** (1996), relative space refers to a state in which internal energy of matters is the constant driving force.

"Continuously under construction by the force-fields established between objects." – G. Graham (1996)

In other words, by relative concept a space is referred to be distinguished for interactions among geographically significant phenomena which change with time. This space can be conceived rather than sensed.

Relationship among the objects and events are developed by human activities. *Urban space, rural space, activity space, social space* are such kind of relative space developed due to systems of interaction between natural and human agents.

"Humanistic geography saw space not as objective structure but as social experience; and the Marxist tradition saw space and society as dialectically intertwined". – Peet, 1998

Smith (1984) represented 'space' as an integrated combination of physical space and human activities.

".....human practice and space are integrated at the level of concept of space itself." – Smith (1984).

Smith (1984) argued that by the process of development natural constraints of a space is reduced leading towards an equalized relative space. But concentration of 'capital' in the process of production into certain spaces develops artificial 'unevenness' producing 'differentiation' and 'relative space'.

Harre (1970) cited an example to define system of interrelationship among the objects. He says "space is the totality of places where things can exist at a given time". For instance, say, three places A, B, C lie in a space, being related by the relation of 'betweenness'. The system of places related by betweenness is the relative space.

Thus places (things) situated in a space have causal relationship. Things in a space are considered to be tied up in cause-effect relationship. In space and time that spatial relationship changes for only the effects not for causes. If one rural settlement (stage-1) is developed to urban structure (stage-2), the spatial elements in the second stage may lose

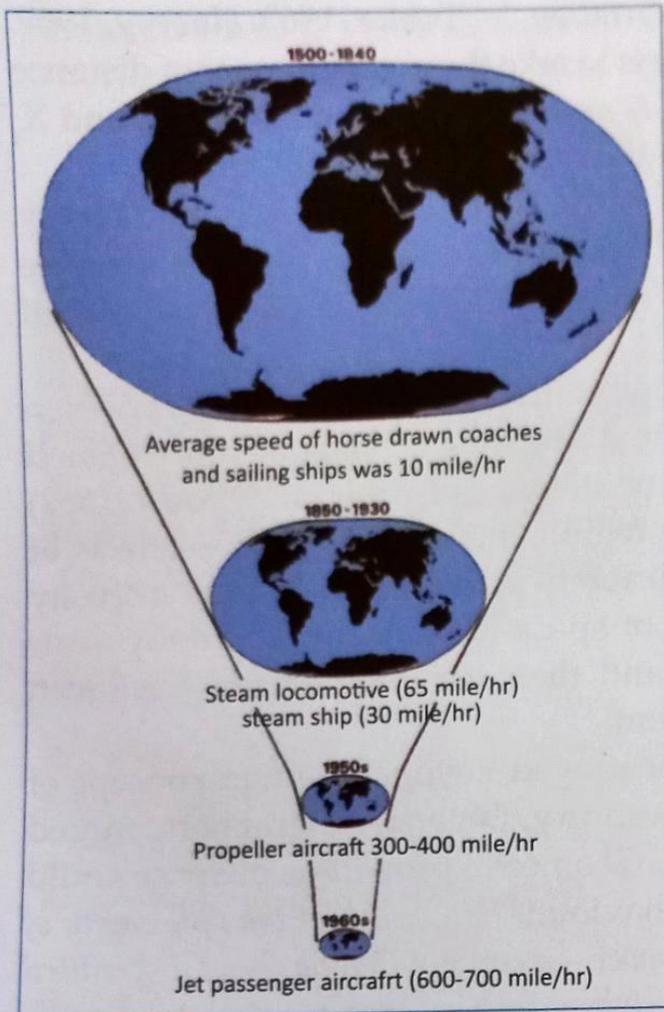


Fig. 15.12 Distance (Spatial Dimension) Shrink with Time – "Time-space Continuum" (David Harvey, 1989)

their relation to the elements of stage one. The water discharge reaching the estuary of a basin may have no connection or very distant link with the factors at source. River flow may have a down stream impact but does not percolate in the opposite direction.

The concepts of relative and absolute space are contradictory, which is supposed to be the reason of why Hartshorne's and Bunge's views are of opposing nature. David Harvey (1969) considers that coherence between these concepts may be a central issue in geography.

15.4.3. Real or Material Space :

The concepts of material and concrete space sprang from the concept of absolute space. It is called real, concrete and dynamic space. Rose (1976) believes that a real space has its own existence and position, it is concrete and palpable. Non-real space is imaginary and fluid which gave birth to feminism.

"Material real space could thus be re-described as the effect of masculinist power, its very materiality also its particular masculinity; but non-real space is simultaneously fluid and imprisoning, but always engendered as famine." – Rose (1976)

15.4.4 Social Space :

Lefebvre proposed the concept of social space in the French (1974) and in English language (1991). 'Production of space' is the title of his English work. According to Richard

Peet (1998), the spatial extent involved in everyday life is social space. According to him, social space is the sum total of society, social system, social activities and social relations. Every society builds its own social space by using its own system of production. With advancement of forces of production society develops humanly constituted field of social events that constitute the social space (Smith, 1984). This building process of social space is different from that of industrial and agricultural production. A social space incorporates many different things even materials for new activities along with their results within it. It incorporates diverse natural and cultural aspects, their interrelations and interactions and so on to establish an area as a unique and complex social space.

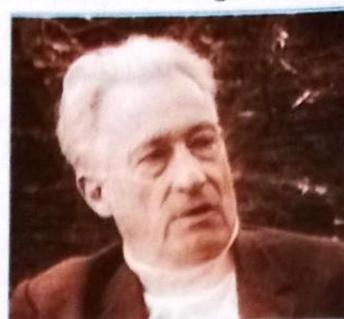


Fig. 15.13 Lefebvre

Lefebvre also opines that a 'space' is not a matter of science which is free from political and philosophical aspects, but rather it is close to them. A space cannot be called absolute, since human races occupies it and other many activities occur in it ever since. The results of such things often go undetected on its landscapes. A space gains its unique character for its historical and natural factors. It is also subject to change through political activities. Hence a space can be called a product of political and philosophical activities.



Fig. 15.14 Social relation and social space in a developed society



Fig.15.15 Social interaction and social space for an underdeveloped society

.....it has been occupied and used and has already been the focus of past processes whose traces are not always evident on the landscape. Space has been shaped and molded from historical and natural elements, but this has been a political process. Space is political and ideological. It is a product literally filled with ideologies." – Lefebvre, 1976

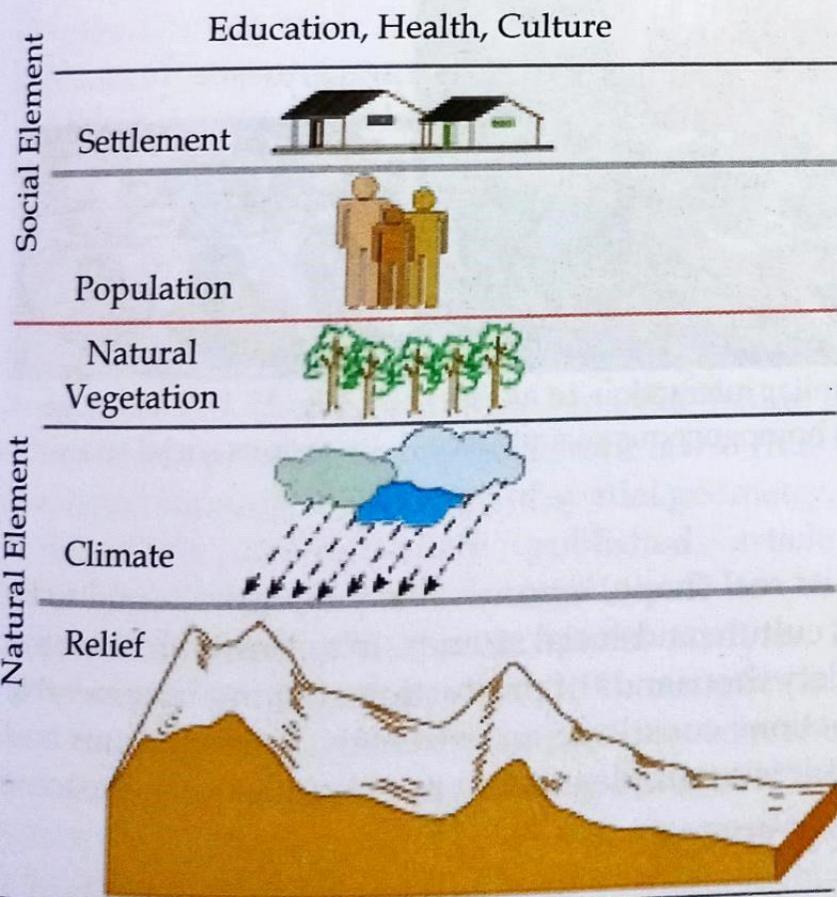


Fig 15.16 Social space is developed as a collective interaction between physical and social phenomena

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Social space is not a mere container of number of objects but contain the relationship among them. It is a kind of relative space.

"Space contains things yet is not a material object; it is a set of relations between things." – R. Peet, 1998

For example, social space in the western part of the district of West Midnapore, West Bengal is different from the eastern part of the district which is only a few kilometers away. People in the western part are culturally and educationally backward and life is harder here because of the infertile land, scarce water and unevenness of ground. Plentiful water and resources, fertility of land is more congenial to ample production of food and greater scopes for cultural and educational development in the eastern part. These two neighboring societies differ not only in matters of natural resources, but also in matters of relation between people, their interactions which result in the process of production, quality of produces, development of life style, etc. [Fig 15.15]

Multiple social spaces overlap and interfere to create hyper complexity. Thus a social space does not indicate a single social relation, but rather multiple relations. Following example is relevant as an instance.

➡ Students in a classroom, teacher, infrastructures in classrooms and ancillary systems interact to create an almost homogeneous social space. A uniform social space is expected from students in a classroom, if they belong to the uniform social backdrop of culture and education. Uniformity is due to similar interactions of similar standard of students through similar actions with similar objectives.

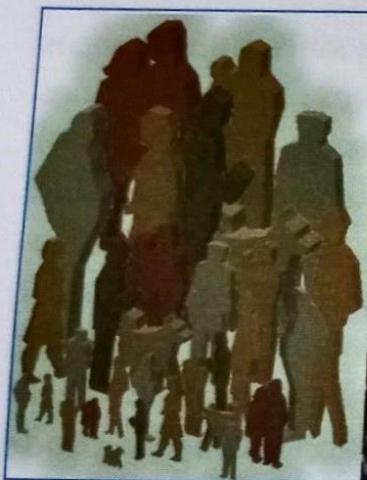


Fig. 15.17 A Heterogeneous interaction develops heterogeneous social space

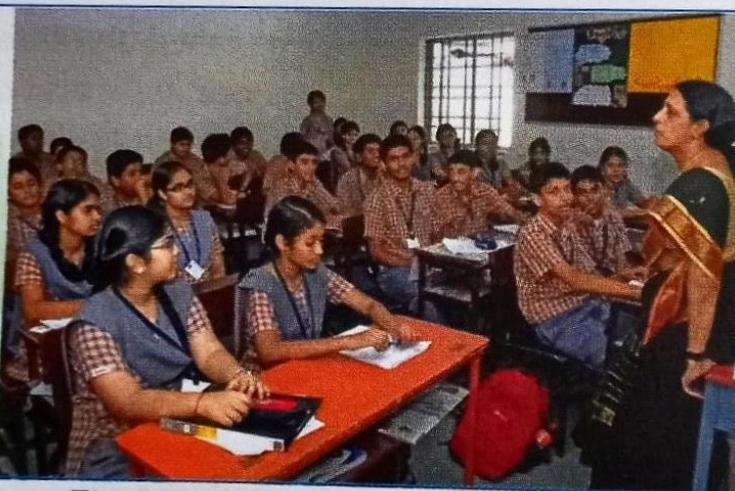


Fig. 15.17 B Similar interaction in a classroom develops homogeneous social space



Fig. 15.17 C Homogeneous social space

➡ Now if we consider a society in its real shape, innumerable people are found to be living with various levels of education, culture and social strands. In a classroom, there are similar interactions while in larger society thousands of production systems, innumerable transfer system and diversified interactions constitute an extremely heterogeneous and complex social space. The obvious result is a complex and hyper-complex social space.

15.5 GEOGRAPHY AS A SPATIAL SCIENCE

15.5.1 Historical Background

Hartshorne's *The Nature of Geography* (1939) strongly influenced pre-world war II-

geography which laid emphasis on regional analysis, uniqueness, and inequalities. During the period of war, geographers serving under different governments intended to make better use of their knowledge for the purpose of building transport systems, locations for industries, etc. by applying the concept of spatial geometry. They were guided by the philosophy of pragmatism in order to develop 'systematic geography'.

As the war was over, geographers grew frustrated concerning the conventional attitude, methods of study and research for geography. Following R. Peet (1998) the causes for such feeling may be as followings :

(i) Scope of geography was directed to a narrow domain in an attempt for analysis and uniqueness.

(ii) It was lacking in modern scientific methods of research.

(iii) It was lacking in direct application of geographical knowledge for social and practical purposes.

(iv) So compared to science subjects geography lost its importance in colleges and universities. Naturally geographers working in different governments were relegated to the background.

At this juncture some geographers ("Social physicists") argued in favour of applying the laws and methods of physics. According to them, modern scientific human activities should be carefully analysed by giving due importance to the concept of space.

Stewart (1947) tried to establish the fact that "*human beings obey the mathematical rules resembling the primitive 'law' of physics*". He advocated for the development of '**social physics**' by applying laws of physics or mathematics to describe human behaviour or social processes. This will follow the standard pattern of (i) collection of quantitative observation; (ii) their condensation into empirical mathematical regularities and (iii) theoretical interpretation of those regularities found. Thus "**social physics of space**" would be developed in a way to lay foundation of a '**new realistic scientific geography**'. Here concentration is given in '**study of space as regularity**'. This attempt is called '**spatial revolution**' that replaced the pre-scientific concept of '**areal differentiation**'.

G.K. Zipf (1949) applied the principle of least effort to explain the behaviour of human being as an individual or social group. He threw the light of scientific analysis on the pattern of human behaviour to establish the importance of the role of distance in transportation or distribution. Thus he succeeded in establishing the **principle of orderliness in spatial extent** that is possible through scientific laws. Thus the place of science in geography was confirmed through the concept of spatial geometry.

Schaefer's posthumously published article "*Exceptionalism in Geography – a methodological examination*" is considered to be important to divert direction of geographical approach towards spatial analysis. In 1953, Fred K. Schaefer criticized Hartshorne's method of regional differentiation and uniqueness. He said that scientific basis for geography cannot be prepared by concentrating on regional uniqueness, but to formulate generalizations and laws about spatial relations. As a result in the first stage of systematic geography importance was given on the analysis of cause-effect relationship as an attempt for preparing the basis of making general laws and models.

Ullman (1953) criticized Hartshorne's regional differentiation by declaring that if we constantly search regional differences, we ignore search for **similarities and principles**

of **generalization** which is at the root of all scientific principles. Geography as areal differentiation implies that, "we are not seeking principles or generalizations or similarities, the goal of all science." – Ullman, 1953 quoted in Peet, 1998.

According to him, the main function of geography is the analysis of **space and spatial interrelation**. By the term spatial interrelation he meant the real and significant relationship among human beings living at places on earth, for example, the activities of exchange of things and commodities among industries, exchange between commercial hubs and its surroundings, cultural exchanges, shipment of things and flow of information through transportation and communication system.

"By spatial interaction I mean actual, meaningful, human relations between areas of the earth's surface, such as the reciprocal relations and flows of all kinds among industries, raw materials, markets, culture and transportation." – Ullman, 1953.

"Space, in this view is the medium through which areas are related through flows." – Ullman, 1957.

15.6 DEVELOPMENT OF GEOGRAPHY AS A SPATIAL SCIENCE :

Many geographers and economists tried to find out spatial order or general rule of distribution of geographically significant things or events over space.

In 1929, **Alfred Weber** discovered a principle of the distribution of location of industries. In 1826 **Von Thunen** gave an interesting law of spatial distribution of the use of agricultural land around important towns or cities. These are the 'theories of space' developed by non-geographers with an assumption of 'isotropic plains'.

In 1933, **Christaller**, while studying the map of southern part of Germany, made an interesting discovery that there is regularities of spatial relation in the distribution of towns of equal size. Then he commented that distribution of geographically significant things, e.g. towns or market places shows spatial regularities and follow the rules of physical science and spatial geometry.

To explain Christaller's 'central place theory', **Berry and Pred** (1961) found that all things are arranged around some nucleus, which is a fundamental law on earth. It is implicit in society as well. In this way a town or a market place develops into a centre of economy, commerce and social activities. This is a way of the birth and growth of a nucleus. A big town has greater influence on its neighbouring areas than a small town. In this way it becomes more and more important. The difference of importance among towns and cities depends upon their spread of service areas, i.e. the more important a town, the greater coverage of service it can provide.

"The crystallization of mass about a nucleus is part of the elementary order of things. Centralistic principles are similarly basic to human community life. In this sense, the town is a centre of a regional community and the mediator of that community's commerce; it functions, then, as the central place of the community. Central places vary in importance. Those of higher order dominate larger regions than those of lesser order, exercise more central functions, and therefore have greater centrality. For all however, "the sum of the distances which rural residents travel to the central place is the smallest conceivable sum." – Berry and Pred (1961).

Losch in 1954, combined spatial concept with economy to invent Spatial Economic Science. Study of location or distribution of economic activities in space is helpful to make this concept easy to understand.

Walter Isard (1956) enriched the concept of space-economy by using mathematical models and graphical synthesis. **Regional Science Association in Harvard University**

worked for the development of this concept for about fifteen years since 1950. Economists like **Edgar S. Dunn** (1954), **Walter Isard** (1956) and **Melvin L. Greenhut** (1956) made major contribution in this project. The main target of this newly found branch of geographical studies was to study the spatial distribution of towns as stated by Losch and Isard and the ways and means of easier conveyance among the centers of services.

According to **William Garrison** (1959) and **Deitrich Bartel** (1973), geography and economics combined together to facilitate systematic study of space in an attempt to give birth to "**science of space combined with system theory**".

According to **Richard Peet** (1998), in ten year's time from 1953-1963, geography was changed into a **spatial science** and was definitely raised to the status of science diverted from descriptive regional geography.

"Altogether the decade, 1953-63 witnessed a shift from geography as a regional description to geography as spatial science in the belated entry of a reluctant discipline to scientific modernity." – Peet, 1998

The transformation is termed as '**Quantitative Revolution**' by **Ian Burton** (1963). *"In the past decade geography has undergone a radical transformation of spirit and purpose, best described as the 'quantitative revolution'."* – Burton, 1963

15.7 METHODS FOR SCIENTIFIC STUDY OF SPACE :

In 1947, **Stewart** mentioned some methods by means of which geography can be founded on scientific ground by finding regularity in spatial attributes of society.

- (i) Collection of quantitative observation.
- (ii) Their condensation into empirical mathematical regularity.
- (iii) Theoretical explanation of regularities of space as used in physical science.

Thus a new chapter began with the application of the laws and theories of physics in social attributes of geography. It is called **social physics of space**.

It was not possible to apply the methods of scientific study in the study of regional uniqueness. According to **R. Peet** (1998), it is time to begin the study of spatial regularities in order to establish geography as a science. In place of descriptive analysis, quantification is considered to be important. In order to establish *spatial regularity*, distance is given most priority. *"Space had to be reconceptualised not only as the irregular characteristics of natural environments describable in metaphorical poetic terms, but as distance pure, simple and quantifiable."* – Peet, 1998

This spatial revolution freed geography from the concept of areal differentiation. Now the concept of space was considered in the light of scientific modernity.

In 1964, **Brian Berry** gave the following methodological conceptual outline for the study of geography as a spatial science :

- (i) *"Like other scientists geographers are not identified so much by the phenomena they study as by their integrating concept."* – Berry 1964.
- (ii) *"The geographic point of view is spatial."* – Berry, 1964.
- (iii) *"Geography's integrating concepts relate to spatial distributions, spatial integration and spatial processes."* – Berry 1964.
- (iv) *"These concern the worldwide ecosystems of which humans are the dominant part."* – Berry 1964.

As a result, there was a wide application of concept of system analysis. It marked the beginning of logical positivism in geography by means of model making, theorizing and construction of hypotheses.

5.8 DIFFERENCE BETWEEN PLACE AND SPACE

Sometimes 'space' and 'place' are taken to be similar as they share common attributes and overlapping domain. These two terms are different in geographic application. In the following table (Table 15.1) attempts are made to examine the distinction between 'place' and 'space'

Table 15.1 : Difference between Place and Space

	PLACE		SPACE
1.	Merrifield, (1993) considers place as a central location surrounding which all the objects, events and matters rotate. All matters, capitals and information concentrates at this centre. The flow of these stands still at the centre; as it happens at the centre of a rotating disk.	1.	1. Space is an absolute independent extent organised in spatial dimensions in which capital, matters and information flow.
2.	"Place is the profound, complex aspect of the human's experience in the world" – Relph, 1976.	2.	In absolute concept, space is the container of objects and events and in relative concept, space is the identity developed by the interrelation of the objects and events.
3.	"Place places man in such a way that it reveals the external bounds of his existence and at the same time the depth of his freedom and reality." – Heidegger, 1958.	3.	Place indicates the location of human being on the earth but space represents the relations and interactions of phenomena on the place to develop an identity.
4.	Luckerman (1964) believes that the concept of place is not clear to geographers as they cannot distinguish between place, region, area and location.	4.	Absolute space may be closer to the idea of area, region or container type of place. Relative space and social space are radically different from the concept of place.
5.	"To have roots in a place is to have a secure point from which to look out on the world." – Relph, 1975.	5.	Being placed on place, society and human being set up spatial relation with surrounding.
6.	Place is where things can exist at a given time.	6.	Space is the totality of places where things exist at a given time. If numbers of places (A, B & C) exist together, the system of places related by between-ness is space.
7.	A candle stand holds a candle that gives light and heat to surrounding regions. Candle stand is the place or container only. Candle stand thus helps in the spatial relation to develop.	7.	The relation that the candle develops with surrounding is the space.

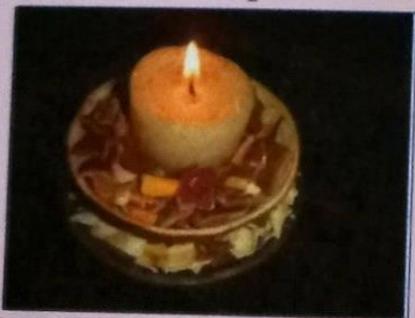


Fig. 15.18 Candle Stand – A place to develop spatial relation

PLACE	SPACE
<p>8. Another instance may be cited in this connection. A container in kitchen may hold some uncooked vegetables. Holding of objects in the container is similar to the idea of place.</p> <div style="display: flex; justify-content: space-around;">   </div> <div style="display: flex; justify-content: space-around;"> <p>Fig.15.19 Container Place</p> <p>Fig-15.20 Container holding uncooked vegetables</p> </div>	<p>8. These uncooked vegetables require expert hand for proper interaction and processing within this container to produce palatable food. This interaction may be similar to the idea of space.</p> <div style="display: flex; justify-content: space-around;">   </div> <div style="display: flex; justify-content: space-around;"> <p>Fig.15.21 Interaction guided by experience, knowledge, culture and practice</p> <p>Fig-15.22 Cooked food – A result of expert interaction similar to the spatial relation</p> </div>

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