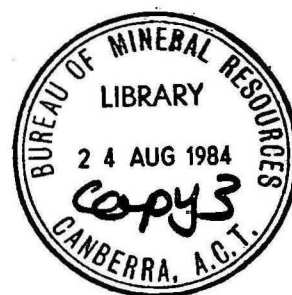


1984/24
03

EMR PUBLICATIONS COMPACTUS
(LENDING SECTION)



BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1984/24

RECORD

GLOSSARY OF MORPHOTECTONICS

Compiled by

C.D. Ollier

Record 1984/24

GLOSSARY OF MORPHOTECTONICS

Compiled by

C.D. Ollier

SUMMARY

Preferred definitions of morphotectonic terms are listed for use by BMR personnel and to serve as a first draft in the establishment of an international glossary planned by the Working Group on Morphotectonics of the International Geographical Union.

PREFACE

The regolith program of the Bureau of Mineral Resources is concerned with the origin and distribution of surficial materials in Australia. With the geomorphic history of Australia going back at least as far as the Permian, it is clear that the time scale of regolith development and tectonic activity are the same, and an understanding of morphotectonics is essential for a full understanding of the regolith. Morphotectonics also has many other applications in the work of the BMR, as in basin studies, remote sensing, and various aspects of geophysics.

Morphotectonics is also a growth area in overseas earth science. A Working Group in Morphotectonics was set up in 1983 as a part of the International Geographical Union to further the development of this discipline. At the meeting of this Working Group in Sofia, Bulgaria, it was decided that one of the first tasks of the group was to produce a Glossary of Morphotectonics, so that eventually a fairly standard use of terms can be achieved, and with it improved communication and increasing clarity of concepts. The Committee elected to produce this glossary comprised Ollier (Australia), Demek (Czechoslovakia) and Ufimtsev (USSR), with Ollier as the Chairman and compiler.

The Glossary of Morphotectonics has been produced as a BMR Record so that it can be used by BMR personnel, especially those involved in the regolith project, and also to serve as a first draft for the Working Group on Morphotectonics of the IGU.

INTRODUCTION

This publication is a Glossary of Morphotectonics, a branch of earth science which is actively developing and which is still in a state of flux. There is still plenty of scope for debate on what is or is not included in Morphotectonics, as well as the definition of individual terms. Most of the definitions in this Glossary are my own, as is the selection of which terms to include. I should therefore explain the basis of my selection.

It became clear fairly early in the compilation that some terms were straightforward, easy to define because everybody had the same concept of what the word meant. Although there are many different definitions of 'fault' or 'continent' or 'plateau', everybody agrees about what the terms mean. Definitions become more difficult with the more abstract concepts, and one of the most difficult of all was the term 'morphotectonics!'

THE DEFINITION OF MORPHOTECTONICS

Since the definition of this term determines the contents of the glossary as a whole, I should explain how I came to my chosen definition.

Here is a list of some earlier definitions of morphotectonics, mostly taken from the glossary of Ufimtsev et al. (1979):

L.Kober, 1928.

The gross and major features of the earth. Genesis of tectonic structures in which an important part is played by geomorphic processes.

E.S. Hills, 1951. A study of the external form and outlines of major topographic units - mountain massifs, plateaux and river basins - as well as their internal structure."

Y.A. Mescherikov, 1960. Branch of geomorphology studying the tectonic influences of large elements of relief, elucidating the connection between surficial features and underlying structures.

Y.A. Mescherikov, 1965. Morphotectonics uses data of the relief of the earth's surface as primary criteria, together with data from geology and geophysics, to interpret underlying, internal structure.

M.V. Piotrovsky, 1968. Tectonics of the earth's crust and its roots in the upper mantle expressed in major relief.

D.A. Timofeev, 1968. Main types of tectonic movements which are the basis of present day relief.

J. Tricart, 1968. Combination of tectogenesis and morphogenesis in faulting and folding.

L. Moldeau, 1969. Morphogenesis controlled by tectonic movements.

B.B. Ermolov, 1969. A term that has nowadays replaced neotectonics.

J.P. De Waart, 1971. In the narrow sense, phenomena reflecting the influence of geomorphic development on tectonic development.

G.I. Khudyakov, 1975. Wide regional study of the character of the primary surficial topography. Includes the outlines of the main topographic units as well as their internal structure. Apart from geological structure, morphotectonics looks at the most important divergences of the earth's surface from the geoid, and areas of dominant erosion rather than sedimentation.

M.V. Piotrovsky, 1983. Morphotectonics is the most adequate term for all the phenomena of the relations between tectonics and relief, including processes and history. A parallel meaning is the study of these features and relationships.

From these definitions several ideas emerge. 1. First there is the influence of tectonics on landforms. This can be obvious, as with a fault scarp, or somewhat inferential, as with supposed tectonic uplift to form a plateau.

2. Second there is the influence of morphology on tectonics. The cutting of a valley may lead to erosional tectonics on the valley side, or a large, high landmass may cause tectonic spreading or gravity sliding.

3. The scale factor comes into several definitions, and many tectonic features are indeed large. It is, however, difficult to define a lower limit to morphotectonic phenomena, so I have chosen to leave scale out of my definition.

4. There is some confusion between tectonics and structure. I have chosen to leave out purely structural considerations. If geomorphic processes are picking out old structures, like strike valleys on Precambrian strata, I would not regard the valleys as morphotectonic phenomena, but merely morphostructural. Differential erosion of old structures by rivers is not regarded as a morphotectonic phenomena; the diversion of rivers by tectonic movements, or the extension of rivers onto newly uplifted coastal plains certainly is. Several authors use the term 'morphostructure' as virtually synonymous with 'morphotectonics.' I have not followed this line, preferring to distinguish between 'structure' as the static internal features of a rock mass, and 'tectonic' as an active process.

It is possible to coin many words to express more complex relationships, such as 'morphoneotectonics', 'morphotectodynamics', 'morphotectostatics' but I have left these out for several reasons. Firstly, such words can be interpreted in a general way from their construction; secondly such general interpretation may differ from a technical definition, but

tight definitions have not yet been accepted; and thirdly I feel there is a danger in letting 'morphotectonics' grow too big - if it becomes all-embracing it will lose its value as a specific term.

SELECTION OF DEFINITIONS

The reader should be aware that this glossary is somewhat idiosyncratic. It is a draft, and no doubt many terms will be altered by the Glossary Committee of the Working Group on Morphotectonics. At present they reflect my personal bias, and my personal technology. There are no accents on non-English words because my machine cannot do them. The definitions have been written in a rather idiomatic way rather than to a consistent formula. Brevity was valued more highly than scholarly precision. I have mixed nouns and adjectives according to what I think is general usage rather than going for consistency. There are few cross references, so if a noun is missing, try to find it under a suitable adjectival phrase. Thus, under 'fault' I have not listed every possible variety, but 'transform fault' and 'listric fault' will be found in the appropriate section. Sources and references are not given. In taking definitions from other languages I have often used fairly free translation. With some terms, such as 'morphotectonics', I have taken the plunge and presented my own selection of possible definitions: with others, such as 'neotectonics', I have given two or three alternative definitions.

I welcome any suggestions for improvements to the Glossary, both on general matters such as the lay-out, and on specific terms which may be badly defined or possibly not included in this version.

ACKNOWLEDGEMENTS

In the preparation of this Glossary I have consulted various other glossaries and dictionaries, especially:-

Ufimtsev, G.F., Onukhov, F.S. and Timofiyev, D.A., 1979. 'Terminology of Structural Geomorphology and Neotectonics.' Geomorphological Commission, Institute of Geography, USSR Academy of Science, Nauka, Moscow.

Dennis, J.G., 1967. 'International Tectonic Dictionary - English Terminology.' Amer. Assoc. Petroleum Geologists, Memoir 7, Tulsa.

Bates, R.C. and Jackson, J.A., 1980. 'Glossary of Geology.' 2nd. ed., American Geol. Inst., Falls Church, Virginia.

I have had valuable correspondence with colleagues overseas, especially Professor J. Demek, Dr. D.A. Lilienberg

and Dr. G.F. Ufimtsev, and with Professor E.S. Hills in Australia.

I think the Working Group on Morphotectonics elected me to compile the Glossary largely because I have access to wordprocessing. It has been produced by my own typing on my personal word-processor, so I must take full responsibility for the contents and the presentation.

Cliff Ollier

A

Abyssal plains: Plains occupying over 40% of the ocean floor at depths of 3-6km with a cover of sediment.

Abyssal hills: Basaltic hills protruding through the sediment cover of abyssal plains.

Accreting plate boundary: A boundary between two plates that are moving apart, with new oceanic-type material being created at the seam.

Accretion hypothesis: A hypothesis that continents grow by the accretion of new land (microcontinents or sedimentary piles) at their margins.

Active fault: A fault likely to move at the present day.

Active gneiss mantled domes: Gneiss mantled domes thought to be actively emerging at the earth's surface.

Airy theory of isostasy: Explanation of major topography by varying thicknesses of material of uniform density over an irregular base.

Allochthon: A mass of rock that has been moved from its place of origin by tectonic processes.

Allochthonous: Formed or produced elsewhere than in its present place.

Alpine folding: Folding characterised by nappes, with old rocks thrust over younger ones.

Anatexis: Melting of formerly solid crustal rocks to form a new magma.

Andes-type geosyncline: Geosyncline where the trench is adjacent to a continent.

Andesite line: The boundary between the circum-Pacific rock province (mainly andesites) and the intra-Pacific rock province (mainly basalts).

Anorogenic: Unrelated to orogenic disturbance.

Antecedent drainage: A drainage system which was established before tectonic movement.

Anteclise: Broad updoming of large size, such as a shield or cratonic arch.

Anticlinal mountain: A mountain formed by an anticlinal fold.

Anticline: A fold that is convex upwards.

Anticlinorium: A series of anticlines and synclines so arranged that they form a large arch or anticline.

Antipodal: Relationship between a point and the point on the opposite side of the earth.

Antithetic faults: Faults that dip in the opposite direction to associated sediments.

Arc-arc collision: Plate tectonic term for the collision of two island arcs.

Arc-trench gap: The stretch of shallow sea between the steep continental side of a deep sea trench and its backing arc of islands.

Areal volcanism: Regional volcanism with many points of eruption, none of which are active for very long. Individual volcanic structures tend to be small.

Aseismic ridge: Submarine ridge with no associated seismic activity, possibly associated with hot spot activity and volcanoes.

Asthenosphere: A plastic layer beneath the lithosphere that transmits seismic waves at low velocity and provides the layer on which tectonic plates can move.

Astrobleme: Structure on earth, usually circular, caused by collision of a meteor or other astral body.

Asymmetric fold: A fold in which one limb dips more steeply than the other.

Atlantic coastline: A coast that is transverse to the trend of fold belts.

Atlantic-type geosyncline: Geosyncline with accumulation of sediment at the trailing edge of a continent.

Atoll: A ring-shaped "coral" island encircling a lagoon.

Aulacogen: The failed arm of a triple junction which did not develop into a spreading site.

Aureole (metamorphic): Altered rocks around a pluton, often resistant to erosion.

Autochthon: A group of rocks that have been moved little from their place of origin, although they may be intensely deformed.

Available relief: The difference between the highest parts of a landscape and base level.

Axes, tectonic: The fabric coordinates, a, b and c, used by structural geologists.

Axis: 1. A line where a folded bed shows maximum curvature.
2. The line of dominant uplift in a mountain chain.

B

Back arc basin: A marine basin behind an island arc.

Backdeep: Oceanic depression on the concave side of an island arc.

Back-folding: Folding in which the folds are overturned towards the interior of an orogenic belt.

Back-slope: The less-sloping side of a ridge.

Back-thrusting: Thrusting towards the interior of an orogenic belt.

Barbed drainage: Drainage pattern in which tributaries join main streams at acute angles but are then reversed; usually an indicator of reversed drainage.

Base level. The level below which land cannot be eroded by running water. Sea level is the ultimate base level.

Basement: The undifferentiated complex of rocks that underlies the rocks of interest in an area.

Basin: 1. An area of internal drainage. 2. A syncline that is circular or elliptical in plan. 3. A pile of sedimentary rocks in a basin.

Basin and range structure/landscape: A regional structure/landscape of fault-block mountains and sediment-filled basins.

Basin and swell: Second order landscape features; a continent can be conceived as consisting of a number of basins separated by swells.

Basin folds: Folds in structural basins, possibly due to differential compaction.

Batholith: A large mass of plutonic rock.

Bedding: The arrangement of sedimentary rocks in beds, layers or strata.

Behead: To cut off by river capture the upper part of a river.

Beheaded stream: The stream from which water has been diverted by river capture.

Belt: A band of a particular kind of rocks or rock

structures exposed at the surface.

Bench: A terrace or small platform.

Benioff zone: A steeply-dipping zone behind island arcs and some continental margins marked by earthquake epicentres and thought to mark subduction sites.

Blueschist facies: Metamorphic rocks indicating high pressure and low temperature, and possible indicators of plate collision. Glaucophane schist.

Bouguer anomaly: A gravity anomaly calculated after correction for latitude, elevation, and terrain.

Bouyancy mechanism: Suggested mechanism permitting nappe movement when lithostatic pressure and hydrostatic pressure become about equal.

Breakers at the nappe front: Excessive crumpling at the front or distal part of a nappe, often characterised by cascade folds. Branden der Deckenstirne.

Brittle zone: The upper zone of the earth's crust where rocks respond to stress by fracture rather than plastic flow.

Bubnoff unit: A conventional measure of process rates such as uplift, erosion, coastal retreat, expressed as millimetres per thousand years.

Butte: A steep-sided hill, often capped by a horizontally-disposed hard rock.

C

Caldera: A large (1-20km) volcanic depression, roughly circular.

Capture: River piracy.

Camber: An apparent anticline along an interfluvium formed by flow of plastic strata beneath a caprock into a valley, with sagging of caprock at the edges.

Capable fault: Legal term for a fault thought capable of future movement. Usually based on activity within a stated time, such as the past 35,000 years.

Cascade: Multiple folds in a competent rock on a topographic slope caused by gravity sliding.

Catastrophe: A sudden violent change in the physical condition of the earth's surface; a cataclismic change in landscape.

Cauldron subsidence: Structure resulting from subsidence with a steep ring fracture (2-20 km diameter), often associated with ring dykes.

Central volcano: Large volcano in which activity persisted at the same centre for a long time.

Chevauchement intercutanes. (internal nappes) A structure where a series of overthrusts are found within seemingly tranquil apparently unmoved strata.

Collapse caldera: A caldera resulting from collapse, after removal of underlying magma.

Collapse structures: Structures resulting from downhill sliding under gravity.

Collision sites: Those places where converging plates collide, with attendant effects of mountain building, subduction, etc.

Compensation, isostatic: Equilibrium attained on the assumption that columns of earth material have equal weights irrespective of the elevation of the ground surface.

Competent: Applied to strata that respond to folding without internal flowage.

Compression: A system of forces or stresses that tends to decrease the volume or shorten the length of a rock.

Consequent stream: A river flowing in the direction of the dip of rocks; a dip stream.

Continent: A large land mass, consisting of sial, rising fairly abruptly above the deep ocean.

Continent-ocean collision: Collision between the oceanic part of one plate and the continental part of another, usually resulting in subduction or obduction.

Continent-continent collision: Collision between two continental parts of plates, as between India and the Asia plate.

Continental basin: A region in the interior of a continent comprising one or several closed basins.

Continental drift: The hypothesis that the continents can drift on the surface of the earth, and that they were once united in one or two supercontinents.

Continental island: An island consisting of continental type material; a microcontinent.

Continental margin: The submarine edge of a continent, comprising continental shelf, continental slope and continental rise.

Continental plate: That part of a plate underlying a continent; thick siallic plate.

Continental platform: Platform-like mass of continent, including the continental shelf, that stands above the oceanic basins.

Continental rise: Submarine surface on the seaward side of the continental slope.

Continental shelf: Gently sloping zone between the shoreline and the steeper continental rise.

Continuous deformation: Deformation by flowage rather than rupture.

Contraction hypothesis: Hypothesis that folds and faults results from a shrinking of the earth.

Convection: A process of fluid flow as a consequence of different temperatures within the medium.

Convection cell: A domain within which subcrustal material is moving by convective flow; often proposed as a driving force for continental drift and plate tectonics.

Convective flow: A postulated movement of material deep in the earth resulting from differences in temperature and density.

Convergent boundary: A boundary where two plates are converging.

Coral reef: Accumulation of coral and other carbonate organic remains to build a rock barrier up to sea level.

Couples oroclinal: Two oroclinal that together form an S shape.

Craton: A relatively large area of a continent, immobile since ancient times.

Cratonization: The process whereby sediments and volcanic rocks deposited at the edge of a craton become welded to the craton, becoming part of it.

Creep: The flow of material in a solid crystalline state.

Crest: The line of highest points in a topographic ridge, anticline, or stratum.

Cross fault: A fault that runs diagonally or perpendicularly to the strike of a strata.

Crushing strength: The compressive stress necessary to cause a solid to fail by fracture.

Crust: The outer layer or layers of the earth, above the mantle.

Cuesta: An asymmetrical ridge.

Culmination: The highest point on a nappe, dome or other structure.

Curie point: The temperature above which rocks cannot be magnetised.

Cycle of denudation: The alternate tectonic uplift and wearing down of a landmass.

Cycle of erosion: The wearing down of a landmass to base level, which will be repeated after tectonic uplift.

Cymatogeny: The broad upwarp of large areas, especially continental margins, by vertical tectonics.

D

Decken structure: Nappe structure. A series of large recumbent folds and overthrust sheets.

Decollement: The independent folding and faulting of an upper series of sedimentary beds by sliding them over an unaffected underlying basement.

Deep: Oceanic area of exceptional depth, often thought to mark subduction sites.

Delta: Alluvial area at a river mouth.

Delta plains: Plains formed at the mouths of major rivers.

Dendritic drainage pattern: The simplest drainage pattern, in which tributaries join at acute angles which point downstream, the whole having a tree-like appearance.

Denudation: The sum of weathering and erosion processes.

Diapir: Dome or anticline in which light, mobile material, such as salt, has intruded overlying, more brittle materials. Piercement fold.

Diastrophism: The processes that deform the earth, and the results of these processes.

Differential compaction: The relative change in thickness of layers of different grain size and composition under loading.

Differential erosion: The more rapid erosion of one part of the earth's surface compared with another.

Digital terrain model: Computer-generated image of topography based on a grid of spot heights.

Dike: See dyke.

Discontinuity: Sudden changes with depth in some physical property of earth material, as indicated by seismic data.

Discontinuous deformation: Deformation of stressed rocks by rupture rather than flowage.

Discordant coast: A coast transverse to the trend of fold belts; an Atlantic-type coastline.

Disharmonic fold: A fold in which plastic and rigid beds have different geometric relationships.

Disjunctive folds: Folds in which brittle beds interbedded

with plastic beds are pulled apart into blocks.

Dislocation: Displacement of rocks on opposite sides of a fracture.

Diverted stream: 1. In stream piracy the stream that was diverted from the beheaded stream by river capture. 2. A stream which has been diverted by tectonic movement, volcanic eruption, landslide, etc.

Divide: Watershed. The line of separation between drainage systems. Interfluve.

Dome: A roughly symmetrical structure in which dips radiate from a centre.

Double island arc: Island arc with an outer line of non-volcanic islands, and an inner line of volcanic islands.

Doubly plunging fold: A fold that plunges in opposite directions from a central point.

Downwarp: A gently inclined area thought to be produced by tectonic lowering of a neighbouring low area.

Drainage divide: The rim of a drainage basin, consisting of watersheds or interfluves.

Drainage pattern: The arrangement of drainage lines within an area: patterns are related to structure and geomorphic history.

Dyke: A vertical or high angle sheet of intrusive igneous rock.

Dyke swarm: A set of numerous dykes, often parallel.

Dynamic equilibrium: The concept that a balance is attained in slope erosion, stream erosion and tectonic uplift, so that the landscape remains the same despite the operation of these processes.

E

Earthquake scarplet: A small fault scarp or step produced at the time of an earthquake.

Ecoulement: The downhill gliding of a large mass of rock under the influence of gravity.

Elbow of capture: Sharp bend in a river course marking the point where one river has been diverted into another by capture.

Endogenic: Relating to deep seated processes.

En echelon faults: Fault system in which faults die out to be replaced by parallel faults slightly offset.

Entrenched meander: A meander eroded below the surface on which it was formed, possibly indicating uplift.

Epeiric: Broad up or down movement of large areas without folding.

Epeirogenic movement: Broad uplift or depression of large areas without folding.

Epeirogeny: Broad movements of uplift and subsidence that affect the whole or large parts of continental areas or ocean basins.

Epicontinental seas: Small seas bordering continents and bounded by barriers other than island arcs.

Epigenic. Relating to processes at or near the surface of the earth.

Erosion: The group of processes which remove rock material from the earth's surface.

Erosion surface: A land surface shaped by erosion. Sometimes limited to rather flat erosion surfaces.

Erosion tectonics: Large-scale folding and faulting consequent upon erosion of valleys.

Erosion thrust: A thrust fault along which the hanging wall moved across an erosion surface.

Etching: Deep weathering followed by removal of weathering products.

Etchplain: An erosion surface formed by deep weathering followed by removal of the weathered material (stripping).

Eugeosyncline: A geosyncline in which volcanic rocks and debris are abundant.

Eulerian pole: When points move apart on a sphere they move along 'latitudes' relative to poles of rotation known as Eulerian poles.

Eustasy: World-wide simultaneous change in sea level.

Eustatic: Related to world-wide changes in sea level.

Exhumed topography: Topography that has been buried under younger rocks and then exposed again by erosion.

Explosion caldera: A roughly circular depression, several kilometres across, formed mainly by violent volcanic explosion.

Extended streams: Old streams which become extended over an emerged coastal plain.

Extension (crustal): The widening of a block of the earth's crust, often associated with normal faulting.

Extinct volcano: A volcano considered (sometimes unwisely) to be safe from renewed eruption.

F

False anticline: Anticline-like structure due to compaction of sediment over a resistant mass such as a hill.

Fault: A fracture along which there has been relative movement of the rocks on each side.

Fault basin: A depression bounded by faults.

Fault block: A mass of rock bounded on at least two opposite sides by faults.

Fault block mountain: A mountain originating by uplift of a large fault-bounded block of rocks.

Fault (chasmic): Fault extending through the lithosphere, bounding crustal fragments or plates.

Fault complex: A system of interconnecting faults.

Fault embayment: A fault-bounded depression invaded by the sea.

Faulting: the movement which causes relative displacement on opposite sides of a fault.

Fault line: The intersection of a fault with the earth's surface.

Fault-line scarp: A scarp that results from differential erosion on opposite sides of a fault, rather than resulting directly from fault movement.

Fault plane: A fault surface, even if curved.

Fault scarp: A scarp formed as a direct result of faulting at the earth's surface.

Fault set: Two or more parallel faults in an area.

Fault system: Two or more fault sets that were formed at the same time.

First order landforms: continents and oceans.

Fissure: An extensive crack.

Fissure eruption: A volcanic eruption from a fissure or from points along a fissure.

Flake tectonics: A variant in collision tectonics, in which one of the plates splits into two flakes, one of which is

subducted, the other obducted.

Flap: An overturned limb lying on the ground surface as a result of gravity sliding.

Flat: A surface of low relief.

Flatiron: A triangular topographic surface, with horizontal base and one elevated corner, formed by erosion of dipping strata.

Flexure: A bend in strata.

Flysch: A body of thin bedded dark shale, siltstone, cross-bedded greywacke and other sediments.

Fold: A bend in strata or any planar structure.

Fold axis: Line following the apex of an anticline or the lowest part of a syncline.

Fold belt: A large strip of folded rocks with the dimensions of a geosyncline or mountain chain.

Fold mountains: Mountains consisting of elevated, folded sedimentary rocks. It is commonly assumed (mistakenly?) that the folding and uplift occurred together in an 'orogeny,' sometimes associated with crustal shortening.

Fold nappe: Recumbent fold in which the middle limb has been completely sheared out.

Fold system: Group of folds showing common features and trends.

Foliation: The laminated structure resulting from segregation of different minerals parallel to schistosity.

Foredeep: Narrow oceanic depression bordering an island arc or continent.

Foreland: The relatively stable area bounding a fold belt and towards which apparent movement has occurred.

Foreland folding: The creation of a fold belt by apparent push of a sedimentary pile towards a foreland.

Fracture: Breaks in rocks due to intense folding or faulting.

Framed basin: Polygonal sedimentary basin bounded by structural highs.

Fringing reef: Coral reef attached to a shore.

G

Gap: Deep notch or gorge in a ridge or mountain chain.

Gash fractures: Tension fractures diagonal to an associated fault.

Geanticline: A broad uplift, generally referring to an area of geosynclinal sediments. Originally synonymous with anticlinorium.

Geodepression: Long, narrow depression, not necessarily filled with sediment.

Geodesy: Investigation of the shape and dimensions of the earth.

Geofracture: Master fracture of great age, often separating very different rocks.

Geographical cycle: Cycle of erosion.

Geoid: The figure of the earth considered as a mean sea-level surface extended through the continents.

Geologic province: Large region with similar geologic history and development throughout.

Geology: Earth science in all its aspects.

Geomorphic cycle: cycle of erosion.

Geomorphology: Scientific study of landforms and associated processes and materials.

Geophysics: Branch of physics dealing with the earth.

Geosphere: The solid portion of the earth.

Geostrophic: Pertaining to deflection resulting from rotation of the earth.

Geosynclinal prism: Mass of sediments accumulated in a geosyncline.

Geosynclinal sediment: Associated sediments or rocks presumed to be characteristic of geosynclinal deposition.

Geosyncline: Large linear trough that subsided over a long period and accumulated a thick succession of sediments and sometimes volcanic rocks.

Geotectonic: Pertaining to the form, arrangement and

structure of the rocks in the earth's crust.

Geothermal gradient: The change of temperature of the earth with depth.

Geotumor: A large swell where the crust is bulged upwards from which strata may glide down under their own weight into adjoining depressions.

Gipfelflur: Plane through accordant summits in mountain region, possibly indicating a former land surface.

Glacio-isostasy: Isostatic balance in areas affected by the weight of glacial ice.

Glencoe type caldera: Cauldron subsidence, accompanied by quietly effusive volcanic activity.

Glide plane: Plane along which gravity sliding occurs.

Glide plane scar: The surface exposure of a glide plane as a slope or escarpment.

Gneiss: Coarse grained, banded metamorphic rock.

Gneiss mantled dome: Granite dome with a mantle of gneiss having foliation parallel to the dome surface.

Gondwana; Gondwanaland: Former supercontinent including India, Australia, Antarctica, and parts of southern Africa and South America.

Gorge: A deep, narrow, steep-sided passage through high ground.

Graben: A relatively long and narrow down-faulted block.

Grade: Continuously descending, smooth curve of a stream channel, supposedly adjusted to be just steep enough to carry its load of sediment.

Graded: Brought to some sort of equilibrium by erosional and depositional processes under the influence of some base level. Refers to both stream channels and hillsides.

Graded profile: A hillslope or stream channel at grade.

Graded slope: Unbroken slope in which equilibrium is attained between production of debris by weathering, and removal of debris by erosion.

Graded stream: A stream which has supposedly reached some sort of equilibrium and is at grade.

Granite: Plutonic rock consisting of alkali feldspar, quartz, mica and sometimes hornblende.

Granite gneiss: Banded metamorphic rock of granitic composition.

Granite tectonics: The structural features of plutons and their surroundings.

Gravitational sliding: gravity sliding.

Gravity: The attractive force exerted by the earth.

Gravity compaction: Compaction of sediment resulting from overburden pressure.

Gravity sliding: Extensive sliding of strata under the influence of gravity, producing overthrust faults, folds and nappes.

Gravity spreading: The spreading of elevated land over surrounding lower country, with faulting and folding, that sets in whenever an elevation over 3km is produced.

Gravity tectonics: Tectonic features which were created in response to gravitational forces.

Great Divide: A major watershed of continental significance.

Great Escarpment: An escarpment of large size following a continental margin and related to major tectonic uplift.

Guyot: Flat-topped seamount, subaerially eroded in the past, since when it has sunk.

H

Hade: The angle of inclination of a fault from the vertical.

Harmonic folding: Folding in which there are no sudden changes in form with depth.

Headward erosion: Extension of a valley by erosion in an upstream direction.

Heat flow: Dissipation of heat from within the earth to the surface by conduction.

Heave: In faulting, the horizontal component of the dip separation.

High, structural: The higher part of a dome or anticline.

High-angle fault: A fault with a dip greater than 45° .

Highland: Elevated region of mountains or plateaus.

High plain: Extensive area of relatively level land well above sea level; a plateau.

Hill: A prominence smaller than a mountain.

Hinge line: A line of abrupt flexure.

Hinterland: The undisturbed terrain behind a fold belt; the side away from which thrusting and recumbent folding appear to have taken place.

Hogback: A ridge produced by erosion on steeply dipping strata; a roughly symmetrical cuesta.

Holocene: The last 10 000 years.

Homoclinal shifting: The downdip movement of a strike river, brought about by relatively greater erosion on the downdip side.

Horizontal slip: The horizontal component of the net slip in faulting.

Horst: A block of rocks, relatively long and narrow, that has been uplifted along faults on either side.

Hydrodynamic: Relating to the force or pressure of water or other fluids.

Hydrostatic stress: State of stress in which all principal stresses are equal.

Hypsometric: Relating to elevation above a datum, usually sea level.

Hypsometric curve: Diagram showing the amount of land at different elevations.

I

Icecap: Regionally extensive glacier.

Imbricate structure: A series of overlapping thrust sheets dipping in the same direction.

Incised meander: Meander cut deeply below the surface on which it originated, possibly of tectonic significance.

Incompetent bed: A bed that deforms by flowage.

Injection folding: Deformation in a plastic layer between more competent layers resulting from differential changes in thickness.

Insequent stream: Streams with courses or stream patterns that are not due to any obvious factors.

Intermontane area: Structural and topographic basin enclosed by mountain ranges.

Intermontane trough: Subsiding area between mountain chains.

Intracratonic: Situated within a stable continental region.

Intracratonic basin: Roughly oval depressed area of considerable size within a continent.

Intramontane: Situated within or amongst mountains.

Intrusion: A body of igneous rock that invades older rock.

Inversion of relief: 1. When lava fills old valleys new valleys may be cut on each side of the flow leaving the lava flow as a ridge. 2. Topography in which anticlinal folds are in lowlands and highlands are on synclines.

Island arc: Curved chain of islands, generally convex towards the ocean, margined by a deep sea trench on the ocean side and with a back-arc basin between the arc and the backing continent, if present.

Island arc type geosyncline: Geosyncline parallel to an arc but separated from it by an arc-trench gap.

Isoclinal: Dipping in the same direction.

Isoclinal fold: A fold with limbs that have parallel dips.

Isostasy: Theoretical balance of all large portions of the earth's crust, as if they were floating on a denser, underlying layer.

Isostatic anomaly: The difference between the observed value of gravity at a point and the normal value of gravity at the point.

Isostatic compensation: 1. Isostatic adjustment, an equilibrium condition in which elevated masses such as continents or mountains are compensated by a mass deficiency beneath them. 2. Lateral flow of sub-crustal material to compensate for changes at the ground surface brought about by erosion and deposition.

Isostatic recovery: Movement of land in response to a change in load to regain balance.

Isostatic uplift: Uplift of land in response to removal of load.

J

Joint: Fracture in rock along which no appreciable movement has occurred.

Joint set: A group of more or less parallel joints.

Joint system: Two or more joint sets, or any group of joints with a characteristic pattern, such as radial, concentric.

Jura-type folds: Folds in an upper series of strata over an unaffected basement.

K

Kilauean type caldera: Caldera formed by collapse on top of a lava shield or dome.

Kinetics: Study of relations between forces and resultant movements.

Klippe: An isolated block of rocks separated from the underlying rocks by a low angle fault plane. Generally the rocks above the fault are the older.

Knee fold: Knee-shaped bend in competent strata resulting from gravity sliding.

Knickpoint: Point of abrupt change of gradient in the long profile of a stream or valley floor.

Krakatauan type caldera: Caldera formed by collapse following a Krakatauan eruption.

L

Lake: A standing body of inland water.

Lake plain: A plain formed by alluvial fill of a former lake.

Lake terrace: Terrace formed around the shores of a former lake by alluvial fill and coastal erosion, terminated by lowering of the lake surface level.

Landform: Term for all the features that together form the surface of the earth, ranging from broad features like plains and plateaus, to valley sides and gullies.

Landslide: The relatively rapid downward sliding of a mass of earth and rock, under the influence of gravity.

Landslip: A landslide, often one triggered by erosional undercutting, or earthquake shock.

Left-lateral fault: A strike-slip fault with movement such that an observer approaching the fault would have to go left to find matching strata, etc. on the far side of the fault.

Lineament: Significant lines visible in landscapes, maps, or remote-sensing images.

Linear: Straight or gently curving physiographic feature.

Lineation: A linear structure within a rock.

Listric fault: A curved fault, steep at the surface and flatter at depth.

Lithostatic pressure: The pressure in the crust of the earth due to the weight of the overlying rocks.

Littoral: Relating to a shore.

L-joints: Horizontal or nearly horizontal joints in igneous rocks.

Longitudinal fault: Fault with strike parallel to the general structure.

Longitudinal stream: A strike stream.

Longitudinal valley: A strike valley.

Low, structural: 1. Area in which the beds are structurally lower than in neighbouring areas. 2. Saddle between local highs along the crest of an anticline.

Low-angle fault: A fault dipping less than 45° .

M

Maar: Volcano consisting of a broad crater in bedrock, below the level of the general groundsurface (often holding a lake), and a surrounding rim of pyroclastics.

Macrostructure: Structural feature of rocks that can be seen by the naked eye.

Magma chamber: A large reservoir in the earth's crust full of magma.

Magnetic anomaly: A departure from the magnetic field of the earth as a whole.

Magnetic declination: The acute angle between the direction of the magnetic and geographic meridians.

Magnetic dip: Magnetic inclination. The acute angle between the vertical and the direction of the earth's total magnetic field in the magnetic meridian plane.

Mantle: Layer of earth between crust and core.

Marginal basin: Submarine basin at the foot of the continental slope.

Marginal fissures: Joints along the margin of an intrusive body that dip inwards towards the intrusion.

Marginal platform: Submarine shelf adjacent to a continent, at a greater depth than the continental shelf.

Marginal thrusts: Thrust faults along the margin of an intrusive body that dip towards the intrusion.

Marginal trench: Submarine, narrow, steep-sided depression parallel to a continental margin.

Massif: A mountainous mass.

Mass movement: Downwards movement of surficial materials by creep, landslides, etc.

Mass wasting: The lowering of a groundsurface by mass movement processes.

Mature landscape: Anthropomorphic description of landscape with various connotations; often indicates slope-dominated landscape with limited development of plateaus and plains.

Mature river: Anthropomorphic description of river; generally indicates smooth long profile, but limited

development of alluvial plains.

Mature valley: Anthropomorphic description of valley: generally means broad, V-shaped valley with little vertical erosion but limited valley widening.

Maturity: The middle and major phase in the anthropomorphic description of landforms and landscapes in terms of youth, maturity and old age.

M-discontinuity: Mohorovicic discontinuity.

Median mass: Plateau or massif between two out-facing mountain ranges or fold belts.

Mediterranean-type geosyncline: Geosyncline with intercontinental sedimentation.

Mega-: 1. Prefix meaning large. 2. Prefix meaning one million times.

Megalineament: A lineament that can be traced for hundreds of kilometres.

Megashear: A transcurrent fault with very large displacement (>100 km).

Mesa: Flat-topped hill or mountain.

Meso-: Prefix meaning middle.

Meta-: Prefix to denote metamorphic equivalent.

Metamorphic rock: Rocks formed by altering earlier rocks in response to high temperature, pressure or both.

Metamorphism. Process of forming metamorphic rocks.

Meteor crater: Topographic depression formed by the impact of a meteor.

Meteoric: Relating to the atmosphere.

Meteoric water: Rainwater.

Micro-: 1. Prefix meaning very small, 2. Prefix meaning one-millionth.

Mid-oceanic islands: Isolated islands that rise from the deep sea floor. Chiefly volcanic.

Mid-ocean ridge: Topographic submarine ridge, often but not always in a mid-ocean position. The centre of sea-floor spreading.

Miogeosyncline: A geosyncline in which volcanic rocks are rare or absent.

Mobile belt: A large, long part of the earth in which sediments accumulate and are folded.

Mobilization: Process that enables rocks to flow.

Mohorovicic discontinuity: Seismic discontinuity about 35 km below the continents and 10 km below the oceans, separating the earth's crust and mantle.

Molasse: Sediment derived from erosion of newly formed mountains and deposited in foredeep basins thought to be genetically related to the mountains.

Monadnock: A residual hill or mountain standing above a plain.

Monocline: A local steepening of otherwise uniform gentle dip.

Morphogenetic region: A region with an assemblage of landforms relating to the prevailing climate, and differing from regions with different climate.

Morphology: Observation of the form of lands.

Morphometry: Measurement and mathematical characterisation of form.

Morphotectonics: The interaction of tectonics and geomorphology, and the study of this part of earth science.

Mount: Mountain. Always used instead of 'mountain' before a proper name.

Mountain: Land considerably higher than the surrounding country.

Mountain chain: A line of mountains.

Mountain range: A line of mountains.

Mud volcano: Conical mound built of mud erupted at the surface, often built around a spring.

Mylonite: Fine-grained rock formed by extreme microbrecciation and milling of rock during movement on a fault surface.

N

Nappe: A large sheet of rock that has moved several kilometres by overthrusting or overfolding.

Negative area: Area that subsided conspicuously or repeatedly.

Neogene: The later two epochs of the Tertiary.

Neotectonics: 1. Tectonic movements of the present and the recent past. 2. Tectonic movements of the Neogene. 3. Legal use relates to so-called 'capable faults', that is faults which display such recent movements that they seem capable of further movement. 'Recent' refers to some stated period, often 35,000 years.

Net slip: The total slip along a fault measured on the fault surface between two points that were originally adjacent.

New Zealand type fault-block landscape: Block-faulted landscape with through rivers and little debris accumulation.

Nickpoint: Point where a sudden change in gradient occurs in the long profile of a stream or valley.

Normal dip: Regional dip of strata, contrasted with local dip affected by local structures.

Normal fault: A usually high-angle fault at which the hanging wall has been depressed relative to the footwall.

0

Obduction: The thrusting of a slab of sea floor over a continental slab during continent-ocean collision.

Oblique fault: Fault with strike oblique to the strike of the strata.

Oblique joint: Joint with strike onlique to the strike of adjacent strata or cleavage.

Oblique-slip fault: A fault with net slip in a direction between the direction of the dip and that of the strike.

Obsequent stream: Antidip stream. A stream flowing in a direction opposite to that of the dip of the strata.

Obsequent fault-line scarp: A scarp along a fault line, where the upthrown block is on the side of the topographic low.

Ocean: The body of salt water that covers two thirds of the earth's surface.

Ocean-ocean collision: Collision between the oceanic part of two plates, usually to form an island arc.

Oceanic islands: Islands that rise from deep water far from continents, usually volcanic.

Oceanic rise: Large area above the deep ocean floor but not part of a mid-ocean ridge.

Offlap: Strata deposited along a receding shore, with successive layers further seaward.

Offset: Displacement of formerly contiguous bodies.

Old age landscape: Anthropomorphic term for a landscape consisting mainly of plains near base level.

Old age river: Anthropomorphic term for a river on broad alluvial plains near base level.

Oldland: The oldest topographic surface of which evidence still survives. A palaeoplain.

Olistostrome: Sedimentary melange. Sedimentary stratigraphic unit with many exotic blocks in fine-grained matrix.

Onlap: Extension of successive strata towards land resulting from deposition in a transgressive sea.

Ophiolites: Altered mafic igneous rocks, presumed to have been erupted on the sea floor.

Order: Expression of the magnitude of landforms, with first order of continents and oceans, second order of features such as mountain chains or regional plains, and third order including individual valleys, hillslopes, etc.

Original dip: The dip of strata immediately after deposition.

Orocline: Bend of a fold belt or mountain chain in a horizontal plane after the formation of the fold belt.

Orogen: Belt of deformed rocks, often metamorphosed and intruded by plutons.

Orogenesis: 1.Original meaning - the process of forming mountains, especially by folding. 2.Modern meaning - the process of forming fold belts.

Orogenic: Adjective derived from orogeny.

Orogenic facies: Classification of sediments according to their presumed relationship to periods of tectonic deformation.

Orogeny: A period of folding related to a specific time span. Also the process of folding.

Oregon-type fault-block landscape: Block fault landscape where original rocks were flat-lying.

Outlier: Portion of stratified group detached from the main body by erosion.

Overflow stream: The spillway from a lake.

Overfold: Fold in which the beds on one limb are overturned.

Overthrust: A thrust fault with low dip.

Overturned: Folds or strata tilted past the vertical.

P

Pacific-type coastline: Coast parallel to the trend of folded rocks.

Pacific-type geosyncline: A geosyncline formed at converging plate boundaries.

Paired metamorphic belts: An inner belt of low-pressure facies (andalusite) and an outer belt of high-pressure facies (glaucophane), of similar age, associated with island arcs.

Paleogene: The early Tertiary, including the Paleocene, Eocene and Oligocene.

Palaeogeography: The geography of an area at some specified time in the past.

Palaeomagnetism: Magnetic signal preserved in rock from some former time.

Palaeoplain: The oldest erosion surface of which we have evidence in the landscape.

Palaeotectonic: The crustal deformation at a given time in the past.

Palinspastic maps: Map showing restoration of folded and faulted rocks to their original relative position.

Pangaea, Pangea: Former supercontinent comprising Gondwanaland and the northern continents.

Panplain: An erosion surface thought to result from lateral erosion by rivers.

Parallel drainage: Drainage pattern with parallel streams, often without structural control.

Parallel fold: Fold in which each bed maintains the same thickness throughout all parts of the fold.

Passive margin: The side of a continent where there is no subduction or collision; a trailing edge.

Pediment: Gently sloping planar erosion surface eroded across hard rock.

Pediment pass: Narrow, flat erosion surface connecting pediments on opposite sides of a ridge.

Pediplain: Extensive erosion surface formed by the coalescence of numerous pediments. Defined by some as an erosion surface resulting from parallel slope retreat.

Peneplain: An extensive erosion surface, almost a plain. Defined by some as an erosion surface resulting from slope decline.

Petrographic province: A region in which the igneous rocks are thought to be derived from a common parent magma.

Physiographic province: A region with similar structure, climate and geomorphic history throughout.

Physiography: The study of the genesis and evolution of landforms.

Piedmont: Lying or formed at the base of mountains.

Piedmont alluvial plain: Plain formed by coalescence of alluvial fans at the base of a mountain range.

Piercement dome: Dome in which the core (usually salt) has broken through the overlying strata.

Plain: An extensive area of nearly level land.

Planation surface: Extensive plain formed by any type of erosional process.

Planeze: A remnant of an original volcanic cone surface after radial erosion has removed much of the volcano; usually triangular.

Plastic zone: Deep zone where rocks deform by plastic flow rather than by brittle fracture.

Plastic deformation: A permanent change in the shape of a solid without rupture.

Plasticity. Property of material enabling permanent deformation without volume change, elastic rebound, or fracture.

Plate: A first order unit of the earth's crust consisting of some continent, some ocean, or some of both.

Plate tectonics: Hypothesis that the earth's crust consists of a number of plates and most tectonic effects occur at plate boundaries

Plateau: An elevated area of comparatively flat land.

Platform: Area of thinner sediment adjoining a geosynclinal trough.

Plugs: Cylindrical bodies of igneous rock, solidified.

volcanic feeders. The topographic features formed by erosion of such feeders.

Plunge: The dip of a fold axis.

Pluton: A large body of igneous rock formed deep in the earth.

Pole-fleeing force: Force supposedly causing land masses to move towards the equator.

Polje (tectonic): A large depression in limestone (karst) country which is of tectonic rather than solutional origin.

Ponding: The formation of a pond or lake by processes such as faulting, volcanic action, or landslide.

Positive area: Area that has been uplifted conspicuously or repeatedly.

Post-orogenic: An event that takes place after a period of folding.

Pratt isostasy: A hypothesis for hydrostatic balance based on changes in density.

Pressure, geostatic: The pressure exerted by a column of rock.

Primarrumpf: An upwarped, progressively expanding dome, with a rise so slow that erosion keeps pace with uplift.

Principal axes of stress: The coordinate axes along which no shearing stress exists.

Principal stresses: Intensities of stress (maximum, minimum and intermediate) along each of three mutually perpendicular axes in terms of which any state of stress can be described.

Profile of equilibrium: 1. Profile of a river which is neither eroding nor depositing; a graded profile. 2. A shore profile on which the incoming and outgoing of beach materials is balanced.

Pyroclastic cone: Volcanic cone consisting of pyroclastics.

Pyroclastics: Fragmental volcanic material which has been blown into the atmosphere by explosive activity.

Q

Quaternary: The younger of the two systems or periods in the Cainozoic era. The past two million years.

R

Radial drainage pattern: Streams radiate from a centre, as on a volcanic cone.

Radial faults: Faults that radiate from a common centre.

Range: A chain of mountains or hills.

Reach: A straight portion of a river.

Recent: The past 10,000 years. The Holocene.

Rectangular drainage pattern: Drainage pattern resulting when streams have right-angle bends, usually joint controlled. Trellis drainage.

Recumbent fold: Fold in which the axial plane is more or less horizontal.

Reef: Ridge of rock just below the water surface, especially one of coral.

Reef atoll: A ring-shaped coral reef.

Reef complex: Reef core and all associated rocks and sediments.

Re-entrant: An indentation in a coast or in any other landform.

Regmatic: 1.Refering to strike slip faults. 2.Fault pattern.

Regression: Retreat of a shoreline, with relative emergence of the land.

Rejuvenated fault: Fault which has moved after a long period of no movement.

Rejuvenation: Anthropomorphic expression of making streams young again. An increase in vertical erosion.

Relative relief: The difference in elevation between the high and low points in a landscape.

Release fractures: Fractures that result from release of pressure.

Relief: The difference in elevation between the high and low points of a landsurface.

Repose, angle of: The slope at which any given material will come to rest under specified conditions.

Resequent fault-line scarp: A fault line scarp in which the downfaulted side is also the topographically low side.

Resequent stream: Dip stream. Stream that flows in the direction of dip.

Resultant: A single force that produces the same results as two or more forces.

Resurgent tectonics: Renewed tectonic movement along ancient lines.

Reticulate: A network.

Retrograding shore line: A shore line that is retreating under wave attack.

Reverse fault: A fault along which the hanging wall has been raised relative to the footwall.

Rheidity: Capacity of material to flow.

Rheology: Study of flowage of materials, especially the plastic flow of rocks.

Rhombochasm: A parallel-sided gap in the siallic crust occupied by simatic crust, interpreted as a dilation.

Ria: Drowned fluvial valley.

Ridge: Relatively narrow and steep-sided strip of elevated land.

Rift: 1.A narrow fissure. 2.A large strike-slip fault parallel to regional structures.

Rift trough: A graben.

Rift valley: Huge graben produced by subsidence between parallel faults.

Right-lateral fault: A strike-slip fault in which an observer on one side notes a matching feature on the far side to be displaced to his right.

Rim syncline: Synclines that develop around the periphery of domes (salt domes, granite domes), presumably in some sort of volume compensation.

Ring dyke, ring dike: A hypabyssal intrusion that is ring-shaped in plan, and dips outwards at a high angle.

Rise: A long and broad elevation of the ocean floor.

River: A stream of flowing water carrying sediment to lower ground.

River capture: The diversion of the headwaters of one river by the headward erosion of another valley, which then carries the captured headwaters.

River system: A main river and all its associated tributaries.

River terrace: A flat area bordering a river, at a higher elevation, that is a remnant of a former flood plain.

Roof and wall structure: Gravity collapse structure with a limb that bends abruptly from moderate dip to vertical.

Root zone: 1.Place where the axial plane of a recumbent fold becomes steeper and dips at a high angle into the earth.
2.Place where a low angle thrust fault becomes steeper and dips at a high angle into the earth.

S

Saddle: 1. A low point in a ridge or crest. 2. A sag in the crest of an anticline.

Sagponds: Ponds occupying depressions along active faults.

Salient: 1. A projection from any land feature. 2. A projection of a foreland into a fold belt.

Salt basins: Closed, subsiding basins filled with evaporites, often part of the rifting that precedes continental break-up.

Salt dome: Dome resulting from upward migration of a mass of salt.

Salt glacier: Mass of mobile salt at the earth's surface that flows slowly outward from an exposed salt plug.

Scarp: An escarpment. Steep slope bounding a plateau, bench, asymmetric cuesta, etc.

Schist: Medium grained metamorphic rock with subparallel orientation of micas which dominate its composition.

Schistosity: The foliation in coarser metamorphic rocks.

Schuppen structure: Imbricate structure.

Scissors fault: Normal fault with displacement decreasing to a point of origin and then increasing again beyond that point.

Sea: A large body of water, usually part of the ocean.

Seamount: A submerged mountain rising from the deep sea floor.

Second order landforms: Sub-continental landforms such as major plateaus and mountain ranges, mid-continental plains.

Sector graben: Eccentric or lateral 'caldera' on the flank of a volcano, produced by down-faulting.

Sedimentary basin: Depressed area with thick sediments in the middle and thinner sediments at the edges.

Seismic: Related to earthquakes.

Seismic centre: The point of origin of an earthquake.

Seismic discontinuity: Physical discontinuity within the earth separating materials in which seismic waves travel at

different velocities.

Seismology: The science of earthquakes.

Separation: The distance between two originally adjacent points displaced by a fault.

Shear: The effect produced by shearing stress.

Shearing stress: A stress causing two adjacent parts of a solid to slide past one another parallel to the plane of contact.

Sheeting: The production of joints roughly parallel to the ground surface, probably as a result of pressure release.

Shelf: Offshore zone extending from the shore to about 200 m where there is usually a rather steep descent to greater depths.

Shield: A part of a continent that has been relatively stable over a long period. A craton.

Shield volcano: A low, broad volcano many kilometres across, built mainly of lava and with slopes generally less than 10°.

Shift: The relative displacement of points on opposite sides of a fault.

Shore: The margin between land and water.

Shoreline of emergence: Shore produced when there is a relative fall in water level.

Shoreline of submergence: Shore produced when there is a relative rise of water level, generally drowning valleys and making the shore more irregular.

Shuttermidges: Ridges that have been moved laterally by strike-slip faulting and which come to block valleys.

Sial: The crustal layer that comprises the continents, of approximately granitic composition.

Sill: An intrusive body of igneous rock, sheet-like and parallel to bedding or other structure in the intruded rock.

Sima: A shell of the earth underlying the continents and directly underlying the oceans, of basaltic composition.

Similar folding: Type of folding in which each successive bed shows the same form as the bed above, implying thinning of the limbs of the fold.

Slaty cleavage: Foliation of slates and other rocks resulting from parallel arrangement of platy minerals.

Slickenside: Polished and striated surface features on a fault plane.

Slide: Landslide.

Slip-sheet: Gravity collapse structure; a bed that has slid down the side of an anticline, fractured, and slid on over the adjacent strata.

Slump: The downward sliding of a mass of earth material, generally over a concave slip plane, with backward rotation of the slumped mass.

Somma type caldera: Caldera formed by collapse of the top of a volcanic cone, generally following Plinian eruption.

Sphenochasm: A triangular piece of oceanic crust separating two cratonic blocks with fault margins converging to a point, interpreted as caused by rotation.

Sphenopeizm: A wedge-shaped compressive area opposed to a sphenochasm.

Spreading site: A line away from which sea-floor spreading is taking place, by repeated intrusion of new basalt.

Stage names: The anthropomorphic names for stages in landscape evolution:- youth, maturity and old age.

Stillstand: A period when sea level does not change.

Stock: The solidified contents of a magma chamber at fairly shallow depth, often roughly cylindrical.

Strato-volcano: Volcano built of both lava flows and pyroclastic deposits; often large, and built over a long period.

Stream: A body of flowing water.

Stream capture: The abstraction of the headwaters of one stream by headward erosion of another stream.

Stream order: Topological scheme for labelling streams. First order streams are unbranched. Two first order streams unite to form a second order. Two second order streams unite to make a third order stream, and so on. There are several systems of stream ordering.

Strength: The limiting stress that a solid can withstand without failing by rupture or continuous plastic flow.

Stress: Force per unit area.

Stress difference: Algebraic difference between maximum and minimum principal stresses.

Strike: The bearing of the outcrop of strata or a structure on a level surface.

Strike ridge: A ridge running parallel to the strike of local strata.

Strike-slip fault: A fault along which movement is mainly horizontal in the direction of the fault.

Strike stream: A stream parallel to the strike.

Strike valley: A valley parallel to the strike.

Stripping: Removal of regolith, perhaps to create an etchplain.

Structural basin: A roughly circular structure in which the rocks dip towards the centre.

Structural bench: A terrace or similar flat area underlain by level strata.

Structural control: The apparent control of form and location of landforms by underlying geological structure:

Structural geology: Study of the structural features of rocks.

Structural geomorphology: The study of landforms that are related to rock structure.

Structural high: The higher part of an anticline or dome.

Structural low: The lowest part of a syncline or basin.

Structural plain: A plain on level strata, possibly owing its existence to some hard band.

Structure: The sum total of all the structural features of an area.

Structure contour: A contour drawn through points of equal elevation on a stratum.

Submarine canyon: Steep valleys that cross the continental margin.

Submergence: Relative fall of land relative to sea at a

coast.

Sub-ocean ridge: Alternative name for so-called mid-ocean ridge, as such ridges are not always located in mid-ocean.

Subsequent stream: Strike stream.

Subsequent valley: Strike valley.

Summit accordance (concordance): The roughly equal elevation of ridge tops and mountain summits that might indicate the former existence of an ancient erosion surface which has been largely destroyed.

Superimposed stream: A stream with a course that was originally established on overlying strata, or on an erosion surface at a higher elevation. The course has been maintained at a lower level, even though the stream course may now be discordant to structure.

Surface thrust: Thrust fault in which the hanging wall is thrust over the ground surface.

Suture: A line, fault, or zone along which continental blocks have collided.

Swell: A low dome.

Symmetrical fold: A fold with limbs dipping at similar angles.

Synclinal axis: The central line of a syncline towards which each limb dips.

Syncline: A fold in rock in which the limbs dip inwards.

Synclinorium: A broad regional syncline including many minor folds.

Syneclise: Broad depression or basin of large size.

Synorogenic: Adjective to describe something, usually granite intrusion, at the same time as the folding of a fold belt.

T

Tableland: Level elevated area, a plateau:

Tablemount: A seamount with a flat top, a guyot.

Tablemountain: 1. A flat-topped mountain, often structurally controlled. 2. A tuya.

Taphrogenesis: Broad vertical movements with high-angle faulting.

Taphrogeny: The formation of rift valleys.

Tear fault: Strike-slip fault that trends transverse to the strike of the deformed rocks.

Tectogene: Deeply downbuckled belt of sediments.

Tectogenesis: The process by which rocks are deformed, the formation of folds, faults, joints and cleavage.

Tectonic. Pertaining to rock structure formed by movement.

Tectonic basin: A surface basin created directly by deformation of the earth's crust.

Tectonic framework: The structural elements of a region, especially the rising, sinking and stable areas.

Tectonic map: Map showing major structural features of an area, generally on a small scale map; detailed maps of the same thing are usually called structural maps.

Tectonic melange: Body of rock composed of tectonically mixed blocks in a sheared shaly matrix.

Tectonic relief: Topographic relief formed directly by tectonic activity.

Tectonics: Study of the broader structural features of the earth, and their causes.

Tectonic transport: Movement within a rock by flowage.

Tectonism: 1. Structural behaviour of an element of the earth's crust. 2. Crustal instability.

Tectonosphere: The crust of the earth where tectonic activity takes place.

Temporary base level: Lowest level to which a stream can

erode under existing structural conditions.

Tensile stress: A stress tending to pull material apart.

Tension: A system of forces tending to pull material apart.

Tension fault. Fault produced by tension.

Tension fracture: Any fracture produced by tension.

Tension joint: A joint that is a tension fracture.

Terrace: Relatively flat area bounded by steeper slopes, often long and narrow.

Terrain: An area of land considered as a group of natural features, especially landforms.

Terrain analysis: Division of a region into terrain elements with similar natural features, especially landforms.

Tertiary: The earlier of the two periods comprising the Cainozoic era (the other is the Quaternary). The system of strata deposited during that period.

Tethys: Pre-Tertiary seaway that separated Europe and Africa and extended across south east Asia.

Tetrahedron theory: Idea that the earth, in shrinking, tends to adopt the form of a tetrahedron rather than a sphere.

Thalassic. Pertaining to the sea.

Thalweg: 1. The long profile of a stream of valley. 2. Line joining the deepest points of a stream channel.

Third order landforms: Individual landforms such as hillsides or valleys.

Threshold. Physical point at which the behaviour of material changes in style, such as from laminar to turbulent flow, from plastic deformation to fracture.

Thrust: 1. Push forward. 2. Fault replacing the overturned limb of a fold.

Thrust fault: A reverse fault, with low angle of inclination.

Thrust plane: The plane of a thrust fault.

Thrust scarps: 1. Sinuous scarps marking the outcrop of a low-angle thrust sheet. 2. Fault scarp of high angle reverse fault.

Thrust sheet: The block above a thrust fault.

Tight fold: Fold in which the limbs diverge at a small angle.

Tilt block: Fault block, the surface of which has been tilted.

Tilt slide: Gravity slide down the slope of a tilted surface.

Topography: Physical features of an area, especially the relief and landforms.

Trailing edge: Edge of a continent where no subduction is occurring; a passive continental margin.

Transcurrent fault: Strike-slip fault.

Transform fault: Category of fault on the sea floor, bordering spreading sites, in which a strike-slip fault gives way to a fault trace along which there is no displacement.

Transgression: Movement of a coastline in a landward direction resulting from a relative rise in sea level.

Transverse fault: A fault whose strike cuts across the general structure.

Trellis drainage: Stream pattern in which tributaries join master streams almost at right angles, usually a combination of strike and dip streams.

Trench: Long, narrow depression in the deep sea, often bordering an island arc.

Triple junctions: Y-shaped junctions where three plates come together and where three spreading sites join.

Trough: A relatively long and narrow depression.

Turtleback: A large, curved topographic surface underlain by metamorphic rocks with foliation parallel to the topographic feature. Variant of gneiss mantled dome. Mainly in Death Valley region, USA.

Turtleback fault: Fault above the metamorphic rock in a turtleback, variously interpreted as a thrust fault, normal fault, or gravity slide.

Tuya: A mountain formed by volcanic eruption beneath an ice cap, with a caprock of lava flows over pillow-lava and pyroclastics.

U

Ultimate strength: The greatest stress that a substance can stand under normal short-time experiments.

Unconformity: A surface of erosion or non-deposition separating younger strata from older rocks.

Undation: Large-scale wave-like fold in the earth's crust.

Undation theory: Theory of mountain building based on broad wave-like uplift with associated gravity sliding and folding, with an outward migration of the wave of uplift.

Uniclinal shifting: The down-dip lateral movement of a river through time across the top of a resistant bed.

Uplift: Relative elevation of part of the earth's surface.

Upthrust: Upheaval of a block, usually on a high-angle thrust fault.

Upwarp: Broad uplift of an area with slight bending.

V

Valley: A long depression, usually followed by a stream.

Valley bulge: Apparent anticline following the line of a valley, formed where incompetent material is forced up into the river bed (and eroded away) by the weight of the hill masses on either side. Competent beds become turned up at the valley sides.

Vertical slip: The vertical component of net slip in faulting.

Vertical tectonics: Tectonics resulting from vertical (radial) movement, as opposed to horizontal (tangential) movement as in compressive folding.

Volcanics: General term for all rocks and pyroclastics erupted from volcanoes.

Volcano: 1. A vent in the earth's crust from which lava, pyroclastics and gas are erupted. 2. A mountain or hill built up by accumulation of material erupted from a volcanic vent.

Volcano-tectonic depression: Surface depression caused by the collapse of the roof of a magma chamber brought about by rapid emptying of the magma.

W

Warping: Gentle bending of the earth's crust, usually over a broad area.

Water gap: A pass in a ridge through which a stream flows.

Watershed: 1. Interfluve; divide between different catchments. 2. In American usage a catchment within a watershed boundary, a drainage basin.

Wildflysch: Highly contorted flysch, containing clay, shale, sandstone and exotic blocks.

Wind gap: Notch through a ridge, no longer followed by the stream which made it.

Window: Area in an overthrust sheet where rocks beneath the thrust plane are exposed by erosion.

Wrench fault: A nearly vertical strike-slip fault.

Y

Young valley: A V-shaped valley; A valley with irregular long profile. Anthropomorphic term for alleged early stage of valley evolution.

Youthful landscape: Anthropomorphic term for landscape considered to be in early stage of development. A landscape with many plateau remnants, and tendency for rivers to flow in gorges.

Z

Zigzag folds: Very sharp V-shaped folds with straight limbs.

Zwischengebirge: Median mass. A plateau between two mountain ranges.