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BARBARA ANN KIPFER, Ph.D.

THE ORDER OF THINGS

HIERARCHIES,
STRUCTURES,
AND
PECKING ORDERS

BARBARA ANN KIPFER, Ph.D.
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This book is dedicated to
the guys who put up with all my
“orders of things”

Paul
Kyle
and Keir
(in age order!)

And special thanks to
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for their tremendous help.

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PREFACE

The world is not to be put in order, the world is in order. It is for us to put ourselves in unison with this order

—Henry Miller

Francis Bacon, seen by some as the first exponent of the scientific method, attempted to organize all of human knowledge, to prepare a thorough and detailed systematization of the whole range of human knowledge—from the ancient to the modern world. *The Order of Things* offers just that: a comprehensive schema, a storyboard of the world.

So many things in our world are related, but how often do we know how? So many subjects and things have a structure, but how often are we aware of what its hierarchy actually is? From the inner workings of the smallest things to the complex system of the universe, this book is an attempt to cover all those things that we have organized, or that we find naturally organized, into:

- SUCCESSIONS
- STRUCTURES
- SEQUENCES
- SCALES
- RANKINGS
- ORDERS
- HIERARCHIES
- DIVISIONS
- CLASSIFICATIONS
- BRANCHES

We know these orders exist, but have you ever tried to look one up? One can easily enough find the plant and animal kingdoms in the encyclopedias, but how about the organization of the Boy Scouts, the Mafia, or sumo wrestling ranks? Want to know the larg-

est islands in the world? Curious about what each line on a UPC code signifies? Would you like to learn the path of an e-mail message? Now you have a place to look.

The Order of Things contains orders from 13 general areas which may apply to one's work, studies, or personal interests. In the book, around 400 orders are covered so that the user may take a wide look at the universe, and at the same time choose to look at narrower views of particular subjects. The book puts the multilayered world into clearer focus by presenting the frameworks and orderings of the mass of information, and can even work as a creativity tool. Its logical structure and word associations can assist in brainstorming, aid in preliminary research, and provide a source of words and facts for writing or fun. *The Order of Things* helps make sense of a very complicated world.

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THE EARTH

Here hills and vales, the woodland and the
 plain, Here earth and water seem to strive
 again . . . Where order in variety we see, And
 where, though all things differ, all agree.

—Alexander Pope, *Windsor Forest*

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ATMOSPHERE

AIR QUALITY INDEX

(established by the Environmental Protection Agency as a measure of air pollutants: carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, and particulates)

- 0–50:** good, no cautionary status
- 51–100:** moderate, no cautionary status, however some pollutants may affect a very small number of people
- 101–150:** unhealthy for sensitive groups, no cautionary status
- 151–200:** unhealthy, alert for elderly or ill to stay indoors and reduce physical activity
- 201–300:** very unhealthy, alert for general population to stay indoors and reduce physical activity
- 301–500:** hazardous, emergency alert, all stay indoors, windows shut, no physical activity

ATMOSPHERIC LAYERS

Homosphere: lower of two portions of atmosphere, from surface to 50–62 mi (80–100 km)

Heterosphere: upper of two portions of atmosphere, above 50–62 mi (80–100 km)

Troposphere: 0–11 mi (18 km), where life and weather are concentrated

Tropopause: layer joining tropo- and stratospheres

Stratosphere: 11–30 mi (18–50 km); includes ozonesphere

Stratopause: layer joining strato- and mesosphere

Mesosphere: 31–50 mi (50–80 km); also called lower ionosphere; airglow and ozone band

Mesopause: layer joining meso- and thermosphere

Thermosphere: 50–250 mi (80–400 km)

Thermopause: layer joining thermo- and exosphere

Exosphere or magnetosphere: 250–40,000 mi (400–64,000 km)

D-layer or D-region: 35–55 mi (56–88 km); absorbs energy of short-wave radio waves reflected by other layers

Kennelly-Heaviside layer, E-layer, or E region: 55–95 mi (88–154 km); during the day, reflects radio waves

Appleton layer, F-layer, or F region: 95–250 mi (154–400 km); reflects radio waves of up to 50 Mhz

FOUR WINDS OF GREEK MYTHOLOGY

Four Directions

Boreas: north

Notus: south

Eurus: east

Zephyr: west

In-Between Directions

Euroauster: southeast

Afer: southwest

Caurus: northwest

Euroclydon: northeast

HUMIDEX HUMIDITY SCALE

(A scale devised to measure comfort layers in extreme heat, based on the temperature and relative humidity.)

20–29: comfortable

30–39: some discomfort

40–45: uncomfortable for everyone

46+: many types of work must be stopped

SMOG ALERT STAGES

Stage 1: up to .20 parts per million (caution to those with heart and respiratory conditions)

Stage 2: up to .35 parts per million (caution against strenuous exercise)

Stage 3: over .35 parts per million (emergency: schools close, people remain indoors)

CAVES

DEEPEST CAVES

(The deepest cave was discovered in 2001.)

Cave	Location	Depth, ft
Krubera-Voronja	Georgian Republic	7,119
Lamprechtsofen-Vogelschacht	Austria	5,354
Gouffre Mirolda	France	5,335
Réseau Jean Bernard	France	5,256
Torca del Cerro del Cuevon (Torca de las Saxifragas)	Spain	5,213
Sarma	Georgian Republic	5,062
Shakta Vjacheslav Pantjukhina	Georgian Republic	4,948
Cehi 2	Slovenia	4,928
Sistema Cheve	Mexico	4,869
Sistema Huautla	Mexico	4,839

CITIES

LARGEST URBAN CENTERS

City	Location	Population
Tokyo	Japan	35,197,000
Mexico City	Mexico	19,411,000
New York City–Newark	U.S.	18,718,000
São Paulo	Brazil	18,333,000
Jakarta	Indonesia	18,215,000
Mumbai (Bombay)	India	18,196,000
Delhi	India	15,048,000
Shanghai	China	14,503,000
Calcutta	India	14,277,000
Buenos Aires	Argentina	12,550,000
Dhaka	Bangladesh	12,430,000

City	Location	Population
Los Angeles–Long Beach– Santa Ana, CA	U.S.	12,550,000
Karachi	Pakistan	11,608,000
Rio de Janeiro	Brazil	11,469,000

LARGEST U.S. CITIES

(per the 2000 census; figures rounded up to nearest hundred thousand)

City	State	Population
New York	New York	8,000,000
Los Angeles	California	3,900,000
Chicago	Illinois	2,900,000
Houston	Texas	2,100,000
Philadelphia	Pennsylvania	1,500,000
Phoenix	Arizona	1,500,000
San Antonio	Texas	1,300,000
San Diego	California	1,300,000
Dallas	Texas	1,200,000
San Jose	California	900,000

CLIMATES AND CLIMATIC REGIONS

BIOMES

(A biome consists of several different ecosystems found together in a single geographical zone, sharing the same climatic conditions.)

Deciduous Forest

Desert

Grasslands/Savannah

Rainforest

Taiga/Coniferous Forest

Tundra

CLIMATE ZONES *(A climate zone is any of the geographical regions loosely divided according to prevailing climate and latitude; listed here coldest to warmest.)*

Polar ice cap (Antarctica)
 Polar tundra (western Greenland)
 Boreal (Siberia)
 Temperate (United States, northern Europe)
 Cold temperate (northern Canada)
 Cool temperate maritime (London)
 Cool coastal desert (Lima, Peru)
 Highland (Quito, Ecuador)
 Middle-latitude dry (North Dakota)
 Warm temperate (Greece)
 Temperate oceanic (Paris)
 Temperate continental (Montreal; New York)
 Tropical-subtropical humid (Charleston, South Carolina)
 Subtropical dry (Perth, Australia)
 Tropical-subtropical dry (Phoenix, Arizona)
 Tropical desert (Egypt)
 Tropical wet-and-dry (Calcutta)
 Tropical wet; monsoon (Myanmar; Singapore)

DESERTS

Desert	Location	Size, sq mi
Sahara	Africa	3,320,000
Great Australian	Australia	1,470,000
Arabian	Arabia	900,000
Gobi	Asia	500,000
Kalahari	Africa	360,000
Taklamakan	China	270,000
Patagonian	Argentina	260,000
Great Basin	U.S.	190,000
Chihuahuan	Mexico	175,000
Namib	Africa	135,000

Desert	Location	Size, mi
Sonoran	U.S. and Mexico	120,000
Kyzylkum	Asia	115,000
Thar	India and Pakistan	77,000

RAIN FOREST LAYERS

Emergent layer, 200 feet above ground: isolated trees that tower above canopy

Canopy, 100–165 feet: tall straight trees form dense, unbroken region

Lower canopy/Understory layer, 40–100 feet: larger leaves, home to many birds, snakes, lizards, big cats, insects

Understory, 10–20 feet: young trees, small conical trees, shrubs

Ground layer: floor vegetation

VEGETATION ZONES

(A vegetation zone is an extensive, sometimes transcontinental, band of similar vegetation on the earth's surface, listed here coldest to warmest.)

Polar and tundra

Boreal forest or taiga (cold forest)

Mountain regions

Temperate forest

Mediterranean (hot dry summers, cool wet winters)

Steppes or dry grassland (hot dry summers, very cold winters)

Tropical rain forest

Desert (hot)

Tropical grassland (always hot, with a wet and a dry season)

ZOOGEOGRAPHICAL REGIONS

(These six geographical divisions of the world have been devised for the study of the distribution of land animals.)

Palaeartic: Europe, northern Africa, northern Middle East, north and central Asia

Nearctic: North America and Greenland

Neotropical (also Neogea): Central and South America to central Mexico, Caribbean

Afrotropical (also Metagea): sub-Saharan Africa, Madagascar, southern Middle East

Oriental: southern Asia and adjacent islands

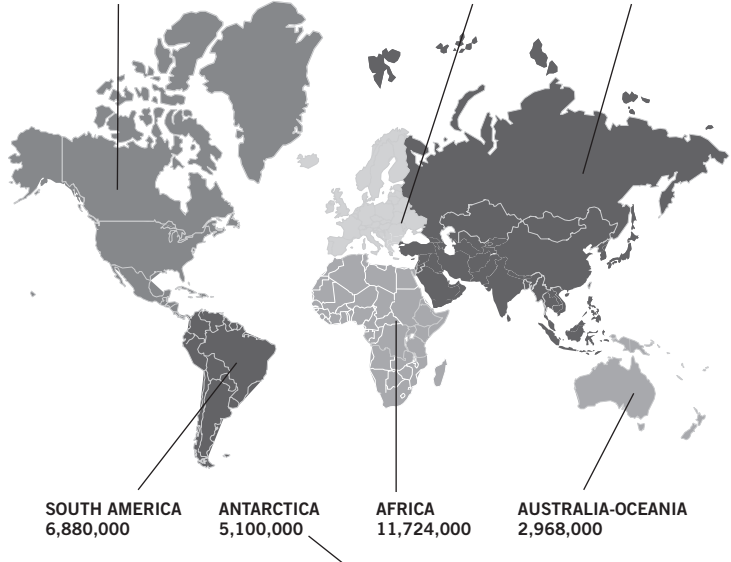
Australian (also Australasian, Notogea): Australia, Oceania

Antarctic: Antarctica

CONTINENTS

SURFACE AREA OF CONTINENTS (*in sq mi*)

NORTH AMERICA 9,365,000 EUROPE 4,000,000 ASIA 17,226,000



SOUTH AMERICA 6,880,000 ANTARCTICA 5,100,000 AFRICA 11,724,000 AUSTRALIA-OCEANIA 2,968,000

POPULATION OF CONTINENTS

Asia	3,879,000,000	South America	379,500,000
Africa	877,500,000	North America	501,000,000
Europe	727,000,000	Australia/Oceania	32,000,000

DEPRESSIONS IN THE EARTH'S SURFACE**DEEPEST DEPRESSIONS** (*maximum depth below sea level*)

Depression	Location	Depth, ft
Dead Sea	Jordan and Israel	1,378
Turfan Depression	China	505
Qattara Depression	Egypt	436
Poluostrov Mangyshlak	Kazakhstan	433
Danakil Depression	Ethiopia	383
Death Valley	California, U.S.	282
Salton Sink	California, U.S.	235
Zapadnyy Chink Ustyurta	Kazakhstan	230
Prikaspiyskaya Nizmennost	Russia and Kazakhstan	220
Ozera Sarykamysh	Uzbekistan and Turkmenistan	148

LARGEST METEORITE CRATERS

Crater	Location	Diameter, mi
Vredefort	South Africa	186
Sudbury	Ontario, Canada	155
Chicxulub	Yucatan, Mexico	106
Popigai	Siberia, Russia	62
Manicouagan	Quebec, Canada	62
Acraman	South Australia	56
Chesapeake Bay	Virginia, U.S.	56
Puchezh-Katunki	Russia	50
Morokweng	South Africa	45
Kara	Russia	40
Beaverhead	Idaho	37

EARTHQUAKES

MERCALLI SCALE

Number	Intensity	Effects	Number on Richter Scale
I	Instrumental	Detected by seismographs and some animals	< 3.5
II	Feeble	Noticed by sensitive people at rest	3.5
III	Slight	Vibration similar to passing truck; hanging objects swing	4.2
IV	Moderate	Felt generally indoors; things rattle and parked cars rock	4.5
V	Rather strong	Felt generally; most sleepers wake up	4.8
VI	Strong	Trees shake; chairs fall over; some damage	5.4
VII	Very strong	General alarm; walls crack; plaster falls	6.1
VIII	Destructive	Chimneys, columns, monuments, weak walls fall	6.5
IX	Ruinous	Some houses collapse as ground cracks	6.9

EARTH SCIENCES

BRANCHES OF EARTH SCIENCE

Atmospheric Sciences

Aeronomy: study of earth's and other planets' atmosphere

Meteorology: study of atmosphere and its phenomena

Climatology: study of physical state of atmosphere

Number	Intensity	Effects	Number on Richter Scale
X	Disastrous	Many buildings destroyed; railway lines bend	7.3
XI	Very disastrous	Few buildings survive; landslides and floods	8.1
XII	Catastrophic	Total destruction; ground forms waves	> 8.1

RICHTER SCALE

Number	Effects
2.0-2.9	Not felt by many; perceived by sensitive seismographic machines
3.0-3.9	Slight vibration; hanging objects swing
4.0-4.9	Vibration; small objects move and rattle
5.0-5.9	Furniture moves; masonry cracks and falls
6.0-6.9	Difficulty standing; walls and chimneys collapse partially
7.0-7.9	Buildings collapse; cracks in ground; landslides
8.0-8.9	Damage to underground structures; rock masses moved

Geological Sciences

Astrogeology: application of geology, geochemistry, geophysics to moon and other planets

Economic geology: geology applied to engineering and materials usage

Engineering geology: geology applied to civil engineering

Environmental geology: geology applied to environmental concerns

- Petroleum geology:** geology applied to hydrocarbon fuel technology
- Urban geology:** geology applied to urban concerns
- Geobotanical prospecting:** use of plants to locate ore deposits
- Geobotany:** study of plants in relation to geologic environment
- Geochemistry:** study of chemical makeup of earth and its processes
- Geochronology:** dating of events in earth's history
- Radiometric dating:** using radioisotopes to date events
- Geochronometry:** study of absolute age of rocks by measuring radioactive decay
- Geocosmogony:** study of the origin of the earth
- Geomorphology:** study of the origin of secondary topographic features of the earth
- Geophysics:** physics of the earth and its environment
- Geodesy:** study of size, shape, gravitational field, etc., of the earth
- Glacial geology:** study of land features resulting from glaciation
- Mineralogy:** study of minerals
- Crystallography:** study of geometric description of crystals
- Structural geology:** study of form, arrangement, and internal structure of rocks
- Paleontology:** study of life as recorded in fossils
- Invertebrate paleontology:** fossils of invertebrates
- Micropaleontology:** fossils of microorganisms
- Paleobotany:** fossils of plants
- Palynology:** fossils of spores, pollen, microorganisms
- Vertebrate paleontology:** fossils of vertebrates
- Petrology:** study of origin, history, structure, etc., of rocks
- Igneous petrology**
- Metamorphic petrology**
- Sedimentary petrology**
- Physical geology:** study of composition of earth and its physical changes

Seismology: study of earthquakes

Stratigraphy: study of rock strata

Historical geology: study of bedded rocks

Volcanology: study of volcanoes

Hydrologic Sciences

Glaciology: study of glaciers

Hydrology: study of the waters of the earth

Limnology: study of lakes

Oceanography: study of oceans

HIERARCHY OF LIVING SYSTEMS

Individual: a plant or animal of a particular species

Population: coexisting group of individuals of the same species

Community: coexisting populations of different species

Ecosystem: several different communities coexisting in a characteristic way

Biome: different ecosystems found together in a single geographical zone, sharing the same climatic conditions

Biosphere: the sum total of all the earth's biomes; the thin life-bearing layer that forms the outer surface of the planet

EARTH STRUCTURES

EARTH LAYERS

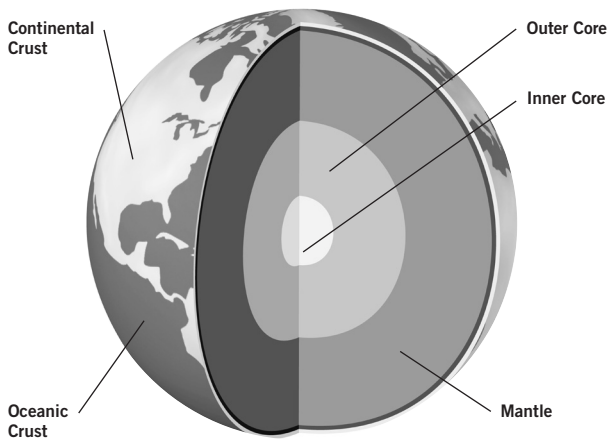
Continental crust: thin layer of hard rock 4–44 mi thick; temperature at bottom of crust about 1,900°F; consists of calcium-iron-magnesium silicates below and aluminum-sodium-potassium silicates above.

Oceanic crust: large, water-filled hollows in crust; average depth 2.2 mi; same composition as lower continental crust

Mantle: dense, semimolten layer of iron-magnesium silicates about 1,800 mi thick, temperature rises to 6,700°F; thicker under oceans than continents

Outer core: molten; 90% iron, 9% nickel, and 1% sulfur; about 1,240 mi thick; temperature approx. 4,000°F

Inner core: dense, hot layer of 90% iron, 9% nickel, and 1% sulfur; about 1,712 mi thick; temperature approx. 8,100°F



CHEMICAL ELEMENTS OF THE EARTH'S CRUST

(percentage, from most to least common)

Oxygen	46.6
Silicon	27.7
Aluminum	8.1
Iron	5.0
Calcium	3.6
Sodium	2.8
Potassium	2.59
Magnesium	2.1

OPENINGS IN THE EARTH'S CRUST

Canyon: very deep valley

Gorge: narrow canyon with steep walls

Valley (col): depression between mountains or raised land

Crater: a bowl-shaped depression

Dale: broad valley

Ravine: deep valley

Glen: narrow valley

Dell: small valley, often wooded

Dingle: narrow dell

Hollow (notch): small valley

Fissure: narrow opening created by land mass movement, as from an earthquake

Vent or Volcano: a fissure emitting lava and/or gases.

Fault: a crack in the earth's crust

Trench: long hole or ditch, often created by running water

Gully: deep trench

Fumarole: a hole or spot in a volcanic region

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